SANATANA DHARMA COLLEGE

ALAPPUZHA

Affiliated to the University of Kerala
Reaccredited by NAAC with A+ grade

CRITERION 2

TEACHING-LEARNING & EVALUATION

2.6.1& 2.6.2

SYLLABUS (UG & PG)

UNIVERSITY OF KERALA

FIRST DEGREE PROGRAMME(CBCS System) in B.A. ENGLISH LANGUAGE AND LITERATURE

Revised Syllabus for 2020 Admissions onwards
(Core, Complementary, Open & Elective Courses)

(2020 ADMISSION ONWARDS)

FIRST DEGREE PROGRAMMES (CBCS System) in B.A. ENGLISH LANGUAGE AND LITERATURE

SEMESTERS I to VI - COURSE BREAKUP [2020 Admission onwards]

Sem No	Course No	Course Title	Instructional Hours	Credits
1	EN 1111.1	Language Course 1: Language Skills	5	4
1		Language Course 2: [Additional Language 1]	4	3
1	EN 1121	Foundation Course 1: Writings on Contemporary Issues	4	2
1	EN 1141	Core Course 1: Introduction to Literary Studies I	6	4
1	EN 1131	Complementary Course 1: Popular Literature and Culture	3	3
1		Complementary Course 2 [External]	3	2
2	EN 1211.1	Language Course 3: Ability Enhancement Compulsory Course- Environmental Studies and Disaster Management	5	4
2	EN 1212.1	Language Course 4: English Grammar Usage and Writing	4	3
2		Language Course 5: [Additional Language 2]	4	3
2	EN 1241	Core Course 2: Introduction to Literary Studies II	6	4
2	EN 1231	Complementary Course 3 : Art and Literary Aesthetics	3	3
2		Complementary Course 4 [External]	3	3
3	EN 1311.1	Language Course 6: English for Career	5	4
3		Language Course 7:[Additional Language 3]	5	4
3	EN 1341	Core Course 3: British Literature I	5	3
3	EN 1321	Foundation Course 2: Evolution of the English Language	4	3
3	EN 1331	Complementary Course 5: Narratives of Resistance	3	3
3		Complementary Course 6 [External]	3	3
4	EN 1411.1	Language Course 8: Readings in Literature	5	4
4		Language Course 9 [Additional Language: 4]	5	4
4	EN 1441	Core Course 4: British Literature II	5	4
4	EN 1442	Core Course 5: Literature of the 20th Century	4	3
4	EN 1431	Complementary Course 7: Philosophy for	3	2

		Literature		
4		Complementary Course 8 [External]	3	3
5	EN 1541	Core Course 6: Literature of Late 20th Century and 21st Century	5	4
5	EN 1542	Core Course 7: Postcolonial Literatures	4	4
5	EN 1543	Core Course 8: 20th Century Malayalam Literature in Translation	4	3
5	EN 1544	Core Course 9: Linguistics and Structure of the English Language	4	4
5	EN 1545	Core Course 10: Criticism and Theory	5	4
5	EN 1551.1	Open Course 1: Communicative Applications in English	3	2
5	EN 1551.2	Open Course 1: Theatre Studies	-do-	-do-
5	EN 1551.3	Open Course 1: Film Appreciation	-do-	-do-
6	EN 1641	Core Course 11: Gender Studies	5	4
6	EN 1642	Core Course 12: Indian Writing in English	5	4
6	EN 1643	Core Course13: Film Studies	5	4
6	EN 1644	Core Course 14: World Classics	4	3
6	EN 1661.1	Elective Course: Translation Studies	3	2
6	EN 1661.2	Elective Course: American Literature	-do-	-do-
6	EN 1661.3	Elective Course: Creative Writing	-do-	-do-
6	EN 1661.4	Elective Course: English for the Media	-do-	-do-
6	EN 1661.5	Elective Course: 20th Century Regional Literatures in English Translation	-do-	-do-
6	EN 1661. 6	Elective Course: Copy Editing	-do-	-do-
6	EN1645	Project	3	4

BA English Language and Literature: Programme Outcome

PO 1: A comprehensive understanding of the discipline of literary studies

PO 2: Realize the divergent and plural voices that come in to the making of the corpus of literary studies.

PO 3: Understand literature as one of the many arts that seeks literary expression and its close connection with other art forms like painting, music, dance, movie and so on down the ages.

PO 4: Imbibe the importance of multidisciplinary approach to understand the nuances of literary expressions.

PO 5: Understand the specific socio-cultural backdrop of the formation of literary representations.

PO 6: Form an awareness of the multiplicities of such socio-cultural realities that shape literary representations and to critique the inherent hegemony.

PO 7: The ability to trace the development of the English language from the early writings to its present day use in specific contexts.

PO 8: Address the requirements of the language use in a globalized context

PO 9: Ensure the importance of study of the English language in relation to the study of language and literature of the mother tongue.

PO 10: Have improved competence in translation and to view the same not only as a tool for cultural transmission but also as skill acquisition.

PO 11: Comprehended the current modes of writings – that which encompasses the issues related to race, gender, ethnicity, climate change etc. and realize the role of literature in inculcating social sensitiveness

PO 12: The competence to identify the literary voices of dissent from diverse parts of the globe and to reflect on the popular culture and literature.

PO 13: A basic knowledge of research methodology and other areas related to the faculty of research.

PO 14: Imbibe a research oriented approach to the study of humanities in connection with the basic understanding of social sciences to initiate a multidisciplinary approach of study.

PO 15: Contribute to the realm of knowledge production with an increased intellectual, creative, critical and multidisciplinary capability.

SEMESTER I

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS SYSTEM)

Core Course 1: EN 1141 Introduction to Literary Studies I

No. of Credits: 4 **No. of Instructional hours: 6 per week [Total: 108 Hours]**

Aim To introduce the world of literature

Objectives

1. Develop an awareness of the diversity of world literature, representing different forms, time and space
2. An awareness of genre, with emphasis on forms of poetry and drama
3. Develop an inquisitiveness to read more of literature in the line of texts suggested in the course.

Course Outcome

CO 1: Introduce varied literary representations.
CO 2: Familiarize students with the nature and characteristics of literature.
CO 3: Discuss the nature and characteristics of literature
CO 4: Introduce two key genres of literature, poetry and drama.
CO 5: Possess a foundational understanding of poetry and drama.

COURSE OUTLINE

Module I Introduction
Art form-Oral-Written- Narrative forms- Poetry- Prose- Literary Fiction- Novel- Novella-Short Story- Electronic Literature-Popular Literature

1. Swapna Gopinath: "What is Literature?" https://freereads854632715.wordpress.com/2020/10/04/what-is-literature/
2. Mario Klarer: Chapter 2, 'Major Genres in Textual Studies' Section on Poetry and Drama Pages (27-56) *An Introduction to Literary Studies*. Routledge, 1999.

Module II Poetry- Forms
What is Poetry? Nature-Characteristics-Poetic Forms-Lyric-Epic-Elegy-Ballad-Ode-Sonnet-Dramatic Monologue-Narrative Poems-Pastoral-Free Verse-Blank Verse -Haiku -Performance Poetry-Graphic Poetry

1. Edgar Allen Poe: "Annabel Lee"
   https://www.poetryfoundation.org/poems/44885/annabel-lee
2. P.B Shelley: "To a Skylark"
   https://www.poetryfoundation.org/poems/45146/to-a-skylark
3. John Milton: "Lycidas"
   https://www.poetryfoundation.org/poems/44733/lycidas
4. Edna St. Vincent Millay: "I, Being born a Woman and Distressed (Sonnet XLI)"
   https://poets.org/poem/i-being-born-woman-and-distressed-sonnet-xli
5. Kae Tempest: "The woman the boy became"
   https://kaleidoscopetodd.tumblr.com/post/108439629368/the-woman-the-boy-became
   https://www.youtube.com/watch?v=YS7vPjsMsJw
6. Matsuo Basho: "The Old Pond"
   https://www.poemhunter.com/poem/the-old-pond/

Module III- Glimpses of World Poetry

1. Khalil Gibran: "On Children"
   https://poets.org/poem/children-1
2. Pablo Neruda: "Tonight I Can Write the Saddest Lines"
   https://www.poemhunter.com/poem/tonight-i-can-write-the-saddest-lines/
3. Mary Elizabeth Frye: "Do not stand at my grave and weep"
   https://www.poemhunter.com/poem/do-not-stand-at-my-grave-and-weep/
4. Gabriel Okara: "You Laughed and Laughed and Laughed"https://theafricanbookreview.com/2014/05/09/you-laughed-and-laughed-and-laughed-gabriel-okara/
5. Wislawa Szymborska: "Possibilities"
   https://www.poemhunter.com/poem/possibilities-21/
6. Amrita Pritam: "I will meet you yet again"
   http://www.littlemag.com/ghosts/amritapritam.html

Module IV Drama

What is Drama? Nature-Characteristics-Tragedy-Comedy-Tragicomedy-One Act Plays-Melodrama-Opera-Pantomime-Mime-Ballet

1. Cedric Mount *: The Never Never Nest*
   https://kupdf.net/download/never-never-nest-one-act-play_5bda8f69e2b6f5b855bfbbc6_pdf
2. Sajitha Madathil*: Matsyagandhi*
   Golden Threshold: An Anthology of One Act Plays and Stories. Orient Blackswan, 2013.
3. Henrik Ibsen: *A Doll's House*
   https://www.gutenberg.org/files/2542/2542-h/2542-h.htm

Recommended Reading

Brillenburg Wrth, Kiene and Ann Rigney. *The Life of Texts: An Introduction to Literary Studies.* Amsterdam, Amsterdam University Press, 2019.

Carey, John. *A Little History of Poetry*. United States, Yale University Press, 2020
Casey, Maryrose. *Creating Space Contemporary Indigenous Theatre*. Brisbane, University of Queensland Press, 2004
Chaudhuri, Rosinka. *A History of Indian Poetry in English*.Cambridge University Press, 2016
Damrosch, David. *What is World Literature?*Princeton University Press, 2018
De, Souza, Eunice. Ed. *These my Words* The Penguin Book of Indian Poetry. Penguin Books, 2012.
Fischer-Lichte, Erika, *History of Drama and Theatre*, Routledge, 2002.
Frow, John. *Genre*.UK, Taylor and Francis, 2013.
Harper, Michael, S, Antony Walton.*The Vintage book of African American Poetry*
New York, Knopf Doubleday Publishing Group, 2012.
Hart, Stephen, M. *The Cambridge Companion to Latin American Poetry*, Cambridge, Cmbridge University Press, 2008.
Hosein , Ann. *The History of Theatre*. New York, The Rosen Publishing Group, 2015.
Ibsen, Henric, *A Doll's House*. Outlook Verlag, 2018.
Klarer, Mario. *An Introduction to Literary Studies*. UK,Taylor and Francis, 2005.
Lal, Ananda, *Theatres of India A Concise Companion*.Oxford University Press, 2009.
Mason, Bim. *Street Theatre and other Outdoor Performance*, Routledge, 1992.
Mc Clatchy, J,D. *The Vintage Book of Contemporary World Poetry*.New York, Vintage Books, 1996.
Mc Clatchy, J,D. *The Vintage Book of Contemporary American Poetry*.New York, Vintage Books, 2009.
Ricks, Christopher. *The Oxford Book of English Verse*, Oxford, Oxford University Press, 1999.
Styan, John L, John Louis Styan. *The English Stage A History of Drama and Performance*. Cambridge, Cambridge University Press, 1996.
Turner, Palgrave Francis. *The Golden Treasury*.New York, Steriling Publishing Private Limited. 2005.
Thayil, Jeet, *60 Indian Poets*, London, Penguin Books Limted,2008.

e-resources

https://www.youtube.com/watch?v=sr3nw7CZvO8 (Video of *A Doll's House*)
https://www.youtube.com/watch?v=yn2HdrAh-fA (Video of *Never Never Nest*)
https://www.youtube.com/watch?v=uCYFQvGdvpo&list=PLw835AzeS24O8LphQisApUy_APpNAG49e&index=14 (Video of *Matsyagandhi*)
https://pabloneruda.net/#
https://www.kahlilgibran.com/
https://www.poetryfoundation.org/poems/browse#page=1&sort_by=recently_added
https://www.poemhunter.com/
https://www.poetryinternational.org/pi/home
https://www.pitt.edu/~dash/folktexts.html
https://www.gutenberg.org/ebooks/search/?query=poetry&submit_search=Go%21
https://www.gutenberg.org/ebooks/search/?query=Drama&submit_search=Go%21https://www.gutenberg.org/ebooks/search/?query=theatre&submit_search=Go%21
https://www.gutenberg.org/ebooks/search/?query=one+act+plays&submit_search=Go%21

SEMESTER I

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS SYSTEM)

Complementary Course 1: EN 1131 Popular Literature and Culture

No: of Credits: 3 **No: Instructional Hours: 3 per week [Total 54 Hours]**

Aim To broaden the idea of literature and the concept of texts

Objectives

1. Learn the difference between genre fiction and literary fiction
2. Gain an understanding of the folk roots of popular literature
3. Gain a perspective into the debate between high and low cultures

Course Outcome

CO 1: Encourage the student to think critically about popular literature.

CO 2: Understand the categories of the "popular" and the "canonical"

CO 3: Identify the conventions, formulas, themes and styles of popular genres such as detective fiction, the science fiction and fantasy, and children's literature.

CO 4: An assessment of the literary and cultural value of popular texts

C O 5: Sensitize students to the ways in which popular fiction reflects and engages with questions of gender, identity, ethics and education.

COURSE OUTLINE

Module I Popular Literature and Culture- A Brief Overview

Popular literature- 'literature of the people'- origins and development- characteristic features- genres and subgenres- folk tales-fairy tales-ballads-romances-periodicals-detective fiction- sci-fi, fantasy-horror-children's literature-cartoon/comic strips- comics-chick lit-dance-music-art-television shows

Essays

1. Glover, David and Scott McCracken. "Introduction". The Cambridge Companion to Popular Fiction. Cambridge: CUP. 2012. (http://www.cambridgeblog.org/wp-content/uploads/2012/08/The-Cambridge-Companion-to-Popular-Fiction-Intro.pdf)

2. Felicity Hughes, 'Children's Literature: Theory and Practice', English Literary History,vol. 45, 1978 (https://www.jstor.org/stable/2872651?seq=1) https://fdocuments.in/document/childrens-literature-55845ad6244ac.html

Module II Prose and Verse

1. Brothers Grimm – "The Juniper Tree" https://www.pitt.edu/~dash/grimm047.html
2. Sir Arthur Conan Doyle – "The Adventure of the Speckled Band" https://etc.usf.edu/lit2go/32/the-adventures-of-sherlock-holmes/352/adventure-8-the-adventure-of-the-speckled-band/
3. Roald Dahl - Extracts from *Charlie and the Chocolate Factory* (Chapters 13 to 15, Penguin 2013) http://jssisdubai.com/Document/Uploaded/CharlieAndTheChocolateFactory.pdf
4. Satyajit Ray – "Professor Shonku and the UFO" (from *The Mystery of Munroe Island and Other Stories*, Puffin Classics 2015)
5. Ruskin Bond – "The Cherry Tree" (Penguin India 2012) http://englishories.blogspot.com/2014/02/the-cherry-tree-ruskin-bond.html
6. Bob Dylan – "Blowin' in the Wind" http://www.bobdylan.com/songs/blowin-wind/
7. John Lennon – "Imagine" https://www.azlyrics.com/lyrics/johnlennon/imagine.html
8. Lewis Carroll – "The Walrus and the Carpenter" (from *Through the Looking Glass*) https://www.poetryfoundation.org/poems/43914/the-walrus-and-the-carpenter-56d222cbc80a9

Module III Comics-Novels

1. Herge:*Tintin in Tibet* (Hergé. Tintin in Tibet. London: Egmont. 2012)
2. Somdev Bhatt: "The Story of Padmavati and Prince Vajramukti" (Vikram-Betaal Story) http://vikrambetalstory.blogspot.com/
3. Anuja Chauhan:*The Zoya Factor*
4. J. K. Rowling:*Harry Potter and the Philosopher'sStone*

Recommended Reading

Chute, Hillary. "Comics as Literature?Reading Graphic Narrative".*PMLA* – Publications of The Modern Language Association of America. 123. 452-465. 2008.

Chauhan, Anuja. *The Zoya Factor* Harper Collins, 2008.

Gill, Rosalind & Herdieckerhoff, Elena. "Rewriting the romance: new femininities in chick lit?".*Feminist Media Studies* 6(4). 2006.

Herge.*Tintin in Tibet*.Baker and Taylor, 2009.

Pawling, Christopher 'Popular Fiction: Ideology or Utopia?' *Popular Fiction and Social Change*. Basingstoke: Macmillan, 1985.

Radway, Janice. 'The Institutional Matrix, Publishing Romantic Fiction', in *Reading the Romance: Women, Patriarchy, and Popular Literature.* London:Verso. 1987.

Rowling, J.K Harry Potter and the Philosopher's Stone, Bloomsbury, 2017.

Suvin, Darco, "On Teaching SF Critically", Positions and Presuppositions in Science Fiction. Kent, Ohio: Kent State University Press. 1989

Todorov, Tzevetan. "The Typology of Detective Fiction".*The Poetics of Prose*. Ithaca: Cornell University Press, 1995

Wilson, Edmund. 'Who Cares Who Killed Roger Ackroyd?', The New Yorker, 20 June 1945.

e-resources

Falvey Memorial Library https://digital.library.villanova.edu/Collection/vudl:24093

Grossman, Lev. Literary Revolution in the Supermarket Aisle: Genre Fiction Is Disruptive Technology. 23 May 2012, https://entertainment.time.com/2012/05/23/genre-fiction-is-disruptive-technology/

Meskin, Aaron. Recognition and Hybridity of Art or Comics as Literature?13 Aug. 2018, www.atmostfear-entertainment.com/literature/comics/recognition-and-hybridity-of-art-or-comics-as-literature/.

Science Fiction: The Literature of Ideas. www.writing-world.com/sf/sf.shtml.

Swirsky, Peter. "Popular and Highbrow Literature: A Comparative View" CLCweb: Comparative Literature and Culture. Volume 1 Issue 4 1999.https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1053&context=clcweb

Thomas, Ronald R. "The Devices of Truth". Detective Fiction and the Rise of Forensic Science .Cambridge: Cambridge University Press. https://pdfs.semanticscholar.org/de55/c1139de3b9b9fada4da62bc1391e060cf603.pdf

SEMESTER II

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Core Course 2: EN 1241 Introduction to Literary Studies II

No. of Credits: 4 **No. of instructional hours: 6 per week [Total: 108 Hours]**

Aim Introduce the world of Literature, esp. Fiction and Non-Fiction

Objectives

1. An awareness of diverse literary representations from different time and space
2. Possess a foundational understanding of fiction and non-fiction.
3. Provide an awareness of genre, with emphasis on forms of short fiction, fiction and non-fiction.

Course Outcome

CO 1: Cherish a taste for the literary among students

CO 2: Comprehend the nature and characteristics of different genres of literature.

CO 3: Detailed awareness of the two key genres of literature- fiction and non-fiction.

CO 4: Imbibe the representational possibilities of the respective genres.

CO 5: Instill a creative and critical aptitude

COURSE OUTLINE

Module I Short Story

What is a short story? History-Characteristics.

1. Rabindranath Tagore: "Kabuliwala" http://theanonymouswriter.com/wp-content/uploads/2015/07/Kabuliwala-by-Rabindranath-Tagore.pdf
2. Hans Christian Anderson: "The Nightingale" https://www.gutenberg.org/files/27200/27200-h/27200-h.htm#nighting
3. Fyodor Dostoyevsky: "An Honest Thief" https://www.gutenberg.org/files/40745/40745-h/40745-h.htm#AN_HONEST_THIEF
4. O Henry : "The Ransom of Red Chief" https://www.gutenberg.org/files/1595/1595-h/1595-h.htm#8
5. Katherine Mansfield: "The Garden Party" https://www.gutenberg.org/files/1429/1429-h/1429-h.htm

6. Jamaica Kincaid: "Girl"
   https://erhsnyc.org/ourpages/auto/2016/3/14/36191544/Girl%20by%20Jamaica%20Kincaid.pdf
7. Cynthia Ozick: "The Shawl"
   https://www.newyorker.com/magazine/1980/05/26/the-shawl
8. Bram Stoker: "Dracula's Guest"
   https://www.gutenberg.org/files/10150/10150-h/10150-h.htm

Module II Novella

History- Characteristics.

1. John Steinbeck : *The Pearl*
   https://www.ptbeach.com/cms/lib02/NJ01000839/Centricity/Domain/211/The-Pearl-John-Steinbeck.pdf
2. Antoine de Saint-Exupery: *Little Prince*
   https://verse.aasemoon.com/images/f/f5/The_Little_Prince.pdf

Module III Novel

History- Characteristics-Types

1. Bibhutibhushan Bandhyopadhyay: *Pather Panchali*

Module IV Non-Fiction

History-Characteristics-Type

1. Ramachandra Guha: "The Cities that Shaped Gandhi, the Cities that Gandhi Shaped"
   http://ramachandraguha.in/archives/the-cities-that-shaped-gandhi-the-cities-that-gandhi-shaped-hindustan-times.html
2. Margaret Atwood: "Attitude" (Speech, 1983)
   http://www.humanity.org/voices/commencements/margaret-atwood-university-toronto-speech-1983
3. Yuval Noah Harari: "A Day in the Life of Adam and Eve" from *Sapiens*: *A Brief History of Humankind*

Recommended Reading

Anjaria, Ulka. *A History of Indian Novel in English*, New York, Cambridge University Press, 2015.

Bandopadhyay, Bibhutibhushan.*Pather Panchali*..Penguin Random House India Private Lmited. 2019.

Casserto, Leonard and Benjamin Reiss.*The Cambridge History of American Novel*. Cambridge University Press, 2011.

Geir Farner. *Literary Fiction*.Bloomsburry. 2014.

Machiavelli, Niccolo. *The Prince*. Dante UP, 2003.

Moretti, Franco. *Atlas of the European Novel 1800-1900*. London, Verso, 1998.

Noah Harari, Yuval. *Sapiens: A Brief History of Humankind* 2014.

---, Yuval, *Homo Deus*: *A Brief History of Tomorrow* 2016.

Quayson, Ato. *The Cambridge Companion to the Postcolonial Novel*.CUP. 2016.

Roy, Rituparna. *South Asian Partition Fiction in English, From Khushwant Singh to Amitav Ghosh* .Amsterdam UP. 2010.

Saunders Smith, Gail. *Non-Fiction Text Structures for better Comprehension and Response.* Gainesville, Maupin House, 2009.

Schwarz, Daniel R. *Reading the Modern European Novel Since 1900*. Wiley Blackwell 2018.

Steinbeck, John. *The Pearl*.Penguin, 1992.

Tickell, Alex. *South-Asian Fiction in English, Contemporary Transformations*. UK, Palgrave Macmillan, 2016.

e-resources

https://www.nobelprize.org/prizes/lists/all-nobel-prizes-in-literature/

https://www.thebalancecareers.com/the-man-booker-prize-winners-1968-to-present-2799885

https://www.abebooks.com/books/50-essential-non-fiction-books/index.shtml

https://www.gutenberg.org/ebooks/search/?query=novels&submit_search=Go%21

https://www.gutenberg.org/ebooks/search/?query=short+stories&submit_search=Go%21

https://encyclopedia.ushmm.org/content/en/project/the-holocaust-a-learning-site-for-students

https://www.holocaust.com.au/resources/websites/

https://www.history.com/topics/world-war-ii/the-holocaust

http://margaretatwood.ca/

https://dostoevsky.org/

http://ramachandraguha.in/

https://www.ynharari.com/

SEMESTER II

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Complementary Course 3: EN 1231 Art and Literary Aesthetics

No: of Credits: 3 **No: of Instructional Hours: 3 per week [Total 54 Hours]**

Aim Introduce the multidisciplinarity of Art and Literary Studies

Objectives:

1. Gain an understanding of various movements in art history and how they relate to literature
2. Engage with works of art that directly refer to literary works and also draw inspiration from art
3. Recognize how all forms of art is part of a continuum.

Course Outcome

CO 1: The student will be able to engage with literature in a broader, educated perspective.

CO 2: The student will be able to think with greater originality and independence about the complex interrelationship between different art forms.

CO 3: The student will be trained to engage sensitively and intelligently in new readings of literature.

CO 4:The course develops an understanding of the co-relation between literature, film, music and painting and encourages ways of reading and seeing which deliver insights into literary texts.

CO 5: Initiate students to implement the multidisciplinary scope of art and literary studies.

Instructions: This course is designed to draw out the relationships between art movements and literature. In the first two modules, the texts/pieces have been chosen to be representative of the various time periods in which these movements originated, so a comparative study of both the paintings, films and the literary works is recommended. The third module discusses music as literary text and the various ways in which this is manifested.

Module I

Literature and Visual Arts - I

1. **Essay**: Herbert Read – extract from *The Meaning of Art* (pg 17-48) Pelican Books, 1959. (https://plunderingtroops.files.wordpress.com/2012/05/herbert-read-the-meaning-of-art.pdf)

2. **Romanticism:**

   Delacroix – Liberty Leading the People (painting)

   Coleridge – "Destruction of the Bastille" (poem)

3. **Pre-Raphaelite Movement:**

   D.G Rossetti – Prosperine (painting)

   D.G Rossetti – "Prosperine" (poem)

4. **Post-Impressionism**

   Amrita Sher-gil – Ancient Story Teller (painting)

   Virginia Woolf – *The Waves* (novel)

Module II

Literature and Visual Arts - II

1. **Expressionism**

   Munch - The Scream / Kahlo – Self Portrait with Thorn (paintings)

   Kafka – "Metamorphosis (novella)"

   The Cabinet of Dr Caligari (film)

2. **Cubism/Surrealism**:

   Picasso - Guernica (painting)

   Max Weber- "Eye Moment" (poem)https://heiup.uniheidelberg.de/journals/index.php/transcultural/article/view/23509/17361 (From the online article- "The Reception of Max Weber's Cubist Poems (1914) in Taishō Japan")

   Aimé Césaire – "The Woman and the Flame" (poem)

   Salvador Dali, Walt Disney Pictures – *Destino* (short film)https://www.youtube.com/watch?v=y_TlaxmOKqs

3. **Postmodernism**

   Banksy - Love is in the Air (Flower Thrower)

   Katsuhiro Otomo – *Akira* (film)

   Zadie Smith – *White Teeth* (novel)

Module III

Literature, Music and Performing Arts

1. **Essay**: T. M. Krishna – "A Culture that Dominates is No Culture At All" (Ramon Magsaysay Address)
   https://thewire.in/rights/tm-krishna-magsaysay-award-speech
   https://www.youtube.com/watch?v=IfR3OddYVBY

2. **Poetry and Music: poems put to music:**

   - "The Lady of Shalott" (poem Tennyson)
     https://www.poetryfoundation.org/poems/45359/the-lady-of-shalott-1832
   - "The Lady of Shalott" (pop music Loreena McKennit)
     https://www.youtube.com/watch?v=80-kp6RDl94

3. **Music as Resistance**

   - Billie Holiday – "Strange Fruit" (Jazz, Harlem Renaissance)
     https://www.youtube.com/watch?v=Web007rzSOI)
   - Langston Hughes- "Harlem" (Harlem Renaissance)
     https://www.poetryfoundation.org/poems/46548/harlem

4. **Music as Text:**

   - "The 1975 – 1975"(Greta Thunberg's speeches on the climate crisis set to music) https://www.youtube.com/watch?v=4fwEG8XK1uU
   - Lin Manuel Miranda – "My Shot" (from Hamilton) (From a Broadway musical about the American founding fathers in rap form)
     https://www.youtube.com/watch?v=Ic7NqP_YGIg

5. **Music in Fiction and Drama**

   - "Do You Hear the People Sing" (from *Les Miserables*)
     https://www.youtube.com/watch?v=K5PzJhU8iI0
   - "The Willow Song" from *Othello*

6. **Music, Dance, Literature**

   - Isadora Duncan – "The Dancer of the Future" (essay)
     https://mccc.edu/pdf/vpa228/the%20dancer%20of%20the%20future%20-%20duncan.pdf

Recommended Reading

e-resources

Astor, Dave. Music in Literature.2 Apr. 2013, www.huffpost.com/entry/music-in-literature_b_2590404 .

Benjamin, Elizabeth and Sophie Corser. "INTRODUCTION Literature and Art: Conversations and Collaborations" MHRA Working Papers in the Humanities, 9 (2015) http://www.mhra.org.uk/pdf/wph-9-1.pdf

Berger, John. Ways of Seeing. Penguin 1972.http://waysofseeingwaysofseeing.com/ways-of-seeing-john-berger-5.7.pdf

Fornäs, Johan. "The Words of Music", Popular Music and Society, (26), 1. 2003. 37-51 https://core.ac.uk/download/pdf/192601065.pdf

Pater, Walter. The Renaissance: Studies in Art and Poetry. London: Macmillan, and Co, 1910. http://www.gutenberg.org/files/2398/2398-h/2398-h.htm

Syjuco, Miguel. "Art and literature are vital to democracy - here's why" Agenda World Economic Forum May 2017. https://www.weforum.org/agenda/2017/05/literature-and-creative-writing-are-vital-to-democracy-here-s-why/

All About the Hamiltons. https://www.newyorker.com/magazine/2015/02/09/hamiltons

SEMESTER III

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE

Core Course 3: EN 1341 British Literature I

No. of Credits: 3 **No. of instructional hours: 5 per week [Total: 90 Hours]**

Aims Introduce the origin and growth of English literature

Objectives

1. Familiarize the historical phases of English literature
2. Provide glimpses of writers and literary texts that are pivotal to an understanding of British literature
3. Discuss the development of British literature across time from Pre-Elizabethan to Restoration Era

Course Outcome

CO 1: Comprehend the origins of English literature

CO 2: Understand the specific features of the particular periods

CO 3: Understand themes, structure and style adopted by early British writers

CO 4: Gain knowledge of growth and development of British Literature in relation to the historical developments

CO 5: Understand how writers use language and creativity to capture human experience through different literary forms

COURSE OUTLINE

Module I Pre-Elizabethan Literature

Anglo-Saxon literature—Bede, Beowulf, King Alfred – Norman Conquest—Ballads—Fall of Constantinople—English Renaissance—Humanism—Reformation—Printing Press, Caxton—Chaucer, Langland—Mystery Plays, Miracle Plays, Morality Plays, Interlude—Thomas More

1. General Prologue,*Canterbury Tales* – Introduction- Lines 1-31
2. Deor's Lament
   http://www.thehypertexts.com/Deor's%20Lament%20Translation.htm
3. Bede's Story of Caedmon book IV chapter xxiv from the Old English translation of HistoriaEcclesiasticaGentisAnglorum
   https://www.heorot.dk/bede-caedmon.html

Module II Elizabethan Age

Gorbuduc-Ralph Roister Doister-Tottel's Miscellany-University Wits-Sidney-Spenser-Isabella Whitney-Mary Sidney Herbert- Kyd,-Marlowe-Bacon-Ben Jonson-Donne and Metaphysical Poetry.

1. Spenser- "Sonnet 30" (from Amoretti)
   www.poetryfoundation.org
2. Isabella Whitney: "A Sweet Nosegay, or Pleasant Poesy, Containing a Hundred and Ten Philosophical Flowers"
   https://www.poetryfoundation.org/poems/45994/a-sweet-nosegay-or-pleasant-poesy-containing-a-hundred-and-ten-philosophical-flowers
3. Extract from *Doctor Faustus*- "Apostrophe to Helen"
4. Two Essays from Bacon ("Of Friendship", "Of Studies")*Bacon's Essays*. Macmillan. 1992.
5. John Donne: "Valediction Forbidding Mourning"
   https://www.poetryfoundation.org/poems/44131/a-valediction-forbidding-mourning

Module III Shakespeare

Elizabethan Theatre-Opening of Globe Theatre-Authorized version of the Bible-Beaumont and Fletcher-Webster

1. Shakespeare "Sonnet 33"
   http://shakespeare.mit.edu/
2. Shakespeare: *A Midsummer Night's Dream*
   http://shakespeare.mit.edu/

Module IV Puritan and Restoration Age

Milton—Bunyan—Civil War—Closing of Theatre—Cromwell—End of Commonwealth—Restoration of Monarchy—Opening of Theatres—Wycherley, Congreve, Etherege—Glorious Revolution

1. John Milton: Extract from Book 9 (*Paradise Lost*) - The Fall of Man – Lines 850-1055
   https://rpo.library.utoronto.ca/poems/paradise-lost-book-ix
2. John Bunyan : "Of the Boy and the Butterfly"
   https://www.poemhunter.com/poem/of-the-boy-and-butterfly/
3. Aphra Behn: "Song"
   https://www.poetryfoundation.org/poems/50527/song-56d22db1a9572

Recommended Reading

Alexander, Michael. *A History of English Literature*. Macmillan.

Baugh, A.C. *A History of English Literature*.Routledge. 2013.

Boitani, Piero. Jill Mann(ed). *The Cambridge Companion to Chaucer*.CUP. 2003.

Carter, Ronald, John McRay. *The Routledge History of Literature in English*. Routledge, 2017

Chaucer, Geoffrey. *The Canterbury Tales.*Trans. Neville Coghill.Penguin, 2003. Print

Christopher Ricks, ed., *English Poetry and Prose1540-1674*

Poplawski, Paul. *English Literature in Context*. CUP.1993

Peck, John, Martin Coyle. *A Brief History of English literature.* Palgrave 2003

Thornley G C and Gwyneth Roberts.*An Outline of English Literature.*Pearson, 2011.

e- resources

https://library.baypath.edu/english-and-literature-web-sites

https://www.gutenberg.org/ebooks/search/?query=shakespeare&submit_search=Go%21

https://www.gutenberg.org/ebooks/search/?query=chaucer&submit_search=Go%21

http://www.literature-study-online.com/resources/#historical

http://www.universalteacher.org.uk/lit/history.htm

https://www.britannica.com/art/English-literature/Elizabethan-poetry-and-prose

https://www.encyclopedia.com/humanities/culture-magazines/restoration-literature-england

https://chaucer.fas.harvard.edu/

https://chaucer.fas.harvard.edu/pages/Synopses-Prolegomena

http://www.dartmouth.edu/~milton/reading_room/contents/text.shtml

https://www.gutenberg.org/files/29854/29854-h/29854-h.htm(Aphra Behn)

http://www.mindfulteachers.org/2013/05/women-writers-at-time-of-shakespeare-e.html

https://internetshakespeare.uvic.ca/Library/SLT/literature/women%20writers/morewomen.html

SEMESTER III

FIRST DEGREE PROGRAMME IN

BA ENGLISH LANGUAGE AND LITERATURE

Foundation Course 2: EN 1321 Evolution of the English Language

No. of Credits: 3 **No. of instructional hours: 4 per week [Total: 72 Hours]**

Aim: Study the historical development of the English Language.

Objectives

1. Demonstrate a thorough understanding of the diachronic development of the English language down the ages.
2. Sensitize students to the changes that have shaped English
3. Enable understanding of the growth of English into a global language

Course Outcome:

CO 1: Knowledge of the paradigm shifts in the development of English.

CO 2: Well aware of the historical paradigm shifts in the history of English Language

CO 3: Imbibe the plural socio cultural factors that went in to the shaping of the English Language.

CO 4: Place English language in a global context.

CO 5: Recognize the politics of many 'Englishes'

COURSE OUTLINE

Module I

Language families – Indo-European family – Germanic group – Consonant shift – Descent of English – Old English and its features- Grimm's law- Verner's law- Umlaut and Ablaut – Dialects of OE – Celtic, Latin and Scandinavian influences

Module II

Norman Conquest – French influence – Middle English – Decay of inflections – Loss of grammatical gender – Impact of Bible Translations – Contributions of Chaucer to English – Rise of Standard English

Module III

Modern English – Contributions of Spenser, Shakespeare and Milton to English –Changes in pronunciation (Great Vowel Shift) – Spelling reform – Dr. Johnson's dictionary – Evolution of English as a Global Language

Module IV

Semantic changes in English -Word formation – Growth of vocabulary – Various Englishes- Digital English.

Recommended Reading:

Barber C.L. *The Story of Language*. Pan Books. 1972.

---, *The English Language, A Historical Introduction*. CUP, 1993.

Baugh, Albert C, Thomas Cable. *A History of the English Language*.Taylor and Francis, 1993.

Crystal, David. *The Stories of English*.Penguin, 2005.

Wood, Frederick T. *An Outline History of English Language.* Macmillan, 2000.

e- resources:

"English language" https://www.britannica.com/topic/English-language

"The History of English" https://www.thehistoryofenglish.com/index.html

"Studying the History of English" http://www.uni-due.de/SHE/index.html

"History of the English Language"
https://en.wikipedia.org/wiki/History_of_the_English_language

"History of English" https://www.englishclub.com/history-of-english/

SEMESTER III

FIRST DEGREE PROGRAMME IN

BA ENGLISH LANGUAGE AND LITERATURE (CBCS SYSTEM)

Complementary Course 5: EN 1331 Narratives of Resistance

Number of Credits: 3 No. of Instructional Hours: 3 [Total 54 Hours]

Aim Introduce the various narratives of resistance, literary and other wise.

Objectives

1. To understand the various modes of resistance needed to subvert oppressive socio-cultural structures.
2. To provide insight into the struggles of people from around the world for identity and rights and contribute proactively to social dynamics.
3. To understand how literature acts as a vehicle for voices of dissent and protest.

Course Outcome

CO 1: Be able to identify themes of resistance in different forms and genres of literature.

CO 2: Have a sense of the various kinds of injustice related to race, ethnicity, gender etc. prevalent in society.

CO 3: Develop an idea of literature as a form of resistance to all forms of totalitarian authority.

CO 4: Understand the inter connection between various genres in manifesting resistance

CO 5: How resistance is an undeniable presence in the everyday narratives of literary and other artistic expressions.

COURSE OUTLINE

Module I Narratives of Resistance

Nature and Function of Resistance- Heterogeneous forms of Resistance-Gender-Dalit-Race-Totalitarianism-Nation State-Holocaust- Slave Narratives-War-Resistance and Social Change

Module II Poetry/Documentary

1. Adrienne Rich- "What Kind of Times Are These" https://www.poetryfoundation.org/poems/51092/what-kind-of-times-are-these
2. Denise Levertov- "Making Peace" https://www.poetryfoundation.org/poems/53900/making-peace
3. Mahmoud Darwish-"ID Card"

https://www.wrmea.org/017-november-december/id-card-by-mahmoud-darwish-a-translation-and-commentary.html

4. S.Joseph : "Between These Lines" https://www.poetryinternational.org/pi/poem/17768/auto/0/0/S-Joseph/Between-These-Lines/en/nocache
5. Tishani Doshi- "Girls are coming out of the Woods" https://www.poetryfoundation.org/poems/152744/girls-are-coming-out-of-the-woods
6. Taslima Nasreen : "Garment Girls" https://www.poemhunter.com/poem/garment-girls/
7. Lucille Clifton: "poem in praise of menstruation" https://www.poetryfoundation.org/poems/54584/poem-in-praise-of-menstruation
8. Peter Davis (Dir): *Nelson Mandela: Prisoner to President* (Apartheid Documentary 1994) https://www.youtube.com/watch?v=Rk-Lxgp9NWg

Module III Prose and Fiction

1. Assange, Julian. "Conspiracy as Governance." State and Terrorist Conspiracies. 7-12 https://cryptome.org/0002/ja-conspiracies.pdf(Article)
2. Sojourner Truth: "Ain't I A Woman?" (Speech) https://www.nps.gov/articles/sojourner-truth.htm
3. Jacinta Kerketta And Nighat Sahiba "On The Power of Poetry And Politics of Language".Huffpost article by Kavitha Muralidharan (Article) https://www.huffingtonpost.in/entry/jacinta-kerketta-nighat-sahiba-kashmir-jharkhand-poems-language_in_5c41f480e4b027c3bbc14a3a?guccounter=
4. Alice Munro: "Boys and Girls" (Short Story) http://www.giuliotortello.it/shortstories/boys_and_girls.pdf
5. K. Saraswathi Amma: "Life, In My View" (Memoir) (Translation J.Devika) https://swatantryavaadini.in/2020/08/30/life-in-my-view-k-saraswathi-amma/#more-982
6. Nemat Sadat :*Carpet Weavers* (Novel) Penguin, 2019.

Recommended Reading

Brueck , Laura. *Writing Resistance: The Rhetorical Imagination of Hindi Dalit Literature.*

Columbia University Press, 2014.

Darwish, Mahmoud.*Unfortunately, It Was Paradise: Selected Poems.*University of California Press, 2013.

De Santis, Christopher C., et al. *The Collected Works of Langston Hughes: The poems, 1941-1950.* Italy,University of Missouri Press, 2001.

Doshi, Tishani. *Girls Are Coming Out of the Woods*. India, Harper Collins Publishers India, 2017.

Dutta, Mohan J. *Voices of Resistance: Communication and Social Change*. Purdue University Press. 2012.

Harlow, Barbara. *Resistance Literature*. New York, Methuen, 1987.

Hosseini, Khaled. *A Thousand Splendid Suns*.Bloomsbury Publishing, 2009.

Jo Glanville, ed. Qissat: *Short Stories by Palestinian Women*. London, Telegram, 2006. 90-94.

Levertov, Denise. *Selected Poems*.United States, New Directions, 2003.

Lewis, T. (2008).“Literature as Resistance”.*The Hudson Review*,60(4), 655–664. www.jstor.org/stable/20464787

Manṭo, SaʿādatḤasan. *Manto*: *Selected Short Stories: Including 'Toba Tek Singh' and 'The Dog of Tithwal'*. India, Random House India, 2012

Munro, Alice. *Selected Stories*. United Kingdom, Random House, 2012.

Neruda, Pablo. *The Poetry of Pablo Neruda*.United States, Farrar, Straus and Giroux, 2015.

Nguyen, Viet Thanh. *Race and Resistance: Literature and Politics in Asian America Race and American Culture*.USA,Oxford University Press, 2002.

Rich, Adrienne. *Collected Poems: 1950-2012.* United States,W. W. Norton, 2016.

Stoltz, Pauline. *Gender, Resistance and Transnational Memories of Violent Conflicts*.Germany, Springer International Publishing, 2020.

Williams, Nerys. *Contemporary Poetry*. United Kingdom, Edinburgh University Press, 2011.

Zimmermann, Jérémie, et al. Cypherpunks: *Freedom and the Future of the Internet*. United Kingdom, OR Books, 2016.

e-resources

https://swatantryavaadini.in/

https://www.thegoodtrade.com/features/inspiring-female-poets

On Literature and Resistance https://againstthecurrent.org/atc074/p1835/

SEMESTER IV

FIRST DEGREE PROGRAMME IN

BA ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Core Course 4:EN 1441 British Literature II

No. of Credits: 4 **No. of instructional hours: 5 per week [Total: 90 Hours]**

Aim: Introduce the historical and philosophical shifts in English literature since 17th century.

Objectives:

1. Familiarize the history of English literature from the 18th century to the Victorian age
2. Understand the socio-political, historical and cultural contexts
3. Be able to identify the changing trends in English literature in the 18th and 19th centuries

Course Outcome:

CO 1: Sensitize students to the changing trends in English literature in the 18th and 19th centuries and connect it with the sociocultural and political developments.

CO 2: Develop the critical thinking necessary to discern literary merit

CO 3: Be able to recognize paradigm shifts in literature

CO 4: Be able to identify techniques, themes and concerns

CO 5: Connect literature to the historical developments that shaped the English history.

COURSE OUTLINE

Module I

History: Age of prose and reason– Critical/literary essay – Sentimental Comedy - anti-sentimental comedy –heroic drama - Neoclassical poetry

1. John Dryden: "A Song for St. Cecilia's Day, 1687" https://www.poetryfoundation.org/poems/44185/a-song-for-st-cecilias-day-1687
2. Lady Mary Wortley Montagu: "The Lover, A Ballad" https://www.poetryfoundation.org/poems/44761/the-lover-a-ballad
3. Oliver Goldsmith – *She Stoops to Conquer* https://www.gutenberg.org/files/383/383-h/383-h.htm

Module II

Transitional Poets – Periodical essay – Rise of the English novel – Fielding, Richardson, Sterne and Smollett

1. Thomas Gray : "Elegy Written in a Country Churchyard"
   https://www.poetryfoundation.org/poems/44299/elegy-written-in-a-country-churchyard
2. Elizabeth Carter: "Written Extempore on the Sea Shore"
   https://www.eighteenthcenturypoetry.org/works/o4984-w0350.shtml
3. Richard Steele – "The Spectator Club"
   https://www.bartleby.com/27/7.html

Module III

French Revolution – Romantic Revival – first and younger generations of Romantics - Lyrical Ballads – familiar/personal essay – Lamb, Hazlitt, De Quincey - fiction in the Romantic age– Walter Scott, Jane Austen

1. William Blake – "The Tyger", "The Lamb"
   https://www.poetryfoundation.org/poems/43687/the-tyger
   https://www.poetryfoundation.org/poems/43670/the-lamb-56d222765a3e1
2. William Wordsworth – "The Kitten at Play"
   https://www.poetrynook.com/poem/kitten-play
3. Mary Lamb: "Choosing a Profession"
   https://www.poetryfoundation.org/poems/51930/choosing-a-profession
4. Charles Lamb – "Dream Children, a Reverie"
   http://essays.quotidiana.org/lamb/dream_children_a_reverie/
5. Jane Austen – *Pride and Prejudice*

Module IV

Victorian poets – Pre-Raphaelite Poetry - Victorian prose writers – Victorian Compromise - Victorian novelists – Women novelists

1. Robert Browning – "My Last Duchess"
   https://www.poetryfoundation.org/poems/43768/my-last-duchess
2. Charlotte Bronte: "On the Death of Anne Bronte"
   https://www.poetryfoundation.org/poems/43710/on-the-death-of-anne-bronte
3. Christina Rossetti – "Goblin Market"
   https://www.poetryfoundation.org/poems/44996/goblin-market
4. R. L. Stevenson – "Walking Tour"
   https://www.thoughtco.com/walking-tours-by-robert-louis-stevenson-1690301
5. Charles Dickens – *A Tale of Two Cities*

Recommended Reading

Alexander, Michael. *A History of English Literature*. Macmillan. 2000

Armstrong, Isobel. *Victorian Poetry: Poetry, Poets and Politics* (Routledge Critical History of Victorian Poetry S). : Routledge. 1996

Baugh, A.C. *A History of English Literature*.Routledge. 2013.

Carter, Ronald, John McRay. *The Routledge History of Literature in English*.

Routledge, 2017

Daiches, David. *A Critical History of English Literature*, Vol. 3, Allied Publishers. 1979

FWH Myers, AC Bradley. *The Complete Works of William Wordsworth*.Imagination Books. 2018

McLane, M. (2008).*The Cambridge Companion to British Romantic Poetry* (Cambridge Companions to Literature) (J. Chandler, Ed.). Cambridge: Cambridge University Press.

Peck, John, Martin Coyle. *A Brief History of English literature*. Palgrave 2003

Poplawski, Paul. *English Literature in Context*. CUP.1993

Quintana, Ricardo. *Oliver Goldsmith as a Critic of the Drama.* Studies in English Literature, 1500-1900. Vol. 5, No. 3, Restoration and Eighteenth Century (Summer, 1965), pp. 435-454 (20 pages) Published By: Rice University

Wordsworth, Jonathan. *The Penguin Book of Romantic Poetry* (Penguin Classics) Paperback .2005

e-resources

http://www.victorianweb.org/previctorian/nc/ncintro.html

https://www.britannica.com/art/Romanticism

https://www.bl.uk/romantics-and-victorians/articles/the-romantics

https://www.gutenberg.org/files/36773/36773-h/36773-h.htm

https://www.gutenberg.org/files/9622/9622-h/9622-h.htm

https://www.gutenberg.org/ebooks/search/?query=wordsworth&submit_search=Go%21

https://library.unt.edu/rarebooks/exhibits/women/17th.htm

SEMESTER IV

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Core Course 5: EN 1442 Literature of the 20th Century

No. of Credits: 3 **No. of instructional hours: 4 per week [Total: 72 Hours]**

Aim Introduce the literary narratives of the 20th century in close connection with the historical time period.

Objectives

1. Examine the ways in which political, cultural and social events in British and European history of the first half of the 20th century, esp. world wars and holocaust, shaped the literature of this period
2. Develop the ability to analyze literary texts of this period in their symbiotic relationship with non-literary developments of the times
3. Acquaint the learners with the significant historical, cultural and imaginative force in 20th century literature

Course Outcome

CO 1: Understand social, political, aesthetic and cultural transformations of early twentieth century in relation to literary texts with their specific formal features.

CO 2**:** Know the stylistic features of Modernism and its various literary and aesthetic movements

CO 3: Critically engage the ideas that characterise the period, especially the crisis of modernity

CO 4: Understand contemporary responses to the historical incidents that mark the period

CO 5: Understand and use critical strategies that emerged in the early twentieth century.

Module I 1900 – 1920

BACKGROUND:

Early Modernism – Suffragette Movement- World War I - the Irish Revolution - the Russian Revolution - War Poetry-the crisis of modernity—stream of consciousness—expressionism—imagism—science fiction

WRITERS ABOUT WHOM AN OVERVIEW IS TO BE GIVEN:

The War Poets (two types), John Galsworthy, Yeats, Joyce, Joseph Conrad, Rudyard Kipling, Arnold Bennett, G.K. Chesterton, E.M. Forster, Ford Maddox Ford, G B Shaw and the realists and those others whose texts are being taught.

Core Texts

1. Augusta Lady Gregory: *The Rising of the Moon* (play). Seven Short Plays, Project Gutenberg, 2012. Pp 75-91. https://www.gutenberg.org/files/41653/41653-h/41653-h.htm#Page_93
2. H.G. Wells: *The War in the Air* (novel), Project Gutenberg, 2008. https://www.gutenberg.org/files/780/780-h/780-h.htm
3. G.B. Shaw: *How He Lied to Her Husband* (play), Project Gutenberg, 2009. https://www.gutenberg.org/files/3544/3544-h/3544-h.htm
4. Ezra Pound: "In a station of the metro" (poem), Poetry: A Magazine of Verse, 1913. https://www.poetryfoundation.org/poetrymagazine/browse?contentId=12675
5. James Joyce: "The Dead" (short story), Dubliners, 1914, Project Gutenberg, 2009. https://www.gutenberg.org/files/2814/2814-h/2814-h.htm#chap15
6. W.B. Yeats: "Easter 1916" (poem), https://www.poetryfoundation.org/poems/43289/easter-1916
7. Wilfred Owen/ "Futility" (poem), https://www.poetryfoundation.org/poems/57283/futility-56d23aa2d4b57

Module II 1920 - 1939

BACKGROUND:

Life between the two World Wars – The Great Depression—rise and spread of fascism—"High" Modernism –World War II – The Fall of the British Empire – Holocaust—revival of poetic drama

WRITERS ABOUT WHOM AN OVERVIEW IS TO BE GIVEN:

Eliot, Auden, Lawrence, Woolf, Graham Greene, Kafka, Aldous Huxley, George Orwell, C.S. Lewis, J.R.R. Tolkien, Sean O' Casey, Katherine Mansfield and those others whose texts are being taught

Core Texts:

1. Virginia Woolf: Chapter 3, A Room of One's Own, pp 35-48 (non-fictional text), http://seas3.elte.hu/coursematerial/PikliNatalia/Virginia_Woolf_-A_Room_of_Ones_Own.pdf
2. T.S. Eliot: "Marina" (poem), https://www.poetrynook.com/poem/marina-0
3. Franz Kafka: "The Bridge" (short story), The Great Wall of China, Trans. Edwin and Willa Muir, https://genius.com/Franz-kafka-the-bridge-annotated
4. W.H. Auden: "The Unknown Citizen" (poem), https://poets.org/poem/unknown-citizen

Module III 1946 - 1966

BACKGROUND:

Rise of New Literatures – Movement poetry—The Absurd—Confessional poetry—The transition to Postmodernism

WRITERS ABOUT WHOM AN OVERVIEW IS TO BE GIVEN:

Philip Larkin and the Movement Poets, Ted Hughes, George Orwell, Kingsley Amis, Samuel Beckett, Harold Pinter, Tom Stoppard and those others whose texts are being taught

Core Texts:

1. Wole Zoyinka / Lion and the Jewel
2. Dylan Thomas/ "Do not go gentle into that good night" (poem), https://poets.org/poem/do-not-go-gentle-good-night
3. Sylvia Plath/ "The Colossus" (poem), The Colossus and Other Poems, https://www.poetryfoundation.org/poems/89119/the-colossus
4. Elizabeth Jennings/ "One Flesh" (poem), http://famouspoetsandpoems.com/poets/elizabeth_jennings/poems/14189

Module IV Holocaust Literature

Background:

Antisemitism –Auschwitz - Genocide – Racism –banality of evil (Hannah Arendt)

Core Texts:

1. Anne Frank: *The Diary of a Young Girl*, http://www.rhetorik.ch/Aktuell/16/02_13/frank_diary.pdf
2. ImreKertesz/ *Fatelessness* (a.k.a. translated as *Fateless*; a novel)
3. Alexander Kimel/ "I Cannot Forget" (poem), https://remember.org/witness/kimel2

Recommended Reading

Bennet, Michael Y.*The Cambridge Introduction to Theatre and Literature of the Absurd*.Cambridge UP, 2015.

Bradbury, Malcolm and James Mcfarlane, editors. Modernism: A Guide to European Literature 1890—1930. Penguin, 1978.

Brooker, Peter, editor.*Modernism/Postmodernism*.Longman Critical Readers.Routledge, 2014.https://www.ebooks.com/en-us/book/1798494/modernism-postmodernism/peter-brooker/

Brooks, David. "Modernism."Encyclopedia of Literature and Criticism.Edited by Martin Coyle et al.First Edition.Routledge, 1991. PP. 119-130.

Esslin, Martin. *The Theatre of the Absurd*.Pelican, 1980.

Ford, Boris. The Modern Age.The Pelican Guide to English Literature 7.Penguin, 1961.

Kirsh, Adam. *The Wounded Surgeon: Confession and Transformation in Six American Poets*. W.W. Norton, 2005

Morrison, Blake. *The Movement: English Poetry and Fiction of the 1950s.*Methuen, 1986.

Nicholls, Peter. *Modernisms: A Literary Guide*. Macmillan, 1995.

SEMESTER IV

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Complementary Course 7: EN1431 Philosophy for Literature

No. of Credits: 2 No. of instructional hours: 3 per week [Total: 54 Hours]

Aim: Engage with the philosophy of literary representations.

Objectives

1. Give the students a historical overview of the major figures in philosophy
2. Introduce to them some of the significant schools of thought that has influenced human perception.
3. Inform students how an understanding of philosophy is vital to the reading of literature.

COURSE OUTCOMES

CO 1: Have a diachronic understanding of the evolution of philosophy from the time of Greek masters to 20th century

CO 2: Have an awareness of the major schools of thought in western philosophy.

CO 3: Have a healthy epistemological foundation at undergraduate level that ensures scholarship at advanced levels of learning.

CO 4: Talk about some of the key figures in Philosophy.

CO 5: Analyze and appreciate texts critically, from different philosophical perspectives

COURSE OUTLINE

Module 1: The World of Greeks

Heraclitus—Flux and the unity of opposites—Socrates—Nature of Poet and Rhapsode—Dialogue with Ion—Plato—Concept of Forms—Ideal vs Physical—Aristotle—Concept of Soul—Beauty—Art—Nature

1. Robert Frost. "West- Running Brook," (the unity of opposites) https://www.internal.org/Robert_Frost/West_Running_Brook
2. S T Coleridge. "Kubla Khan," (Socratic idea of poet as light, winged, holy), https://www.poetryfoundation.org/poems/43991/kubla-khan
3. P B Shelley. "Ozymandias," (Plato's idealism) https://www.poetryfoundation.org/poems/46565/ozymandias
4. John Keats. "Endymion" (First 33 lines) (Aristotle's idea of soul, beauty, art and nature)

https://www.poetryfoundation.org/poems/44469/endymion-56d2239287ca5

Module 2: Enlightenment and After

Rene Descartes—Rationalism—Dualism—Spinoza—idea of Nature and God—Pantheism—concept of substance and modes—Cartesian dualism vs Spinoza's monism—John Locke—Liberalism—Empiricism—Immanuel Kant—Transcendental Idealism—Edmund Husserl—Phenomenology—Karl Marx—Critique of Capitalist Society—Base and Superstructure

1. Emily Dickinson. "The Brain—is wider than the Sky" (Debate the Cartesian mind body or material immaterial dualism)https://www.poemhunter.com/poem/the-brain-is-wider-than-the-sky/
2. Walt Whitman. "On the Beach at Night Alone." (Spinoza's pantheism), https://www.poetryfoundation.org/poems/48856/on-the-beach-at-night-alone
3. William Ross Wallace. "The Liberty Bell," (Locke's liberalism and the turn of humanity), https://allpoetry.com/The-Liberty-Bell8
4. D. H. Lawrence. "How Beastly the Bourgeois Is?" (Marx's idea of social class), https://poets.org/poem/how-beastly-bourgeois

Module 3: Nihilism, Existentialism and Afterwards

Friedrich Nietzsche—Death of God—Nihilism—Martin Heidegger—Dasein and the question of Being—Sigmund Freud—Id—Ego—Super-ego—Libido—Jean-Paul Sartre—Ontology of Being and Nothing—Simone de Beauvoir—Social and Historical construction of Gender

1. Wallace Stevens. "Sad Strains of a Gay Waltz," (Nietzsche's idea of nihilism and the death of god), https://poeticresolution.wordpress.com/2012/01/31/sad-strains-of-a-gay-waltz-by-wallace-stevens/
2. W H Auden. "Who's Who?" (Heidegger's idea of Dasein and Geworfenheit, "Being-thrown-in-the-world), https://sonnetsatlagcc.wordpress.com/2016/10/30/whos-who-by-w-h-auden/
3. Ted Hughes. "Hawk Roosting," (ego that mediates the instinctual id and the critical super-ego), https://allpoetry.com/Hawk-Roosting
4. Maya Angelou. "When I think of myself," (de Beauvoir's concept of becoming), https://allpoetry.com/poem/14326523-When-I-Think-About-Myself-by-Maya-Angelou

Recommended Reading

Durrant, Will. *The Story of Philosophy*, Simon & Schuster, 1991.

Gaarder, Jostein. *Sophie's World*: 20th Anniversary Edition. Orion, 2015.

Garvey, James and Jeremy Stangroom.*The Story of Philosophy: A History of Western Thought*.

Quercus, 2013.

Gibson, John. *The Philosophy of Poetry*.Oxford UP, 2015.

Ghosh, Ranjan, Lutz Koepnick, et al. *Philosophy and Poetry*: Continental Perspectives.

Columbia UP, 2019.

Russell, Bertrand. *History of Western Philosophy*.Routledge, 2016.

e-resources

Stanford Encyclopedia of Philosophy
https://plato.stanford.edu/?gclid=CjwKCAjwlID8BRAFEiwAnUoK1VLA5qiyuVNYZmNU8foMZGAfKurtC8Ve2xTbCGk_BEq6AB0KI_i3ChoCkwgQAvD_BwE

https://www.philosophybasics.com/general_whatis.html (What is Philosophy)

http://www.rosenfels.org/Durant.pdf (*The Story of Philosophy* – Will Durrant)

https://archive.org/details/SophiesWorld_989/page/n5/mode/2up (Sophie's World)

http://www.ntslibrary.com/PDF%20Books/History%20of%20Western%20Philosophy.pdf

(*History of Western Philosophy*)

SEMESTER V

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Core Course 6: EN 1541 Literature of Late 20th Century and 21st Century

No. of Credits: 4 No. of instructional hours: 5 per week [Total: 90 Hours]

Aim: Engage with the diversity of forms and contexts of more recent literatures.

Objectives

1. Expose students to the literatures of this period in their relationship with historical (social, cultural and political) developments

2. Introduce them to the basics of Postmodern writing and the conditions of its emergence and development

3. Sensitize them to the plurality and diversity of the literature of this period reflecting the reality of a multi-cultural world and polyphonic cultural sphere

Course Outcome

CO 1:Identify the various socio-cultural changes that evolved in the late modernist period

CO 2: Relate to the diverse currents of postmodern literature and its reflections in the contemporary ethos

CO 3: Assimilate the inherent multiplicities and fluidity of societal perspectives

CO 4: Develop an innate sympathy for the tragedies of Holocaust and an awareness regarding the environmental impasses threatening the modern world

CO 5: Empathise with the marginalised and comprehend their predicament.

Module I: Postmodernism

Background:

Developments leading to Postmodernism –Metafiction – Intertextuality – Pastiche – magic realism – minimalism – hyperreality

Core Texts:

1. Denise Riley: "Pastoral." Selected Poems. Reality Street Editions, 2000. Pp. 64-65. https://docplayer.net/84625719-Denise-riley-selected-poems.html
2. Harold Pinter. *Homecoming*. Faber, 1991

http://shiraz.fars.pnu.ac.ir/portal/file/?970459/%20Pinter_Harold%20_-_Plays_3_Faber_1991_.pdf

3. E.L.Doctorow: *Ragtime*. Random House, 1975.

Module II: African-American Literature

Key Concepts:

Racism - Slavery - Civil rights – Mulatto- Harlem Renaissance—Afro-American feminism—1968 riots

Core Texts:

1. Toni Morrison: "Recitacif" (short story). https://www.cusd80.com/cms/lib/AZ01001175/Centricity/Domain/1073/Morrison_recitatifessay.doc.pdf
2. Gwendolyn Brooks: "The Mother" (poem). https://www.poetryfoundation.org/poems/43309/the-mother-56d2220767a02
3. Maya Angelou: *I Know Why the Caged Bird Sing*, Chapters 33-34.
4. August Wilson. Ma Rainey's Black Bottom (play). https://augustwilsonstudygroup.files.wordpress.com/2018/02/ma-rainey-_1_.pdf

Module III: Digital Literature

Key Concepts:

Evolution of the reader – Electracy vs Literacy –E-books - Role playing games - interactive fiction–hypertexts – network fiction – locative narratives – non-linearity – animated poetry – insta poems- chatterbots – Twitterature - importance of connectivity

Core Texts:

1. Carpenter, J.R: "Along the Briny Beach." https://collection.eliterature.org/3/works/along-the-briny-beach/index.html
2. Wah, Fred, et al: "High Muck a Muck." https://collection.eliterature.org/3/works/high-muck-a-muck/index.html
3. Bouchardon, Serge and Vincent Volckaert: "Loss of Grasp." https://bouchard.pers.utc.fr/deprise/home

Module IV: Climate Fiction

Key concepts:

Anthropocene - greenhouse effect - global warming - climate activists – dystopia

Core Texts:

1. Ian McEwan: *Solar*
   https://www.you-books.com/book/I-Mcewan/Solar
2. Maja Lunde: *The History of Bees*. Translated by Diane Oatley. Touchstone, 2015.
   https://www.scribd.com/read/354121952/The-History-of-Bees-A-Novel#

Recmmended Reading

Anderson, Gregera. Climate Fiction and Cultural Analysis.Taylor and Francis, 2019.

Butler, Christopher. *Postmodernism: A Very Short Introduction*. OUP 2002.

Docherty, Thomas. *Postmodernism, A Reader*. Taylor and Francis, 2016.

Ellis Erle C, Erle Christopher Ellis. Anthropocene A Very Short Introduction.OUP, 2018.

Graham, Maryemma, Jerry W. Ward, Jr. The Cambridge istory of African American Literature.

Gregson, Ian. Postmodern Literature.Bloomsbury Academic, 2004.

Jameson, Fredric. Postmodernism or the Cultural Logic of Late Capitalism.Duke University Press, 1991.

Len Platt, Sarah Upstone. Postmodern Literature and Race.CUP, 2015.

MScHale,Brian. Len Platt. *The Cambridge History of Postmodern Literature*.CUP, 2016.

Rettberg, Scott. Electronic Literature.Wiley, 2018.

SEMESTER V

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS SYSTEM)

Core Course 7: EN 1542 Postcolonial Literatures

No. of Credits: 4 **No. of Instructional Hours: 4[Total: 72 Hours]**

Aim Introduce the varied narratives of decolonization

Objectives

1. Initiate critical thought on colonialism and after
2. Introduce the fundamental concepts in postcolonial theory
3. Understand the global effects of the colonial enterprise

Course Outcome

CO 1: Ability to critique colonial history

CO 2: Awareness of the socio-political contexts of colonialism and postcolonialism

CO 3: Understanding of the effects of colonialism in various nations

CO 4: Knowledge of the key terms in post-colonial thought

CO 5: Study of the race and gender dynamics in postcolonial literature

COURSE OUTLINE

Module I: Key Terms

Colonization-Orientalism-decolonisation-hybridity-appropriation-mimicry-negritude-othering, third world- aboriginality-transnationalism-multiculturalism-diaspora

Module II: Poetry

1. Andrew Suknaski: "Indian Site on the Edge of Tonita Pasture" https://www.tesisenred.net/bitstream/handle/10803/8113/TNBR17de17.pdf?sequence=17&isAllowed=y
2. Derek Walcott:"A Far Cry from Africa" https://poets.org/poem/far-cry-africa
3. Oodgeroo Noonuccal:"Gooboora, the Silent Pool" https://www.poetrylibrary.edu.au/poets/noonuccal-oodgeroo/poems/gooboora-the-silent-pool-0719052
4. John Pepper Clark:"Night Rain"

https://allpoetry.com/poem/10602495-Night-Rain-by-John-Pepper-Clark

5. Louise Bennett Coverley:"Colonisation in Reverse" https://www.poetrybyheart.org.uk/poems/colonization-in-reverse-2/
6. Alamgir Hashmi:"Pakistan Movement" https://englishsummary.com/pakistan-movement-hashmi-text/
7. Leslie Marmon Silko:"Toe'osh: A Laguna Coyote Story" http://english.fib.unpad.ac.id/wp-content/uploads/2012/04/Leslie-Marmon-Silko-Toe%E2%80%99osh-A-Laguna-Coyote-Story.pdf
8. Octavio Paz:"The Broken Water Jug" http://mexicobob.blogspot.com/2013/03/the-raina-broken-water-jar.html

Module III: Prose

Non-fiction

1. Ngugi wa Thiong'o – extract from "The Language of African Literature" (Thiong'o, Ngugi wa. *Decolonising the Mind: The Politics of Language in African Literature*. Oxford Currey, 2011) https://postcolonial.net/wp-content/uploads/2019/04/Ngugi_Excerpts_Language_of_African_Lit.pdf

Fiction

1. Doris Lessing : *No Witchcraft for Sale*https://www.polk.k12.ga.us/userfiles/826/Classes/182955/No%20Witchcraft%20for%20Sale.pdf
2. Jean Rhys : *Wide Sargasso Sea*

Module IV: Drama and Visual Media

1. Jane Harrison – *Stolen* https://www.uibk.ac.at/anglistik/staff/davis/stolen-by-jane-harrison.pdf
2. Chimananda Ngozi Adichie – "The Danger of a Single Story" (Ted Talk) https://www.youtube.com/watch?v=D9Ihs241zeg
3. Niki Caro (dir) – *Whale Rider* (Caro, Niki, and Witi Ihimaera. *Whale Rider*. Icon Home Entertainment, 2008)

Recommended Reading

Ashcroft, Bill, Gareth Griffiths and Helen Tiffin, *The Empire Writes Back: Theory and Practice in Post-Colonial Literatures* (London/New York: Routledge, 2002)

Ashcroft, Bill, Gareth Griffiths and Helen Tiffin, *Concepts in Postcolonial Studies* (London: Routledge, 1998)

Loomba, Ania, *Colonialism/Postcolonialism* (London: Routledge, 2005)

McLeod, John, *Beginning Postcolonialism* (Manchester: Manchester University Press, 2010)

Mohanty, Chandra T, ‘Under Western Eyes: Feminist Scholarship and Colonial Discourses’ (in Williams, Patrick, and Laura Chrisman. *Colonial Discourse and Post-Colonial Theory: A Reader.* London: Routledge. 2013)

Nayar, Pramod K, *Postcolonialism: A Guide for the Perplexed* (London: Continuum, 2010)

Spivak, Gayatri C, ‘Can the Subaltern Speak?’ ((in Williams, Patrick, and Laura Chrisman. *Colonial Discourse and Post-Colonial Theory: A Reader*. London: Routledge. 2013)

e-resources

http://www.postcolonialweb.org/

https://scholarblogs.emory.edu/postcolonialstudies/

https://www3.dbu.edu/mitchell/postcold.htm

SEMESTER V

FIRST DEGREE PROGRAMME IN

BA ENGLISH LANGUAGE AND LITERATURE (CBCS SYSTEM

Core Course 8: EN 1543 20th Century Malayalam Literature in Translation

Number of Credits: 3 **No. of Instructional Hours: 4 per week [Total: 72]**

Aim Introduce literary narratives of 20th century Malayalam Literature

Objectives

1. Introduce the students to the historical and socio-cultural atmosphere in which Malayalam literature became enriched
2. Provide the students a basic understanding of Malayalam literature
3. Get an understanding of the gradual transformation of Malayalam literature from the early modern to the post modern

Course Outcome

CO 1: Generate knowledge about the varied milieu of the development and growth of Malayalam literature and be sensitive to its socio cultural and political implications.

CO 2: Get a basic knowledge of the literary and the non-literary works produced inMalayalam

CO 3: Discern the vibrancy of Malayalam literature

CO 4: Sense the distinctness of the socio-cultural arena in which Malayalam literature isproduced

CO 5: Know the value of literature produced in regional languages and key role oftranslation in the growth of language and literature.

COURSE OUTLINE

Module I Poetry

Background to the growth of Malayalam poetry – beginning of modernism in Malayalam poetry - the major poets – contemporary Malayalam poetry

1. Nalapat Balamani Amma: "The Housewife" www.poetryfoundation.org
2. Edasseri Govindan Nair: "The Cooking Pot and the Sickle" https://www.edasseri.org/English/translations/PuthankalavumArivalum.htm
3. D. Vinayachandran: "Advent"
4. Sugatha Kumari: "The Temple Bell"
5. K. G. Sankara Pillai: "Goorkha"

https://www.poetryinternational.org/pi/poem/8733/auto/0/0/K-G-Sankara-Pillai/Goorkha/en/tile

6. Anitha Thampi: "While Sweeping the Front Yard" https://www.poemhunter.com/poem/while-sweeping-the-front-yard/ https://www.poetryinternational.org/pi/poem/19138/auto/0/0/Anitha-Thampi/Sweeping-the-Front-Yard/en/tile
7. Vipitha: "The Snakes have Hollows" http://www.modernliterature.org/2020/09/09/poems-by-vipitha/

MODULE II Fiction

A brief history of Malayalam Fiction– Major writers - Emergence of Novel – major novelists – contemporary Malayalam fiction – major female writers --- transformation from modern to post – modern themes and techniques.

Short Story

1. O.V Vijayan: " After the Hanging" https://www.google.co.in/books/edition/Wind_Flowers/GHHX2QDHYxgC?hl=en&gbpv=1 (from *Wind Flowers* (Ed. R. E. Asher, V. Abdulla).Penguin. 2004
2. Sarah Joseph: "Inside Every Woman Writer" (from *Breaking the Silence: An Anthology of Women's Literature.*(Ed. Dr. Shobhana Kurien, Bookmates Publishers, 2017.
3. N. S. Madhavan: "Higuita"
4. Maythil Radhakrishnan: "Pythagoras"
5. C. Ayyappan: "Spectral Speech"
6. Ashitha : "In the Moonlit Land"
7. Sithara S. : "Fire"

(Stories Sl.no: 3-7) from *The Oxford India Anthology of Malayalam Literature* (2- Volume Set) OUP, 2017)

Novel

1. Lalithambika Antharjanam: *Agnisakshi Fire, My Witness* OUP, 2015
2. Vaikkom Muhammed Basheer: *Pathumma's* Goat.

MODULE III Non-Fiction

1. K. K. Kochu: "Writing the History of Kerala: Seeking a Dalit Space" K Satyanarayana, Susie J Tharu. *No Alphabet in Sight* Penguin, 2011
2. J Devika: "Imagining Women's Social Space in Early Modern Keralam", Section II Page no 9-16) (opendocs.ids.ac.uk,2002)https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/2932/wp329.pdf;sequence=1

MODULE IV Drama

Evolution of Drama – influence of colonialism in the emergence of drama – major dramatists.

1. Kavalam Narayana Panikkar: *The Lone Tusker*. *The Oxford India Anthology of Malayalam Literature* (2- Volume Set) OUP, 2017.

Recommended Reading

George, K.M. *ASurvey of Malayalam Literature*, Asia Publishing House, 1968.

---, *Western Influence on Malayalam Language and Literature*, Sahitya Academy. 1972.

Paniker, K Ayyappa. *A Short History of Malayalam Literature*. Dept of Public Relations, Govt of Kerala, 1977.

Nair, Sreedevi. K. *Women Writers of Kerala*. SSS Publications, 2012.

e-resources

https://www.edasseri.org/ListenToEdasseriPoems.htm

https://www.poemhunter.com/i/ebooks/pdf/edasseri_govindan_nair_2012_9.pdf

http://keralasahithi.synthasite.com/

http://sahitya-akademi.gov.in/library/meettheauthor/kadammanitta_ramakrishnan.pdf

SEMESTER V

FIRST DEGREE PROGRAMME

BA ENGLISH LANGUAGE AND LITERATURE

Core Course 9: EN 1544 Linguistics and Structure of the English Language

No. of Credits: 4 **No. of instructional hours: 4 per week (Total: 72 hours)**

Aim Understand the language Structure of the English Language

Objectives

1. Give the students a preliminary idea regarding the nature, function and scope of languages, in general
2. Sensitize the students to the specificities of the oral and written dimensions of English.
3. Appreciate Linguistics as a branch of learning with its own defined material and methodology

Course Outcome

CO 1: Understand the phonological and grammatical structure of English Language

CO 2: Be able to analyse actual speech in terms of the principle of linguistics

CO 3: Improve the accent and pronunciation of the language

CO 4: Introduce the students to internationally accepted forms of speech and writing in English.

CO 5: Explore the ancient linguistic tradition of India

COURSE OUTLINE

Module I: Linguistics

Introduction - Nature and scope of Linguistics – Types of Linguistics – Historical Linguistics, Phonetics, Phonology, Morphology, Syntax, Semantics and Pragmatics, Lexicography Approaches to the study of language – Diachronic and Synchronic – Prescriptive and Descriptive Language as a system of signs – Sign, Signifier and Signified, Langue and Parole, Competence and Performance, Syntagmatic and Paradigmatic axes.

Varieties of Language – Dialect, Register, Pidgin and Creole.

Significance of Received Pronunciation (RP)

Module II Phonetics and Phonology

Phonetics – definition – types – Articulatory, Acoustic and Auditory.

Speech mechanism – Organs of speech – Speech sounds – classification - Vowels , Cardinal vowels, Consonants – three part labelling

Phonology – Phonemes – Allophones and their distribution

Syllable structure – Suprasegmental features - Stress – word stress and sentence stress – Strong and weak forms - Rhythm –Juncture –Intonation – Assimilation – Elision

Transcription (sentences and passages) – IPA

Module III Morphology and Syntax

Morphology – Morphemes – classification – Free and Bound – Roots and Affixes – Lexical and Grammatical – Inflectional and Derivational - Allomorphs and their distribution

Syntax – Word classes – Form class and Function class – Formal features

Traditional Grammar – Structural and Functional study of grammatical categories – Grammaticality and Acceptability

Structural grammar – Introduction to IC Analysis – Phrase Structure (PS) Grammar – Transformational Generative (TG) Grammar

Module IV Linguistics in Ancient India

Major practitioners – Panini - Ashtadhyayi – Karaka theory, Katyayana – Va:rttika , Patanjali – Mahabhasya, Bharthruhari – Vakyapadiya – Sphota theory

Influence on Modern Linguistics

Texts for Reference:

Balasubramanian, T. *A Textbook of English Phonetics for Indian Students*.Second Edition. Madras: Macmillan, 2013. Print.

Chalker, Sylvia. *The Little Oxford Dictionary of English Grammar*. Oxford: OUP, 1995. Print.

Davidappleyard.com/English/pronunciation.htm.Web

Hocket, F. Charles. *A Course in Modern Linguistics*. New Delhi: Macmillan, 1958. Print.

Jones, Daniel. *English Pronouncing Dictionary*.Seventeenth Edition. Cambridge, CUP, 2006. Print.

Kapoor, Kapil. *Language Linguistics and Literature: The Indian Perspective*. Academic Foundation, 1994.

Lyons, John. *Language and Linguistics: An Introduction*. Cambridge, CUP, 1989. Print.

Marks, Jonathan. *English Pronunciation in Use: Elementary*. Cambridge, CUP, 2008. Print.

Rani, D. Sudha.*A Manual for English Language Laboratories*. New Delhi: Pearson, 2010. Print.

T. Eastwood, John. *Oxford Guide to English Grammar*. New Delhi: OUP, 1994. Print.

Trask, R. L. *Key Concepts in Language and Linguistics*. London, Routledge, 2004. Print.

SEMESTER V

FIRST DEGREE PROGRAMME IN

ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Core Course 10: EN 1545 Criticism and Theory

No. of Credits: 4 **No. of instructional hours: 5 [Total: 90 Hours]**

Aim Provide a historical and critical over view of the origin and development of literary criticism

Objectives

1. Give the students a historical overview of the critical practices from classical period to the present.
2. Introduce to them some of the significant concepts that had a seminal influence on the development of critical thought.
3. To develop in them a critical perspective and capacity to relate and compare various critical practices and schools.

Course Outcome.

CO 1: Analyze and appreciate texts critically, from different perspectives.

CO 2: Appreciate Indian Aesthetics and find linkages between Western thought and Indian critical tradition.

CO 3: Show an appreciation of the relevance and value of multidisciplinary theoretical models in literary study.

CO 4: Demonstrate an understanding of important theoretical methodologies and develop an aptitude for critical analysis of literary works.

CO 5: Gain a critical and pluralistic understanding and perspective of life

COURSE OUTLINE

Module I Western Critical Thought

1. **Classical:**

Plato-Mimesis and the critique of poetry

Aristotle: Tragedy

Longinus: The Sublime

2. Neo Classical:

Dryden: Defense of Poetry

3. Romantic:

William Wordsworth: Definition of poetry

S.T. Coleridge: Fancy and Imagination

4. Victorian:

Matthew Arnold: Function of poetry, Touchstone method

5. Modernism:

T.S. Eliot: Theory of Impersonality, Dissociation of Sensibility, Objective Correlative, Tradition and Individual Talent

Module II Indian Aesthetics

The Evolution of Indian Poetics-Art and Aesthetics of Dramatic Experience-Bharatamuni-Natyasastra - Rasa Theory-Alamkara- Ritisiddhant- Dhwani Siddhant- Vakrokti- Auchitya-Thinai Poetics

(Mention the importance of the above schools of thought in Indian Criticism and their relation to Western Criticism like Rasa is equivalent to purgation or catharsis, Dhvani and symbolism, vibhavas and objective correlative, Alamkara and Rhetorics, Vakrokti and Ambiguity etc.)

Module III A Brief Introduction to Critical Theory

1. New Criticism - Russian Formalism
2. Structuralism(Langue/Parole, Sign-Signifier-Signified)
3. Deconstruction
4. Feminisms (Waves of Feminism, Womanism, Intersectionality, Gynocriticism)
5. Psychoanalytic Criticism: (Id, Ego, Super ego)
   (The Real, the Imaginary, the Symbolic)
6. Postcolonial Criticism: (Orient/Occident, Eurocentrism, Othering, Negritude, Subaltern)
7. Gender and Sexuality: (Performativity)
8. Modernism, Postmodernism (Parody and Pastiche)

Module IV Practical Criticism

1. Literary Forms and Devices
2. Criticism of an unseen passage (Prose OR Poetry) using any of the theories prescribed.

Recommended Reading

Barry, Peter. *Beginning Theory - An Introduction to Literary and Cultural Theory*.Fourth Ed.

Manchester UP, 2017.

Cuddon, J A and M A R Habeeb. *The Penguin Dictionary of Literary Terms and Literary Theory:* Fifth Edition. Penguin: 2015.

Das, B and J M Mohanty.*Literary Criticism: A Reading*. Oxford UP, 1997.

Habeeb, M A R. *Literary Criticism from Plato to the Present: An Introduction*. Wiley-Blackwell,

2011

Lodge, David and Nigel Wood.*Modern Criticism and Theory*: A Reader. Routledge, 2014.

Nagarajan, M S. English *Literary Criticism and Theory*. Hyderabad: Orient Blackswan, 2011.

Pollock, Sheldon. *A Rasa Reader: Classical Indian Aesthetics*. Columbia UP, 2016.

Seturaman, V S. *Indian Aesthetics*. Laxmi Publications, 2017.

Upadhyay, Ami. *A Handbook of The Indian Poetics and Aesthetics*. Bareilly: Prakash Book

Depot, 2017.

e-resources

Classical Criticism http://www.egyankosh.ac.in/bitstream/123456789/22610/1/Unit-1.pdf

Classical Criticism
https://www.academia.edu/35408906/CLASSICAL_CRITICISM_A_CRITICAL_ENQUIRY

From Plato to the Present

http://elibrary.bsu.az/books_400/N_33.pdf

Longinus –On the Sublime https://sites.google.com/site/zhmlit/literary-criticism/longinus-s-ideas-on-the-sublime

John Dryden https://literariness.org/2017/11/17/literary-criticism-of-john-dryden/

Criticism of Dryden http://www.eajournals.org/wp-content/uploads/Dryden-as-the-Father-of-English-Criticism.pdf

Classical and Neo classical criticism https://ddceutkal.ac.in/Syllabus/MA_English/Paper_02.pdf

Dr Johnson as a Critic

https://literariness.org/2017/12/05/literary-criticism-of-samuel-johnson/

Romantic Criticism https://ddceutkal.ac.in/Syllabus/MA_English/Paper_07.pdf

Romantic Criticism
http://studymaterial.unipune.ac.in:8080/jspui/bitstream/123456789/4853/1/Romantic%20Criticism.pdf

Wordsworth's theory of poetry
https://dducollegedu.ac.in/Datafiles/cms/ecourse%20content/B.A.%20(Hons)%20ENG%20PAPER%209%20WORDSWORTH_S_THEORY_OF_POETRY_IN_THE_LYR.pdf

Coleridge as critic
https://dducollegedu.ac.in/Datafiles/cms/ecourse%20content/B.A.%20(Hons)%20ENG%20PAPER%209%20Coleridges_Biographia_Literaria_1817.pdf

Matthew Arnold as critic https://www.lsj.org/literature/essays/arnold

Arnold and High culture https://sites.udel.edu/britlitwiki/matthew-arnold/

T S Eliot as critic https://sites.google.com/site/nmeictproject/presentations/4-1-introduction-t-s-eliot-as-a-critic

Indian Aesthetics https://www.openart.in/general-topics/indian-aesthetics/

A Student's Handbook of Indian Aesthetics
https://www.cambridgescholars.com/download/sample/63790

Rasa Theory

https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004120632194631nishi_Rasa_Theory.pdf

The Rasa Theory https://sg.inflibnet.ac.in/bitstream/10603/126482/9/09_chapter%203.pdf

Rasa- Indian Aesthetic Theory https://globalphilosophyresources.com/2017/08/10/rasa-indian-aesthetic-theory/

Literary Theory https://courses.lumenlearning.com/introliterature/chapter/introduction-to-critical-theory/

Held, D. (1980). Introduction to critical theory: Horkheimer to Habermas. Berkeley: University of California Press.

Literary Theory http://ekladata.com/Tn8NJwPeVe21wsE0MuX7LyFQ6Gg/Literary-Theory_an-overview.pdf

Literary Theory http://elibrary.bsu.az/books_400/N_92.pdf

Literary theory https://mthoyibi.files.wordpress.com/2011/05/literary-theory_an-introduction_terry-eagleton.pdf

Practical criticism
https://www.danielxerri.com/uploads/4/5/3/0/4530212/teaching_practical_criticism.pdf

Practical criticism http://egyankosh.ac.in/bitstream/123456789/22635/1/Unit-1.pdf

https://iep.utm.edu/literary/ (What is Literary Theory)

https://courses.lumenlearning.com/suny-britlit1/chapter/literary-criticism/ (Literary Criticism)

http://site.iugaza.edu.ps/ahabeeb/files/2012/02/An_Introduction_to_Literature__Criticism_and_Theory.pdf (Introduction to Literary Theory and Criticism)

https://ayushnanda.com/history-indian-aesthetics-brief-notes (History of Indian Aesthetics)

https://www.cambridgescholars.com/download/sample/63790 (A Student's Handbook of Indian Aesthetics)

https://www.slideshare.net/m_b2011/comparative-aesthetics (Comparison between Indian and Western Aesthetics)

SEMESTER V

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Open Course: 1 EN 1551.1 Communicative Applications in English

No: of Credits: 2 **No. of Instructional Hours 3[Total 54]**

Aim To excel in communicative capabilities

Objectives

1. Help the students overcome their inhibitions about speaking in English about their day-to-day life and learning experiences within and outside college
2. Develop them into clear, unpretentious and effective communicators, both in speech and in writing
3. Give them the rudiments of grammar, with an emphasis on the correct usage of the language in various contexts

Course Outcome

CO 1: Learners majoring in some subject other than English will have a working knowledge of the type of English that is required in real life situations, especially the globalized workplace.

CO 2: Well trained to write clear, well-framed, polite but concise formal letters and e-mails for a variety of purposes

CO 3: Acquire some of the soft-skills that go hand in hand with English –namely, the ability to prepare for an interview and face it confidently, the ability to participate boldly a group discussion and contribute meaningfully to it, the ability to make a simple and interesting presentation of 5-10 minutes before a mixed audience on anything that they have learnt in the previous semesters of the UG programme

NOTE TO COURSE INSTRUCTORS AND QUESTION PAPER SETTERS

This course does not have any "Core" reading material. A list of useful reference books and other resources has been provided, but it must be emphasized that none of them should be used exclusively, in the manner of core books. Instead the teacher and students must exercise their discretion and take whatever is useful from them.

Module I Talking about Oneself

- One's basic details –academic career from Plus 2 onwards
- One's home village or locality

- Family members and what they do
- Interests/hobbies
- Abilities and strengths (with illustrative examples/anecdotes)
- Weaknesses (with illustrative examples/anecdotes)
- Brief narrative with a few "highlights" of things learnt during the first 2 years of the degree programme (this could include curricular and co-curricular things such as participation in NCC or NSS or some club)
- Aims and ambitions in life (both career and social aims)
- Any one person who inspires or (in the past) inspired/used to inspire the student and proved to be a role-model for her/him
- A memorable experience in the life of the student and why it is so memorable

BALL GAME FOR BREAKING DOWN INHIBITIONS

- This may be played as often as possible with a small basketball or volleyball.
- The teacher and all the students in class stand in a circle around a cleared space either indoors or outdoors.
- The teacher throws the ball to a student randomly loudly saying, "My name is …….. (her name) I come from ……. (her home village/locality).
- The student has to repeat those sentences substituting the teacher's name and place with her own and throw the ball back at the teacher. If she gets it correctly, the teacher throws the ball to the next student. If not the teacher repeats the utterance with a stress on the word/part to be corrected and throws the ball back to the same person.
- This is to be repeated till the student gets it right and also speaks in a voice loud enough to be heard by everybody.

Writing about Oneself

1. Basic Grammar: Gender Agreement, Number Agreement, Subject-Verb Agreement, Use of Articles and Tenses

2. Exercises –Note: Students need not remember the names of the tense forms but they must know develop the ability to use them correctly. Teachers handling this course can take 3 or more items from Module I and make the students write about them in a simple, conversational style. This writing can then be checked for gender and number agreement as well as the proper use of articles and tense forms and feedback can be given with a view to reinforcing their ability to write grammatically.

Module II Communicating with Others

1. INTRODUCING OTHERS

- Introducing a classmate to an audience mentioning their basic details, good qualities, interests and achievements and also narrating some shared experience or something that one has found striking about them

- Researching a celebrity and introducing a classmate as if he/she were that person

NOTE: The number of classmates and "celebrities" introduced like this by each student can be fixed depending on the number of students in the class and the time available.

- Compeering a programme

2. ROLE PLAY

- Opening and concluding conversations with familiars and strangers

- A student talking to a bank manager enquiring about study loans

- A traveler asking for help at a railway enquiry counter

- A tourist asking for information at an enquiry counter about places to visit in a new state, hotel rates, how to get to those places, etc.

- A citizen journalist reports on some special event or untoward situation happening near him/ her in the background

3. GROUP DISCUSSION on one or more of the following:

- Some issue of common concern from the students' lives

- A recent news item

- A recent film

Guidelines

The first 2 rounds of discussion may be on non-controversial topics and the discussion group may be given some preparation time; the next 2 should be spontaneous and on slightly more controversial topics. The class may be split into 2 (or 4) groups. While one group is carrying on the discussion, another group of people may be posted to observe them. Each participant should have a watcher unknown to him/her, who will make notes on that person and give them to the teacher for a feedback. Points to be watched shall be –the student's level of participation, body language, voice, manner, confidence level and overall contribution to the discussion. Through this method the principles of healthy group discussion can be "derived" and taught. Observer students should be required to take notes during discussion and the teacher should guide them in refining their notes.

4. INTERVIEW

- A brief recapitulation of how to prepare a CV or resume (since the students would have done this in their 1st semester)
- How to write an application letter to go with it
- Preparation for an interview: researching the subject/organization, the responsibilities on the job one is seeking –things to do on the previous day
- Non-Verbal factors: Dress, punctuality, body language, eye contact, sitting posture
- Types of interview questions: fact seeking, searching or opinion seeking, confirmatory, open and closed questions
- Ways of disagreeing politely with the panelists, refusing to take provocations, asking for clarifications
- What to do before and during a telephonic interview

Module III Letters, Mails and Notices

1. Drawing up brief notices for various events
2. Basic elements of an email and some points of netiquette
3. Formal letters and emails for the following purposes:

- Applying for a job
- Seeking information
- Ordering a product
- Making enquiries and bookings
- Making a complaint
- Giving negative feedback tactfully
- Asking for help
- Apologizing for mistakes made
- Thanking people for services/help received
- Writing a proposal for a grant/ project/ scholarship (basic structure)

Fine Tuning One's English

1. What is Mother-tongue Interference and why does it happen? –Speech sounds in English that are NOT found in Malayalam –some English sounds/words commonly mispronounced by Malayalis

2. 2-3 sessions of listening to British speech –2 -3 sessions of listening to American speech

3. Getting the most out of a dictionary –how to look for a word –some common words with multiple meanings (all widely used) –meaning of 'connotation', 'pejorative', 'dialect', 'slang', 'expletive' and 'profanity' with an example each

4. Making a 5-10 minute presentation on any topic chosen by the student and approved by the teacher

5. Writing for Social Media platforms and creating content for various purposes targeted at Social Media readers/ viewers

6. Personal blog writing

Recommended Reading

Basic Communication Skills (book with CD). P. Kiranmai Dutt and Geetha Rajeevan. Foundation Books, CUP, 2011: Part I and III. Price: 150/

Essential English Grammar: A self-study reference and practice book for elementary students of English (with answers) 2nd Edition. Raymond Murphy. CUP, 2010.

The Craft of Business Letter Writing. Matthew M. Monippally. Tata McGraw Hill, 2006: Especially Part I and II (Chapters 1-6), Chapter 9 and 10 in Part III and the Appendix, "Rogues' Gallery".

E-Mailing (book with CD).Louise Pile. Viva Books, 2009.

Communication for Business: A Practical Approach (4th Edition). Shirley Taylor. Pearson Education, 2006: Relevant Chapters in Units 3, 4, 5, 6, 8 and 18.

A Dictionary of Contemporary English (New Edition with DVD ROM). Pearson Longman, 2009.

e-resources:

1. www.grammar-monster.com

2. Powerpoint Presentation in www.wikipedia.org on English spelling

3. BBC World resources on learning English

SEMESTER V

FIRST DEGREE PROGRAMME IN

BA ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Open Course1: EN 1551.2 Theatre Studies

No. of credits: 2 **No. of instructional hours: 3 per week (Total: 54 hours)**

Aim: Introduce and Equip dramatic methods and production

Objectives

1. Give an introduction to the world of drama and its techniques
2. Provide exposure to different experimental theatres
3. Develop the skills among students to create and perform drama

Course Outcome

CO 1: Understand the various theatres, techniques and practices

CO 2: Appreciate the medium of drama

CO 3: Initiate collaborative performances.

CO 4: Attempt production of plays

CO 5: Equip learners to choose a career in theatre.

COURSE OUTLINE

Module I Origin and Growth of Theatre

Greek Stage – Sophocles, Aeschylus, Euripides, Aristophanes – The Chorus

Tragedy, Comedy – Comedy of Humours – Comedy of Manners – Problem Play – One-Act Plays – Flash drama.

Aristotle's definition of Tragedy – Six components of Tragedy – The Roman Stage – The Medieval Stage – Elizabethan Stage – Marlowe, Shakespeare – Jacobean Theatre – Restoration Theatre – 19th Century Theatre – Modern Theatre – Epic Theatre, Theatre of the Absurd.

Module II Indian Theatre

Indian classical drama – Kalidasa – Major contributors of Indian English drama – Girish Karnad-–Mahasweta Devi.

Origin of Theatre in Kerala – Theatre movements in Kerala –KPAC - Discuss the major plays including Edasseri Govindan Nair's Koottukrishi and Thoppil Bhasi's plays – An overview of Thanathu Nataka Vedi and Radio plays – Contemporary stage.

Module III Praxis

Preparation of a script – writing a one-act play – various techniques – plot, characterisation, etc. – activities to be organised by dividing the students into groups.

Assignment (5 marks): To write the script from a novel or short story.

Recommended Reading:

Banks, R.A. *Drama and Theatre Arts*.Hodder Arnold H&S, 1985.

Bhatia, Nandi (ed.). *Modern Indian Theatre: A Reader*. Oxford University Press, 2009.

Butcher, Samuel Henry.*The Poetics of Aristotle.* Create Space Independent Publishing Platform, 2017.

Esslin, Martin. "Introduction".*Theatre of the Absurd*.Bloomsbury Academic, 2015.

Keith, Berriedale. The Sanskrit Drama in its Origin, Development Theory and Practice.Motilal ,1992.

Menon, A. Sreedhara. *Social and Cultural History of Kerala*.Sterling Publishers, 1979.

Storey, Ian C. and Arlene Allan.*A Guide to Ancient Greek Drama*.Wiley Publishers, 2014.

SEMESTER V

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Open Course1: EN 1551.3 Film Appreciation

No. of credits: 2 No. of instructional hours: 3 per week [Total 54 hours]

Aim Introduce the world of movies and sensitize its representative politics

Objectives

1. Enable the students from various disciplines to decipher the meaning of a movie
2. Familiarize students with the emerging area of film studies
3. Make them aware of the evolution of the filmic medium.

Course Outcome

CO 1: Decipher the meaning of a movie

CO 2: Watch, understand and analyze films from a critical perspective

CO 3: Connect movies to its multidisciplinary scope of appreciation and learning.

CO 4: Equip them to write critically about film.

CO 5: Equip them to be resourceful to find a career in areas related to film

COURSE OUTLINE

Module I Evolution and Key concepts

Defining film – A brief history(Lumiere brothers and the beginning) - Language of Cinema – Types of Shots, Angles – Camera Movements –180 degree Rule – 30 degree rule- Focus – Use of colour and lighting, sound- music- Editing – Different styles of Editing - Mise-en-Scene, Auteur theory- Major film genres–Famous Adaptations - Different stages of Production – Censorship.

Module II Major Movements and the Masters (Discuss only the basics and the major film makers)

- Soviet Cinema and Montage
- German Expressionism
- Italian Neo Realism

- French Poetic Realism and French New Wave
- Third World cinema
- Documentary films
- Short films
- The Digital world
- OTT platforms

Famous Directors: Alfred Hitchcock, Charlie Chaplin, Ingmar Bergman, Andrei Tarkovsky, Luis Buñuel, Akira Kurosawa, Satyajit Ray.

Module III Indian and Malayalam Cinema

Beginning of Indian cinema – Dada SahebPhalke – Golden age of Indian cinema – Satyaji Ray – popular Bollywood cinema – beginning and growth of Malayalam cinema – parallel cinema in Malayalam – AdoorGopalakrishnan – contemporary Malayalam cinema.

Practical Sessions: Script Analysis and Writing Reviews

Writing about film – the basics of film review – analyse the films based on the theoretical approaches in the above modules.

Case studies – Script Analysis and Review

The Titanic

Mother India

Manichithrathazhu

Recommended Reading:

Alex Clayton and Andrew Klevan – *The Language and Style of Film Criticism* 2011.

Amy Villarejo. *Film Studies: The Basics*. Routledge, 2013.

Andrew Dix. *Beginning Film Studies*.Manchester University Press, 2013.

Geoffrey Nowell-Smith: *The Oxford History of World Cinema*. OUP, 1997.

James Monaco – *How to Read a Film*. Harbor Electronic Publishing, 2013.

Jill Nelmes: *Introduction to Film Studies*. Routledge, 2011.

Madhu Muttam: *Manichithrathazhu Screenplay*. DC Books, 2010.

Renu Saran. *History of Indian Cinema*. Diamond Books, 2012

Robert Stam. *Literature through Film*.Taylor & Francis, 2011.

Robert Stam and Alessandra Raengo (ed.). Literature and Film.Wiley-Blackwell, 2004.

Steve Katz: Film Directing Shot by Shot: *Visualizing from Concept to Screen*. Focal Press, 1991.

Steven Ascher. *The Filmmaker's Handbook.*Penguin, 2012.

Susan Hayward. *Cinema Studies: The Key Concepts*. Taylor & Francis Ltd/Routledge, 2000.

e-resources:

https://www.cs.ubc.ca/~udls/slides/udls-sampoorna-biswas-film-appreciation-1.pdf

https://nofilmschool.com/Film-theory-basic-terms

http://www.jccsskc.edu.hk/newweb/modules/cjaycontent/content/1112prefectPhoto/Act06/Film Appreciation.pdf

https://plato.stanford.edu/entries/film/

SEMESTER VI

FIRST DEGREE PROGRAMME IN

BA ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Core Course 11: EN 1641 Gender Studies

No: of Credits: 4 **No of Instructional Hours: 5 [Total: 90hours]**

Aim: Introduce and problematize gender constructs.

Objectives

1. Explore the historical variables that have contributed towards the social norms of gender and sexuality
2. Understand the significance of making gender an integral concept of social analysis
3. Develop a conceptual understanding of the field of gender studies

Course Outcome

CO 1: Recognize the patriarchal bias in the formation of history and knowledge.

CO 2: Analyse the ways in which gender, race, ethnicity class, caste and sexuality construct the social, cultural and biological experience of both men and women in all societies.

CO 3: Recognize and use the major theoretical frames of analysis in gender studies

CO 4: CO 5: Interrogate the social constructions of gender and the limiting of the same in to the male-female binary in its intersections with culture, power, sexualities and nationalities

CO 5: Examine gender issues in relation to the sustainable goals of development

COURSE OUTLINE

Module I Introduction to Gender Studies

Gender, Patriarchy- Family- Identities- Essentialism- Difference- Ideology- Intersectionality- Feminisms-Womanism-Dalit Feminism-Islamic Feminism

1. bell hooks. "Feminist Politics:Where we Stand" *Feminism is for Everybody*: *Passionate Politics*. London: Pluto, 2000: pp.1-6. https://excoradfeminisms.files.wordpress.com/2010/03/bell_hooks-feminism_is_for_everybody.pdf
2. Judith Lorber. "The Social Construction of Gender." https://ieas.unideb.hu/admin/file_9695.pdf
3. Vijila Chirappad: "Wasteland" (poem) https://feminisminindia.com/2018/01/11/5-dalit-women-poets/

Module II Gender and Sexuality

Body-Sexualities-Performativity-Heterosexuality-Sexual Orientation-Non-normative Sexualities-Desire-Heteronormativity-Homosexuality-LGBTQI-Queer-Transgender-Pride Parade-Posthuman Orientation.

1. A. Revathi. *The Truth about Me:A Hijra Life Story*(Life Narrative)
2. Margaret Atwood: "Helen of Troy Does Countertaps" Dancing (poem) https://apoemaday.tumblr.com/post/181494581744/helen-of-troy-does-countertop-dancing
3. Kalki Subramaniam: "Breaking Binaries, Establishing Identity" TEDxDumas https://www.youtube.com/watch?v=_j1NzEGMNdo

Module III Gender and Culture

Culture, Modernity, Consumption, Sexual Economies, Commodity Culture

1. Nivedita Menon: "India: Section 377: How Natural is Normal?" http://www.sacw.net/SexualityMinorities/nivedita01Jan2004.html
2. Maya Angelou: "Phenomenal Woman" (poem) https://www.poetryfoundation.org/poems/48985/phenomenal-woman
3. Meena Kandasamy: "Mascara" (poem) https://www.poemhunter.com/poem/mascara-4/

Module IV: Gender, Power and Human Rights

Power, Sexual Politics, Discourse, Sexual Citizenship, Discrimination, Human Rights, Gender Justice

1. Alice Walker: *Meridian* (Novel)
2. Mahaswetha Devi: *Draupadi* (Short Fiction)
3. Mayilamma:Chapter 13. "Protest: The First Year" (Pages 55 – 59) Jyothibai Pariyadathu*Mayilamma: The Life of a Tribal Eco-warrior*. Orient Blackswan, 2018.

Recommended Reading

Butler, Judith. Gender Trouble: *Feminism and the Subversion of Identity*. New York: Routledge, 1990.

Cranny-Francis,Anne. Wendy Waring, Pam Stavropoulos, Joan Kirkby. *Gender Studies Terms and Debates*.Macmillan, 2017.

Delap, Lucy. *Feminisms: A Global History*. Penguin, 2020.

Foucault, Michel. *History of Sexuality*.Penguin Books: 1977

Kate, Millet. *Sexual Politics*. New York: Doubleday. 1969.

Kumar, A.*The History of Doing*, New Delhi: Kali for Women,1998.

Marao, Lori, J. *Fifty-One Key Feminist Thinkers*. Taylor and Francis, 2016.

Naples, Nancy A. *Companion to Women's and Gender Studies*. Wiley, 2020.

Roth, Benita. *Separate Roads to Feminism*. CUP,2004.

Sullivan, Nikki. *A Critical Introduction to Queer Theory*.NYU, 2003.

e- resources

https://kalkisubramaniam.com/

https://www.e-ir.info/2017/02/06/online-resources-feminism/

https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)30239-9/fulltext

https://plato.stanford.edu/entries/feminist-philosophy/

http://www.gender.cawater-info.net/knowledge_base/rubricator/feminism_e.htm

https://guides.lib.purdue.edu/c.php?g=352219&p=2375079

SEMESTER VI

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Core Course 12: EN 1642 Indian Writing in English

No. of Credits: 4 No. of Instructional Hours: 5 per week [Total 90 hours]

Aim: Trace the growth and development of Indian English Writing

Objectives

1. Familiarize the students with the genesis of Indian Writing in English.
2. Acquaint them with the major movements in Indian Writing in English and their historical connections.
3. Introduce them to the stalwarts of Indian Literature in English through the study of selected literary texts

Course Outcome

CO 1: Make students aware of different aspects of colonization like cultural colonization.

CO 2: Trace the historical and literary genesis and development of Indian Writing in English

CO 3:Acquaint them with the major movements in Indian Writing in English across varied period and genres

CO 4: Address the plurality of literary and socio-cultural representations within Indian life as well as letters.

CO 5:Enhance the literary and linguistic competence of students by making them aware of how language works through literature written in the subcontinent.

COURSE OUTLINE

Module I Introduction

Colonialism- Macaulay's Minutes- historical context for the rise of Indian writing in English

1. K. Satchidanandan: "The Plural and the Singular The Making of Indian Literature" *Positions: Essays on Indian Literature.* New Delhi: Niyogi Books, 2019.

Module II Poetry

Impact of Romanticism- Impact of Nationalism on Indian English Poetry- Aurobindo Ghose- Rabindranath Tagore- Sarojini Naidu- Nissim Ezekiel- A. K. Ramanujan- Jayantha Mahapatra-

R. Parthasarathy- Give Patel- Vikram Seth- Meena Aledander- Mamang Dai- Mamata Kaliya- Eunice De Souza- Karthika Nair- Vivek Narayan- Jeet Thayil- Meena Kandasamy

1. Michael Madhusudan Dutt: "I Sigh for Albion's Distant Shore"http://archive.thedailystar.net/2004/11/13/d41113210292.htm
2. Toru Dutt: "A Tree of Life" https://www.poetrycat.com/toru-dutt/the-tree-of-life
3. Rabindranath Tagore: "Where the Mind is Without Fear" https://allpoetry.com/where-the-mind-is-without-fear
4. Arvind Krishna Mehrotra: "Aligarh" https://www.poetryfoundation.org/poetrymagazine/poems/150263/aligarh
5. Kamala Das : "An Introduction" https://www.poemhunter.com/poem/an-introduction-2/
6. Eunice de Souza: "Advice to Women" https://www.poemhunter.com/poem/advice-to-women-2/
7. Arundhathi Subramaniam: "When Landscape Becomes Woman"https://www.usawa.in/poetry/three-poems-by-arundhati-subramaniam.html
8. Shalim M. Hussain : "Golluckgonj"https://www.nezine.com/info/ZWFybmZZL0htZk95SVRQeWNtcHExZz09/a-few-poems-by-shalim-m-hussain.html

Module III Fiction and Non Fiction

Pre independence fiction-partition fiction- Raja Rao- Mulk Raj Anand- Fiction of the Diaspora- V.S. Naipaul- Salman Rushdie- Chitra Divakaruni- Kiran Desai- Shashi Deshpande- Gita Hariharan- Arundhati Roy- Shashi Tharoor- Mukul Kesavan-Manu Joseph- Anees Salim

Short stories

1. R.K. Narayan: "Father's Help"
2. Anita Desai: "Games at Twilight"
3. Jhumpa Lahiri :"A Temporary Matter"

Novel

1. Amitav Ghosh: *The Glass Palace*
2. Easterine Kire: *A Terrible Matriarchy: A Novel*

Essays

1. Salman Rushdie: "Imaginary Homelands" https://www.terrain.org/wp-content/uploads/2015/11/Rushdie1992ImaginaryHomelands.pdf

Module IV Drama

Indian Classical Drama- Modern Drama- Social Drama- Amateur Theatre- Street Theatre- Indigenous Theatre- Vijay Tendulkar- Badal Sircar- Safdar Hashmi-Mahasweta Devi- Mahesh Dattani- Manjula Padmanabhan

1. Girish Karnad: *Nagamandala*

Recommended Reading

Chaudhuri, Rosinka. A History of Indian Poetry in English. Cambridge, Cambridge University Press, 2016

Desai, Anita. Games at Twilight.Random House, 2011.

De, Souza, Eunice. Ed. These my Words The Penguin Book of Indian Poetry. Penguin Books, 2012.

Dodiya, Jaydising. Indian English Poetry Critical Perspective.

Iyengar .R.Srinivasa.Indian Writing in English. Sterling Publishers Private Limited. 1983.

Lahiri, Jumpa. Interpreter of Maladies.Houghton Mifflin Harcourt, 2000

Mehrotra, Arvind Krishna (ed). A History of Indian Literature in English. New York: Columbia University Press, 2003

Mukherjee, Meenakshi. The Perishable Empire.OUP. 2000.

Naik, M.K, ed. Aspects of Indian Writing in English. Macmillan India Limited. 1982.

---. A History of Indian English Literature. Sahitya Akademi. 2009.

Narayan, R.K Malgudi Days.Pengin Publishing Group. 2006

Roy, Arundhati. The God of Small Things. Penguin Random House Private Limited, 2017

Singh, Kushwanth. Train to Pakistan. Ravi Dayal Publisher, 2013

Rushdie, Salman. Imaginary Homelands. Randm House, 2012

Tayil, Jeet. 60 Indian Poets. Penguin Books Limited, 2008.

e- resources

https://www.tagoreweb.in/

https://www.bookgeeks.in/best-indian-authors-and-their-novels-in-english/

https://poetsindia.com/

SEMESTER VI

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Core Course 13: EN 1643 Film Studies

No. of credits: 4 No. of instructional hours: 5 per week (Total: 90 hours)

Aim: Introduce the theoretical study of films

Objectives

1. Familiarize students with the emerging area of film studies and make them equipped to decipher the meaning of a movie.
2. Enable the students to understand the medium of cinema with an ample knowledge of the basic terminologies
3. Help them trace the evolution of the different movements in the film history

Course Outcome

CO 1: Recognize the language of films and use it creatively**.**

CO 2: Analyze films from both technical and non-technical perspectives

CO 3: Engage questions of social justice and gender justice by critiquing representations of culture.

CO 4: Use film as a medium of communication

CO 5: Derive an interest in various careers related to film

Module I The Basics

The basic understanding of the word 'film'- film as art, business and technology – three aspects of a movie: literary, dramatic, cinematic–- a brief history – optical illusion – series photography – motion picture – projection – the evolution of narratives- studios.

Language of Cinema- Types of Shots, Angles –Camera Movements –Focus – Use of colour and lighting, Sound- Editing – Different styles of Editing -30 degree rule and 180 degree rule- Mise-en-Scene, Auteur theory- Major film genres: Western, Romance, Musical, Horror, Buddy etc.

Different stages of Production: Preproduction, Production, Postproduction – Censorship – Remakes - films in the new era - - the Digital Era – OTT platforms.

Suggested Viewing: *Arrival of a Train at a Station* (Lumiere), *A Trip to Moon* (Méliès), *The Great Train Robbery* (Edwin S Porter), *The Birth of a Nation* (D W Griffith).

Module II Major Movements in Film history

The Silent Era – Soviet Cinema – Eisenstein and Montage– German Expressionism – The New German Cinema (Fassbinder, Herzog, Wenders)- Italian Neo Realism -Beyond Neo Realism (Fellini)- French poetic realism and French New Wave – Scandinavian Cinema(Ingmar Bergman)- Spanish cinema (Luis Buñuel)- The Polish School – Japanese cinema-Third World Cinema- Classical Hollywood Cinema and after- Documentary films- Nanook of the North- Dogme 95

Suggested Viewing: *Battleship Potemkin* (Eisenstein), *Cabinet of Dr. Caligari* (Robert Wiene), *Bicycle Thieves* (De Sica), *The Jazz Singer, Man with a Movie Camera, Citizen Kane, The Seventh Seal.*

Module III Film Studies in Context: Indian cinema

A brief history – Phalke- Indian Cinema from 30s to 60s – The golden 50s – Indian parallel cinema – the Indian masters– contemporary Indian Cinema.

History of Malayalam cinema –the beginning - New wave – Contemporary trends- Film Society movements- Remakes in Malayalam Cinema.

Suggested Viewing: *Raja Harishchandra* (Phalke), *Pather Panchali* (Satyajit Ray), *Mother India, Elipathayam, Chemmeen.*

Module IV Adaptation

Adaptation- Intersemiotic Transposition – literature and film – three types of adaptation – narration and point of view in film and novel - Fidelity criticism-Intertextuality- Famous adaptations.

Writing about film – A few case studies.

Films for close viewing:

1. *Rashomon*
2. *Psycho*
3. *Chidambaram*

Recommended Reading:

Andreu Dix.*Beginning Film Studies*.Manchester UP. 2008.

Ascher, Steven. *The Filmmaker's Handbook*.Penguin, 2012.

Birdwell, David and Kristin Thomson.*Film Art: An Introduction*. MacGraw Hill, 2012.

Clayton, Alex and Andrew Klevan.*The Language and Style of Film Criticism*

Cook, David A. *A History of Narrative Film*.W W Norton, 1996.

Dix, Andrew. *Beginning Film Studies*.Manchester University Press, 2013.

Gokulsing, K. Moti and Wimal Dissanayake. Routledge *Handbook of Indian Cinema*.Routledge, 2018.

HaHayes, Susan. *Cinema Studies: The Key Concepts.*Taylor & Francis Ltd/Routledge, 2000.

Katz, Steve. *Film Directing Shot by Shot: Visualizing from Concept to Screen*. Focal Press, 1991.

Kristeva, Julia. Intertexuality: Theories and Practices

Monaco, James. *How to Read a Film*. Harbor Electronic Publishing, 2013.

Muttam, Madhu. *Manichithrathazhu Screenplay*. DC Books, 2010.

Nelmes, Jill. *Introduction to Film Studies*.Routledge, 2011.

Nowell-Smith, Geoffrey. *The Oxford History of World Cinema*.OUP, 1997.

Ray, Satyajit. *Our Films, Their Films*. Orient Blackswan, 2001.

Stam, Robert and Alessandra Raengo (ed.). *Literature and Film*.Wiley-Blackwell, 2004.

Stam, Robert. *Literature through Film.*Taylor & Francis, 2011.

Saran, Renu.*History of Indian Cinema*.Diamond Books, 2012.

Villarejo, Amy. Film Studies: The Basics. Routledge, 2013.

e-resources:

https://www.cs.ubc.ca/~udls/slides/udls-sampoorna-biswas-film-appreciation-1.pdf

https://nofilmschool.com/Film-theory-basic-terms

http://www.jccsskc.edu.hk/newweb/modules/cjaycontent/content/1112prefectPhoto/Act06/Film Appreciation.pdf

https://plato.stanford.edu/entries/film /

https://youtu.be/gNoKDkGlgjw

https://cpb-ap-se2.wpmucdn.com/thinkspace.csu.edu.au/dist/5/1410/files/2015/10/Cinema-Studies-Key-Concepts-1-289afca.pdf

SEMESTER VI

FIRST DEGREE PROGRAMME IN

ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Core Course 14: EN 1644 World Classics

No: of Credits: 3 No: of Instructional Hours: 4 [Total: 72 hours]

Aim: Introduce the timeless classics of world literature

Objectives:

1. The course will aid the learner to have a comprehensive study of the historical evolution of classical works from the classical age to the present postmodern age.
2. Enable the learner to imbibe the significance of Classics as a major cultural influence in literatures around the world
3. Understand major Western and non-western literary forms of written and oral traditions.

Course Outcome

CO 1: Understand the study of Classics as a means of discovery and enquiry into the formations of great literary works and how the rich imagery of these classical works continues beyond the twentieth century.

CO 2: Recognize the diversity of cultures and the commonalities of human experience reflected in the literature of the world.

CO 3: Imbibe a fair knowledge in the various Classical works from different parts of the world, at different time periods, across cultures.

CO 4: Examine oneself and one's culture through multiple frames of reference, including the perception of others from around the world.

CO 5: Develop and aesthetic sense to appreciate and understand the various literary works with a strong foundation in the World Classics.

COURSE OUTLINE

Module I Prose

Course Description:

Literary classics: definitions – critical concepts – the emergence of classics – a brief survey –

Greek and Roman: Homer, Virgil, Aeschylus, Sophocles – Euripides – Aristophanes – Nikos Kazantzakis

Italian: Dante, Boccaccio – Tasso- Ariosto – Machiavelli

Sanskrit: Vyasa- Valmiki – Kalidasa – Sudraka – Bhasa – Shriharsha – Jayadeva

German: Goethe – Hermann Hesse

Russian: Dostoevsky – Tolstoy – Gorky – Solzhenitsyn

British: Aphra Behn – Mary Shelley –James Joyce

Core Reading:

1. T S Eliot's "What is a Classic?" Online Source: http://bracchiumforte.com/PDFs/tseliot.pdf

Module II: Poetry

1. Ovid's *Metamorphoses, Selections* - 'Bacchus' (Book III), lines from 512-733, (Plautus. The Pot of Gold, Tr. E F Watling. Harmondsworth: Penguin, 1965. https://johnstoniatexts.x10host.com//ovid3html.html

Module III: Drama

1. Kalidasa's *Abhijñāna Śākuntalaṁ*. (Ed. Ramesh Chandra. Tr. A H Edgren. New Delhi: Global Vision, 2004). http://www.gutenberg.org/files/16659/16659-h/16659-h.htm

Module IV: Fiction

1. Dostoevsky's *Notes from the Underground*. (Penguin Classics) https://www.planetebook.com/free-ebooks/notes-from-the-underground.pdf
2. Gabriel Garcia Marquez: *One Hundred Years of Solitude*. Harper Collins. 2004

Recommended Reading

Abrams. M H, Geoffrey Harpham. *A Glossary of Literary Terms*. Cengaga Learninf, 2012

Beard Mary, and John Henderson. *Classics: A Very Short Introduction*. Indian Edition, OUP, 2006.

Nicoll, Allardyee. *World Drama from Aeschylus to Anouilh*. New York: Harcourt Brace, 1950.

e-resources

Homer's Odyssey.http://www.gutenberg.org/files/1727/1727-h/1727-h.htm

Virgil's Aeneid.http://www.gutenberg.org/files/228/228-h/228-h.htm

Du Fu' Poems.http://www.chinese-poems.com/due.html

Jayadeva. Gita Govinda. http://www.ocasopress.com/pdf/jayadeva_gita_govinda_translation.pdf

Sophocles. Oedipus Rex. https://www.slps.org/site/handlers/filedownload.ashx?moduleinstanceid=22453&dataid=25126&FileName=Sophocles-Oedipus.pdf

Shri Harsha .Nagananda .http://www.yorku.ca/inpar/nagananda_boyd.pdf

Johann Wolfgang von Goethe. Faust.http://www.gutenberg.org/files/14591/14591-h/14591-h.htm

Samuel Butler. Waiting for Godot.http://srgm.org.in/English%20121%20Samuel%20%20Beckett%20Waiting%20for%20Godot.pdf

Nathaniel Hawthorn. Scarlet Letter.https://www.gutenberg.org/files/25344/25344-h/25344-h.htm

Mary Shelley. Frankenstein.https://www.planetebook.com/free-ebooks/frankenstein.pdf

Charlotte Bronte. Jane Eyre. https://www.planetebook.com/free-ebooks/jane-eyre.pdf

James Joyce's Ulysses.https://planetpdf.com/planetpdf/pdfs/free_ebooks/Ulysses_NT.pdf

SEMESTER VI

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Elective Course1: EN 1661.1 Translation Studies

No. of credits 2 No. of instructional hours: 3 per week [Total: 54]

Aim Equip learners with a professional skill

Objectives

1 Familiarize the students with the basics and nuances of translation.
2 Understand the theory and practice of translation and get well versed in the uniqueness of language structures.
3 Prepare students to take up translation as a profession.

Course Outcome

CO 1: Comprehend and practise the skills required to become a professional translator

CO 2: Help learners recognize the art involved in translation and encourage translation as a profession

CO 3: Acquire clarity regarding problems of translation

CO 4: Procure and improve language and vocabulary skills

CO 5: undertake an independent translation project.

COURSE OUTLINE

Module I Fundamentals of translation

Definitions-a brief history of translation in Malayalam-Theories of translation-linguistic-literary-cultural-communicative-Types of translation-Literary-Non-Literary-Technology aided translation. Source language-Target language-Afterlife-Linguistic and cultural systems-fidelity-untranslatability- confusions-equivalence- Principles of Translation- Types of Translation

Module II Case Studies

1. Analysis of a translated Text:

a. From Malayalam to English

i. A story

ii. A poem

b. From English to Malayalam

1. A story

2. Problems of translations

Module III: Translation Practice

a. Non-Literary(Equivalent technical terms-idioms, phrases, proverbs in English and Malayalam-Translation of sentences and passages from English to Malayalam and vice-versa)

b. Literary(Translation of short literary prose pieces including fiction from English to Malayalam and vice-versa)

COURSE MATERIAL

Core reading

Harishankar, V. Bharathi, Mini Krishnan and G.S. Jayasree.*Word Worlds: Translation and Communication*. OUP, 2013.

Recommended Reading

Abdulla, V. and R.E.Asher,Ed.Wind Flowers, New Delhi: Penguin,2004.

Ashly, C,N O. Henriyude Theranjedutha Kathakal Papion,Kozhikodu.

Basheer, Vaikom Muhammed. Poovan Banana and Other Stories. Abdulla,V.tr. Hyderabad: Orient Black Swan,2009.

Hatim, Basil and Jeremy Munday, *Translation: An Advanced ResourceBook*.London: Routledge,2004.

Palumbo, Giuseppe. *Key Terms in Translation Studies*. Continuum,2009.

Ramakrishnan, Malayattoor. Roots. Abdulla, V.tr.Hyderabad: Orient Black Swan,2009.

Vasudevan Nair, M.T. *Kuttiedathi and Other Stories.* Abdulla,V.tr. Hyderabad:Orient Black Swan,2009.

'Vanampadiyodu' by Vyloppilly Sreedhara Menon.(Translation of Keats' Ode to a Nightingale)

SEMESTER VI

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Elective Course 2: EN 1661.2 American Literature

No. of credits 2 No. of instructional hours: 3 per week [Total: 54 hours]

Aim: Introduce the uniqueness and diversity of American Literature

Objectives

1. Provide knowledge of the writers who have steered the course of American literature
2. Provide insight into the techniques and stylistic peculiarities of American literature
3. Equip students to identify ideas and themes typical of American literature

Course Outcome

1. Instill a sense of the "Americanness" that characterizes American literature
2. Enable the students to place American literature within the corpus of world literature even while identifying its uniqueness.
3. Identify the themes and narratives particular to American literary expressions
4. Generate interest in a field of specialization
5. Enquire about the recent and more popular forms of literature.

COURSE OUTLINE

Module I: Poetry

1. Walt Whitman – "O Captain! My Captain!"
2. Anne Sexton: "Her Kind"
3. Wallace Stevens – "The Snowman"
4. Charles Bukowski: "So You Want To Be A Writer"
5. Denise Levertov: "What Were They Like?"
6. Archibald MacLeish: "Ars Poetica"

Module II: Drama

1. Tennessee Williams – *Lord Byron's Love Letter*
2. Saul Bellow – *The Wrecker*

Module III: Prose

1. Martin Luther king Jr. – "Letter from Birmingham Jail"
2. Alice Walker – "Saving the Life That Is Your Own: The Importance of Models in the Artist's Life"

Module IV: Fiction

1. Mark Twain – "The Celebrated Jumping Frog of Calaveras Country" https://www.gutenberg.org/files/10947/10947-h/10947-h.htm
2. Bret Harte"The Outcasts of Poker Flat" https://www.gutenberg.org/files/1312/1312-h/1312-h.htm
3. Toni Morrison: *Beloved*

Recommended Reading

Burt, Daniel S. The Chronology of American Literature.Houghton Mifflin, 2004.

Harper, Michael, S, Antony Walton. The Vintage book of African American Poetry

New York, Knopf Doubleday Publishing Group, 2012.

Hart, Stephen, M. The Cambridge Companion to Latin American Poetry, Cambridge, Cmbridge University Press, 2008.

SEMESTER VI

FIRST DEGREE PROGRAMME IN

BA ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Elective Course 3: EN 1661.3 Creative Writing

No. of credits 2 **No. of instructional hours: 3 per week [Total: 54 hours]**

Aim Generate interest and prompt creativity.

Objectives

1. Recognise the elements needed to give expression to their creativity.
2. Encourage students to use these self-recognized elements to develop their creative writing talent.
3. Sensitize them to the fact that creative writing has gone beyond the traditional genres in today's world and includes many new forms that have grown with the media and social media boom, thereby blurring the boundaries between "creative" and "functional" writing.

Course Outcome

CO 1: Create a body of original creative works which exhibit basic elements of literary writing.

CO 2: Generate the ability to apply the creative as well as critical approaches to the reading and writing of literary genres.

CO 3: Critique and support the creative writing of peers in a guided workshop environment.

CO 4: Engage in literary output by identifying, analyzing and expressing socially sensitive and personally abstract themes and ideas.

CO 5: Gain expertize in providing critical readings of works of literary expressions.

COURSE OUTLINE

Module I: Art and Craft of Writing

- Introduction

Creative Writing definition – Measuring Creativity – Inspiration and Agency – Creativity and Resistance – Imagination – Importance of Reading

- The Art and Craft of Writing

Tropes and Figures – Style and Register – Formal/Informal Usage – Varieties of English – Language and Gender – Word Power – Grammar and Word Order – Tense and Time

Module II: Creative Writing across Genres

- Poetry

Definition – Beginning to write poems – Shape, Form, Technique – Rhyme and Reason – Fixed forms and Free Verse – Modes of Poetry (Lyrical, Narrative, and Dramatic) – Voices – Indian English poets/works – Problems with writing poetry – Beginning to write

Individual Creative Activity

Poems

- Fiction

Fiction – Literary and Popular Fiction – Short Story – Analysis of a short story – A Conversation with a creative writer – Beginning to write

Individual Creative Activity

Short Stories

- Drama

Concepts and characterization of drama – Verbal/non-verbal elements – Different styles of contemporary theatre in Indian English – Developing a situation – Creating a sequence of events – Transforming it into a scene for a play

Individual Creative Activity

One Act Play

- Writing for Children

Children's literature – writing verse – fiction – scripting for children's theatre

Individual Creative Activity

Poems/Short Stories/Plays for children

Module III: Creative Writing in Other Forms

Reviews

Book reviews, Film reviews

Travel Writing

Travelogues

Life Writings

Memoirs, Diary Entry, Biography, Autobiography

Blogs

Personal/Social/Cultural/Instagram poem/blogs

Creative Writing in Commercial Sphere

Forms

Advertisements, Tourist brochure, Recipe Writing

Individual Creative Activity

Book/film reviews, Travelogues, Memoirs, Diary Entry, Biography (Max. 300 words), Autobiography (Max. 300 words), Personal/Social/Cultural/Instagram poems/blogs

Course Material

Modules I & II

Creative Writing: A Beginner's Manual by Dev, Anjana Neira et al. Pearson Longman, 2009.

Reference

Modules III

Book Review

www.writingcenter.unc.edu/tips-and-tools/book-reviews/

www.writingcenter.unc.edu/esl/resources/writing-critique/

Film Review

www.wikihow.com

"How to Write a Movie Review (With Sample Reviews)"

Travelogues

www.researchgate.net/publication/274640565_TRAVELOGUES_AN_INNOVATIVE_AND CREATIVE_GENRE_OF_LITERATURE

www.academichelp.net/create-writing/write-travelogue.html

Memoir

www.selfpublishingschool.com/how_to_write_a_memoir/

“How to Fast Draft Your Memoir with Rachael Herron”

www.youtube.com

Diary Entry

www.reliving.co.uk/write-a-diary-entry-expressing-your-feelings/

Biography

www.masterclass.com/articles/how-to-write-a-biography#6-tips-on-how-to-write-a-biography/

Autobiography

www.theclassroom.com/write-autobiography-university-4581.html/

“How to Write an Autobiography: The Ultimate Guide with Pro Tips”

www.essaypro.com/blog/autobiography

Blogs

“How to Write a Blog Post: A Step-by-Step Guide”

blog.hubspot.com

www.wordstream.com>blog>2015/02/09>how-to-write-a-blog-post

Instagram Poems/Blogs

www.writersxp.com>how-to-become-an-instagram-poet

www.business2community.com>instagram>14-blogging...>02308043

Advertisements

“Creativity in Advertising-Harvard Business Review by Werner Reinartz and Peter Saffert

www.hbr.org>2013/06>creativity-in-advertising-when-it-w.../

Tourist Brochure

www.library.uncg.edu>nclitmap>TravelBrochureInclusion

www.wikihow.com>...>ArtMedia>Brochures>

Recipe Writing

www.sharonpalmer.com>rules-for-good-recipe-writing

www.thekitchn.com>how-to-write-a-recipe-58522

"How to write a recipe" by Jessica Focht 1 Nov. 2019

www.grammarly.com/blog/how-to-recipe/

Reviews - Commercial

Product

www.impactbnd.com/blog/how-to-write-product-reviews/

General Reference

Abrams, M. H., Geoffrey Galt Harpham. A Glossary of Literary Terms Eleventh Edition. Cengage Learning

Cheney, Theodore A. Rees. Writing Creative Nonfiction: Fiction Techniques for Crafting Great Non-Fiction Writing and Journalism. Ten Speed Press

Cuddon, J. A., Dictionary of Literary Terms & Literary Theory. Penguin.

Earnshaw, Steven. Ed. The Handbook of Creative Writing.Edinburgh University Press.

Mills, Paul. The Routledge Creating Writing Coursebook.Routledge.

Morley, David. The Cambridge Introduction to Creative Writing.Cambridge University Press.

Prasad B. A Background to the Study of English Literature. Macmillan

Roney, Lisa. Serious Daring: Creative Writing in Four Genres. Oxford University Press.

Zinsser, William. On Writing Well: The Classic Guide to Writing Non-Fiction.HarperCollins.

https://www.scribendi.com/advice/best_book_blogs_2015.en.html

Note: How to implement this course

Students should be exposed to the above as far as possible in the classroom sessions. Since there are many forms listed, group work and division of work along with self-teaching activities may be resorted to. Keeping this in view, certain items in the syllabus have been listed for individual/team writing. Writing workshops should also be conducted.

SEMESTER VI

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Elective Course 4: EN 1661.4 English for the Media

No. of credits: 2 **No. of instructional hours: 3per week [Total: 54 hours]**

Aim: To introduce the essential requirements of writing for the media.

Objectives

1. To familiarize students with the process of writing for the media
2. To make them familiar with the specific use of English in the field of media
3. To generate interest in various aspects of media and thereby to equip them with the basic writing skills required for the same.

Course Outcome

CO 1: Generate interest in various aspects of media and thereby to equip them with the basic writing skills required for the same.

CO 2: Enable the students to take up jobs in the media industry- both in the print, broadcast and the new media.

CO 3: Equip the students with the necessary writing procedures so that they can initiate themselves into the media industry even without doing a specialized programme on the topic.

CO 4: Promote their writings with the help of the new media

CO 5: Instill confidence in learners to choose a profession in media.

Module I Writing for the print media

Newspaper: Writing headlines – Analysing newspaper articles - Practising interview skills – Planning and writing a newspaper article

Magazine: Composing magazine covers – Planning the contents of a magazine – Giving instructions for a photo shoot – Planning and writing a true life story.

Module II Writing for Radio, Television and Film

Radio: Understanding the language of radio presenters – Understanding the production process – Planning a newslist – Giving post production feedback.

Television: Understanding the pre-production process – Organising a filming schedule – Filming on location – Editing a TV documentary

Film: Writing a screenplay – Pitching successfully – Organising a shoot –Writing a film review.

Module III Writing for advertisements and New media

Advertisement and Marketing: Selling your services to a potential client – Creating a print advert – Creating a screen advert – Presenting a finished advert – Analysing market trends and taking action – Setting up a marketing communication strategy – Organising the relaunch of a product – Evaluating the success of a relaunch.

New Media: Briefing a website designer – Analysing problems and providing solutions – Planning and writing a blog – Creating a podcast.

Core Reading:

Ceramella, Nick and Elizabeth Lee.Cambridge English for the Media.Cambridge UP, 2008.

Recommended Reading

Allen, Victoria, Karl Davis et al. Cambridge Technicals Level 3 Digital Media. Hodder,2016.

Axford,Barrie and Richard Huggins. New Media and Politics. Sage,2001.

Hayward, Susan. Cinema studies: The Key Concepts. Routledge, 1996.

Manovich, Lev. The Language of New Media. Cambridge: MIT P, 2002.

Ogilvy, David. Ogilvy on Advertising.Welbeck. 2007.

Ouellette, Laurie. The Media Studies Reader.Routledge, 2012.

Parthasarathy, Rangaswami. Here is the News! Reporting for the Media.Sterling Publications. 1998.

Raman, Usha. Writing for the Media.OUP, 2009.

Ryan, Michael and James W Tankard.Writing for Print and Digital Media.McGraw-Hill, 2005.

e-resources

https://www.google.co.in/books/edition/Designing_New_Media/

https://www.google.co.in/books/edition/AS_Media_Studies

https://www.google.co.in/books/edition/Social_Media_and_Democracy

https://www.google.co.in/books/edition/Writing_Feature_Articles

https://www.google.co.in/books/edition/Writing_Space

http://downloads.bbc.co.uk/writersroom/scripts/bbcradioscene.pdf

https://indiegroundfilms.files.wordpress.com/2014/01/titanic-numbered.pdf

https://podcasts.google.com/

SEMESTER VI

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Elective Course 5: EN 1661.5 20th Century Regional Literatures in English Translation

No. of credits: 2 **No. of instructional hours: 3per week [Total: 54 hours]**

Aim : Introduce and broaden the knowledge about the richness of regional literatures.

Objectives

1. Introduce the diversity of the nature and features of literary productions within the country and to synthesis ideas that connect them
2. Equip to analyze and defend a plurality of paradigms that will enable a greater understanding of the complex and interdisciplinary nature of translation.
3. Enhance the competence and skill development in the area of translation studies.

Course Outcome

CO 1: Think creatively and critically within and beyond the singularity of regional literature

CO 2: Overcome language barrier in the appreciation of literature

CO 3: Equip to identify the uniqueness as well as the shared history of the regional literatures

CO 4: Engage in translating regional texts into English

CO 5: Be able to evaluate their own competences in translation and will be capable of selecting specialized translation courses for higher studies and also as profession.

COURSE OUTLINE

Module I: Poetry

1. Amrita Pritam (Punjabi) " Oedipus" http://apnaorg.com/books/english/selected-poems-amrita-pritam/selected-poems-amrita-pritam.pdf
2. Ka. Naa. Subramanyam (Tamil)"Experience" Sachidananda,K. ed. Signature: *One Hundred Indian Poets.* NBT 2006.
3. Navakanta Baruna (Asamiya) "Tete-a-tete" https://www.poemhunter.com/poem/tete-a-tete-4/
4. Sitakant Mahapatra (Oriya) 'Death of Krishna" (*Death Of Krishna And Other Poems* by Sitakant Mahapatra Calcutta : Rupa & Co., 1992.
5. K.Ayappa Paniker "Bhagavathykunjamma's Bharatanatyam"

https://www.poemhunter.com/ayyappa-paniker/poems/

Module II:

Fiction/ Non-Fiction

1. Perumal Murgan :*Poonachi: or the Story of a Black Goat* Pushkin Press, 2020.
2. U R Ananthamurthy : *Samskara: A Rite for A Dead Man* New Delhi Oxford University Press 2013

Short Story:

1. Ismat Chughtai 'The Quilt"https://archive.org/stream/LihaafTheQuiltIsmatChughtai/Lihaaf%20%5BThe%20Quilt%5D%20-%20Ismat%20Chughtai_djvu.txt.
2. Fakir Mohan Senapati "Rebati" https://www.scoop.it/topic/tghpnpv/p/4099690484/2018/07/24/rebati-by-fakir-mohan-senapati-pdf995
3. Amin Kamil: "Cock Fight" http://kamil.neabinternational.org/cockfight.htm

Module III: Drama

1. Vijay Tendulkar : *His Fifth Woman* (*THE CYCLIST and HIS FIFTH WOMAN*Oxford University Press, 2006.
2. Salish Alekar:*The Dread Departure* (Collected Plays of Satish Alekar by Satish Alekar New Delhi ; Oxford : Oxford University Press, 2010)

Recommended Reading

Abdulla, V.and R.E. Asher, Ed. *Wind Flowers*. New Delhi: Penguin, 2004.

Adil Jussawalla (ed) *New Writing in India* Harmondsworth: Penguin.1974.

Ashly C N .tr.*O Hendriyude Theranjedutha Kathakal* by. Papion, Kozhikodu.

Bhattacharya, Bhabani (ed.) *Contemporary Indian short stories Volume II* Sahitya Akademi, 2006

Catford, J. C. 1965. *A Linguistic Theory of Translation. London: Oxford University Press.*

Gokak V.K. (ed). Literatures in Modern Delhi: The Publication Indian Languages Division,

1957

Hatim, Basil and Jeremy Munday.*Translation: An Advanced Resource Book*. London: Routledge,2004.

Mukherjee, Meenakshi and Nissim Ezekiel.(ed) *Another India*, New Delhi: Penguin,1990.

Nandi, Pritish ed. *Selected Poems of Amrita Pritam Dialogue* Calcutta Publication, 2001.

Sachidananda, K. ed *Signature: One Hundred Indian Poets* . NET India New Delhi 2000

Palumbo, Giuseppe. *Key Terms in Translation Studies*.Continuum, 2009.

Vasudevan Nair, M.T. *Kuttiedathi and Other Stories.* Abdulla, V. tr. Hyderabad: Orient Black Swan,2009.

Ramakrishnan, Malayattoor. *Roots.* Abdulla, V. tr. Hyderabad: Orient Black Swan, 2009.

.Basheer, Vaikom Muhammed.*Poovan Banana and Other Stories*. Abdulla, V. tr. Hyderabad: Orient Black Swan, 2009.

Sreedhara Menon ,Vyloppilly .Vanampadiyodu' (Translation of Keats' Ode to a Nightingale)

e-resources:

(http://kamil.neabinternational.org/cockfight.htm)

(https://www.scoop.it/topic/tghpnpv/p/4099690484/2018/07/24/rebati-by-fakir-mohan-senapati-pdf995)

https://archive.org/stream/LihaafTheQuiltIsmatChughtai/Lihaaf%20%5BThe%20Quilt%5D%20-%20Ismat%20Chughtai_djvu.txt

https://www.poemhunter.com/ayyappa-paniker/poems/

https://www.epw.in/engage/article/case-collaborative-translation-literary-texts-south-asia

https://www.poetrytranslation.org/poems/from/india

https://kitaab.org/2018/01/19/100-great-indian-poems-editors-note-and-8-poems/

http://indianpoetrytranslations.blogspot.com

https://www.worldliteraturetoday.org/blog/poetry/three-poems-india-kedarnath-singh

https://zubaanbooks.com/found-in-translation-stories-from-india/

http://osou.ac.in/eresources/CIT-01-Unit-01-Meaning,%20Nature%20and%20Scope%20of%20Translation.pdf

SEMESTER VI

FIRST DEGREE PROGRAMME IN

B A ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Elective Course 6: EN 1661.6 Copy Editing

No. of credits: 2 **No. of instructional hours: 3per week [Total: 54 hours]**

Aim: Introduce a skill and career oriented course

Objectives

1. Familiarize students with the concepts of copy- editing and impart basic copy-editing skills.
2. Give exposure to the practice of copy editing
3. Open up areas of further possibilities regarding choice of career.

Course Outcome

CO 1: Gain Through knowledge og the theoretical and practical knowledge of copy editing

CO 2: Copy-edit non–technical materials of moderate difficulty.

CO 3: Produce consistently well-organized written discourse.

CO 4: Find employment in the editing field as copy-editors, sub-editors and webeditors.

CO 5: Help them find employment in the publishing field

COURSE OUTLINE

Module I

What is copy-editing - scope and need - various typescripts - electronic - conversion of manuscripts - copy-editing - preliminary steps.

Module II

Preparing the text - the quantity of copyediting needed - interacting with the author - creation of selfcontained, well-edited copies and books - coherence and consistency - the question of copyrights - acknowledgements and other legal issues - incorporating illustrations - copy-editing blurbs and titles and cover descriptions - dealing with multiauthorship - proof-reading - repeated proofs.

Module III

The problem of style - the concept of in-housestyle - in-house style manuals - the question of grammar – abbreviations – concord – nouns - proper nouns – punctuation – spelling – ambiguity – dates – money measurements - a brief understanding of the make-up of a standard book - preliminary pages - indexing a book - bibliographical references - special books like scientific and technological books - On-screen copy editing – definition - scope - different types - technical issues involved - legal and safety concerns - software tools.

Module IV

Practice session On grammatical trouble points - use of MLA Handbook as an in-house style manual – basic copyediting using materials such as assignments and projects from students - use of electronic versions of these materials for onscreen copy- editing practice.

Recommended Reading

Butcher, Judith, et al. Butcher's Copy-editing, Fourth Edition. New Delhi:

Chicago Manual of Style, 15th Edition of Manual of Style. University of Chicago, 2003.

Greenbaum, Sidney and Janet Whitcut, Longman Guide to English Usage. Harmondsworth: Penguin,1996.

Huddleston, R and Geoffrey K. Pulia, A Student's Introduction to English Grammar. CUP, 2005.

New Hart's Rules; The Handbook of Style for Writers and Editors.Oxford University Press, 2005.

New Oxford Dictionary for Writers and Editors: The Essential A to Z Guide to the Written Word. OUP, 2005.

Suttcliffe, Andrea J, Ed., The New York Public Library Writer's Guide to Style and Usage. Macmillan, 2000.

Turtoa, ND and Heaton, JB.Dictionary of Common Errors.Longman, 1998.

SEMESTER VI

FIRST DEGREE PROGRAMME (CBCS System)

Common guidelines for Project/Dissertation

B.A. ENGLISH LANGUAGE AND LITERATURE: EN 1645

Credits: 4 **Total Instructional hours: 3 per week [Total: 54 hours]**

A. Guidelines for Teachers:

1. The Project/Dissertation should be done under the direct supervision of a teacher of the department, preferably the Faculty Advisor for the sixth semester. However the work of supervising the Projects should be distributed equally among all the faculty members of the department.

2. The teaching hours allotted in the sixth semester for the Project/Dissertation [i.e., 3 hours/week] is to be used to make the students familiar with Research Methodology and Project writing.

3. A maximum of five students will work as a group and submit their project as a [single] copy for the group. The members of a group shall be identified by the supervising teacher. Subsequently each group will submit a project/dissertation and face the viva individually/separately.

4. The list containing the groups and its members should be finalized at the beginning of the sixth semester.

5. Students should identify their topics from the list provided in consultation with the supervising teacher or the Faculty Advisor of the class [Semester 6] as the case may be. The group will then collectively work on the topic selected.

6. Credit will be given to original contributions. So students should not copy from other projects.

7. There will be an external evaluation of the project by an External examiner appointed by the University. This will be followed by a viva voce, which will be conducted at the respective college jointly by the external examiner who valued the projects/dissertations and an internal examiner. All the members within the group will have to be present for the viva voce. The grades obtained [for external evaluation and viva voce] will be the grade for the project/dissertation for each student within that group.

8. The Project/Dissertation must be between 20 and 25 pages. The maximum and minimum limits are to be strictly observed.

9. A Works Cited page must be submitted at the end of the Project/Dissertation.

10. There should be a one-page Preface consisting of the significance of the topic, objectives and the chapter summaries.

11. Two copies have to be submitted at the department by each group. One copy will be forwarded to the University for valuation and the second copy is to be retained at the department.

B. General guidelines for the preparation of the Project:

• Paper must of A4 size only.

• One side Laser Printing.

• Line Spacing: double.

• Printing Margin: 1.5 inch left margin and 1 inch margin on the remaining three sides.

119

• Font: Times New Roman only.

• Font size: Main title -14/15 BOLD & matter - 12 normal.

• The project need be spiral-bound only.

• Paragraphs and line spacing: double space between lines [MLA format].

• Double space between paragraphs. No additional space between paragraphs.

• Start new Chapter on a new page.

• Chapter headings (bold/centred) must be identical as shown:

Chapter One

Introduction

• Sequence of pages in the Project/Dissertation:

i. Cover Page.

ii. First Page.

iii. Acknowledgement, with name & signature of student.

iv. Certificate (to be signed by the Head of the Dept and the Supervising Teacher).

v. Contents page with details of Chapter Number, Chapter Heading & Page Numbers.

• Specimen copies for (i), (ii), (iv) and (v) will be sent to the colleges.

• Chapter divisions: Total three chapters.

Preface

Chapter One: Introduction - 5 pages

Chapter Two: Core chapter - 15 pages

Chapter Three: Conclusion - 5 pages.

Works Cited

[Numbering of pages to be done continuously from Chapter One onwards, on the top right hand

corner]

C. Specific guidelines for preparation of Project:

1. Only the Title of the Project Report, Year and Programme/Subject should be furnished on the cover page of the University copy of the Project. The identity of the College should not be mentioned on the cover page.

2. Details like Names of the Candidates, Candidates' Codes, Course Code, Title of Programme, Name of College, Title of Dissertation, etc. should be furnished only on the first page.

3. Identity of the Candidate/College should not be revealed in any of the inner pages.

4. The pages containing the Certificate, Declaration and Acknowledgement are not to be included in the copy forwarded to the University.

5. The Preface should come immediately before the Introductory Chapter and must be included in all the copies.

D. Selection of Topics:

Students are permitted to choose from any one of the following areas/topics. Selection of topics/areas has to be finalized in the course of the first week of the final semester itself with the prior concurrence of the Faculty Advisor / Supervisor:

1. Post-1945 literature. This must not include the prescribed work/film coming under Core study. [Works/films other than the prescribed ones can be taken for study]

2. Analysis of a film script.

3. Analysis of advertisement writing [limited to print ads]. Study should focus on the language aspect or be analyzed from a theoretical perspective [up to a maximum of 10 numbers].

4. Analysis of news from any of these news stations/channels: AIR, Doordarshan, NDTV, Headlines Today, Times Now, BBC, and CNN. [News from 5 consecutive days highlighting local, regional, national, international, sports, etc]

5. Celebrity Interview: from film, politics, sports and writers [Only one area or one personality to be selected].

6. Studies on individual celebrities in the fields of arts and literature. Example: a Nobel Prize winner, a dancer/singer/musician/film star, etc, of repute [Only one personality to be selected].

7. Studies based on any 5 newspaper editorials or articles by leading international or national columnistslike Thomas Friedman, Paul Krugman, Anees Jung, etc.

8. Compilation and translation of any 5 folk stories of the region.

9. Analysis of the language used in email and sms. The study should focus on the language aspect used in such modes of messaging, limiting to 10 pieces of email/sms. [Reference: David Crystal Txtng: the GR8 Dbt. OUP, 2008]

10. Studies on popular folk art forms like Koodiyattam, Theyyam, Pulikali, Chakyar Koothu, Nangyar Koothu, Kalaripayattu, Kathakali, Mohiniyattam, Maargamkali, Oppanna, etc. [Only one art form to be selected].

11. Study on any 5 popular songs in English. Songs of popular bands like the ABBA, Boney M, Backstreet Boys, Beatles, Pink Floyd, Rolling Stones, Westlife, Boyzone, etc can be selected.

12. Study based on the life and works of one Nobel Prize winner in literature.

E. Details of Course Contents:

(1) Academic writing: The following areas are to be made familiar to the students during the course of the 3 instructional hours/week set aside for the same in the sixth semester:

(a) Selecting a Topic

(b) Compiling a Working Bibliography

(c) Writing Drafts

(d) Plagiarism and Academic Integrity

(e) Mechanics of Writing

(f) Methods of quoting texts:

(g) Format of the Research Paper

Reference text: *M.L.A. Handbook* 8th Edition.

(2) Documentation of sources in the works cited page(s): Samples of different types of sources will be provided.

Question Paper Pattern

No questions should be asked from Additional/ Suggested/ Recommended Reading.

Max. Marks: 80 **Time: 3 hours**

Part One

10 questions to be answered, each in a word or sentence. **(10 x 1=10marks)**

Part Two

Eight questions to be answered from a total of 12 and to be written in not more than 50 words.

(8 x 2= 16marks)

Part Three

Six questions to be answered from a total of 9 and to be written in around 100words.

(6 x 4 = 24marks)

Part Four

Two questions to be answered out of four and to be written in not less than 300 words.

(2 x 15= 30marks)

UNIVERSITY OF KERALA

FIRST DEGREE PROGRAMME IN

Career related 2(a)

ENGLISH AND COMMUNICATIVE ENGLISH

(CBCS SYSTEM)

2013 Admissions onwards

SEMESTERS I to 6

(Core, Complementary, Vocational Open Courses)

SYLLABI

SEMESTER I

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
COMMUNICATIVE ENGLISH

Core Course I – READING POETRY: CG 1141

No. of credits: 3
No. of instructional hours: 5 per week (Total: 90 hrs)

AIMS

1. To sensitize students to the language, forms and types of poetry.
2. To make them aware of the diverse poetic devices and strategies.
3. To help them read, analyse and appreciate poetry.
4. To enhance the level of literary and aesthetic experience and to help them respond creatively.

OBJECTIVES

On completion of the course, the students should be able to
1. identify the various forms and types of poetry
2. explain the diverse poetic devices and strategies employed by poets.
3. read, analyse and appreciate poetry critically.
4. respond critically and creatively to the world around.

COURSE OUTLINE

Module 1:

- Subjective and Objective Poetry
- Types of Poetry: Lyric, Ode, Sonnet, Elegy, Ballad, Epic, Mock Epic, Dramatic Monologue, Haiku.
- Stanza – couplet, tercet, terza rima, ottava rima, quatrain, spensarian stanza, rime royal.
- Poetic devices: alliteration, assonance, simile, metaphor, image, symbol, rhythm, rhyme.
- Meter: Heroic Couplet, Free Verse and Blank Verse.

Module 2:

Representative poetry from British literature.

Module 3:

Representative poetry from American, Irish, German, Russian, Australian and Indian literatures.

Module 4:

Practical criticism – intensive reading of poems at phonological, structural and semantic levels.
Critical analysis and appreciation of unseen poem.

COURSE MATERIAL

Module 1:
Core reading: Chapter 1 from *A Concise Companion to Literary Forms.* Emerald, 2013.

Reference
1. Abrams, M.H. *A Glossary of Literary Terms* (Rev. ed.)
2. Hobsbaum, Philip. *Metre, Rhyme and Verse Form*. New Critical Idiom. Indian Reprint.Routledge, 2007.

Reading List
1. Wainwright, Jeffrey. *The Basics: Poetry*. Indian Reprint. Routledge, 2009.
2. Hudson, W.H.: *An Introduction to the Study of English Literature*
(Chapter 3, The Study of Poetry)

Modules 2:

1. William Shakespeare - Sonnet 18 (Shall I compare Thee to a Summer's Day)
2. John Donne – A Valediction Forbidding Mourning
3. Thomas Gray – Elegy Written in a Country Churchyard
4. Samuel Taylor Coleridge - Kubla Khan
5. Robert Browning – Porphyria's Lover
6. Siegfried Sassoon – A Subaltern

Core reading: *Aeolian Harp: An Anthology of Poetry in English*. Scientific International Pvt. Ltd, 2013.
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Module 3:

1. Robert Frost – The Road Not Taken
2. Bertolt Brecht – General, Your Tank
3. Louis Macneice – Prayer Before Birth
4. Peter Porter – A Consumer's Report
5. Kamala Das – An Introduction

Core reading: *Aeolian Harp: An Anthology of Poetry in English*. Scientific International Pvt. Ltd, 2013.

Module 4:
Practical criticism – intensive reading of poems at phonological, structural and semantic levels.

Core reading: *Aeolian Harp: An Anthology of Poetry in English*. Scientific International Pvt. Ltd, 2013.

Reference:
A Concise Companion to Literary Forms. Emerald, 2013.
Seturaman, V.S, Ed. *Practical Criticism*. Chennai: Macmillan, 2007.
Bernard Blackstone. *Practical English Prosody: a handbook for students.* Longman, 2009.

Instruction to Teachers:

- The work of each author has to be placed against the literary backdrop of the age.
- The literary significance of the work is to be briefly discussed in the classroom and hence the student is expected to have an awareness of the respective works.
- Questions are not to be asked from such details at the examination.

SEMESTER I

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
COMMUNICATIVE ENGLISH

Foundation Course I: WRITINGS ON CONTEMPORARY ISSUES: CG 1121.3

No. of credits: 2
No. of instructional hours: 3 per week (Total 54 hrs.)

AIMS

1. To sensitize students to the major issues in the society and the world.
2. To encourage them to read literary pieces critically.

OBJECTIVES

On completion of the course, the students should be able to

1. have an overall understanding of some of the major issues in the contemporary world.
2. respond empathetically to the issues of the society.
3. read literary texts critically.

COURSE OUTLINE

Module I: Globalization and its Consequences
Essay: "The Globalized World" – Avinash Jha.
Poem: "Unending Love" - Rabindranath Tagore

Module II: Environmental Issues
Essay: "Forests and Settlements" - Romila Thapar
Poems: (1) "God's Grandeur" - G.M.Hopkins
(2) "The World is too Much with Us" - Wordsworth

Module III: Human Rights
Essay: "Thinking about Human Rights" - Manisha Priyam, Krishna Menon & Madhulika Banerjee,
Poem: "London" - William Blake
Fiction: *Untouchable* [an extract] – Mulk Raj Anand

Module IV: The Gender Question
Essays: "Gender, Culture and History" – Manisha Priyam, Krishna Menon & Madhulika Banerjee,
Fiction: "The Elder Sister" – M. T. Vasudevan Nair

COURSE MATERIAL

Modules 1 - 4
Core reading: *Meeting the World: Writings on Contemporary Issues*. Pearson, 2013.

SEMESTER I

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
COMMUNICATIVE ENGLISH

Vocational Course I - BASICS OF COMMUNICATION: CG 1171

No of credits: 3
No of instructional hours: 3 per week (Total 54 hrs)

AIM

1. To provide the students with an ability to build and enrich their communication skills.
2. To make them familiar with different types ofcommunication.
3. to understand the barriers to effective communication
4. engage students in meaningful communication through effective tasks.

OBJECTIVES

On completion of the course students should be able to:

1. Identify the basic principles of communication
2. Analyse the various types of communication
3. Make use of the essential principles of communication.
4. identify the prominent methods and models of Communication.

Module 1

Communication - definition – meaning – elements - basics of communication - communication process - importance of communication - the seven C's of communicationcompletness - conciseness – consideration – conctretness - claritycourtsey and correctness.

Module 2

Models of communication
Ancient - rhetorics - Aristotle - modern --Linear model - dynamic models

Module 3

Channels of communication - formal and informal – verbalnon – verbal - body language - sign language -para language circumstantial language - intrapersonal and interpersonal communication - group and mass communication - network communication - impact of IT on communication - pathways ofcommunication - downward – upward - horizontal.

Module 4

Barriers to communication - sender-centric – receiver-centric and organizational – socio-cultural - information overload - overcoming communication barriers.

COURSE MATERIAL

Reading list

1. Fisk, J. Introduction to Communicative Studies, 1990. London: Routledge.
2. Aggrval, Shalini. Essential Communication Skills, 2009. New Delhi: Anne Books.
3. Marsen, Sky. Communication Studies 2009. New York, Palg rave.
4. Knapp .M. Essentials of Non-Verbal Communication Theory Rea. 1995Orlando, FL: Harcourt.
5. Cobley. P. (ed.) The Communication Theory reader 1995, London: Routledge.
6. McQuail d. Communication, 1975; London; Longman.
7. Prince. S. Communication Studies, 1997. London. Longman.
8. Beck, Andrew et al, AS Communication Studies: The Essential Introduction. 2004. London. Routledge.

SEMESTER I

FIRST DEGREE PROGRAMME IN
ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Complementary Course - HISTORY OF ENGLISH LITERATURE [Semesters 1 to 3]

Common for

FIRST DEGREE PROGRAMME IN
ENGLISH LANGUAGE AND LITERATURE (CBCS System)
&

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
ENGLISH & COMMUNICATIVE ENGLISH

NOTE TO TEACHERS:

The syllabus - a rationale

Books, and the authors who write them, have a complex relationship with the societies that produce them. It is hoped that this syllabus will help students develop both an understanding and an appreciation of some of the complexities involved in the production of and reception of British literature.

This syllabus is organised chronologically. It is intended to enable a student to understand the following things:

- One, how people lived during various ages in Britain.
- Two, what sort of social and political organisations evolved there.
- Three, what the beliefs and practices of the people were ie. how the culture of Britain evolved.
- Four, what kind of literature emerged out of these conditions.

None of these are dealt with at depth. A broad overall picture is what the student is expected to gain.

It is hoped that, apart from giving valuable background information that will enable students to understand and appreciate individual works from any age better, the syllabus will also help them develop a sense of history and the ability to organise, evaluate and present ideas from one coherent body of knowledge. This mental training should be as important as the facts that they study. Therefore teachers should take care to get students to read books and access other authentic sources to learn more about the topics covered.

SEMESTER I

FIRST DEGREE PROGRAMME IN
ENGLISH LANGUAGE AND LITERATURE (CBCS System)
&
CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
ENGLISH & COMMUNICATIVE ENGLISH

Complementary Course – HISTORY OF ENGLISH LITERATURE- 1

Common for EN 1131 & CG 1131

B.A. English Main - Complementary Course I: EN 1131
No. of credits: 3
No. of instructional hours: 3 per week (Total: 54 hrs)

B.A. Career related 2(a) English and Communicative English -
Complementary Course I: CG 1131
No. of credits: 4
No. of instructional hours: 4 per week (Total: 72 hrs)

COURSE DESCRIPTION

Module 1:
The Early history of England - Roman Britain - The coming and settlement of the Germanic tribes - The arrival of Christianity - The Anglo Saxon Heptarchy - The Viking invasions - The reassertion of British control - Old English literature – Bede, *Beowulf*, King Alfred.

Module 2:
The Norman invasion – Feudalism - Middle English literature – Langland - *Sir Gawain and the Green Knight* - Medieval romances, alliterative verse – Chaucer – *The Canterbury Tales* - The beginnings of English drama - Miracle, morality and mystery plays, and Interludes.

Module 3:
The Renaissance - The Tudors - The English Reformation and Counter-reformation - Trade and colonialism - The Stuart Age - Elizabethan poetry – Spenser - Renaissance drama - Ben Jonson - The University Wits – Shakespeare – Bacon - Thomas More - Authorised (King James) Version of the Bible.

Core texts:

(1) *A Concise History of English Literature and Language,* Primus Books, Delhi 2013.
(2) Ashok, Padmaja. *The Social History of England*. Orient Black Swan 2011.

Books recommended:

Peck, John and Martin Coyle. *A Brief History of English Literature*. Palgrave, 2012.
Poplawski, Paul Ed. *English Literature in Context*. CUP, 2008.
Thornley G C and Gwyneth Roberts. *An Outline of English Literature*. Pearson, 2011.

SEMESTER II

FIRST DEGREE PROGRAMME IN ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Core Course II – READING DRAMA: CG 1241

No. of credits: 4
No. of instructional hours: 5 per wk (Total: 90 hrs)

AIMS

1. To enable the students to read, analyse and appreciate drama
2. To sensitize them to the verbal and visual language of drama
3. To help them watch, write about, and perform plays

OBJECTIVES

On completion of the Course, the students should be able to

1. identify the various forms and schools of drama
2. analyse and appreciate drama
3. write critically about and engage actively in producing / performing drama

COURSE OUTLINE

Module 1:

- Drama – Origins and early forms: Greek Drama, Mystery plays, Miracle Plays, Morality Plays and Interludes.
- The Major Dramatic Genres: Tragedy, Comedy, and Tragi-Comedy.
- Types of comedy – Romantic Comedy, Comedy of Humours, Comedy of Manners/ Restoration Comedy, Sentimental Comedy, farce, burlesque, black comedy.
- Types of Tragedy: Revenge Tragedy, Domestic Tragedy, Heroic Drama.
- Other forms: melodrama, masque, One-Act Plays, epic drama, absurdist drama, kitchen-sink drama
- Dramatic Devices – irony, soliloquy, aside, chorus.

Module 2: Shakespeare

Module 3: Modern drama (British / European/American)

Module 4: One-Act play.

COURSE MATERIAL

Module 1
Core reading: Chapter 2 from *A Concise Companion to Literary Forms.* Emerald, 2013.

Module 2
Core reading: Shakespeare: *Macbeth* (Cambridge University Press)

Module 3
Core reading: Arthur Miller: *All My Sons* (Oxford University Press)

Module 4
Core reading: J.M. Synge: *Riders to the Sea* (Orient Blackswan Edition)

Instruction to Teachers:

- The work of each author has to be placed against the literary backdrop of the age.
- The literary significance of the work is to be briefly discussed in the classroom and hence students are expected to have an awareness of the respective works.
- Questions are not to be asked from such details at the examination

SEMESTER II

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
COMMUNICATIVE ENGLISH

Vocational Course II - PHONETICS: CG 1271

No. of credits: 4
No. of instructional hours: 6 per week (Total: 108 hrs)

AIMS

1. To sensitize students to the nuances of spoken and written forms of English
2. To help them overcome specific problems resulting from mother tongue interference

OBJECTIVES

On completion of the course, the students should be able to

1. develop a neutral accent and improve their general standard of pronunciation
2. speak globally intelligible English

COURSE OUTLINE

Module 1

What is phonetics-– articulatory phonetics- acoustic phonetics - auditory phonetics - speech mechanism – air stream mechanism- organs of speech-various accents – RP – BBC American - Indian.

Module 2

Classification of speech sounds – vowels – pure vowels – diphthongs - consonants – classification according to manner and place - minimal pairs.

Module 3

Phonology – phonemes – classification – distribution – syllabic structure – transcription-broad and narrow – allophones - suprasegmentals – stress – word-stress and sentence-stress – rhythm – juncture – intonation – falling-- rising-- fall-rise--rise-fall-level - grammatical- semantic and discourse function of intonation - assimilation – elision.

Module 4

Remedial phonetics - error analysis - accent neutralization - Practice session - use of language lab – transcription tasks

COURSE MATERIAL

Modules 1- 4

Reading list

T. Balasubramanian. *A Textbook of English Phonetics for Indian Sudents.* Second edition. Macmillan, 2013.

Aslam, Mohammed and Aadil Amion Kak. *Introduction to English Phonetics and Phonology*, Foundation Books, 2007.

Lyons, John. Language and Linguistics: An Introduction, CUP, 1981.

Gimson, A.C. and Edward Arnold. *An Introduction to the Pronunciation of English* CUP, 1980.

Collins, Beverley and Inger Mees, *Practical Phonetics and Phonology: A Resource Book for Students,* Routledge, 2005.

Reference

1. Jones, Daniel. *English Pronouncing Dictionary*. 17th Edn. CUP.

2. Marks, Jonathan. *English Pronunciation in Use: Elementary*. CUP, 2008.

SEMESTER II

FIRST DEGREE PROGRAMME IN ENGLISH LANGUAGE AND LITERATURE (CBCS System) & CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System) ENGLISH & COMMUNICATIVE ENGLISH

Complementary Course – HISTORY OF ENGLISH LITERATURE - II

Common for EN 1231 & CG 1231

B.A. English Main - Complementary Course III: EN 1231
No. of credits: 3
No. of instructional hours: 3 per week (Total: 54 hrs)

B.A. Career related 2(a) English and Communicative English - Complementary Course II: CG 1231
No. of credits: 4
No. of instructional hours: 4 per week (Total: 72 hrs)

COURSE DESCRIPTION

Module 1:
The rise of Puritanism - The Civil War, Colonial Expansion, the Commonwealth and the Restoration in England, the impact of these on literature and social life - Donne and the metaphysical – Milton – John Bunyan - Restoration theatre.

Module 2:
The Eighteenth Century - Enclosures, urbanisation and the rise of the middle class – general literary ambience of the period.

Module 3:
The Enlightenment - the rise of modern science and the rise of capitalism - Coffee Houses in London as centres of social and political discussions - Essay and Novel - Neo-classical verse - Pope, Dryden, Swift, Dr Johnson and Daniel Defoe – periodicals – Addison, Steele.

Module 4:
The Romantic Age - Basic tenets of the Romanticism – French Revolution – Gothic writings -The precursors : Blake and Burns - Wordsworth and the Lake Poets – Coleridge - Keats, Shelley, Byron – Charles Lamb – Imperialism - Orientalism and slavery - The fiction of Jane Austen and Mary Shelley.

Core texts:

(1) *A Concise History of English Literature and Language,* Primus Books, Delhi 2013.
(2) Ashok, Padmaja. *The Social History of England*. Orient Black Swan 2011.

Books recommended:

Peck, John and Martin Coyle. *A Brief History of English Literature*. Palgrave, 2012.
Poplawski, Paul Ed. *English Literature in Context*. CUP, 2008.
Thornley G C and Gwyneth Roberts. *An Outline of English Literature*. Pearson, 2011.

SEMESTER III

FIRST DEGREE PROGRAMME IN ENGLISH LANGUAGE AND LITERATURE (CBCS System)

Foundation Course II – INFORMATICS: CG 1321

No. of credits: 3
No. of instructional hours: 4 per week (Total: 72 hrs)

AIMS

1. To update and expand basic informatics skill and attitudes relevant to the emerging knowledge society
2. To equip students to utilize the digital knowledge resources effectively for their chosen fields of study

OBJECTIVES

On completion of the course, the students should be able to

1. update and expand their knowledge in the field of informatics
2. understand the nature of the emerging digital knowledge society
3. use digital knowledge resources effectively for their studies

COURSE OUTLINE

Module 1

Informatics: an introduction.

History and development of computers – Types of computers – Personal Computers (PC) – Workstations – Laptops – Palmtops – Mobile devices – Notebooks – Mainframe computers – Super computers – IT and the Internet - Cyber ethics and cyber crimes like hacking and morphing.

Module 2

Basic Hardware and Software.

Monitor – CRT and LCD – CPU – Mouse – Keyboard – Ports – USB – Input/output devices – Printers – Scanners – Pen drives - Modems – Microphones – Speakers – Bluetooth devices.

Module 3

Operating Systems:

Microsoft Word – Excel – PowerPoint – Linux – Computer virus – Antivirus tools – File formats – jpg – jpeg – mp3 – zip – RAR.

Module 4

Net working and Internet:

What is networking? – LAN – WAN – Search engines – Social Net working.

COURSE MATERIAL

Modules 1 – 4:
Ravindran Asari - *The Basics of Informatics.* Scientific International Pvt. Ltd, 2013.

Reading list:

1. Alexis and Mathew Leon. *Fundamentals of Information Technology.* Leon Vikas
2. Beekman, George and Eugene Rathswohl. *Computer Confluence.* Pearson Education.
3. Norton, Peter. *Introduction to Computers*. Indian Ed.2. Evans, Alan, Kendal Martin et al *Technology in Action.* Pearson Prentice Hall, 2009.
4. Norton, Peter. *Introduction to Computers*. Indian Ed
5. Rajaraman, V. *Introduction to Information Technology*. Prentice Hall.

SEMESTER III

FIRST DEGREE PROGRAMME IN
ENGLISH LANGUAGE AND LITERATURE (CBCS System)

READING FICTION

Common for

ENGLISH LANGUAGE AND LITERATURE Core Course III: EN 1341
&
CAREER-RELATED FIRST DEGREE PROGRAMME (CBCS) - Group 2 (a) IN ENGLISH & COMMUNICATIVE ENGLISH Core Course III: CG 1341

No. of credits: 3
No. of instructional hours: 4 per week (Total: 72 hrs)

AIMS:

1. To make students aware of the diverse fictional forms in prose.
2. To enable them to analyse and appreciate various fictional writings.
3. To give them an insight into other cultures.
4. To help them think and write imaginatively.

OBJECTIVES

On completion of the course, the students should be able to

1. identify different fictional forms
2. analyse and appreciate fictional writings.
3. write imaginatively.

COURSE OUTLINE

Module 1

- Prose fiction - fable, short story, novel.
- Elements of fiction - plot, theme, characterization (flat and round characters), setting, point of view.
- Types of Novel – romance, picaresque novel, sentimental novel, epistolary novel, historical novel, gothic novel, science fiction, detective fiction, utopian, dystopian fiction, Bildungsroman - Creative- non fiction
- Narrative strategies - stream of consciousness, Meta fiction.

Module 2

Modern British fiction

Module 3

Modern European fiction

Module 4

Short Stories

COURSE MATERIAL

Module 1
Core reading: Chapter 3 from *A Concise Companion to Literary Forms.* Emerald, 2013.

Module 2
Core reading: George Orwell: *Animal Farm* (Penguin Edition)

Module 3
Core reading: Voltaire: *Candide* (Penguin Classics)

Module 4
Core reading: *Golden Threshold: An Anthology of One Act Plays and Stories One Act Plays,* Orient Blackswan, 2013:

The following short stories:

O'Henry:	"Romance of a Busy Broker"
Katherine Mansfield:	"The Little Girl"
A.C. Doyle:	"The Red-headed League"
Norah Burke:	"The Family Man"
R.K.Narayan:	"Lawley Road"

Further reading
1. Klarer, Mario. *An Introduction to Literary Studies*. Sec. Ed. Indian Reprint. Routledge, 2009. (Section: Fiction)
2. Hudson,W. H. *An Introduction to the Study of English Literature*. (Chapter IV: The Study of Prose Fiction)

Instruction to Teachers:

- The work of each author has to be placed against the literary backdrop of the age.
- The literary significance of the work is to be briefly discussed in the classroom and hence the student is expected to have an awareness of the respective works.
- Questions are not to be asked from such details at the examination.
- While discussing fiction, the formal, structural and stylistic aspects of the work should be referred to.

SEMESTER III

FIRST DEGREE PROGRAMME IN
ENGLISH LANGUAGE AND LITERATURE (CBCS System)
&

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
ENGLISH & COMMUNICATIVE ENGLISH

Core Course IV - METHODOLOGY AND PERSPECTIVES OF HUMANITIES

Common for EN 1342 & CG 1342

B.A. English Main - EN 1342
No. of credits: 4
No. of instructional hours: 5 per week (Total: 90 hrs)

B.A. Career related 2(a) English and Communicative English - CG 1342
No. of credits: 3
No. of instructional hours: 4 per week (Total: 72 hrs)

AIMS

1. To introduce students to the methodological issues specific to the humanities
2. To develop in them a critical perspective in pursuing literary studies

OBJECTIVES

On completion of the course, the students should be able to

1. explain the key concepts in literary theory and criticism
2. make sense of literature
3. read literature critically from a theoretical perspective.

COURSE OUTLINE

Module 1

Key Concepts:
Humanities – Differences between natural, social and human sciences – facts and interpretation – history and fiction – objectivity versus subjectivity.

Module 2

A critical overview of literature from the perspective of the Humanities.
Impact of society on literature – text types – genres – literary canon – literary interpretation and evaluation.

Module 3

Literary terms – Text oriented approaches – philology – rhetoric – stylistics – new criticism – semiotics – ambiguity.

COURSE MATERIAL

Modules 1 – 3

Core text:

Humanities: **Methodology and Perspectives**, by Dr K Kamala, published by mainSpring publisher, Chennai, 2014.

Reading list:

1. Kundu, Abhijit. "Understanding the Humanities." *The Humanities*: *Methodology and Perspectives.* New Delhi: Pearson Education, 2009.
2. Eagleton, Terry. "What is Literature?"
3. Klarer, Mario. *An Introduction to Literary Studies*. Special Indian Edition: Routledge, 2009.
4. Guerin, Wilfred L, et al. *A Handbook of Critical Approaches to Literature.* New Delhi: OUP, 2009.
5. Nagarajan, M.S. *English Literary Criticism and Theory.* Hyderabad: Orient Longman, 2007.
6. Holghman,William, Hugh Holman. *A Handbook to Literature.* New Delhi: Pearson Education, 2009.
7. Seldon, Ramon, et al. *A Reader's Guide to Contemporary Literary Theory.* ND: Pearson Education, 2005.
8. Bennet, Andrews, Nicholas Royale. *Introduction to Literature, Criticism and Theory,* 3rd Edn. ND: Pearson Education, 2009.
9. Barnet, Sylvan, William Cain. *A Short Guide to Writing about Literature,* 9th Edition. ND: Pearson, 2008.

Direction to Teachers

The various approaches to literature should be discussed with illustrations, where ever necessary.

SEMESTER III

FIRST DEGREE PROGRAMME IN
ENGLISH LANGUAGE AND LITERATURE (CBCS System)
&
CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
ENGLISH & COMMUNICATIVE ENGLISH

Complementary Course – HISTORY OF ENGLISH LITERATURE - III

Common for EN 1331 & CG 1331

B.A. English Main - Complementary Course V: EN 1331
No. of credits: 3
No. of instructional hours: 3 per week (Total: 54 hrs)

B.A. Career related 2(a) English and Communicative English -
Complementary Course III: CG 1331
No. of credits: 4
No. of instructional hours: 4 per week (Total: 72 hrs)

COURSE DESCRIPTION

Module 1:
The Victorian Age - The Reform Acts - Changes in social life - Industrialisation and its impact on the society - Rise of Oxford and Cambridge Universities - Spread of science and technology and its impact – Marx, Darwin, J.S. Mill, Freud - India and the Empire - The Victorian novel - Charles Dickens, George Eliot and Thomas Hardy - Victorian poetry - Arnold, Browning and Tennyson – Pre-Raphaelites – Oscar Wilde and the aestheticians.

Module 2:
Early 20th century - Influences on the social milieu - The First World War - The war poets – Modernism - T S Eliot, Yeats, Auden, Joyce, D.H. Lawrence, Virginia Woolf, Joseph Conrad, G B Shaw and the realists.

Module 3:
The mid-twentieth century and after - World War II - Life between the two World Wars - Effects of the Wars on society and literature - The dissolution of the British empire - The welfare state – Modern to the Post-modernism - Feminism and environmentalism.

Module 4:
Poetry, fiction and drama of the period - Life in the 60s, 70s and 80s - Larkin and the Movement - Ted Hughes, Carol Ann Duffy - George Orwell, Kingsley Amis, Graham Green, Salman Rushdie - Samuel Beckett, Harold Pinter and Tom Stoppard – new trends in English theatre – Literature and New Media in Contemporary England - Contemporary life in England.

Core texts:

(1) *A Concise History of English Literature and Language,* Primus Books, Delhi 2013.
(2) Ashok, Padmaja. *The Social History of England*. Orient Black Swan 2011.

Books recommended:

Peck, John and Martin Coyle. *A Brief History of English Literature*. Palgrave, 2012.
Poplawski, Paul Ed. *English Literature in Context*. CUP, 2008.
Thornley G C and Gwyneth Roberts. *An Outline of English Literature*. Pearson, 2011.

SEMESTER III

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
COMMUNICATIVE ENGLISH

Vocational Course III: COPY EDITING: CG 1371

No. of credits: 4
No. of instructional hours: 4 per week (Total: 72 hrs)

AIMS

1. To familiarize students with the concepts of copy- editing.
2. To impart to them basic copy-editing skills.
3. To help them find employment in the publishing field.

OBJECTIVES

On completion of the course, the students should be able to

1. copy-edit non–technical materials of moderate difficulty.
2. produce consistently well-organized written discourse.
3. find employment in the editing field as copy-editors and sub-editors.

COURSE OUTLINE

Module 1

What is copy-editing - scope and need - various typescripts - electronic - conversion of manuscripts - copy-editing - preliminary steps.

Module 2

Preparing the text - the quantity of copyediting needed - interacting with the author - creation of self-contained, well-edited copies and books - coherence and consistency - the question of copyrights - acknowledgements and other legal issues - incorporating illustrations - copy-editing blurbs and titles and cover descriptions - dealing with multiauthorship - proof-reading - repeated proofs.

Module 3

The problem of style - the concept of in-housestyle - in-house style manuals - the question of grammar – abbreviations – concord – nouns - proper nouns – punctuation – spelling – ambiguity – dates – money measurements - a brief understanding of the make-up of a standard book - preliminary pages - indexing a book - bibliographical references - special books like scientific and technological books - On-screen copy editing **–** definition - scope - different types - technical issues involved - legal and safety concerns - software tools.

Module 4
Practice session
On grammatical trouble points - use of MLA Handbook as an in-house style manual – basic copy-editing using materials such as assignments and projects from students - use of electronic versions of these materials for onscreen copy- editing practice.

COURSE MATERIAL

Reading list

1. *Chicago Manual of Style,* 15th Edition of *Manual of Style.* University of Chicago, 2003.
2. Greenbaum, Sidney and Janet Whitcut, Longman *Guide to English* Usage. Harmondsworth: Penguin,1996.
3. Huddleston, R and Geoffrey K. Pulia, A *Student's Introduction to English Grammar.* CUP, 2005.
4. New Hart's Rules; The *Handbook of Style for Writers and Editors.* Oxford University Press, 2005.
5. *New Oxford Dictionary for Writers and Editors:* The *Essential A to Z Guide to the Written Word.* OUP, 2005.
6. Turtoa, ND and Heaton, JB. *Dictionary of Common Errors.* Longman, 1998.
7. Suttcliffe, Andrea J, Ed., *The New York Public Library Writer's Guide to Style and Usage.* Macmillan, 2000.

Reference

Butcher, Judith, et al. *Butcher's Copy-editing,* Fourth Edition. New Delhi:

SEMESTER IV

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
ENGLISH & COMMUNICATIVE ENGLISH

Core Course V – READING PROSE: CG 1441

No. of credits: 3
No. of instructional hours: 4 per week (Total: 72 hrs.)

AIMS

1. To help students understand and appreciate different types of prose writing.
2. To introduce to them the basics concepts of style and literary devices in prose.
3. To acquaint them with cultural diversity and divergence in perspectives.
4. To enable them to write creatively and critically.

OBJECTIVES

On completion of the course, the students should be able to:

1. recognize various types of prose writings.
2. analyse, understand and appreciate prose writings
3. write creatively and critically in an expository or argumentative way.

COURSE OUTLINE

Module 1

- Essay – formal/impersonal essay and informal/personal essay
- Types of essays: periodical essay, critical essay
- Life Writing: biography, autobiography, memoir and diaries.

Module 2

Prose up to the 18th Century.

Module 3

19th Century Prose

Module 4:

Modern Prose

COURSE MATERIAL

Module 1:
Core reading: Chapter 4 from *A Concise Companion to Literary Forms.* Emerald, 2013.

Module 2:
Core reading: *Reflections* (A Collection of Essays published by Pearson Education)

Essays: 1. Bacon: Of Studies
2. Samuel Pepys: (An extract from Pepys' Diaries) 1660 Jan - Feb.
3. Addison: *Sir Roger at the Assizes*
4. James Boswell: (An extract from *Life of Samuel Johnson*)

Further reading
Hudson, W.H. *An Introduction to the Study of English Literature*. Chapter: The Study of The Essay.

Module 3:
Core reading: *Reflections* (A Collection of Essays published by Pearson Education)

Essays*:* 1. Lamb: *Dream Children*
2. Hazlitt: *On Familiar Style*
3. Ruskin: *On Reading*

Module 4:
Core reading: *Reflections* (A Collection of Essays published by Pearson Education)

Essays: 1. Robert Lynd: *Indifference*
2. Camus: *Nobel Prize Acceptance Speech*
3. Anne Frank: *The Diary of a Young Girl* (an extract)

Instruction to Teachers:

- The work of each author has to be placed against the literary backdrop of the age.
- The literary significance of the work is to be briefly discussed in the classroom and hence the student is expected to have an awareness of the respective works.
- Students should be made to listen to and read speeches and prose passages.
- Questions are not to be asked from such details at the examination

SEMESTER IV

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
ENGLISH & COMMUNICATIVE ENGLISH

Core Course XI - WORLD CLASSICS: CG 1442

No. of credits: 3
No. of instructional hours: 4 per week (Total: 72 hrs)

AIMS

1. To introduce students to the world of the classics in literature.
2. To broaden their outlook and sensibility.

OBJECTIVES

On completion of the Course, the students should be able to

1. read and appreciate classical works.
2. evaluate classical texts critically.
3. place and assess their own culture and classics.

COURSE OUTLINE

Module 1

Classics – literary classics – definition – critical concepts – the emergence of classics – a brief survey of the classics.
Greek and Roman: Homer – Virgil – Aeschylus – Sophocles – Euripides – Aristophanes – Nikos Kazantzakis.
Italian: Dante – Boccaccio – Tasso – Ariosto - Machiavelli – Alberto Moravia.
Sanskrit: Vyasa – Valmiki – Kalidasa – Sudraka – Bhasa – Shri Harsa – Jayadeva.
German: Goethe – Hesse –
Russian: Pushkin – Gogol – Dostoevsky – Tolstoy - Chekhov – Gorky – Pasternak – Solzhenitsyn.

Module 2
Poetry

Module 3
Drama

Module 4
Fiction

COURSE MATERIAL

Module 1
Reference

1. Beard, Mary, and John Henderson. *Classics; A Very Short Introduction.* Indian Edition, OUP, 2006.
2. Highet, G. *The Classical Tradition*. Oxford University Press, 1949.
3. Eliot, T.S. 'What is a Classic?
4. Nicoll, Allardyce. *World Drama from Aeschylus to Anouilh*. New York: Harcourt Brace, 1950.
5. Hadas, Moses. *Greek Drama*. Bantam Classics, 1983.
6. Abrams, M.H. *A Glossary of Literary Terms.*

Module 2
Core reading: Kalidasa: *Ritusamhara.* Canto One. Summer (From KALIDASA: THE LOOM OF TIME translated by Chandra Rajan, Penguin Books).

Module 3
Core reading: Sophocles: *Antigone* (Cambridge University Press)

Module 4
Core reading: Kazantzakis: *Zorba the Greek* (Penguin Classics)

Instruction to Teachers [Modules 1 to 4]:

- The work of each author in Module 1 has to be placed against the literary backdrop of the age.
- Only the major works of the writers mentioned in Module 1 are to be made familiar to the students.
- **Only short answer-type questions [Qn. II] and Short Essay-type questions [Qn. III] are to be asked from Module 1 at the examination.**
- The literary significance of the works prescribed for study in Modules 2 – 4 are also to be discussed in the classroom. However the student is expected to have only a general awareness of the respective author/work.

SEMESTER IV

FIRST DEGREE PROGRAMME IN
ENGLISH LANGUAGE AND LITERATURE (CBCS System)
&
CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
ENGLISH & COMMUNICATIVE ENGLISH

Complementary Course - HISTORY OF ENGLISH LANGUAGE

Common for EN 1431 & CG 1431

B.A. English Main - Complementary Course VII: EN 1431
No. of credits: 2
No. of instructional hours: 3 per week (Total: 54 hrs)

B.A. Career related 2(a) English and Communicative English -
Complementary Course IV: CG 1431
No. of credits: 4
No. of instructional hours: 4 per week (Total: 72 hrs)

AIMS

1. To familiarize students with the origin and development of the English Language
2. To make them aware of the changes in different areas of the language.

OBJECTIVES

On completion of the course, the students should be able to

1. identify the various language families
2. trace the evolution of the English language
3. list the changes in the different areas of the language

COURSE OUTLINE

Module 1

Nature of language – human languages and animal communication systems – flux in language – language families – Indo-European family – Germanic group – the descent of English – broad characteristics.

Module 2

Periods in the history of English language – **Old English** – Celtic, Latin and Scandinavian influences – effect on grammar and syntax – Norman conquest – French influence – growth of national feeling – adoption of English – **Middle English** – decay of inflection – loss of grammatical gender – French Influence on the vocabulary – dialectal diversity – the rise of standard English – contribution of major

writers to the English language – Chaucer, Spenser, Shakespeare, Milton – the impact of Bible Translations on the English language.

Module 3

Modern English – Renaissance and after – general characteristics of English – changes in pronunciation and grammar – attempts to reform English – Spelling through the ages – problems and prospects of spelling reform – Development of Dictionaries – Dr. Johnson's dictionary – slang and standard speech – English dialects – evolution of English as a global language.

Module 4

Word formation and growth of vocabulary – makers of English – Semantics – changes of meaning – widening, restriction, amelioration, radiation, concatenation, synaesthesia, metonymy, synecdoche, faded metaphors, euphemism, divergence of meaning – some present-day trends in the English language – slang and jargon – varieties of dialects – various 'Englishes' – influence of the colonies.

Core text:

A Concise History of English Literature and Language, Primus Books, Delhi 2013.

Reading list

Modules 1 to 4

1. Baugh A.C. *A History of the English Language*. Chennai: Allied Published, 1978.
2. Barber C.L. *The Story of Language*. Penguin, 1982.
3. Wood F.T. *An Outline History of the English Language.* Macmillan, 2008.
4. Crystal, David. *English as a Global Language.* London: Cambridge University Press, 1997.
5. Mugglestone. *Oxford History of English*, Indian Edition: Oxford University Press, 2009.

SEMESTER IV

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Vocational Course IV - PRINT AND ONLINE WRITING: CG 1471

No of credits: 4
No of instructional hours: 4 per week (Total 72 hrs)

COURSE OUTLINE

Module 1:

- Introduction to print media; History and its development.
- Brief history of printing and publication in India.

Module 2

- News; News value; element of news; News Gathering techniques in general
- Types of reporting ; Qualities of a reporter
- Structure and format of news-pyramid, inverted pyramid, hour glass style
- Changing trends in journalistic writing.

Module 3:

- Online writing; Evolution, development, Features
- Online communication; Blogs; WWW, Social Networking sites.
- Cyber crime, E- Governance, Mobile Governance, Wiki leaks

COURSE MATERIAL

Reference:

Print

1. Ahuja B.N and S S Chabra. *Principles and Techniques of Journalism*. Surjeet Publications, 2006.
2. Aluwalia J.P. *Modern News Structure in Print Media and Electronic Media*. Adyayan Publishers New Delhi, 2007.
3. Burns, Lynette Sheridan. *Understanding Journalism.* Vistar Publications, New Delhi 2002.
4. Khandekar Vanitha Kochler; *The Indian Media Business*. Vivek Mehta response Books, New Delhi, 2003.
5. Parthasarathy Rangaswami. *Journalism in India*. Sterling Publishers, New Delhi, 1997.
6. Parthasarathy Rangaswami. *Basic Journalism India*. Macmillan India Ltd, Madras 1997.
7. Prabhakar Navel and Basu Narendra. *Encyclopedia of Mass Media and Communication in the 21st Century* V.1. Commonwealth Publishers, New Delhi , 2006.

Cyber Journalism

1. Dewdney Andrew and Ride Peter, *New Media Hand Book*, Routledge, London, 2009
2. Dorner Jane. *Writing for the Internet*. Oxford , New York, 2002
3. Kumar Arawind, *Online News*, Amnol Publishers, New Delhi, 2011.
4. Ray Tapas, *Online Journalism,* Cambridge University Press, New Delhi, 2009.
5. Siapera Eugenia, *Understanding New Media*, Sage publications 2012.

SEMESTER IV

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System)
ENGLISH & COMMUNICATIVE ENGLISH

Vocational Course V - THEATRE STUDIES: CG 1472

No. of credits: 4
No. of instructional hours: 4 per week (Total: 72 hrs)

Aims

1. To provide an introduction to theatre studies
2. Familiarize the students with fundamental theories on theatre
3. Introduce the students to Western and Indian theatre

Objectives

1. To sensitize students that theatre is praxis
2. To develop the listening and writing skill of students
3. To help students appreciate theatre
4. Respond creatively to the world around

COURSE OUTLINE

Module 1:
Origin of Western theatre

What is theatre? — Short intro to Greek playwrights and practice –Seneca – Miracles – Moralities – Mysteries – Chorus and its evolution – Aristotle's theory of drama – mimesis – catharsis – Elizabethan stage and conventions – Jacobean theatre – Restoration theatre conventions – 19th century English theatre.

Core reading

1. Harold Bloom Ed. *Greek Drama*. Aristotle, *Poetics.* Philadelphia: Chelsea House. 2004. 35 – 50.
2. Harold Bloom Ed. *Greek Drama*. Friedrich Nietzsche*, The Birth of Tragedy.* 97 – 114.

References

1. Harold Bloom Ed. *Greek Drama*. Friedrich Schiller "The Use of the Chorus in Tragedy." Philadelphia: Chelsea House. 2004. 17 – 24.
2. Harold Bloom Ed. *Greek Drama*. Lane Cooper: "Introduction to *Ten Greek Plays"* 25 – 34.
3. Harold Bloom Ed. *Greek Drama*. William Arrowsmith*:* "The Criticism of Greek Tragedy" 51 – 78.
4. Peter Womack. *English Renaissance Drama*. Oxford: Blackwell. 2006.
5. John O'Brien. "Drama: Genre, Gender, Theatre." *A Concise Companion to the Restoration and Eighteenth Century*. Ed. Cynthia Wall. Oxford: Blackwell. 2005. 183 – 201.

Module 2
Introduction to Indian theatre.

Temple culture – Folk theatre – Basic concepts of art experience – Sahṛdaya – Bhasa – Kalidasa – Dance drama – Theatre in Kerala – Kathakali – Kutiyattam - 20th century Indian theatre.

Core reading: M. Hiriyanna. "The Number of Rasas." *Art Experience*. Mysore: Kavyalaya. 1997. 69 – 72.

References

1. M.L.Varadpande. *History of Indian Theatre*. "Origins."New Delhi: Abhinav Publications. 2005. 9 – 38.
2. Philip B. Zarrilli. "A Social history of Kathakali: Personage, Connoisseurship and Aesthetics."*Kathakali Dance-drama: where gods and demons come to play*. London: Routledge, 2000. 17 – 38.
3. P.Venugopalan Ed. *Kutiyattam Register* "Kutiyattam" Thiruvananthapuram:Margi, 2007. 21–34.
4. Ananda Lal. "A Historiography of Modern Indian Theatre." *Modern Indian Theatre: A Reader*. Ed. Nandi Bhatia. New Delhi: Oxford UP. 2009. 31 – 40.
5. Mahesh Dattani. "Contemporary Indian Theatre and its Relevance." *Modern Indian Theatre: A Reader.* 469 – 472.

Module 3

Sub-genres: Problem Play – Poetic drama – Epic theatre – Radio play – Absurd theatre – Metatheatre – Postcolonial theatre.

Core reading

1. Martin Esslin. "Introduction: The Absurdity of the Absurd." *The Theatre of the Absurd*. 3rd Ed. Britain: Penguin. 1980. 19 – 28.
2. Helen Gilbert & Joanne Tompkins. "Introduction: Re-acting (to) Empire" *Post-Colonial Drama: Theory, Practice, Politics.* London & New York: Routledge. 1996. 1 – 14.

Reference

Kenneth Pickering. *Key Concepts in Drama and Performance*. New York: Palgrave Macmillan, 2005.

Module 4

Praxis: Writing dialogues – Preparation of script for acting based on narratives/stories/reports – Learning the process of staging a play through an enactment of the prepared script(s) which may be group activity in the class. The class may be divided into groups and they can be assigned specific tasks like script writing, choreography etc which can finally lead to the production of the script.
(This module must be effectively used by the teacher for internal/continuous assessment and so no separate texts for study is provided)

General reference

1. Keir Alam. *The Semiotics of Theatre and Drama*. London, Methuen, 1980.
2. Christopher M. Byrski. *The Concept of Ancient Indian Theatre*. New Delhi, Munshilal Manohardas, 1974.
3. Rachel Baumer and James Brandon, eds. *Sanskrit Drama in Performance*. Honolulu, Univ of Hawaii Press, 1981

SEMESTER V

FIRST DEGREE PROGRAMME IN ENGLISH LANGUAGE AND LITERATURE (CBCS System) & CAREER RELATED FIRST DEGREE PROGRAMME 2(a) (CBCS System) ENGLISH & COMMUNICATIVE ENGLISH

Core Course - LITERARY CRITICISM:

Common for EN 1541 & CG 1541

B.A. English Main – Core Course VI: EN 1541
No. of credits: 4
No. of instructional hours: 5 per week (Total: 90 hrs)

B.A. Career related 2(a) English and Communicative English – Core Course VII: CG 1541
No. of credits: 4
No. of instructional hours: 5 per week (Total: 90 hrs)

AIMS

1. To give the students a historical overview of the critical practices from classical period to the present.
2. To introduce to them some of the significant concepts that had a seminal influence on the development of critical thought.
3. To develop in them a critical perspective and capacity to relate and compare various critical practices and schools.
4. To help them read and analyze literary texts from different perspectives.

OBJECTIVES

On completion of the course, the students should be able to

1. trace the development of critical practices from ancient times to the present.
2. explain the critical concepts that emerged in different periods
3. analyze and appreciate texts critically, from different perspectives.

COURSE OUTLINE

Module I

A. Classical Criticism:

Nature and function of criticism – contributions of Plato – concept of mimesis and inferiority of art – Aristotle –major concepts – mimesis, katharsis, hamartia – definition of tragedy – parts of tragedy – Horace and the concept of decorum –Longinus – the sublime.

B. Indian Aesthetics:

Theory of Rasa, Vyanjana and Alankara.

[The relationship between Unit A and Unit B to be discussed. For eg. The concept of Rasa and purgation, Alankara and figures of speech, etc.]

Core reading [Unit B]:
Sethuraman. V.S. Ed. *Indian Aesthetics: An Introduction.* Macmillan, India, 1992.

- Das Gupta,S.N. "The Theory of Rasa", (pp 191-196) in *Indian Aesthetics: An Introduction.* Ed. V.S. Sethuraman. Macmillan, India,1992.
- KuppuswamiSastri. "The Highways of Literary Criticism in Sanskrit" (pp. 173–190), in *Indian Aesthetics:An Introduction.* Ed. V.S.Sethuraman. Macmillan India, 1992.
- Raghavan, V. "Use and Abuse of Alankara" (pp. 235–244) in *Indian Aesthetics: An Introduction*. Macmillan India, 1992.

Module 2
Renaissance and Neo-Classical Criticism:
Sir Philip Sidney – his "Defence of Poetry" **–** definition of poetry **–** neo-classicism – Dryden – estimate of authors **–** Johnson **– "**Lives of Poets" – Shakespeare criticism – moral judgment of literature.

Module 3
Romantic and Victorian Criticism:
Romanticism – Wordsworth – "Preface to Lyrical Ballads" – definition of poetry – concept of poetic diction and language – Coleridge – definition of poetry – Fancy and Imagination.
The Victorian Period: Arnold – concept of culture **–** the function of poetry – touchstone method – disinterestedness and high seriousness – moralistic criticism.

Module 4
Twentieth Century Criticism:
Eliot and Modernism – "Tradition and Individual Talent" – historic sense – impersonality – poetic emotion **–**objective correlative – dissociation of sensibility – Richards and "Practical Criticism" – poetry and synaesthesia – scientific and emotive uses of language – four kinds of meaning.

COURSE MATERIAL

Modules 1 – 4
Core reading:
Nagarajan, M.S. *English Literary Criticism and Theory*: *An Introductory History*. Hyderabad: Orient Longman, 2006.

Further reading:
1. Abrams, M.H. *A Glossary of Literary Terms*.Seventh Edition. Singapore: Thomson & Heinle, 1999.
2. Wimsatt Jr., William K. and Cleanth Brooks. *Literary Criticism: A Short History*. Calcutta: Oxford and IBH, 1957.
3. Waugh, Patricia. *Literary Theory and Criticism: An Oxford Guide.* New Delhi: OUP, 2009.
4. Seldon, Raman et al, *A Reader's Guide to Contemporary Literacy Theory.* New Delhi: Pearson Education, 2005.
5. Bennet Andrews and Nicholas Royale. *Introduction to Literature, Criticism and* edition. New Delhi: Pearson Education, 2009.
6. Harmon, William, Hugh Holman.*A Handbook to Literature.*10th Edition. New Delhi: Pearson Education, 2009

SEMESTER V

FIRST DEGREE PROGRAMME (CBCS System)

CAREER-RELATED FIRST DEGREE PROGRAMME (CBCS) - Group 2 (a) IN ENGLISH & COMMUNICATIVE ENGLISH

Core Course VIII - FILM STUDIES: CG 1542

No. of credits: 3
No. of instructional hours: 4 per week (Total: 72 hrs)

AIMS

1. To give the students basic knowledge in the history, art and culture of motion picture.
2. To introduce to them the key concepts in film studies.
3. To help them analyze and appreciate films.
4. To enable them pursue higher studies and careers in film.

OBJECTIVES

On completion of the course, the students should be able to

1. discover the language of cinema
2. explain the key concepts in film studies.
3. analyse films as texts.
4. write critically about films.

COURSE MATERIAL

Module 1: **Understanding film**

What is film – its hybrid nature – the language of cinema – authorship - a brief history – film movements – Montage theory and Soviet cinema of the 20s – German expressionism and experiments with mise-en-scene – French poetic realism – classical Hollywood cinema and genre – Italian neo-realism – French New wave - contemporary international trends.

Module 2: **Indian Cinema**

Phalke and the desi enterprise – Indian cinema 30s to the 60s – The golden 50s – Indian art cinema and the Indian New wave – History of Malayalam Cinema – New wave in Malayalam cinema – Contemporary trends in Malayalam cinema

Module 3: Literature and Film

Literary language and Film language- adaptation and notions of fidelity- Narrative structure and strategies in film and fiction - time, space, character and setting - dialogue – music – sound effects.

Module 4: **Film analysis**
Films for close viewing:

Psycho
Rashomon
My Fair Lady
Chemmeen

COURSE MATERIAL

Core text:
Introduction to Film Studies [Reading the Popular series]. Orient Blackswan, 2013.

Reading list

1. Villarejo, Amy. *Film Studies: the Basics.* Routledge, Indian Reprint, 2009.
2. Hayward, Susan. *Key Concepts in Cinema Studies.* London: Routledge, 1997.
3. Bywater, Tim and Thomas Sobchack. *Introduction to Film Criticism*. Pearson India, 2009.
4. Corrigan, Timothy, J. *A Short Guide to Writing about Film*. Pearson India, 2009.
5. Kupsc, Jarek. *The History of Cinema for Beginners.* Chennai: Orient Blackswan, 2006.
6. Dix, Andrew. *Beginning Film Studies*. New Delhi: Viva Books, 2010.
7. Stam, Robert and Alessandra Raengo. *Literature and Film: A Guide to Theory and Adaptation.* Oxford: Blackwell, 2003.

Suggested viewing list

Michael Radford's *Il Postino*
Robert Wiene's *The Cabinet of Dr. Caligari*
Sergei Eisenstein's *Battleship Potemkin*
Victorio De Sica's *Bicycle Thief*
John Ford's *Stagecoach*
Mehboob's *Mother India*
Satyajit Ray's *Pather Panchali*
Abbas Kiarostami *Ten*

Note to the teacher

The objective of this course is to enable literature students to understand the language of cinema as also the ways in which that language is different from a literary language. Simultaneously they could also be taught the specificities of medium, narrative and the history of cinema. The lectures should use a lot of clips from different films to illustrate the points. It is strongly recommended that films or film clips should be screened as far as possible for every topic of this course. Any film of the teacher's choice other than the ones suggested may also be screened to illustrate the specific topics. The four films selected for close analysis help in understanding the narrative techniques of cinema, its engagements with sound, music and songs as also modes of adaptation from genres such as short story, play and novel.

SEMESTER V

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Core Course IX - INDIAN WRITING IN ENGLISH: CG 1543

No. of credits: 3
No. of instructional hours: 3 per week (Total: 54 hrs)

AIMS

1. To introduce students to Indian writing in English.
2. To broaden and sharpen their aesthetic and analytical skills.

OBJECTIVES

On completion of the course, the students should be able to

1. trace the development of Indian writing in English.
2. explain the Indianness in Indian literature in English.
3. read and appreciate Indian literature.
4. analyse the strength and constraints of Indian English as a literary medium.

COURSE OUTLINE

Module 1: Poetry.

Module 2: Drama.

Module 3: Fiction.

COURSE MATERIAL

Module 1: Poetry.
Core reading:
Poems:
1. Toru Dutt: The Lotus [*The Golden Treasury*]
2. Sarojini Naidu: Village Song [*The Golden Treasury*]
3. Keki Dharuwalla: The Ghagra in Spate [*Ten Twentieth Century Indian Poets*]
4. Kamala Das: My Grandmother's House [*Ten Twentieth Century Indian Poets*]
5. Nissim Ezekiel: Goodbye Party for Miss Pushpa T.S. [*Ten Twentieth Century Indian Poets*]
6. R. Parthasarthy: from Exile [*Ten Twentieth Century Indian Poets*]
7. Gieve Patil: On Killing a Tree [*Ten Twentieth Century Indian Poets*]
8. A.K. Ramanujan: A River [*Ten Twentieth Century Indian Poets*]

Core reading:
(a) *The Golden Treasury of Indo-Anglian Poetry* Ed. V. K. Gokak. Sahiyta Akademi.
(b) *Ten Twentieth Century Indian Poets*. Ed. R. Parthasarathy. OUP.

Module 2: Drama.
Core text: *Instant Impact: A Selection of Six One-Act Plays*. Indian Open University Publishers, Chennai.

Non detailed study of the following short plays:
Rabindranath Tagore: *Chandalika.*
Mahashweta Devi: *Bayen.*

Module 3: Fiction.
Core reading: M. T. Vasudevan Nair. *The Mist*. (Tr. Premila V. M.) Orient Blackswan.

Recommended Reading:
1. Iyengar, K. R. Srinivasa. *Indian Writing in English.*
2. Naik, M.K. *A History of Indian English Literature.*

Instruction to Teachers:
The work of each author has to be placed against the literary backdrop of the age. The literary significance of the work is to be briefly discussed in the classroom and hence the student is expected to have an awareness of the respective works. Questions are not to be asked from such details at the examination.

SEMESTER V

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Open Course I - CREATIVE WRITING: CG 1551.1

No. of credits: 2
No. of instructional hours: 3 per week (Total: 54 hrs)

AIMS

1. To make the students aware of the various aspects of Creative Writing.
2. To expose and familiarise the students to representative English writers and their works.
3. To equip the students to attempt at practical creative writing.
4. To strengthen the creative talents and writing skills.

OBJECTIVES

1. To identify different poetic forms.
2. To analyse and appreciate poems and short stories.
3. To write book and film reviews.
4. To appreciate literary works.

COURSE OUTLINE

Module 1

Poetry - introduction: Chief elements: theme, structure, imagery and symbols, rhythm – reference to major poetic forms [with representative/select examples] like lyric, sonnet, ode, ballad, epic, dramatic monologue, and free verse.

Practice sessions: critical appreciation of the given poems - emphasis on theme, structure, style, symbols, images, rhythm and diction.

- William Blake - "The Lamb"
- Emily Dickinson – "I Heard a Fly Buzz When I Died"
- Wole Soyinka – "Telephone Conversation"
- RabindranathTagore – "Where the Mind is Without Fear"
- Kamala Das – "A Hot Noon in Malabar"

Poetry writing sessions: based on common/everyday themes in various forms – to initiate students into poetry writing.

Module 2

Short Story - introduction: Characteristic features of short stories in general – plot construction, characterization, narration, local colour, atmosphere and title.

Short story appreciation: critical appreciation of the given stories and their authors - emphasis on theme, structure, style, images and dialogue.

- Edgar Allan Poe – "The Oval Portrait"
- Chinua Achebe – "The Voter"
- A.C. Doyle: The Adventure of the Speckled Band
- Kushwanth Singh – "The Portrait of my Grandmother"

Short story writing sessions: based on topics/themes - to be given in the class - from everyday life and situations.

Module 3

(a) **Writing for Children**: Varieties – themes – fantasy - language – imparting values and morals – illustrative examples.

Required reading:

- Lewis Carroll – *Alice in Wonderland* [Abridged version]
- C.S. Lewis - *The Chronicles of Narnia: The Lion, the Witch and the Wardrobe.*
- Khyrunnisa A – *Howzzat Butterfingers!* Puffin Books, 2010.

(b) **Science Fiction**: Characteristic features – characterization - plot construction – setting – title - impact on films – representative examples: R.L.Stevenson: *Dr. Jekyll and Mr. Hyde*, H.G. Wells: *Time Machine*, Jules Verne: *20,000 Leagues Under the Sea*.

Module 4

Book and Film reviewing: Elements of book/film reviewing – pertinent questions that a good review must answer – aim/purpose of book and film reviews - sample book/film reviews from newspapers and magazines.

Practice sessions: Writing book and film reviews - of classics and recently published/released books/films.

Books for general reference

1. Abrams, M.H. *A Glossary of Literary Terms*. Seventh Edition.
2. Prasad, B. *A Background to the Study of English Literature*. Macmillan.
3. Bernays, Anne and Pamela Painter. *What If?: Writing Exercises for Fiction Writers*. William Morrow & Company, Nov 1991.

Direction to the Teachers

- Focus should be on the main points mentioned in the contents of the syllabus. These are to be illustrated with the examples mentioned in the respective modules.
- Practice sessions should be arranged within the classroom to enable the students to try their hands at the various categories mentioned within each module. Multiple examples may also be mentioned in the class.
- **Questions are not to be asked from any of the individual titles/works mentioned and will only be on general comprehension: on the contents of the course structure mentioned in each module, including the writers mentioned in the syllabus.**

SEMESTER V

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Open Course I - TRANSLATION STUDIES - CG 1551.2

No. of credits: 2
No. of instructional hours: 3 per week (Total: 54 hrs)

AIMS

1. To familiarize students with the concepts and theories of translation.
2. To introduce to them the art of translation.
3. To help them pursue translation as a profession.

OBJECTIVE

On completion of the course, the students should be able to

1. explain the concepts and theories of translation.
2. undertake various translation works.
3. find employment as translators.

COURSE OUTLINE

Module 1: Fundamentals of translation
Definitions – a brief history of translation in Malayalam – Theories of translation – linguistic – literary – cultural – communicative – Types of translation – Literary – Non-Literary – Technology aided translation.

Module 2: Key Concepts
Source language – Target language – Afterlife – Linguistic and cultural systems – faithfulness – confusions – equivalence

Module 3: Case Studies
1. Analysis of a translated Text:
    a. From Malayalam to English
        i. A story
        ii. A poem

    b. From English to Malayalam
        1. A story
        2. Problems of translations

Module 4: Translation practice
a. Non – Literary (Equivalent technical terms – idioms, phrases, proverbs in English and Malayalam – Translation of sentences and passages from English to Malayalam and vice–versa)

b. Literary (Translation of short literary prose pieces including fiction from English to Malayalam and vice-versa)

COURSE MATERIAL

Modules 1 - 4

Core reading: *Word Worlds* (Oxford University Press)

Further reading

1. Hatim, Basil and Jeremy Munday. *Translation: An Advanced Resource Book.* London: Routledge, 2004.
2. Palumbo, Giuseppe. *Key Terms in Translation Studies.* Continuum, 2009.
3.Vasudevan Nair, M.T. *Kuttiedathi and Other Stories*. Abdulla, V. tr. Hyderabad: Orient Black Swan, 2009.
4. Ramakrishnan, Malayattoor. *Roots*. Abdulla, V. tr. Hyderabad: Orient Black Swan, 2009.
5. Basheer, Vaikom Muhammed. *Poovan Banana and Other Stories.* Abdulla, V. tr. Hyderabad: Orient Black Swan, 2009.
6. Abdulla, V.and R.E. Asher, Ed. *Wind Flowers*. New Delhi: Penguin, 2004.
7. *O. Hendriyude Theranjedutha Kathakal* tr. by C N Ashly. Papion, Kozhikodu.
8. *'Vanampadiyodu'* by Vyloppilly Sreedhara Menon. (Translation of Keats'Ode to a Nightingale)

SEMESTER V

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Open Course I - ENGLISH FOR THE MEDIA: CG 1551.3

No. of credits: 2
No. of instructional hours: 3 per week (Total: 54 hrs)

AIMS
1. To sensitize students to the English language used in the media
2. To make them professionally skilled and employable in the media.

OBJECTIVES
On completion of the Course, the students should be able to
1. explain the nature and scope of the communication media
2. write headlines and articles for newspapers and magazines and design their content
3. produce and present scripts and programmes for Radio and TV
4. design and write webs, blogs and advertisements

COURSE OUTLINE

Module 1
Main-stream media: nature, characteristics, purpose - Print – broadcast - visual media – new/digital media – power and vulnerability of each – media convergence.

Newspapers: News stories, features – Headlines, subheads, captions, reviews.
Vocabulary that can affect the slant, emotive words and neutral words. Cohesion techniques, use of passive structures.

- Writing to answer the five Ws and H
- The inverted pyramid style
- Writing an editorial
- Editing: Cutting dead wood

Planning and Writing features – Editorials – Op-Ed pieces – Interviews: skills needed – Language used - The phrases that areused for the interview for Introductions - Interrupting - Markers for buying time, to elicit more clarity - how to use linguistic ploys – use of connectives to help progression and continuity - use of the right pace, punctuating explanations using the right words - the art of questioning and its overall philosophy.

Analysing news stories and features – political ideologies and language of newspapers – style - House styles of leading newspapers – emphasis given to use of desi words and foreign words.

Magazines: Writing for specific audience - magazine covers – layout - planning content – writing a true-life story - The Magazine Cover lines – The use of imperatives, use of questions in Cover lines - use of rhyming and alliteration - The use of specific verb forms used to express future - importance of photographs.

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Module 2

Radio: Role of presenters – importance of voice, diction, delivery and language - introducing the guests/features/news/Introducing different genres of music, Pre-teach - Vocabulary, relevance of the topic sentence, language used in debriefing, contextual use of phrasal verbs of a DJ or a presenter.

Format of the Radio script- Radio Programming- Writing for different Radio programmes: interviews, talk shows, reviews, music programmes, phone-in or on demand programmes - Translating creative works from other medium: delivering plays and classics, Radio news – news value – news script

TV: Scripts for TV- The pre-production process - Required vocabulary to understand process - The phrases used in conversation, Script writing - Editing a T.V. Documentary - roles of an editor and output editor, – selection of news – language of news writing/reporting.

TV programming: – use of formal/conversational language - abbreviations used in the filming schedule and its relevance - collocations used in T.V. as a medium - the technical vocabulary

Film:

Writing a screenplay – films as a social commentary – language in film: mirroring in-vogue vocabulary, changes with genre - The features of spoken dialogues, how language helps to pitch successfully - The relevance of log line. Vocabulary for Pre-production – Language used in explaining potential problems, presenting solutions

Writing Film Reviews: Pre – Teach Vocabulary, Structure of the Content, Mapping the different stages of how a film is born, Language devices used, Use of Contrasting Information & Additional Information, Vocabulary used.

Module 3

Digital/New Media: E- writing – rules – writing news for the web – House Style of popular news-based websites - blogs - planning and writing a blog - technical writing – search engine optimization – writing for the social media. Use of Noun phrases, the use of pronouns, contractions, comparatives and clauses, the language used for informing and language used in a good blog.

COURSE MATERIAL

Modules 1 - 4

Core reading:. *English for the Media*, Cambridge University Press, 2013**.**

Further reading

1. Ceramella, Nick and Elizabeth Lee. *Cambridge English for the Media*, CUP, 2008**.**
2.. Kaushik, Sharda, *Script to Screen: An Introduction to TV Journalism.* Macmillan, 2003.
3. Booher, Dianna. *E- Writing: 21st Century Tools for Effective Communication.* Macmillan, 2008.

SEMESTER V

FIRST DEGREE PROGRAMME IN ENGLISH LANGUAGE & LITERATURE (CBCS System) - Group 2 (a)

Vocational Course VI - ENGLISH LANGUAGE TEACHING: CG 1571

No. of credits: 4
No. of instructional hours: 4 per week (Total: 72 hrs)

AIMS

1. To introduce students to teaching of English as a second language.
2. To aid them in understanding learning from a teacher's perspective.

OBJECTIVES

On completion of the Course, the students should be able to

1. comprehend the concepts in language teaching.
2. understand the important psychological principles behind second language acquisition.
3. understand different approaches and methods of teaching English as second Language.
4. plan lessons effectively.

COURSE OUTLINE

Module 1

Teaching/learning distinction – Principles of language teaching – Acquisition and learning – micro teaching – Audio-visual aids – language lab.

Module 2

Theories of second language acquisition: Behaviourism – Watson – Pavlov's Classical Conditioning – Skinner's Operant Conditioning – Cognitivism – Noam Chomsky-Language Acquisition Device – Krashen-Monitor Hypothesis-Input Hypothesis-Affective Filter Hypothesis – Constructivism – Piaget, Vygotsky, Bruner – Zone of Proximal Development (ZPD) – Scaffolding.

Module 3

Approaches and Methods: Structural Approach – Oral Approach – Situational Approach – Communicative Approach – Eclectic Approach – Grammar-Translation Method – Bilingual Method – Direct Method – Silent Way.

Module 4

Planning and Evaluation: Two-column Lesson Plans for teaching language skills, prose, poetry, and grammar - Testing and Evaluation - internal and external evaluation – Types of tests-Achievement and Diagnostic tests – Types of Questions-Essay, annotation, short questions, multiple choice questions.

COURSE MATERIAL

Reading list

1. Stern, H. H. *Fundamental Concepts of Language Teaching.* OUP, 2003.
2. Larsen-Freeman, Diane. *Techniques and Principles in Language Teaching*. OUP, 2003.
3. Huebener, Theodore. *Audio-Visual Techniques in Teaching Foreign Languages*. New York UP, 1967.
4. Leonard, David C. *Learning Theories, A-Z.* Greenwood Publishing Group, 2002.
5. Richards, J. C. & Theodore S. Rodgers. *Approaches and Methods in Language Teaching.* CUP, 2007.
6. Baruah, T. C. *The English Teacher's Handbook*. New Delhi: Sterling, 2009.
7. Paliwal, A. K. *English Language Teaching*. Jaipur: Surabhi Publications, 1998.

SEMESTER V

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Vocational Course VII - THE LANGUAGE OF ADVERTISING: CG 1572

No of credits: 3
No of instructional hours: 3 per week (Total 54 hrs)

AIMS

1. To provide the students with an ability to enrich their creative skills.
2. To make them understand the different types of advertising
3. To make them familiar to the role of advertising in the society.

OBJECTIVES

On completion of the course students should be able to:

1. Identify and analyse the various types of advertising.
2. Make use of the essential principles of advertising in ordinary situations.
3. Identify the impact of advertising in society.

COURSE OUTLINE

Module 1

- Definition - what is advertising?
- Brief history of advertising with particular reference to India
- Importance of advertising.

Module 2

- Advertising media - newspaper, magazines, radio, television, Internet, board, hoardings.
- Importance of media selection.

Module 3

- Types of advertisements - consumer ads, retail ads, business-to-business ads, trade ads and financial ads.
- Functions of advertising - promotion of sale, education, entertainment.

Module 4

- AIDA principle - Impact of advertising in society.
- Present status of advertising

COURSE MATERIAL

Reference

1. Kumar, Arun & Tyagi, *Advertising Management.* New Delhi: Atlantic Publishers and Distributors, 2004.
2. Rowse, Edward & Louis. *Fundamentals of Advertising.* USA: Kessinger Publishing, 2005.
3. Wells, Burnett & Moriarty. *Advertising: Principles and Practice.* UP: Dorling Kindersley (India) Pvt. Limited, 2007.
4. Gupta, Oma. *Advertising in India: Trends and Impact.* NewDelhi: Kalpaz Publications, 2005.
5. Ken Burtenshaw, Nik Mahon. *Caroline Barfoot: The Fundamentals of Creative Advertising,* Switzerland, AVA Publications, 2006.
6. Albert A. Reed, Kate E. Griswold, James Barrett Kirk, Leroy Fairman, George French. *Advertising and Selling.*
7. Trehan, Mukesh & Trehan, Renju. *Advertising and Sales Management,* 2010.
8. Vilanilam J.V. *Parasyam* (Malayalam). Kottayan: NBS.
9. Delly D.Larry and Jugenheimer Donald. Advertising Media Planning, PHI Learning, New Delhi, 2009.
10. Ahuja B.N and S.S. Chabra. Advertising and Public Relation

SEMESTER V

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Vocational Course VIII – AUDIO VISUAL WRITING: CG 1573

No of credits: 3
No of instructional hours: 3 per week (Total 54 hrs)

AIMS

1. To provide the students with an ability to enrich their creative skills.
2. To make them aware of the different types of television programmes.
3. To make them familiar to the role of television in the society.

OBJECTIVES

On completion of the course students should be able to:

1. Identify and analyse the various types of television programmes.
2. Identify the impact of television in society.

COURSE OUTLINE

Module l:

- History and development of television in India
- SITE and educational television
- Production process: from idea to shooting script; research and planning location; lights; production proposal; treatment, script outline, screenplay
- Camera movements

Module 2:

- News bulletins; Scripting for TV news
- Television documentary, types of programs.
- Impact and influence of television channels

Module 3:

- Introduction to Radio, History of Radio in India
- Radio as a medium of communication-Advantages and disadvantages
- Components of a Radio program-words, music, sound effects, silence, types of radio programs

Module 4:

- Different types of radio: Community radio, Amateur radio, Internet radio, Satellite radio, Educational radio, FM radio
- Qualities of radio announcer, RJ

COURSE MATERIAL

Reference

1. Wills, Edgar (1967), *Writing Television and Radio Programmes,* New York.
2. Yorke, Ivor (1978), *The Technique of Television News,* London.
3. Sunderaj, Victor (2006), *Children and Television,* New Delhi.
4. Menon, Mridula (2007), Indian Television and Video Programmes, New Delhi, Kanishka Publishers
5. Yadav (2004), *Television and Social Change,* Lucknow.
6. P.C.Chatterji, *Broadcasting in India* (1991), Sage Publications.
7. H.R.Luthra (1986), *Indian Broadcasting,* Ministry of Information and Broadcasting, Govt. of India.
8. K.S. Rajasekharan, *Drishyabhasha* (Malayalam), Thiruvananthapuram, State Institute of Languages.
9. Vijaya Krishnan, Baiju Chandran, Prabhakaran and Sunni Joseph, *Drishyasravyamadhyamangal* (Malayalam), Thiruvananthapuram, State Institute of Languages.

Further Reading

1. Aiyer B. Alakrishnan, Digital Television Journalism, Authors press, Delhi, 2006
2. Casey Bernadette and Casey Neil; Key concepts in Television studies
3. Nalin Mehta, Television in India, Routledge, New York, 2011.
4. Orlebar Jereemy, The Television Handboook; Routledge, New York, 2011.
5. Hasen Seema, Mass Communication- principles and concepts, CBS publishers and distributers, New Delhi, 2010.

SEMESTER VI

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Core Course X - TRAVEL LITERATURE: CG 1641

No. of credits: 3
No. of instructional hours: 5 per week (Total: 90 hrs)

Aims:

1. To help students read and appreciate different kinds of travel literature.
2. To introduce to them the basics concepts of travel writing and literary tropes in travel.
3. Facilitate, promote and disseminate curiosity on travel writing which will lead to future research.
4. To enable them to critically analyse multi and cross-disciplinary approaches in travel writing.
5. To understand the themes of self, culture, history, writing, and travel.

Objectives:

On completion of the course, the students should be able to:

1. Read and enjoy various types of travel literature.
2. Analyse, understand and appreciate travel writings.
3. Analyse inter-cultural crossings and perceptions in a self-reflexive and critical manner.

COURSE OUTLINE

Module 1: Travel Literature: The Stalwarts
Module 2: Some Treasures of Travel Literature
Module 3: Travelling in India
Module 4: Indian Travel Literature

COURSE MATERIAL

Module 1: Travel Literature: The Stalwarts.
An introduction to early 20th century travel writing – early attempts at travel writing as a distinct genre - early British and American travel writings of repute.

Core Reading: Graham Green: *Journey without Maps* (Penguin, 1936) (Part One: "The Way to Africa", pp 11-19)
Suggested Reading: Freya Stark: *Riding to the Tigris* (1959)

Module 2: Some Treasures of Travel Literature.
Travel literature in the 70s - great travel writings - examples of some remarkable narratives of travel by British and American authors.

Core Reading: Bill Bryson: *Notes from a Small Island* (1995) Chapters 25-29

Suggested Reading:
Bruce Chatwin: *In Patagonia* (1977) Part 1-20**.**

Module 3: Travelling in India.
Contemporary travel writings on India by western authors.

Core Reading: William Dalrymple. "The Dancer of Kannur" from *Nine Lives* (2009) pp. 29-55
Suggested Reading:
1. Dervla Murphy: *On a Shoestring to Coorg* (1976)
2. Robyn Davidson: *Desert Places* (1997)

Module 4: Indian Travel Literature.
Indian perspectives in travel writing - their experiences of travel - glimpses of travel writings by Indian writers.

Core Reading: Amitav Ghosh: *Dancing in Cambodia and At Large in Burma* (1998). Dancing in Cambodia pp. 1-54.
Suggested Reading: Pico Iyer: *Falling Off the Map: Some Lonely Places in the World* (1994)

Further Reading:
Modules 1 – 4:
Duncan, James and Derek Gregory. *Writes of Passage: Reading Travel Writing*. London and New York: Routledge, 1999.
Fussell, Paul. *Abroad: British Literary Travelling between the Wars*. New York: Oxford University Press, 1980.
Pratt, Mary-Louis. *Imperial Eyes: Travel Writing and Transculturation*. London & New York: Routledge, 1992.

SEMESTER VI

FIRST DEGREE PROGRAMME (CBCS System)

Common for

ENGLISH LANGUAGE AND LITERATURE - Core Course XIV: EN 1644
&
CAREER-RELATED FIRST DEGREE PROGRAMME (CBCS) - Group 2 (a) IN ENGLISH & COMMUNICATIVE ENGLISH - Core Course XI - CG 1642

WOMEN'S WRITING

No. of Instructional hours : 4 per week (Total: 72 hrs) – for EN 1644
: 5 per week (Total: 90 hrs) - for CG 1642

No. of Credits : 3 [EN 1644 & CG 1642]

Aims:

1. To introduce students to the development of women's writing in various countries.
2. To familiarize them with the diverse concerns addressed by feminism.
3. To motivate them to critically analyse literary works from a feminist perspective.

Objectives: On completion of the course, the students should be able to

1. The students will have an awareness of class, race and gender as social constructs and about how they influence women's lives.
2. The students will have acquired the skill to understand feminism as a social movement and a critical tool.
3. They will be able to explore the plurality of female experiences.
4. They will be equipped with analytical, critical and creative skills to interrogate the biases in the construction of gender and patriarchal norms.

COURSE OUTLINE

Module 1: Essays
Module 2: Poetry
Module 3: Short Fiction
Module 4: Drama

COURSE MATERIAL

Module 1: Essays **[Detailed study]**

1. Virginia Woolf: "Shakespeare and his Sister" (Excerpt from *A Room of One's Own*)
2. Alice Walker: "In Search of our Mothers' Gardens" (From *In Search of Our Mother's Gardens*)
3. Jasbir Jain: Indian Feminisms: The Nature of Questioning and the Search for Space in

Indian Women's writing. (From *Writing Women Across Cultures*

Module 2: Poetry. **[Detailed study]**

1. Elizabeth Barrett Browning : **"**A Musical Instrument"
2. Marianne Moore : "Poetry"
3. Adrienne Rich : "Aunt Jennifer's Tigers"
4. Sylvia Plath : "Lady Lazarus"
5. Margaret Atwood : "Spelling"
6. Kishwar Naheed : "I am not That Woman"
7. Suniti NamJoshi : "The Grass Blade"
8. Nikki Giovanni : "Woman"

Module 3: Short Fiction **[Non-detailed study]**

1. Katherine Mansfield : "The Fly"
2. Shashi Deshpande : "A Wall is Safer"
3. Sara Joseph : "Inside Every Woman Writer"
4. Amy Tan : "Rules of the Game"

Module 4: Drama **[Non-detailed study]**

1. Sheila Walsh : "Molly and James"
2. Mamta G Sagar : "The Swing of Desire"

Core text:

Modules 1 – 4: Dr Sobhana Kurien, ed. *Breaking the Silence: An Anthology of Women's Literature*. ANE Books.

Books for reference:

Beauvoir, Simone de. *The Second Sex*. UK: Hammond Worth, 1972.
Davis, Angela. *Women, Race and Class*. New York: Random, 1981.
Devi, Mahasweta. *Breast Stories*. Calcutta: Seagull, 1998.
Gilbert, Sandra and Susan Gubar. *The Mad Woman in the Attic: The Woman Writer*. Yale UP, 1978.
Goodman, Lisbeth ed. *Literature and Gender*. New York: Routeledge, 1996.
Green, Gayle and Copelia Kahn. *Making a Difference: Feminist Literary Criticism*. New York: Routeledge.
Humm, Maggie ed. *Feminisms: A Reader*. New York: Wheat Sheaf, 1992.
Jain, Jasbir ed. *Women in Patriarchy: Cross Cultural Readings.* New Delhi: Rawat, 2005
Millett, Kate. *Sexual Politics*. New York: Equinox-Avon, 1971.
Rich, Adrienne. *Of Woman Born*. New York: Norton.
Roudiex, Leos S. ed. *Desire in Language*. New York: Columbia UP, 1975.
Showalter, Elaine. *A Literature of their Own*.
Spacks, Patricia Mayor. *The Female Imagination*. New York: Avon, 1976.
Tharu, Susie and K Lalitha. *Women Writing in India Vol I & II*. New Delhi: OUP, 1991.
Walker, Alice. *In Search of our Mothes' Gardens*. New York: Harcourt Brace Jovanovich, 1983.
Woolf, Virginia. *A Room of One's Own*. London: Hogarth, 1929.

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Instruction to Teachers [Modules 1- 4]:

- The work of each writer mentioned in Modules 1 – 4 has to be placed against the literary backdrop of the age.
- The major works of the writers mentioned in the modules can be made familiar to the students
- The literary significance of the work is to be briefly discussed in the classroom and hence the student is expected to have only a general awareness of the respective author..
- **Questions are to be asked only from the prescribed poems, fiction and drama.**

SEMESTER VI

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Core Course XII
20th CENTURY MALAYALAM LITERATURE IN ENGLISH TRANSLATION: CG 1643

No. of instructional hours: 3 per week
No of Credits: 3

Aims: 1. To introduce the students to the richness of twentieth century Malayalam writing
2. To provide the students a basic understanding of twentieth century Malayalam Writing
3. To introduce to them some of the major twentieth century Malayalam writers
4. To help them analyse and appreciate twentieth century Malayalam literature.

Objective: On completion of the course, the students should be able to
1. Discern the richness of twentieth century Malayalam writing
2. Discern the distinctiveness of twentieth century Malayalam writing
3. Discuss the salient features of the works of major twentieth century Malayalam writers
4. Analyse and appreciate twentieth century Malayalam writing

COURSE OUTLINE

Module 1: Malayalam Poetry in the twentieth century
Module 2: Malayalam Novel in the twentieth century
Module 3: Malayalam Short Fiction in the twentieth century

COURSE MATERIAL

Module 1: Malayalam Poetry in the twentieth century.
The modern age – characteristics – the Romantics in Malayalam poetry – major poets – second generation of romantics and the early 20th century – Malayalam literature after independence – modernist phase in malayalam poetry – Changampuzha, O.N.V. Kurup, Vyloppilli Sreedhara Menon, Ayyappa Paniker, Sugathakumari, Kadammanitta Ramakrishnan, Balamani Amma, Vishnu Narayanan Namboodiri, D. Vinayachandran, Sachidanandan, Balachandran Chullikad,etc.

Detailed study of the following poems:
1. ONV Kurup – "A Requiem to Mother Earth"
2. Balachandran Chullikkad – "Where is John?"
3. Sugatha Kumari – "The Temple Bell"
4. Nalapat Balamani Amma - "The Story of the Axe"

Core Text: *In the Shade of the Sahyadri: Selections from Malayalam Poetry and Short Fiction***.** OUP, 2012.

Module 2: Malayalam Novel in the twentieth century
Malayalam short story in English translation – representative masters of the craft - Thakazhi Sivasankara Pillai, Basheer, Lalithambika Antharjanam, Paul Zacharia, etc.

Non-detailed study:Novels:

- Malayatoor Ramakrishnan, *Roots* (Novel), Tr. V. Abdulla, Orient Blackswan, 2009, 140 p.
- M. T. Vasudevan Nair, *Creature of Darkness*. Orient Longman

Module 3: Malayalam Short Fiction in the twentieth century
Malayalam short story in English translation – representative masters of the craft - Thakazhi Sivasankara Pillai, Basheer, Lalithambika Antharjanam, Paul Zacharia, etc. – new generation writers - modern women short story writers.

Short stories:

1) Thakazhy Sivasankara Pillai – "In the Flood"
2) Vaikkom Muhammed Basheer – "The World Renowned Nose"
3) T.Padmanabhan – "The Girl Who Spreads Light"
4) Paul Zacharia – "The Last Show"
5) Lalithambika Antherjanam – "Wooden Cradles"
6) C. Ayyappan: "Spectral Speech"
7) Gracy – "Orotha and the Ghosts"
8) Ashita – "In the Moonlit Land"
9) Chandramati – "The (Postmodern) Story of Jyoti Vishwanath"
10) K.R. Meera – "The Vein of Memory"

Core Text: *In the Shade of the Sahyadri: Selections from Malayalam Poetry and Short Fiction***.** OUP, 2012.

Recommended reading:
A Short History of Malayalam Literature - K. Ayyappa Paniker - Information & Public Relations Department, Kerala State, April 2006. [available on: www.suvarnakeralam.kerala.gov.in/book.pdf]
Introduction to *Ten Women Writers of Kerala.* Sreedevi K. Nair (ed) pages x – xx. [for 'Modern women short story writers']

<u>Instruction to Teachers</u> [Modules 1- 4]:

- Students may be given sufficient background information about the authors/genre included in Modules 2 – 4. **Questions are to be asked only from the prescribed poems, fiction and drama in Modules 2 to 4.**
- The work of each writer mentioned in modules 2 – 4 has to be placed against the literary backdrop of the age. The text referred to in Module 1 is to used for the purpose.
- The literary significance of the work prescribed is to be briefly discussed in the classroom. However the student is expected to have only a general awareness of the respective author.
- The major works of the writers mentioned in module 1 have to be made familiar to the students.
- Questions are not to be asked from Module 1 at the examination.

SEMESTER VI

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Elective Course - AMERICAN LITERATURE: CG 1661.1

No. of credits: 2
No. of instructional hours: 3 per week (Total: 54 hrs)

AIMS

1. To introduce students to American literature, life and culture
2. To broaden their aesthetic and intellectual faculties

OBJECTIVES

On completion of the course, the students should be able to

1. trace the origin and development of American literature, life and culture
2. identify what is distinctly American in American literature
3. read and appreciate American literature

COURSE OUTLINE

Module 1

Origin and development of American literature
17th and 18th centuries – Literary beginnings – development in the 19th century – the Transcendentalists – Emerson – Thoreau – Poe – Dickinson – Whitman – Hawthorne – Melville – Mark Twain – Henry James – 20th century – Post-War scene – Hemingway – Fitzgerald - Faulkner – American theatre - O'Neill – Miller – Tennessee Williams – Modern Poetry - Frost – Ezra Pound.

Module 2: Poetry

Module 3: Drama

Module 4: Short Fiction

COURSE MATERIAL

Module 1

Reading list

1. Spiller, Robert E. *The Cycle of American Literature.* Macmillan.
2. Fisher, William J. Ed. *An Anthology of American Literature.* Vols. I and II.

Module 2
Core reading [Detailed study]

Poems:

1. Edgar Allan Poe: To Helen
2. Walt Whitman: I Hear America Singing
3. Emily Dickinson: Because I could not stop for Death
4. Robert Frost: Mending Wall
5. Wallace Stevens: The Emperor of Ice- Cream

Module 3
Core reading [Detailed study]

Eugene O'Neill – *Thirst* [One Act play – available on www.theatrehistory.com/plays/**thirst**001.html]

Module 4
Core reading: Fiction: Hemingway: *The Old Man and the Sea* **[Non detailed study]**

SEMESTER VI

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Elective Course - COMMUNICATIVE APPLICATIONS IN ENGLISH: CG 1661.2

No. of credits: 2
No. of instructional hours: 3 per week (Total: 54 hrs)

AIM

1. To help the students attain high level proficiency in all the four language skills.
2. To equip them for competitive examinations and various International English Language Tests.
3. To enhance their career prospects and employability.
4. To help them develop their personality by fine tuning their communication and presentation skills.

OBJECTIVES

On completion of the course, the students should be able to

1. use English for international communication.
2. engage in all kinds of communication activities – informal, formal/business related and academic.
3. perform well in language tests and competitive examinations.

COURSE OUTLINE

Module 1

Listening and Speaking: varieties of modern English – British, American, Indian – basic sounds – deviations in American and other varieties.

Verbal Communication: conversation – basic techniques – how to begin, interrupt, hesitate and end – how to express time, age, feelings and emotions – how to respond – using language in various contexts/situations – talking about oneself, others – attending an interview – addressing an audience – using audio-visual aids – compering – group discussion.

Non-verbal Communication: body language : postures – orientation – eye contact – facial expression – dress – posture – self concept – self image – self-esteem – attitudes.

Module 2

Reading and Writing

Skimming and scanning – writing short messages – e mails – preparing notes and reports based on visuals, graphs and diagrams – official/business related letters – preparing agenda, minutes – CV – Describing persons, places, incidents and events – short argumentative essays.

Words often confused and misused – synonyms – antonyms – idioms commonly used – corresponding American expressions.

Module 3
Writing for Specific Purposes
Scientific writing – preparation of project proposals – writing of summaries and reviews of movies and books in English/regional languages.

Module 4
Practical Sessions
Language Skills Test (Written)
Teachers could encourage the students at the following tasks:

1. Translation of short and simple passages – from Malayalam to English
2. Providing captions for photos and pictures
3. Symposium – presenting different aspects of a debatable topic.

COURSE MATERIAL

Reading list
1. Mukhopadhyay, Lina et al. Polyskills: *A Course in Communication Skills and Life Skills*. Foundation, 2012.
2. O'Conner, J. D. *Better English Pronunciation.* CUP.
3. Swan, Michael. *Practical English Usage.* OUP.
4. Driscoll, Liz. *Cambridge: Common Mistakes at Intermediate.* CUP.

Reference
Jones, Daniel. *English Pronouncing Dictionary*, 17th Edn. CUP.

SEMESTER VI

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH

Vocational Course IX – TECHNICAL ENGLISH: CG 1671

No. of credits: 3
No. of instructional hours: 3 per week (Total: 54 hrs)

COURSE OBJECTIVES:

- To introduce learners to Language Skills in all technical and industrial specialisations
- To develop non-verbal and verbal skills in Technical English
- To enable learners to meet their professional needs like effective inter-personal skills
- To develop strategies and tactics that scientists, engineers, and others will need in order to communicate successfully on the job

COURSE OUTLINE

MODULE 1

- Technical Vocabulary - meanings in context; vocabulary for describing machines/gadgets; procedure & processes; engineering/scientific terminology
- Reading comprehension exercises with analytical questions on content – Evaluation of content

MODULE 2

- Communicating in the Technical Workplace: discussions of processes; technical problems & solutions; safety instructions
- Principles for collection of empirical data; research tools-questionnaire; sample
- Procedural Instructions: a set of operating procedures for a piece of technical equipment

MODULE 3

- Designing Documents: entering information in tabular form; Writing analytical paragraphs
- Writing general and safety instructions – Preparing checklists – Writing e-mail messages.
- Writing different types of reports like industrial accident report and survey report

MODULE 4

- Technical writing : writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future
- Technical Solution Proposal: a technological or scientific solution
- Technical White Paper: a short technical white paper that explains a technical process to a novice in the field who is thinking of investing in a business related to technology presented in the white paper.

COURSE MATERIAL

Reference:

Alred, Gerald J., Charles T. Brusaw, and Walter Oliu. Handbook of Technical Writing. 6th ed. Boston: Bedford/St. Martin's, 2000.

Dhanavel S.P., English and Communication skills for students of science and Engineering, Orient Black Swan, Chennai, 2011.

Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007).

Morgan, David and Nicholas Regan. Take-Off: Technical English for Engineering. Garnet Publishing Limited, 2008.

Pickett, Nell Ann, Ann A.Laster and Katherine E.Staples. Technical English: Writing, Reading and Speaking. New York: Longman, 2001.

Thorn, Michael and Alan Badrick. An Introduction to Technical English. Harlow: Prentice Hall Europe, 1993.

Rizvi, M.Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill PublishingCompany, 2007.

SEMESTER VI

CAREER-RELATED FIRST DEGREE PROGRAMME (CBCS) - Group 2 (a)
IN ENGLISH & COMMUNICATIVE ENGLISH

Vocational Course X – BUSINESS COMMUNICATION IN ENGLISH: CG 1672

COURSE OBJECTIVES:

- To introduce learners to Language Skills in Business English
- To develop non-verbal and verbal Business communication skills
- To equip learners with high professional expertise in Business communication
- To enable learners to meet their professional needs like effective Business management and inter-personal skills.

COURSE OUTLINE

MODULE 1

- **Business English vocabulary and usage**; Describing your job; Describing your company; Vocabulary for organising meetings (minutes, secretary, chair, etc); Vocabulary for cash flow, profit and loss accountants, terminology of finance; Internet vocabulary; IT vocabulary; Marketing Lexis - brands
- **Competence in Verbal and Non-verbal Business Communication** : Business-related speeches, dialogues, discussions; Interaction with Clients/Customers; Formal/ Public speeches - informative, persuasive, ceremonial; Talking about Total Quality Management; Talking about different management structures, philosophies
- Language/Phrases for meetings; Phrases for telephoning; Phrases for greetings, introductions, partings; Lexis for hobbies, interests, family

MODULE 2

- **Inter-personal Skills**: Soft skills, Leadership qualities and Etiquettes; Social and Professional Relationships; Levels of formality; Introducing yourself, Introducing Others, Greetings, Saying Goodbye.
- Agreeing / Disagreeing; Giving opinions; Interrupting / Dealing with interruptions; Asking for clarification; Requests; Offers; Complaining & Dealing with complaints; Making arrangements
- Resolving Workplace Conflicts; Organising meetings and events; Being interviewed and interviewing; Discussing advantages and disadvantages of candidates

MODULE 3

- **Effective Business correspondence:** Writing CVs and letters of application; Writing letters of complaint, enquiry, etc.; Writing short reports.
- Business correspondence for various purposes; Survey Questionnaires; Proofreading and Editing; typical functions of negotiation: Requests, Offers, Refusal, Acceptance; emails and faxes

MODULE 4

- **Business English in real life situations**: Advertising – effectives and impact; Marketing strategies for brands/products; Customer care services
- Describing the culture of a business/a national culture/regional culture; Describing experiences of culture clash/misunderstanding; discussions about ideal company culture
- Effective use of modern communication technology; Language of presentations, OHP, slides, etc. Texting, Tele-conference and Video-conference.

COURSE MATERIAL

Reference

Alred, Gerald J., Charles T. Brusaw, and Walter Oliu. The Business Writer's Handbook. 6th ed. New York: St. Martin's, 2000.

Cypres, Linda. *Let's Speak Business English*. Hauppauge, NY: Barron's Educational Series, 1999.

Geffner, Andrew P. Business English. Hauppauge, New York: Barron's Educational Series, 1998.

Good, Edward C. Mightier Than the Sword. Charlottesville: Word Stone Publications, 1989.

Guffey, Mary Ellen. Business Communication: Process and Product. 3rd ed. Cincinnati: South-Western College Publishing, 2000.

Jones, Leo and Richard Alexander. New International Business English. New York: Cambridge University Press, 1996.

Piotrowski, Maryann V. Effective Business Writing. New York: Harper Collins, 1996.

UNIVERSITY OF KERALA

SEMESTER VI

FIRST DEGREE PROGRAMME (CBCS System)

Common guidelines for Project/Dissertation

B.A. ENGLISH LANGUAGE AND LITERATURE: EN 1645
Total Instructional hours: 3/week
Credits: 4

CAREER RELATED FIRST DEGREE PROGRAMME 2(a) IN ENGLISH & COMMUNICATIVE ENGLISH: CG 1644
Total Instructional hours: 3/week
Credits: 4

A. Guidelines for Teachers:

1. The Project/Dissertation should be done under the direct supervision of a teacher of the department, preferably the Faculty Advisor for the sixth semester. However the work of supervising the Projects should be distributed equally among all the faculty members of the department.
2. The teaching hours allotted in the sixth semester for the Project/Dissertation [i.e., 3 hours/week] is to be used to make the students familiar with Research Methodology and Project writing.
3. A maximum of five students will work as a group and submit their project as a [single] copy for the group. The members of a group shall be identified by the supervising teacher. Subsequently each group will submit a project/dissertation and face the viva individually/separately.
4. The list containing the groups and its members should be finalized at the beginning of the sixth semester.
5. Students should identify their topics from the list provided in consultation with the supervising teacher or the Faculty Advisor of the class [Semester 6] as the case may be. The group will then collectively work on the topic selected.
6. Credit will be given to original contributions. So students should not copy from other projects.
7. There will be an external evaluation of the project by an External examiner appointed by the University. This will be followed by a viva voce, which will be conducted at the respective college jointly by the external examiner who valued the projects/dissertations and an internal examiner. All the members within the group will have to be present for the viva voce. The grades obtained [for external evaluation and viva voce] will be the grade for the project/dissertation for each student within that group.
8. The Project/Dissertation must be between 20 and 25 pages. The maximum and minimum limits are to be strictly observed.
9. A Works Cited page must be submitted at the end of the Project/Dissertation.
10. There should be a one-page Preface consisting of the significance of the topic, objectives and the chapter summaries.

11. Two copies have to be submitted at the department by each group. One copy will be forwarded to the University for valuation and the second copy is to be retained at the department.

B. <u>General guidelines for the preparation of the Project:</u>

- Paper must of A4 size only.
- One side Laser Printing.
- Line Spacing: double.
- Printing Margin: 1.5 inch left margin and 1 inch margin on the remaining three sides.
- Font: Times New Roman only.
- Font size: Main title -14/15 BOLD & matter - 12 normal.
- The project need be spiral-bound only.
- Paragraphs and line spacing: double space between lines [MLA format].
- Double space between paragraphs. No additional space between paragraphs.
- Start new Chapter on a new page.
- Chapter headings (bold/centred) must be identical as shown:

Chapter One
Introduction

- Sequence of pages in the Project/Dissertation:
  i. Cover Page.
  ii. First Page.
  iii. Acknowledgement, with name & signature of student.
  iv. Certificate (to be signed by the Head of the Dept and the Supervising Teacher).
  v. Contents page with details of Chapter Number, Chapter Heading & Page Numbers.

- Specimen copies for (i), (ii), (iv) and (v) will be sent to the colleges.
- Chapter divisions: Total three chapters.

  Preface
  Chapter One: Introduction - 5 pages
  Chapter Two: Core chapter - 15 pages
  Chapter Three: Conclusion - 5 pages.
  Works Cited

[Numbering of pages to be done continuously from Chapter One onwards, on the top right hand corner]

C. <u>Specific guidelines for preparation of Project</u>:

1. Only the Title of the Project Report, Year and Programme/Subject should be furnished on the cover page of the University copy of the Project. The identity of the College should not be mentioned on the cover page.

2. Details like Names of the Candidates, Candidates' Codes, Course Code, Title of Programme, Name of College, Title of Dissertation, etc should be furnished only on the first page.

3. Identity of the Candidate/College should not be revealed in any of the inner pages.

4. The pages containing the Certificate, Declaration and Acknowledgement are not to be included in the copy forwarded to the University.

5. The Preface should come immediately before the Introductory Chapter and must be included in all the copies.

D. Selection of Topics:

Students are permitted to choose from any one of the following areas/topics. Selection of topics/areas have to be finalized in the course of the first week of the final semester itself with the prior concurrence of the Faculty Advisor / Supervisor:

1. Post-1945 literature. This must not include the prescribed work/film coming under Core study. [Works/films other than the prescribed ones can be taken for study]

2. Analysis of a film script.

3. Analysis of advertisement writing [limited to print ads]. Study should focus on the language aspect or be analyzed from a theoretical perspective [up to a maximum of 10 numbers].

4. Analysis of news from any of these news stations/channels: AIR, Doordarshan, NDTV, Headlines Today, Times Now, BBC, and CNN. [news from 5 consecutive days highlighting local, regional, national, international, sports, etc]

5. Celebrity Interview: from film, politics, sports and writers [Only one area or one personality to be selected].

6. Studies on individual celebrities in the fields of arts and literature. Example: a Nobel Prize winner, a dancer/singer/musician/film star, etc, of repute [Only one personality to be selected].

7. Studies based on any 5 newspaper editorials or articles by leading international or national columnists like Thomas Friedman, Paul Krugman, Anees Jung, etc.

8. Compilation and translation of any 5 folk stories of the region.

9. Analysis of the language used in email and sms. The study should focus on the language aspect used in such modes of messaging, limiting to 10 pieces of email/sms. [Reference: David Crystal *Txtng: the GR8 Dbt.* OUP, 2008]

10. Studies on popular folk art forms like Koodiyattam, Theyyam, Pulikali, Chakyar Koothu, Nangyar Koothu, Kalaripayattu, Kathakali, Mohiniyattam, Maargamkali, Oppanna, etc. [Only one art form to be selected].

11. Study on any 5 popular songs in English. Songs of popular bands like the ABBA, Boney M, Backstreet Boys, Beatles, Pink Floyd, Rolling Stones, Westlife, Boyzone, etc can be selected.

12. Study based on the life and works of one Nobel Prize winner in literature.

E. Details of Course Contents:

(1) Academic writing: The following areas are to be made familiar to the students during the course of the 3 instructional hours/week set aside for the same in the sixth semester:

(a) Selecting a Topic: pages 6–7.

(b) Compiling a Working Bibliography: pages 31-33.

(c) Writing Drafts: pages 46-49.

(d) Plagiarism and Academic Integrity: pages 51-61.

(e) Mechanics of Writing: pages [Spelling & Punctuation]: pages 63-78.

(f) Methods of quoting texts: pages 92 – 101.

(g) Format of the Research Paper: pages 115-121.

Reference text: *M.L.A. Handbook* 7th edition.

(2) Documentation of sources in the works cited page(s): Samples of different types of sources will be provided.

UNIVERSITY OF KERALA

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (LOCF)

CAREER RELATED FIRST DEGREE PROGRAMME 2(a)

BA ENGLISH AND COMMUNICATIVE ENGLISH CBCSS

(2022 Admission Onwards)

Learning Outcomes Based Curriculum Framework (LOCF) for Career Related First Degree Programme 2(a)

BA English and Communicative English CBCSS

SEMESTERS I to VI- COURSE BREAKUP

[2022 Admission onwards]

Semester	Course Number	Course Name	Instructional Hours	Credits
I	EN 1111.3	Language Course I- Language Skills	5	4
I		Additional Language	5	3
I		Foundation Course	3	2
I	CG 1141	Core I: Introduction to Literary Studies	5	4
I	CG 1171	Vocational Course I: Soft Skills	4	3
I	CG 1131	Complementary Course I: English for Specific Purposes	3	3
II	EN 1211.3	Language Course III- English Grammar, Usage and Writing	5	3
II		Additional Language	5	3
II	CG 1241	Core II: British Literature I	5	3
II	CG 1242	Core III: Narratives of Resistance	3	3
II	CG 1271	Vocational Course II: Narratives of Social Justice and Restitution	4	3
II	CG 1231	Complementary Course II: Language for Media	3	2
III	EN 1311.3	Language Course V- English for Career	5	4
III		Foundation Course II: History of English Language	4	3
III	CG 1341	Core IV: British Literature II	5	4
III	CG 1342	Core V: Popular Literature	4	4
III	CG 1371	Vocational Course III: Translation Studies	4	3
III	CG 1331	Complementary Course III : Environmental Studies and Disaster Management	3	3
IV	EN 1411.3	Language Course VI Readings in Literature	5	4
IV	CG 1441	Core VI: 20th Century World Literature	5	4
IV	CG 1442	Core VII: 20th Century Malayalam Literature in Translation	4	4
IV	CG 1471	Vocational Course IV: Language Editing and Publishing	4	3

IV	CG 1472	Vocational Course V: Content Writing	4	3
IV	CG 1431	Complementary Course IV: Literatures of Travel and Tourism	3	3
V	CG 1541	Core VIII: Film Studies	4	3
V	CG 1542	Core IX: Indian Literature	4	3
V	CG 1543	Core X: Criticism and Theory	5	4
V	CG 1571	Vocational Course VI: Theatre Studies	3	3
V	CG 1572	Vocational Course VII: English Language Teaching	3	3
V	CG 1573	Vocational Course VIII: Language for Advertisement and Marketing	3	3
V	CG1551.1 CG1551.2	Open Course: English for Communication Film Appreciation	3	2
VI	CG 1641	Core XI: Gender Studies	5	4
VI	CG 1642	Core XII: Linguistics and Structure of English Language	5	4
VI	CG 1671	Vocational Course IX: Screen Writing and Subtitling	4	3
VI	CG 1672	Vocational Course X: Public Relations and Corporate Communication	4	3
VI	CG 1661.1 CG 1661.2 CG 1661.3	Industry Based Electives: Proof Reading and Copy Editing Academic Writing Professional Communication Practice	4	3
VI	CG 1643	Project	3	4
		Total Hours and Credits	150	120

Learning Outcomes Based Curriculum Framework (LOCF) for Career Related First Degree Programme 2(a) BA English and Communicative English CBCSS -Programme Outcome

PO 1: Bring in a harmonious blend of sensitive knowledge production and skill development

PO 2: Simultaneous rendering of language use and literary manifestations for a holistic approach towards education.

PO 3: Develop knowledge competence in select thrust areas that would provide directions to the students in terms of research as well as career options

PO 4: Recognize the varied possibilities multiple disciplines offer in terms of knowledge creation and skill acquisition.

PO 5: Make the students aware of the formation of knowledge and the politics of the same.

PO 6: Comprehend the current modes of writings – that which encompasses the issues related to power, race, caste, gender, ethnicity, climate change etc. and realize the role of literature in inculcating social sensitiveness

PO 7: Equip the students to identify and resist the socio cultural hegemonies and their literary representations through narratives of pluralities.

PO 8: Contribute to the realm of knowledge production with an increased intellectual, creative, critical and multidisciplinary capability.

PO 9: Enhance the skill attributes in the curriculum and help the students with the same in everyday praxis.

PO 10: Focus on specific vocational skills

PO 11: Address the requirements of the language use in a globalized context.

PO 12: Practice oriented approach for knowledge creation through skill enhancement

PO 13: Put into practice the theoretical, practical and performative elements within the learning of language and literature and connect it to the everyday realities of life and living.

PO 14: Equip the students to enhance their theoretical and practical wisdom to comprehend the regional requirements and contribute to the development of the society and economy.

PO 15: Imbibe a research-oriented approach to the study of humanities in connection with the basic understanding of social sciences to initiate a multidisciplinary approach of study.

SEMESTER I

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Core Course 1: CG 1141 Introduction to Literary Studies

No. of Credits: 4 **No. of Instructional hours: 5 per week [Total: 90 Hours]**

Aim: To introduce Literary Studies

Objectives

1. Develop an awareness of the diversity of world literature, representing different forms, time and space.
2. An awareness of different genres
3. Develop an inquisitiveness to read and love literature

Course Outcome

CO 1: Introduce varied literary representations.

CO 2: Comprehend the nature and characteristics of literature.

CO 3: Possess a foundational understanding of literary forms and representations

COURSE OUTLINE

Module I Introduction

Art form-Oral-Written- Narrative forms- Poetry- Poetic forms- Prose- Literary Fiction- Novel-Novella-Short Story-Essays- Drama- Tragedy-Comedy-Tragicomedy-One Act Plays-Melodrama-Opera-Pantomime-Mime-Ballet Electronic Literature-Popular Literature

1. Swapna Gopinath: ―What is Literature? https://freereads854632715.wordpress.com/2020/10/04/what-is-literature/

Module II Poetry

1. P.B Shelley: ― 'To a Skylark' https://www.poetryfoundation.org/poems/45146/to-a-skylark
2. Elizabeth Barret Browning : 'If thou must love me...' (Sonnet 14) https://poets.org/poem/if-thou-must-love-me-sonnet-14
3. Emily Dickinson: "Hope" is the thing with feathers https://www.poetryfoundation.org/poems/42889/hope-is-the-thing-with-feathers-314
4. Gabriel Okara: ― 'You Laughed and Laughed and Laughed'

https://theafricanbookreview.com/2014/05/09/you-laughed-and-laughed-and-laughed-gabriel-okara/

5. Wislawa Szymborska: — 'Possibilities'
   https://www.poemhunter.com/poem/possibilities-21/

Module III Fiction

1. Rabindranath Tagore: — 'Kabuliwala'
   http://theanonymouswriter.com/wp-content/uploads/2015/07/Kabuliwala-by-Rabindranath-Tagore.pdf
2. O Henry : — 'The Ransom of Red Chief'
   https://www.gutenberg.org/files/1595/1595-h/1595-h.htm#8
3. Katherine Mansfield: — 'The Garden Party'
   https://www.gutenberg.org/files/1429/1429-h/1429-h.htm
4. Bram Stoker: "Dracula's Guest"
   https://www.gutenberg.org/files/10150/10150-h/10150-h.htm
5. Antoine de Saint-Exupery: *Little Prince*
   https://verse.aasemoon.com/images/f/f5/The_Little_Prince.pdf

Module IV Drama

1. Henrik Ibsen: *A Doll's House*
   https://www.gutenberg.org/files/2542/2542-h/2542-h.htm

Suggested Reading

Anjaria, Ulka. *A History of Indian Novel in English*, New York, Cambridge University Press, 2015.

Brillenburg Wrth, Kiene and Ann Rigney. *The Life of Texts: An Introduction to Literary Studies.*Amsterdam, Amsterdam University Press, 2019.

Carey, John. *A Little History of Poetry*. United States, Yale University Press, 2020

Casey, Maryrose. *Creating Space Contemporary Indigenous Theatre*. Brisbane, University of Queensland Press, 2004

Casserto, Leonard and Benjamin Reiss.*The Cambridge History of American Novel*. Cambridge University Press, 2011.

Chaudhuri, Rosinka. *A History of Indian Poetry in English*.Cambridge University Press, 2016 Damrosch, David. What is World Literature?Princeton University Press, 2018

De, Souza, Eunice. Ed. *These my Words* The Penguin Book of Indian Poetry. Penguin Books, 2012.

Fischer-Lichte, Erika, *History of Drama and Theatre*, Routledge, 2002. Frow, John. Genre.UK, Taylor and Francis, 2013.

Geir Farner. *Literary Fiction*.Bloomsburry. 2014.

Harper, Michael, S, Antony Walton.*The Vintage book of African American Poetry* New York, Knopf Doubleday Publishing Group, 2012.

Hart, Stephen, M. *The Cambridge Companion to Latin American Poetry*, Cambridge, Cmbridge University Press, 2008.

Hosein , Ann. *The History of Theatre*. New York, The Rosen Publishing Group, 2015. Ibsen, Henric, A Doll's House. Outlook Verlag, 2018.

Klarer, Mario. *An Introduction to Literary Studies*. UK,Taylor and Francis, 2005. Lal, Ananda, Theatres of India A Concise Companion.Oxford University Press, 2009. Mason, Bim. Street Theatre and other Outdoor Performance, Routledge, 1992.

Mc Clatchy, J,D. *The Vintage Book of Contemporary World Poetry*.New York, Vintage Books, 1996.

Mc Clatchy, J,D. *The Vintage Book of Contemporary American Poetry*.New York, Vintage Books, 2009.

Moretti, Franco. *Atlas of the European Novel 1800-1900*. London, Verso, 1998.

Ricks, Christopher. *The Oxford Book of English Verse*, Oxford, Oxford University Press, 1999.

Roy, Rituparna. *South Asian Partition Fiction in English, From Khushwant Singh to Amitav Ghosh* .Amsterdam UP. 2010.

Styan, John L, John Louis Styan. *The English Stage A History of Drama and Performance*. Cambridge, Cambridge University Press, 1996.

Tickell, Alex. *South-Asian Fiction in English, Contemporary Transformations*. UK, Palgrave Macmillan, 2016.

Turner, Palgrave Francis. *The Golden Treasury*.New York, Steriling Publishing Private Limited. 2005.

Thayil, Jeet, *60 Indian Poets*, London, Penguin Books Limted,2008.

e-resources

https://www.youtube.com/watch?v=sr3nw7CZvO8 (Video of A Doll's House)
https://pabloneruda.net /# https://www.kahlilgibran.com /

https://www.poetryfoundation.org/

https://www.poemhunter.com/

https://www.poetryinternational.org/pi/home https://www.pitt.edu/~dash/folktexts.html
https://www.gutenberg.org/ebooks/search/?query=poetry&submit_search=Go%21

https://www.gutenberg.org/ebooks/search/?query=one+act+plays&submit_search=Go%21

https://www.nobelprize.org/prizes/lists/all-nobel-prizes-in-literature
https://www.thebalancecareers.com/the-man-booker-prize-winners-1968-to-present-2799885
https://www.abebooks.com/books/50-essential-non-fiction-books/index.shtml
https://www.gutenberg.org/ebooks/search/?query=novels&submit_search=Go%21
https://www.gutenberg.org/ebooks/search/?query=short+stories&submit_search=Go%21
https://encyclopedia.ushmm.org/content/en/project/the-holocaust-a-learning-site-for-students
https://www.holocaust.com.au/resources/websites/

https://www.history.com/topics/world-war-ii/the-holocaust

SEMESTER I

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Vocational Course I CG 1171 Soft Skills

No. of credits: 3 **Instructional hours: 4 per week [72 hours]**

Aim: Understand and practice soft skills

Objectives

1. Develop unique soft skills to enhance an individual's interpersonal communication skills, social skills and career performance
2. Inculcate potential skills to prepare students to deal with the world in a productive manner.
3. Enhance leadership qualities and demonstrate a positive work outlook

Course Outcome

CO 1: Advance unique soft sills which is beneficial for a successful life and better career performances

CO 2: Increase personal, social and professional skills

CO 3: Confront their surroundings enthusiastically with confidence

COUTSE OUTLINE

Module I Introduction to Soft Skills

Soft Skills- definition and significance- difference between soft skills and hard skills – soft skills vs. life skills

Module II Personal Skills

Discovering the self- setting goals- values- attitude-positivity and motivation- developing Positive Thinking- Body language and Etiquette- listening skills - Time Management Skills- Life skills.

Module III Social Skills

Nonverbal; communication - interpersonal skills - Circumstantial use of Language-Public Speaking- Decision-Making and Problem-Solving Skills - Conflict Management - Stress Management-Emotional Intelligence-

Module IV Professional Skills

Job oriented skills- Team work - organizational skills - Communication skills- - Interview & Group discussion skills- team communication - leadership skills- corporate communication styles (assertion, persuasion, negotiation.) - Presentation skills- -Professional etiquette

Suggested Reading

Peter, Francis. *Soft Skills and Professional Communication*. New Delhi: Tata McGraw Hill. 2012. Print.

Singh, Prakash and Raman, Meenakshi. *Business Communication*. New Delhi: Oxford UP.2006. Print.

Bailey, Edward P. *Writing and Speaking at Work: A Practical Guide for Business Communication*. Pennsylvania: Prentice Hall. 2007.Print.

Pease, Allan and Peas, Barbara. *The Definitive Book of Body Language*. New York: RandomHouse.2006.Print.

De Bono, Edward.1993. *Serious Creativity*. Re print. Harper Business.

Pease, Allan. 1998. *Body Language: How to Read Others Thoughts by their Gestures*. Suda Publications. New Delhi.

Gardner, Howard. 1993. *Multiple Intelligences: The Theory in Practice: A Reader* Basic Book. New York.

De Bono, Edward. 2000. *Six Thinking Hats*. 2nd Edition. Penguin Books.

De Bono, Edward. 1993. *Serious Creativity.* Re print. Harper Business.

Instructions to Teachers

This course is activity oriented Classroom activities must be conducted to impart the same to students. Internal evaluations shall be done in the form of extended practical activities.

Instructions to Question Paper Setters

Since this is a vocational course, students' practical knowledge must be evaluated along with their theoretical awareness.

SEMESTER I

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Complementary Course I CG 1131 English for Specific Purposes

No. of credits: 3 **Instructional hours: 3 per week [54 hours]**

Aim: To enhance the ability of students to use language in various professional and academic settings.

Objectives

1. To develop an overview of ESP
2. To enable the students to understand the various possibilities and aspects of ESP
3. To equip the students with certain English proficiency to meet the academic and occupational needs

Course Outcome

CO 1: Understand ESP and differentiate English for General Purpose and English for Specific Purpose

CO2: Be able to speak and write English for various specific purposes

CO 3: Familiarize with the vocabulary and language of Business English, Technical English, Travel English, Medical English, Legal English, English for Logistics, BPO English

COURSE OUTLINE

Module 1

English for Specific Purpose- Introduction:

Definition of English for Specific Purpose- Characteristics of ESP-Importance of ESP -English for General Purpose (EGP)-EGP vs. ESP- Types of ESP-EAP and EOP- Brief history and development of ESP-Needs analysis-definition-Common abbreviations in ESP-BE, EAP, ELP, EMP, EOP, EST, EVP, IELTS, TEEP, TOEFL

Module II

Business English: -Business Correspondence: business letters, letter of complaint-letter of enquiry-Emails-Memos-Agenda-Minutes-Chairing a meeting-key tasks of the chair-chairing meeting effectively-Turn taking and its strategies - Negotiations: Negotiating language- process-

negotiating with suppliers and clients-job applications-resumes-cover letters- preparing for interviews- survey questionnaire- Power Point presentations

Module III

English for Logistics-What is Logistics?-Essential vocabulary-commonly used terms and abbreviations

Suggested Reading

Anthony, Laurence. *Introducing English for Specific Purposes*, 2018

Paltridge Brian and Sue Starfield, *The Handbook of English for Specific Purposes*,2012

Dudley-Evans Tony, Maggie Jo Saint John, *Developments in English for Specific Purposes: A Multidisciplinary Approach* 2011

Waters, Alan and Tom Hutchinson, *English for Specific Purposes: A Learning Centered Approach* 1988

Talbot, Fiona. *How to write effective Business English?* 2009

e-resources

https://busyteacher.org/20571-7-turn-taking-strategies-boost-student-speaking.html

https://www.englishclub.com/business-english/negotiations-process.html

https://www.thesuccessfactory.co.uk/blog/the-ultimate-guide-to-chairing-meetings-

effectively#s3

https://www.fluentu.com/blog/business-english/english-for-logistics-vocabulary/

Travel English: Definition-Vocabulary, phrases and expressions for traveling

Online reference:-https://preply.com/en/blog/travel-english-vocabulary-phrases/

Legal English: Definition- Legal English vocabulary for court procedure and beyond

Online reference:- https://www.fluentu.com/blog/business-english/legal-english-vocabulary/

Medical English: Definition-medical English vocabulary

Online reference : https://www.englishclub.com/english-for-work/medical-vocabulary.html

English for BPO : Definition-Vocabulary and Phrases for dealing with customers in Call

Centre : https://www.fluentu.com/blog/business-english/call-center-english/

SEMESTER II

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Core Course II CG 1241 British Literature I

No. of Credits: 3 **No. of Instructional hours: 5 per week [Total: 90 Hours]**

Aim Introduce the origin and growth of English literature

Objectives

1. Familiarize the historical phases of British literature
2. Provide glimpses of writers and literary texts that are pivotal to an understanding of British literature
3. Discuss the development of British literature across time from Pre-Elizabethan to Restoration Era

Course Outcome

CO 1: Comprehend the origins and development of British literature and understand the specific features of the particular periods

CO 2: Understand the major concerns, structure and style adopted by early British writers

CO 3: Gain knowledge of growth and development of British Literature in relation to the historical developments

COURSE OUTLINE

Module I Pre-Elizabethan Literature

Anglo-Saxon literature—Bede, Beowulf, King Alfred – Norman Conquest—Ballads—Fall of Constantinople—English Renaissance—Humanism—Reformation—Printing Press, Caxton—Chaucer, Langland—Mystery Plays, Miracle Plays, Morality Plays, Interlude—Thomas More

1. Geoffrey Chaucer: General Prologue, Canterbury Tales – Introduction- Lines 1-31
2. Deor‘s Lament http://www.thehypertexts.com/Deor's%20Lament%20Translation.htm
3. Thomas Moore: ‘Of Their Towns, Particularly of Amaurot’ (from Book 2 of *Utopia*)

Module II Elizabethan Age

Gorbuduc-Ralph Roister Doister-Tottel's Miscellany-University Wits-Sidney-Spenser-Isabella Whitney-Mary Sidney Herbert- Kyd,-Marlowe-Bacon-Ben Jonson-Donne and Metaphysical Poetry.

1. Spenser- —Sonnet 30 (from Amoretti) www.poetryfoundation.org
2. Isabella Whitney: — 'A Sweet Nosegay, or Pleasant Poesy, Containing a Hundred and Ten Philosophical Flowers' https://www.poetryfoundation.org/poems/45994/a-sweet-nosegay-or-pleasant-poesy-containing-a-hundred-and-ten-philosophical-flowers
3. Extract from Doctor Faustus- — 'Apostrophe to Helen'
4. Two Essays from Bacon (—Of Friendship, —Of Studies) Bacon's Essays. Macmillan. 1992.
5. John Donne: —Valediction Forbidding Mourning https://www.poetryfoundation.org/poems/44131/a-valediction-forbidding-mourning

Module III Shakespeare

Elizabethan Theatre-Opening of Globe Theatre-Authorized version of the Bible-Beaumont and Fletcher-Webster

1. Shakespeare —Sonnet 33 http://shakespeare.mit.edu/
2. Shakespeare: A Midsummer Night's Dream http://shakespeare.mit.edu/

Module IV Puritan and Restoration Age

Milton—Bunyan—Civil War—Closing of Theatre—Cromwell—End of Commonwealth—Restoration of Monarchy—Opening of Theatres—Wycherley, Congreve, Etherege—Glorious Revolution

1. John Milton: Extract from Book 9 (Paradise Lost) – 'The Fall of Man' – Lines 850-1055 https://rpo.library.utoronto.ca/poems/paradise-lost-book-ix
2. John Bunyan : — 'Of the Boy and the Butterfly' https://www.poemhunter.com/poem/of-the-boy-and-butterfly/
3. Aphra Behn: — 'Song' https://www.poetryfoundation.org/poems/50527/song-56d22db1a9572

Suggested Reading

Alexander, Michael. A *History of English Literature*. Macmillan. Baugh, A.C. A History of English Literature.Routledge. 2013.

Boitani, Piero. Jill Mann(ed). *The Cambridge Companion to Chaucer*.CUP. 2003.

Carter, Ronald, John McRay. *The Routledge History of Literature in English*. Routledge, 2017 Chaucer, Geoffrey. *The Canterbury Tales*.Trans. Neville Coghill.Penguin, 2003. Print Christopher Ricks, ed., *English Poetry and Prose1540-1674*

Poplawski, Paul. *English Literature in Context*. CUP.1993

Peck, John, Martin Coyle. *A Brief History of English literature*. Palgrave 2003 Thornley G C and Gwyneth Roberts.*An Outline of English Literature*.Pearson, 2011.

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https://library.baypath.edu/english-and-literature-web-sites
https://www.gutenberg.org/ebooks/search/?query=shakespeare&submit_search=Go%21
https://www.gutenberg.org/ebooks/search/?query=chaucer&submit_search=Go%21
http://www.literature-study-online.com/resources/#historical
http://www.universalteacher.org.uk/lit/history.html

https://www.britannica.com/art/English-literature/Elizabethan-poetry-and-prose

https://www.encyclopedia.com/humanities/culture-magazines/restoration-literature-england
https://chaucer.fas.harvard.edu/

https://chaucer.fas.harvard.edu/pages/Synopses-Prolegomena
http://www.dartmouth.edu/~milton/reading_room/contents/text.shtml
https://www.gutenberg.org/files/29854/29854-h/29854-h.htm (Aphra Behn)
http://www.mindfulteachers.org/2013/05/women-writers-at-time-of-shakespeare-e.html
https://internetshakespeare.uvic.ca/Library/SLT/literature/women%20writers/morewomen.html

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SEMESTER II

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Core Course III CG 1242 Narratives of Resistance

No. of Credits: 3 **No. of Instructional hours: 3 per week [Total: 54 Hours]**

Aim Introduce the various narratives of resistance, literary and other wise.

Objectives

1. To understand the various modes of resistance needed to subvert oppressive socio-cultural structures.
2. To provide insight into the struggles of people from around the world for identity and rights and contribute proactively to social dynamics.
3. To understand how literature acts as a vehicle for voices of dissent and protest.

Course Outcome

CO 1: Be able to identify themes of resistance in different forms and genres of literature and to identify injustices related to race, ethnicity, sexuality, gender etc. prevalent in society.

CO 2: Develop an idea of literature as a form of resistance to all forms of totalitarian authority.
CO 3: Understand the inter connection between various genres in manifesting resistance and how it becomes an undeniable presence in the everyday narratives of literary and other artistic expressions.

COURSE OUTLINE

Module I Narratives of Resistance

Nature and Function of Resistance- Heterogeneous forms of Resistance-Gender-Dalit-Race-Totalitarianism-Nation State-Holocaust- Slave Narratives-War-Resistance and Social Change

Module II Poetry/Documentary

1. Adrienne Rich- ―What Kind of Times Are These
   https://www.poetryfoundation.org/poems/51092/what-kind-of-times-are-these
2. Denise Levertov- ―Making Peace
   https://www.poetryfoundation.org/poems/53900/making-peace
3. Mahmoud Darwish-―ID Card
   https://www.wrmea.org/017-november-december/id-card-by-mahmoud-darwish-a-translation-and-commentary.html

4. S. Joseph : — 'A Letter to Malayalam Poetry' https://www.poetryinternational.org/pi/poem/17781/auto/0/0/S-Joseph/A-Letter-to-Malayalam-Poetry/en/tile
5. Tishani Doshi- — 'Girls are coming out of the Woods' https://www.poetryfoundation.org/poems/152744/girls-are-coming-out-of-the-woods
6. Taslima Nasreen : — 'Garment Girls' https://www.poemhunter.com/poem/garment-girls/
7. Lucille Clifton: — 'poem in praise of menstruation' https://www.poetryfoundation.org/poems/54584/poem-in-praise-of-menstruation
8. Peter Davis (Dir): *Nelson Mandela: Prisoner to President* (Apartheid Documentary 1994) https://www.youtube.com/watch?v=Rk-Lxgp9NWg

Module III Prose and Fiction

1. Assange, Julian. – 'Conspiracy as Governance. State and Terrorist Conspiracies' 7-12 https://cryptome.org/0002/ja-conspiracies.pdf(Article)
2. Sojourner Truth: — 'Ain't I A Woman?' (Speech) https://www.nps.gov/articles/sojourner-truth.html
3. Jacinta Kerketta And Nighat Sahiba —On The Power of Poetry And Politics of Language‖.Huffpost article by Kavitha Muralidharan (Article) https://www.huffingtonpost.in/entry/jacinta-kerketta-nighat-sahiba-kashmir-jharkhand- poems-language_in_5c41f480e4b027c3bbc14a3a?guccounter=
4. Alice Munro: — 'Boys and Girls' (Short Story) http://www.giuliotortello.it/shortstories/boys_and_girls.pdf
5. K. Saraswathi Amma: — 'Life, In My View' (Memoir) (Translation J. Devika) https://swatantryavaadini.in/2020/08/30/life-in-my-view-k-saraswathi-amma/#more-982
6. Living Smile Vidya: *I am Vidya: A Trangender's Journey*

Suggested Reading

Brueck , Laura. *Writing Resistance: The Rhetorical Imagination of Hindi Dalit Literature.*Columbia University Press, 2014.

Darwish, Mahmoud.Unfortunately, *It Was Paradise: Selected Poems*.University of California Press, 2013.

De Santis, Christopher C., et al. *The Collected Works of Langston Hughes: The poems, 1941-1950.* Italy,University of Missouri Press, 2001.

Doshi, Tishani. *Girls Are Coming Out of the Woods*. India, Harper Collins Publishers India, 2017.

Dutta, Mohan J. *Voices of Resistance: Communication and Social Change*. Purdue University Press. 2012.

Harlow, Barbara. *Resistance Literature*. New York, Methuen, 1987.

Hosseini, Khaled. *A Thousand Splendid Suns*.Bloomsbury Publishing, 2009.

Jo Glanville, ed. Qissat: *Short Stories by Palestinian Women*. London, Telegram, 2006. 90-94. Levertov, Denise. Selected Poems.United States, New Directions, 2003.

Lewis, T. (2008).—*Literature as Resistance*.The Hudson Review,60(4), 655–664. www.jstor.org/stable/20464787

Manṭo, Sa'ādatḤasan. Manto: *Selected Short Stories: Including 'Toba Tek Singh' and 'The Dog of Tithwal'*. India, Random House India, 2012

Munro, Alice. *Selected Stories*. United Kingdom, Random House, 2012.

Neruda, Pablo. *The Poetry of Pablo Neruda*.United States, Farrar, Straus and Giroux, 2015.

Nguyen, Viet Thanh. *Race and Resistance: Literature and Politics in Asian America Race and American Culture.*USA,Oxford University Press, 2002.

Rich, Adrienne. *Collected Poems: 1950-2012*. United States,W. W. Norton, 2016.

Stoltz, Pauline. *Gender, Resistance and Transnational Memories of Violent Conflicts*.Germany, Springer International Publishing, 2020.

Williams, Nerys. *Contemporary Poetry*. United Kingdom, Edinburgh University Press, 2011.

Zimmermann, Jérémie, et al. Cypherpunks: *Freedom and the Future of the Internet*. United Kingdom, OR Books, 2016.

e-resources

https://swatantryavaadini.in/ https://www.thegoodtrade.com/features/inspiring-female-poets

On Literature and Resistance https://againstthecurrent.org/atc074/p1835/

SEMESTER II

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Vocational Course II CG 1271 Narratives of Social Justice and Restitution

No. of credits: 3 **Instructional hours: 4 per week [total 72 Hours]**

Aim: To cultivate social sensitivity and identify the modes of addressing the areas concerned through specific skill development and career.

Objectives:

1. To create awareness of the language usage in understanding criminal justice, child welfare, mental health, agencies for the elderly, research organizations, advocacy, human rights, community development, international social work and substance abuse programs.
2. To sensitize the students to social needs and problems and find out the appropriate means of resilience and resistance.
3. To understand and practice Literature and Language to deal with social problems.

Course Outcome

CO 1: Make students cognizant regarding pressing social issues and to apply language skills, knowledge, and social skills to identify and defend human rights violations.

CO 2: Acquire skills of social work intervention in human needs and societal issues.

CO 3: Consider the importance of law and imbibe a clear set of values which informs the social work practice.

COURSE OUTLINE

Module 1

Background

Defining trauma- narratives of struggle,-bearing witness-silence,-testimony- post-traumatic stress disorder- post memory- intergenerational trauma- Recovery pattern- laws- The Impact and Implications of Trauma and Abuse- Child sexual abuse

1. A Lifetime of Anger and Pain": Kali Tal and the Literatures of Trauma (Review) David J. DeRose, *Postmodern Culture* (7:1) January 1997 https://worldsofhurt.com/derose_review/
2. Sonia Falerio's *The Good Girls* (novel) Black Cat, February 2021

3. *Rugmini* (Film) Directed by K.P Kumaran

Module 2

Background

Refugee crisis- UNHCR- land rights-internal displacement- dislocation-land acquisition.

1. Siddhartha Sarma: *Year of the Weeds* (Novel) Duckbill Books and Publications Pvt Ltd, 2018.)
2. Hansda Sowvendra Shekhar; 'The Adivasi Will Not Dance' by Hansda Sowvendra Shekhar (Short story from the collection *The Adivasi Will Not Dance: Stories*, Tiger Publishing Private Limited; 2011th edition (10 January 2017)
3. Brazil's Supreme Court to rule soon on Indigenous land rights (News paper report) https://www.aljazeera.com/news/2021/8/25/brazils-supreme-court-to-rule-soon-on-indigenous-land-rights

Module 3

Background

Privilege- Power- Protest and Politics- Disabled-differently-abled-disabled friendly- politics of inclusion and exclusion-Transgender-Intersex-Transvestite- SRS- Preferred Pronouns- Trauma induced by various diseases

1. *Njan Avanalla Aval* (movie)
2. Malini Chib: *One Little Finger* (Autobiography) Sage Publications Pvt. Ltd; 1st edition April 2017)
3. Megha Rao: *Teething* Harper Collins India December 2021

Module 4

Practice- Writing trauma narratives- short projects- Interviewing, transcribing and editing testimonies of trauma survivors- Building community with trauma survivors (within the classroom and beyond) -Organizing Group projects on Social issues and problems of their choice and are expected to submit a report- Observation visits to various NGOs/Hospitals/Industries and Social welfare agencies to expose the students to the activities of various agencies.

Suggested Reading

Herman, Judith Lewis: *Trauma and Recovery*, Basic Books, 1997

Jacques, Juliet, *Trans: A Memoir*, Verso 2015

Kalli Tal. *Worlds of Hurt: Reading the Literatures of Trauma*. CUP, 1995

Mibang, Tamo , M.C. Behera. *Tribal Studies: Emerging Frontiers of Knowledge*, Mittal Publications, 2007.

Vickroy, Laurie. *Trauma and Survival in Contemporary Fiction* University of Virginia Press, 2002.

Wong, Alice, *Disability Visibility: First Person Stories from the twenty-first Century*, Vintage Books, 2020

Instruction to Teachers

1) The movies Article 15 and Pinjar are to be shown

2) Make the students explore how contemporary fiction narratives represent trauma--that response to events so overwhelmingly intense that normal responses become impaired.

3) Investigate the complex relationship between sociocultural influences and intimate personal relations portrayed through narratives

4) Examine how contemporary trauma narratives are indeed personalized responses to this century's emerging awareness of the catastrophic effects on the individual psyche of wars, climate catastrophe, poverty, colonization, sexual abuse, and domestic abuse.

Instruction to Question Paper Setters

Questions shall focus more on the practice of writing on issues and causes related to social justice. It should reflect how the paper sensitized the students on the issues discussed.

SEMESTER II

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Complementary Course II CG 1231 Language for the Media

No. of credits: 2 **Instructional hours: 3 per week [Total: 54 Hours]**

Aim: Introduce specific language skills for a career in media

Course objective

1. To understand how the content and presentation of media shapes our thoughts, vision, ethics and action
2. To develop ability to contribute to debates regarding major trends brought by digital media that drive social change
3. To understand the convergence of mass media as the futuristic trend opening up exciting career and creative opportunities

Course Outcome

CO1: Develop specific language skills for various media

CO2: Comprehend the trends and evolution of language use in media

CO3: Understand the role and use of language in the evolutionary history of medias

COURSE OUTLINE

Module I

Media- old media- new media- Media Convergence- Mass media effects and uses- Language use in various media- print/ digital- Language shift (Evolution) - types of narratives in media and specific language use- articles- feature writing- reports- stories- literary journalism (narrative journalism)- Hypodermic needle- two step flow theory- cultivation theory- social learning theory- Mc Luhan's Media determinism- Spiral of silence- Media hegemony-Agenda setting- uses and gratification approach

Module II

Digital culture and digital identity- User generated communication- Facebook, Instagram, Twitter- You Tube- Participatory culture and social media- Digital media and public sphere- Network theory- (Manual)Media and e-democracy- smartphone culture and society- New narrative forms like online shots, flash fiction, web series, viral videos, interactive comics, digital

trailers- trolls- Media and public opinion- Role of social media in democracy- cyber activism (with suitable examples)- Cyber Crime- online bullying, stalking, online frauds-Netiquettes

Module III

Practice Module

Writing for the print media-Writing headlines – Analysing newspaper articles, Planning and writing a newspaper article- Magazine: Composing magazine covers –Planning the contents of a magazine – Giving instructions for a photo shoot –Planning and writing a true life story, Writing for Radio, Television - Radio: Understanding the language of radio presenters – Understanding the production process - Television: Editing a TV documentary - Writing for advertisements- Advertisement: Creating a print advert –Creating a screen advert, Writing for the New Media: Briefing a website designer –Planning and writing a blog – Creating a podcast- Vlogs. Photography and photojournalism - Photo essays: an understanding of photo essay as a visual depiction of an event/issue. Writing Captions for photographs.

Classroom practice/Activities

1. Write a radio script for any one of the following: (a) Prime time News bulletin. (b) Radio drama based on a short story. (c) Radio feature on an event in your college.
2. Create a photo essay on a theme of your choice, with suitable captions.
3. Use any camera or mobile phone with video facility to create a 1-5-minute fiction story on a topic of your choice.
4. Preparing Newspaper Report
5. Writing blog

Suggested Reading

Manovich, Lev. “What is New Media?” in *The Language of New Media*. Cambridge: MIT Press. pp. 19-48. 2001.

Narula, U. *Communication Models*. Atlantic Publishers and Dist. 2006.

Baran, S.J. *Mass communication Theory: Foundations* Ferment & Future. Belmont CA: Wadsworth. 2010.

McQuail, D. *Mass Communication Theory: An Introduction*. Thousand Oaks: Sage. 2010.

Rogers, E and Singhal, A. *India's Communication Revolution: From Bullock Carts to Cyber marts.* Sage. 2001.

Kumar, K. J. *Mass Communication in India*. Mumbai: Jaico Pub. House. 2013.

Jeffrey, Robin. *India's Newspaper Revolution: Capitalism, Politics and the Indian language Press, 1977-99*. C. Hurst & Co. Publishers, 2000.

Baruah, U. L. *This is All India Radio*. Publications Division Ministry of Information & Broadcasting. 2017. Ninan, Sevanti. Through the Magic Window: Television and Change in India. Penguin. 1995.

Mankekar, Purnima. *Screening Culture, Viewing Politics: An Ethnography of Television, Womanhood, and Nation in Postcolonial India.* Duke University Press. 1999.

Gupta, Nilanjana. *Switching Channels: Ideologies of Television in India*. Oxford University Press, India. 1998.

Monaco, James, et al. *How to Read a Film: The Art, Technology, Language, History, and Theory of Film and Media*. New York: Oxford University Press. 2000.

Hill, John, and Pamela Church Gibson. *The Oxford Guide to Film Studies.* Oxford: Oxford University Press. 1998.

Aruna Zachariah., *Print Media, Communication and Management : Elements, Dimensions and Images*, Kanishka Publishers, Delhi, 2007

Ambrish Saxena., *Fundamentals of Reporting & Editing*, Kanishka Publishers, Delhi.

George A. Hough., *News Writing*, Kanishka Publishers, Delhi, 2006

Suhas Chakravarty.,*News Reporting & Editing : An Overview*, Kanishka Publishers, Delhi

Instructions to Teachers:

Teachers should stick to the syllabus for theoretical aspects. Regularly do classroom practice as per Module III

Instructions to Question Paper Setters

It is essential to evaluate Students' practical knowledge along with their theoretical awareness. Questions should focus more on the practice of writing for the media.

SEMESTER III

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Foundation Course II CG 1321 Evolution of the English Language

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: Study the historical development of the English Language.

Objectives

1. Demonstrate a thorough understanding of the diachronic development of the English language down the ages.
2. Sensitize students to the changes that have shaped English
3. Enable understanding of the growth of English into a global language

Course Outcome:

CO 1: Knowledge of the paradigm shifts in the development of English.

CO 2: Imbibe the plural socio cultural factors that went in to the shaping of the English Language.

CO 3: Recognize the politics of many 'Englishes'

COURSE OUTLINE

Module I

Language families – Indo-European family – Germanic group – Consonant shift – Descent of English – Old English and its features- Grimm's law- Verner's law- Umlaut and Ablaut – Dialects of OE – Celtic, Latin and Scandinavian influences

Module II

Norman Conquest – French influence – Middle English – Decay of inflections – Loss of grammatical gender – Impact of Bible Translations – Contributions of Chaucer to English – Rise of Standard English

Module III

Modern English – Contributions of Spenser, Shakespeare and Milton to English –Changes in pronunciation (Great Vowel Shift) – Spelling reform – Dr. Johnson's dictionary – Evolution of English as a Global Language

Module IV

Semantic changes in English -Word formation – Growth of vocabulary – Various Englishes- Digital English.

Suggested Reading:

Barber C.L. *The Story of Language*. Pan Books. 1972.

---, *The English Language, A Historical Introduction*. CUP, 1993.

Baugh, Albert C, Thomas Cable. *A History of the English Language*.Taylor and Francis, 1993.
Crystal, David. The Stories of English.Penguin, 2005.

Wood, Frederick T. *An Outline History of English Language*. Macmillan, 2000.

e-resources:

―English language‖ https://www.britannica.com/topic/English-language

―The History of English‖ https://www.thehistoryofenglish.com/index.html

―Studying the History of English‖ http://www.uni-due.de/SHE/index.html

―History of the English Language‖
https://en.wikipedia.org/wiki/History_of_the_English_language

―History of English‖ https://www.englishclub.com/history-of-english/

SEMESTER III

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Core Course IV CG 1341 British Literature II

No. of Credits: 4 **No. of Instructional hours: 5 per week [Total: 90 Hours]**

Aim: Introduce the historical and philosophical shifts in British literature since 17th century.

Objectives

1. Familiarize the history of British literature from the 18th century to the Victorian age
2. Understand the socio-political, historical and cultural contexts
3. Be able to identify the changing trends in British literature in the 18th and 19th centuries

Course Outcome

CO 1: Sensitize students to the changing trends in British literature in the 18th and 19th centuries and connect it with the sociocultural and political developments.

CO 2: Develop the critical thinking necessary to discern literary merit and to recognize paradigm shifts in literary representations.

CO 3: Connect literature to the historical developments that shaped the British history.

COURSE OUTLINE

Module I

History: Age of prose and reason– Critical/literary essay – Sentimental Comedy - anti-sentimental comedy –heroic drama - Neoclassical poetry

1. John Dryden: ―A Song for St. Cecilia's Day, 1687‖ https://www.poetryfoundation.org/poems/44185/a-song-for-st-cecilias-day-1687
2. Lady Mary Wortley Montagu: ―The Lover, A Ballad‖ https://www.poetryfoundation.org/poems/44761/the-lover-a-ballad
3. Oliver Goldsmith – She Stoops to Conquer https://www.gutenberg.org/files/383/383-h/383-h.html

Module II

Transitional Poets – Periodical essay – Rise of the English novel – Fielding, Richardson, Sterne and Smollett

1. Thomas Gray : ―Elegy Written in a Country Churchyard‖ https://www.poetryfoundation.org/poems/44299/elegy-written-in-a-country-churchyard
2. Elizabeth Carter: ―Written Extempore on the Sea Shore‖ https://www.eighteenthcenturypoetry.org/works/o4984-w0350.shtml
3. Richard Steele ―The Spectator Club https://www.bartleby.com/27/7.html

Module III

French Revolution – Romantic Revival – first and younger generations of Romantics - Lyrical Ballads – familiar/personal essay – Lamb, Hazlitt, De Quincey - fiction in the Romantic age– Walter Scott, Jane Austen

1. William Blake : The Tyger, ―The Lamb https://www.poetryfoundation.org/poems/43687/the-tyger https://www.poetryfoundation.org/poems/43670/the-lamb-56d222765a3e1
2. William Wordsworth : The Kitten at Play https://www.poetrynook.com/poem/kitten-play
3. Mary Lamb: ―Choosing a Profession‖ https://www.poetryfoundation.org/poems/51930/choosing-a-profession
4. Charles Lamb – ―Dream Children, a Reverie‖ http://essays.quotidiana.org/lamb/dream_children_a_reverie/
5. Jane Austen – Pride and Prejudice

Module IV

Victorian poets – Pre-Raphaelite Poetry - Victorian prose writers – Victorian Compromise - Victorian novelists – Women novelists

1. Robert Browning – ―My Last Duchess‖ https://www.poetryfoundation.org/poems/43768/my-last-duchess
2. Charlotte Bronte: ―On the Death of Anne Bronte‖ https://www.poetryfoundation.org/poems/43710/on-the-death-of-anne-bronte
3. Christina Rossetti – ―Goblin Market‖ https://www.poetryfoundation.org/poems/44996/goblin-market
4. R. L. Stevenson – ―Walking Tour https://www.thoughtco.com/walking-tours-by-robert-louis-stevenson-1690301
5. Charles Dickens – A Tale of Two Cities

Suggested Reading

Alexander, Michael. *A History of English Literature*. Macmillan. 2000

Armstrong, Isobel. *Victorian Poetry: Poetry, Poets and Politics* (Routledge Critical History of Victorian Poetry S). : Routledge. 1996

Baugh, A.C. *A History of English Literature*.Routledge. 2013.

Carter, Ronald, John McRay. *The Routledge History of Literature in English*. Routledge, 2017

Daiches, David. *A Critical History of English Literature*, Vol. 3, Allied Publishers. 1979

FWH Myers, AC Bradley. *The Complete Works of William Wordsworth*.Imagination Books. 2018

McLane, M. (2008).*The Cambridge Companion to British Romantic Poetry* (Cambridge Companions to Literature) (J. Chandler, Ed.). Cambridge: Cambridge University Press.

Peck, John, Martin Coyle. *A Brief History of English literature*. Palgrave 2003 Poplawski, Paul. English Literature in Context. CUP.1993

Quintana, Ricardo. *Oliver Goldsmith as a Critic of the Drama. Studies in English Literature, 1500-1900. Vol. 5, No. 3, Restoration and Eighteenth Century* (Summer, 1965), pp. 435-454 (20 pages) Published By: Rice University

Wordsworth, Jonathan. *The Penguin Book of Romantic Poetry* (Penguin Classics) Paperback

.2005

e-resources

http://www.victorianweb.org/previctorian/nc/ncintro.html
https://www.britannica.com/art/Romanticism

https://www.bl.uk/romantics-and-victorians/articles/the-romantics

https://www.gutenberg.org/files/36773/36773-h/36773-h.htm
https://www.gutenberg.org/files/9622/9622-h/9622-h.htm

https://www.gutenberg.org/ebooks/search/?query=wordsworth&submit_search=Go%21
https://library.unt.edu/rarebooks/exhibits/women/17th.htm

SEMESTER III

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Core Course V CG 1342 Popular Literature

No. of Credits: 4 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: To broaden the idea of literature and culture and the concept of texts

Objectives

1. Give an awareness about cultural studies and popular culture
2. Learn the difference between genre fiction and literary fiction
3. Gain a perspective into the debate between high and low cultures and literatures

Course Outcome

CO 1: Understand the categories of the ―popular and the ―canonical

CO 2: Identify the conventions, formulas, themes and styles of popular genres such as detective fiction, the science fiction and fantasy, and children's literature and assess the literary and cultural formation of the popular.

CO 3: Sensitize students to the ways in which popular fiction reflects and engages with questions of gender, identity, ethics and education.

COURSE OUTLINE

Module 1: Introduction to Cultural Studies

Culture and cultural studies – ideology and culture – popular culture - cartoon/comic strips-comics-chick lit—music-bands-dance-art-television shows.

Articles

1. Meena T Pillai. ― 'What is Cultural Studies?' https://popularliterature2acbcss.blogspot.com/2022/03/what-is-cultural-studies-by-dr-meena.html
2. Ranajit Chakrabarty and Mugdha Sengupta ― "Popular Culture in Dooradarsan" Social Change Vol. 34, no. 3, Sep. 2004 pp. 1-15. https://journals.sagepub.com/doi/pdf/10.1177/004908570403400301

Module 2: Reading Popular Culture

Article

1. Basil Thomas — "Clothing the Praxis of Culture: Dress Code as Text in Tom's Cartoons." Littcrit Vol 45, no 2, Dec. 2019, pp. 99-104.

Poems/Songs

1. Bob Marley — "Get Up Stand Up" https://www.google.com/search?kgmid=/g/11cmh88q_v&hl=en-IN&shem=tbcfctco&q=Get+Up+Stand+Up&kgs=93df29330c92b33d&shndl=17&source=sh/x/kp/osrp/4&entrypoint=sh/x/kp/osrp
2. BTS Band: "So What" (Korean) https://www.youtube.com/watch?v=66VsKox3itk English translation of the lyrics https://genius.com/Genius-english-translations-bts-so-what-english-translation-lyrics
3. Manu Manjith, Sithara Krishnakumar and Midhun Jayaraj : "Poomathe Ponnamma" https://www.youtube.com/watch?v=6_FImV_TL24

Films

1. *Kumbalangi Nights.* (2019).
2. *Harry Potter and the Sorcerer's Stone*.(2001)

Module 3: Popular Literature: Essay and Novel

Popular literature- - origins and development- characteristic features- genres and subgenres- folk tales-fairy tales-ballads-romances-periodicals-detective fiction- sci-fi- fantasy-horror-children's literature.

Article

Arshad Ahammad A. — "Popular Fiction: A Short Introduction" https://popularliterature2acbcss.blogspot.com/2022/03/popular-fiction-short-introduction-by.html

Novel

C S Lewis — *The Lion, the Witch and the Wardrobe* (Chronicles of Narnia). Geoffrey Bles, 1950.

Module 4: Reading Popular Tales

Fairy/folk tales

1. Yei Theodora Ozaki — "The Farmer and the Badger". Japanese Fairy Tales. https://etc.usf.edu/lit2go/72/japanese-fairy-tales/4836/the-farmer-and-the-badger/

2. "Ali Baba and the Forty Thieves." — Tales from the Arabian Nights. https://sites.pitt.edu/~dash/alibaba.html

Detective Story

Arthur Conan Doyle — "The Adventure of the Devil's Foot" (Sherlock Holmes Collection) https://sherlock-holm.es/stories/pdf/a4/2-sided/devi.pdf

Pulp fiction

Vidya Subramaniam. — "Me." *Blaft Anthology of Tamil Pulp Fiction*, edited by Rakesh Khanna, Blaft Publications, 2008, pp 116-19.

Horror Story

Maria Rose: "Betty." *Grandhakaarante Maranavum Mattu Bheethikathakalum*. Mathrubhumi Books, 2020. (story translated into English by Priya K Nair)

Fanfiction

Amit Chaudhuri : "Wensleydale." Tales from a Master's Notebook: Stories Henry James Never Wrote, edited by Philip Horne, Vintage, 2018.

Sci-fi

Eleanor Arnason : "Holmes Sherlock." The Mammoth Book of Best New SF 26, edited by Gardner Dozois, Robinson, 2013.

Suggested Reading

Burns, Gary (editor). *A Companion to Popular Culture*. Wiley Blackwell, 2016.

Dozois, Gardner (editor). *The Mammoth Book of Best New SF 26*. Robinson, 2013.

Highmore, Ben. Culture. Routledge, 2015.

Horne, Philip (editor). *Tales from a Master's Notebook: Stories Henry James Never Wrote*. Vintage, 2018.

Khanna, Rakesh (editor). *Blaft Anthology of Tamil Pulp Fiction*. Blaft Publications, 2008.

Pawling, Christopher. "Popular Fiction: Ideology or Utopia?' *Popular Fiction and Social Change.* Basingstoke: Macmillan, 1985.

Rowling, J.K. *Harry Potter and the Philosopher's Stone*, Bloomsbury, 2017.

Ryan, Michael (editor). *Cultural Studies. An Anthology*. Wiley Blackwell, 2008.

Suvin, Darco, ―*On Teaching SF Critically, Positions and Presuppositions in Science Fiction*. Kent, Ohio: Kent State University Press. 1989

Todorov, Tzevetan. ―*The Typology of Detective Fiction. The Poetics of Prose*. Ithaca: Cornell UP, 1995.

Walton, David. *Introducing Cultural Studies. Learning through Practice*. Sage, 2008.

e-resources

Grossman, Lev. Literary Revolution in the Supermarket Aisle: Genre Fiction Is Disruptive Technology. 23 May 2012, https://entertainment.time.com/2012/05/23/genre-fiction-is-disruptive-technology/

Khair, Tabish. "Indian Pulp Fiction in English: A Preliminary Overview from Dutt to Dé." The Journal of Commonwealth Literature, vol. 43, no. 3, Sept. 2008, pp. 59–74, doi:10.1177/0021989408095238.

Lee , L. J. Guilty Pleasures: Reading Romance Novels as Reworked Fairy Tales . Marvels & Tales 22 (1) 2008. https://www.muse.-jhu.edu/article/247497

Swirsky, Peter. ―Popular and Highbrow Literature: A Comparative View‖ CLCweb: Comparative Literature and Culture. Volume 1 Issue 4 1999. https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1053&context=clcweb

Instructions to Teachers

The primary intention of this course is to familiarize the students with popular literature and culture. Since popular fiction contributes largely to enhance reading habits of young people, the prescribed texts and stories are meant to read by students themselves. Teachers should not teach the stories or novels in detail in the classroom since they are prescribed for non-detailed study. Instead, the teachers are supposed to discuss the popularity and the cultural relevance of the works and the features of the genre to which they belong to.

Instructions to Question Paper Setters

No deeper level textual questions should be asked from the prescribed stories, novels and films. Questions may be asked about the readability, popularity and timelessness of the prescribed texts and features of various subgenres. Questions should be to assess the reading habits of the students, not to evaluate critically the prescribed texts.

SEMESTER III

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Vocational Course III CG 1371 Translation Studies

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: Introduce translation as a career option

Objectives

To introduce / familiarize learners to:

1. Translation Studies as a discipline

2. Systematic understanding of the process of translation

3. Translation Practice as a Profession

Course Outcome

CO1: To appreciate Translation Studies as an independent academic discipline

CO2: To critically reflect on the process of translation and its types

CO3: To build a genuine interest and to focus on a career in the field of translation

COURSE OUTLINE

Module 1

Conduct classroom activities of translation practice including a simple text, anecdotes, small passages from short stories and poems. All these exercises will focus on the following key concepts:

- Source text & Target text

- Equivalences

- Faithfulness

- Untranslatability: Linguistic & Cultural

- Types of translation: Transliteration, Literary v/s Scientific, Free v/s Bound

Translation

Module 2

Conduct classroom activities of translation practice including newspaper cuttings, notices, official documents and a short piece of legal document. All these exercises will focus on the following key concepts:

- Source text & Target text

- Equivalences

- Faithfulness

- Untranslatability: Linguistic & Cultural

- Types of translation: Transliteration, Literary v/s Scientific, Free v/s Bound

Translation

Module III

Susan Bassnet: Chapter 1: Central Issues, Translation Studies

'Three Hundred Ramayanas: Five Examples and Three Thoughts on Translation' https://www.trans-techresearch.net/wp-content/uploads/2015/05/three-hundred-Ramayanas-A-K-Ramanujan.pdf

Module IV

Translation Practice- Provide exercises as per Module I and II

Suggested Reading

Abdulla, V. and R.E. Asher, editors. *Wind Flowers*. Penguin, 2004.

Ashly, C.N. *O. Henriyude Theranjedutha Kathakal* Papion. Kozhikodu.

Basheer, Vaikom Muhammed. *Poovan Banana and Other Stories*. Translated by V. Abdulla, Orient Black Swan, 2009.

Hatim, Basil and Jeremy Munday. *Translation: An Advanced Resource Book*. Routledge, 2004.

Palumbo, Giuseppe. *Key Terms in Translation Studies*. Continuum, 2009.

Instruction to Teachers

The course should focus on the practice of translation

Instruction to Question Paper Setters

Questions should be asked so as to discuss the concerns within the act of translation. It should also focus on translation practice.

SEMESTER III

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Complementary Course III CG 1331 Environment Studies and Disaster Management

No. of Credits: 3 **No. of Instructional hours: 3 per week [Total: 54 Hours]**

Aim: Create awareness and sensitivity towards environment and related concerns

Objectives:

1. Engage with a wide range of issues in environmental studies and disaster management.
2. Acquire a set of values for environmental protection and conservation
3. Manage natural disasters and other emergency situations and to develop a critical vocabulary related to environmental studies and disaster management

Course Outcome:

CO1: understand environmental crises and disaster management situations

CO2: take lead in spreading environmental values and creating awareness among the public

CO 3: respond in a better way to a natural calamity or disaster and articulate environmental concerns using appropriate vocabulary

COURSE OUT LINE

Module I

Understanding the Environment & Resources and their Conservation- Natural Resources- biodiversity- conservation

Introduction: Environment-its importance-types of ecosystems

1. "Chief Seattle's Speech"
2. "Trophic Cascade" (A poem by Camille T. Dungy)
3. The Inheritors of the Earth (A translation of Short Story by Vaikom Muhammed Basheer)
4. 'Conservation in the Era of Climate Change: Role of Youth' (Dr. A. Biju Kumar) https://www.youtube.com/watch?v=jfZ1x3EdZMk

Module II

Environmental Pollution

Introduction: Types-Causes-Effects-Waste management-Policies and practices

1. Beat Plastic Pollution (An article from unenvironment.org)
2. "Memory of Hiroshima" (A poem by K. Satchidanandan)
3. E is for E-waste (Ellen Banda-Aaku)

Module III

Disaster Management

Introduction: Natural and Man-made- health emergency- handling hazardous materials- managing personal disasters- bomb threats- disasterpreparedness-management-rehabilitation

1. An introductory essay on Disaster Management
2. The Truth about the Floods (A poem by Nissim Ezekiel)
3. A newsletter on Bhopal Gas Tragedy
4. 'Relief Standard Operating Procedure for Natural & Man-made disaster,' an essay.

Module IV

Students are expected to engage in any one of the activities suggested below.

1. Visit to a local area to document environmental assets: River/Forest/Grassland/Hill
2. Visit to a local polluted site: Urban/Rural/Industrial/Agricultural
3. Study of simple ecosystems: Pond/River/Hill slopes
4. Mock drill organized in their college by the local disaster management agencies

Text Book Prescribed:

Ecoscapes

Edited by Dr Kishore Ram, Assistant Professor, Department of English, N.S.S College,Kottiyam, Dr Gireesh J., Assistant Professor, Department of English, Govt. Arts College, Thiruvananthapuram, Ranjith Krishnan K.R., Assistant Professor, Department of English, N.S.S College, Kottiyam and Dr Deepa Prasad L. Assistant Professor, Research Centre and Department of English, University College, Thiruvananthapuram. Publishers: Emerald

Suggested Reading

Bharucha, Erach.*The Biodiversity of India.* Mapin Publishing Pvt. Ltd. Ahmedabad, 2003.

Brunner, R C. *Hazardous Waste Incineration*. McGraw Hill Inc,1989.

Clark, R S. *Marine Pollution*. Clanderson Press, Oxford, 2008.

Cunningham, W P. *Environmental Encyclopaedia*. Jaico Publishing House, Mumbai, 2001.

Hawkins, R. E .*Encyclopedia of Indian Natural History*, Bombay Natural History Society, Bombay, 2005.

Heywood V.H. and Watson RT, *Global Biodiversity Assessment*. Cambridge University Press.1995.

Jadhav H and Bhosale V.M. *Environmental Protection and Laws*. Himalaya Publishing House, Delhi, 1995.

Odum EP. *Fundamentals of Ecology*. WB Saunders Co. USA, 1971.

Bumgarner, Jeffrey B. *Emergency Management: A Reference Handbook*. ABC-Clio, 2008.

Birkland, Thomas A. *Lessons of Disaster: Policy Change after Catastrophic Events.*Georgetown University Press, 2006.

Cahill, Kevin M. *Emergency Relief Operations*. FordhamUP, 2003.

SEMESTER IV

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Core Course VI CG 1441 20th Century World Literature

No. of Credits: 4 **No. of Instructional hours: 5 per week [Total: 90 Hours]**

Aim: Understand the diversity of cultures and the commonalities of human experience in the literature of the world.

Objectives

1. Expand the knowledge of narrative and literary representations and genres across the globe.
2. Help students contextualise contemporary English studies
3. Trace the concerns literatures of the late 20th century and 21st Century engage in

Course Outcome

CO 1: Get acquainted with varied socio-cultural and political experiences and expressions.

CO 2: Gain a theoretical grounding to read literatures in English from different regions and accept the fact that world literature is literature that gains in translation.

CO 3: Learn to avoid homogenising cultures and languages and protect the diversity of languages and cultures present in literary works.

COURSE OUTLINE.

Module I: Poetry

1. Pablo Neruda: — 'Tonight I Can Write the Saddest Lines' https://www.poemhunter.com/poem/tonight-i-can-write-the-saddest-lines/
2. Adonis – "A Vision" https://www.poetryfoundation.org/poetrymagazine/poems/149492/a-vision-5c897d52e7fe7
3. Mary Elizabeth Frye: — 'Do not stand at my grave and weep' http://www.yourdailypoem.com/listpoem.jsp?poem_id=322
4. Yuri Izdryk — 'Make Love'

http://l.academicstudiespress.com/borderlines/poem/Make_Love_ukr/

5. Yahuda Amichai — "Problem in a Math Book" https://www.poetryfoundation.org/poetrymagazine/browse?contentId=40663
6. Thomas Transtromer- 'Alone' https://anthonywilsonpoetry.com/2016/09/14/alone-by-tomas-transtromer/

Module II: Fiction

1. Haruki Murakami — *Norwegian Wood*. Penguin, 1989.
2. Jose Saramago — *Death at Intervals*. RHUK, 2009.
3. Shahad Al Rawi. — *The Baghdad Clock*. One world Publications, 2016.
4. João Guimarães Rosa — "The Third Bank of the River". (Short Story) http://www.sphstigers.org/ourpages/users/jasher/SSBootCampWebsite/The%20Third%20Bank%20of%20the%20River.pdf
5. Jamaica Kincaid — "Girl". (Short Story) https://erhsnyc.org/ourpages/auto/2016/3/14/36191544/Girl%20by%20Jamaica%20Kincaid.pdf

Module III: Drama

1. Lady Gregory: *Rising of the Moon*
2. Nilo Cruz — *Anna in the Tropics* https://www.york.cuny.edu/Members/tamrhein/Anna%20Script%20and%20Notes.pdf

Module IV: Non-fiction

1. Umberto Eco. "On the Elusive Concept of Ugliness." https://lithub.com/umberto-eco-on-the-elusive-concept-of-ugliness/#:~:text=I%20am%20ugly%2C%20but%20I,power%E2%80%94is%20nullified%20by%20money
2. Yuval Noah Harari. "The World after Coronavirus." Financial Times. 20 Mar. 2020. https://www.ft.com/content/19d90308-6858-11ea-a3c9-1fe6fedcca75

Suggested Reading

Boruszko, Graciela, and Steven Tötösy de Zepetnek, eds. "New Work about World Literatures".Special Issue.CLC Web: Comparative Literature and Culture 15.6. 2013.

Casanova, Pascale. *The World Republic of Letters*. Tr. M. B. DeBevoise. Cambridge: Harvard UP, 2004.

Damrosch, David. *How to Read World Literature*. London: Blackwell, 2009.

Damrosch, David. *What Is World Literature?* Princeton: Princeton University Press, 2003.

Damrosch, David, April Alliston, Marshall Brown, Page duBois, Sabry Hafez, Ursula K.

Heise, DjelalKadir, David L. Pike, Sheldon Pollock, Bruce Robbins, HaruoShirane, Jane Tylus, and Pauline Yu, eds. *The Longman Anthology of World Literature*. New York:

Pearson Longman, 2009. 6 Vols.

Davis, Paul, John F. Crawford, Gary Harrison, David M. Johnson, and Patricia Clark Smith,

eds. *The Bedford Anthology of World Literature*. New York: Bedford/St. Martin's, 2004. 6

Vols.

D'haen, Theo. *The Routledge Concise History of World Literature*. London: Routledge, 2011.

D'haen, Theo, David Damrosch, and DjelalKadir, eds. *The Routledge Companion to World*

Literature. London: Routledge, 2011.

D'haen, Theo, César Domínguez, and MadsRosendahl Thomsen, eds. *World Literature: A*

Reader. London: Routledge, 2012.

Domínguez, César. "GualterioEscoto: A Writer across World-Literatures". *Translation and*

World Literature. Ed. Susan Bassnett. London: Routledge, 2019. 75-91.

Hashmi, Alamgir. *The Commonwealth, Comparative Literature, and the World*. Islamabad:

Indus Books, 1988.

Juvan, Marko, ed. "World Literatures from the Nineteenth to the Twenty-first Century".

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Juvan, Marko. *Worlding a Peripheral Literature*. Singapore: Palgrave Macmillan, 2019.

doi:10.1007/978-981-32-9405-9.

Lawall, Sarah, ed. *Reading World Literature: Theory, History, Practice*. Austin: University

of Texas Press, 1994.

Pizer, John. *The Idea of World Literature: History and Pedagogical Practice*. Baton Rouge:

Louisiana State University Press, 2006.

Prendergast, Christopher, ed. *Debating World Literature*. London: Verso, 2004.

Puchner, Martin, Suzanne Conklin Akbari, WiebkeDenecke, VinayDharwadker, Barbara Fuchs, Caroline Levine, Sarah Lawall, Pericles Lewis, and Emily Wilson, eds. *The Norton Anthology of World Literature.* New York: W. W. Norton, 2012. 6 Vols.

Rothenberg, Jerome, and Pierre Joris, eds. *Poems for the Millennium: A Global Anthology*. Berkeley: University of California Press, 1998. 2 Vols.

Sturm-Trigonakis, Elke.*Comparative Cultural Studies and the New Weltliteratur*. West Lafayette: Purdue University Press, 2013.

Tanoukhi, Nirvana. "The Scale of World Literature".*New Literary History* 39.3 (2008).

Thomsen,MadsRosendahl. *Mapping World Literature: International Canonization and Transnational Literatures.* London: Continuum, 2008.

SEMESTER IV

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Core Course VII CG 1442 Twentieth Century Malayalam Literature in Translation

No. of Credits: 4 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim Introduce literary narratives of 20th century Malayalam Literature

Objectives

1. Introduce the students to the historical and socio-cultural atmosphere in which Malayalam literature became enriched
2. Provide the students a basic understanding of Malayalam literature
3. Get an understanding of the gradual transformation of Malayalam literature from the early modern to the post modern

Course Outcome

CO 1: Discern the varied milieu of the development and growth of Malayalam literature and be sensitive to its socio cultural and political implications.

CO 2: Get a basic knowledge of the literary and the non-literary works produced in Malayalam and the politics of its plurality.

CO 3: Sense the distinctness of the socio-cultural- political arena in which Malayalam literature developed.

COURSE OUTLINE

Module I Poetry

Background to the growth of Malayalam poetry – beginning of modernism in Malayalam poetry- the major poets – contemporary Malayalam poetry

1. Nalapat Balamani Amma: — 'The Housewife' www.poetryfoundation.org
2. Edasseri Govindan Nair: — 'The Cooking Pot and the Sickle' https://www.edasseri.org/English/translations/PuthankalavumArivalum.htm
3. D. Vinayachandran: — 'Advent'
4. Sugatha Kumari: — 'The Temple Bell'
5. K. G. Sankara Pillai: — 'Goorkha'

https://www.poetryinternational.org/pi/poem/8733/auto/0/0/K-G-Sankara-Pillai/Goorkha/nl/tile

6. Anitha Thampi: — 'While Sweeping the Front Yard' https://www.poemhunter.com/poem/while-sweeping-the-front-yard/ https://www.poetryinternational.org/pi/poem/19138/auto/0/0/Anitha-Thampi/Sweeping-the-Front-Yard/en/tile
7. Vipitha: — 'The Snakes have Hollows' http://www.modernliterature.org/2020/09/09/poems-by-vipitha/

Module II Fiction

A brief history of Malayalam Fiction– Major writers - Emergence of Novel – major novelists – contemporary Malayalam fiction – major female writers --- transformation from modern to post–modern themes and techniques.

Short Story

1. O.V Vijayan: — 'After the Hanging' https://www.google.co.in/books/edition/Wind_Flowers/GHHX2QDHYxgC?hl=en&gbpv=1 (from *Wind Flowers* (Ed. R. E. Asher, V. Abdulla).Penguin. 2004
2. Sarah Joseph: — 'Inside Every Woman Writer' (from Breaking the Silence: An Anthology of Women's Literature.(Ed. Dr. Shobhana Kurien, Bookmates Publishers, 2017.
3. N. S. Madhavan: — 'Higuita'
4. Maythil Radhakrishnan: — 'Pythagoras'
5. C. Ayyappan: — 'Spectral Speech'
6. Ashitha : — 'In the Moonlit Land'
7. Sithara S. : — 'Fire'

(Stories Sl.no: 3-7) from The Oxford India Anthology of Malayalam Literature (2- Volume Set) OUP, 2017)

Novel

1. Lalithambika Antharjanam: *Fire, My Witness* (Agnisakshi) OUP, 2015
2. Vaikkom Muhammed Basheer: *Pathumma's Goat*

Module III Non-Fiction

1. K. K. Kochu: — 'Writing the History of Kerala: Seeking a Dalit Space' K Satyanarayana, Susie J Tharu. *No Alphabet in Sight* Penguin, 2011
2. J Devika: — 'Imagining Women's Social Space in Early Modern Keralam', Section II Page no 9-16) (opendocs.ids.ac.uk,2002)

https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/2932/wp329.pdf;sequence=1

Module IV Drama

Evolution of Drama – influence of colonialism in the emergence of drama – major dramatists.

1. C.N. Sreekantan Nair. *Kanchana Sita*.
   (*In the Shade of the Sahyadri: Selections from Malayalam Poetry and Short Fiction*. OUP, 2012).

Suggested Reading

George, K.M. *A Survey of Malayalam Literature*, Asia Publishing House, 1968.

---, *Western Influence on Malayalam Language and Literature*, Sahitya Academy. 1972.

Paniker, K Ayyappa. *A Short History of Malayalam Literature*. Dept of Public Relations, Govt of Kerala, 1977.

Nair, Sreedevi. K. *Women Writers of Kerala*. SSS Publications, 2012.

e-resources

https://www.edasseri.org/ListenToEdasseriPoems.htm
https://www.poemhunter.com/i/ebooks/pdf/edasseri_govindan_nair_2012_9.pdf
http://keralasahithi.synthasite.com/

http://sahitya-akademi.gov.in/library/meettheauthor/kadammanitta_ramakrishnan.pdf

SEMESTER IV

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Vocational Course IV CG 1471 Language Editing and Publishing

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: Skill Development

Objectives:

1. Familiarize students with basic concepts related to editing and publishing
2. Cultivate in them the skills necessary to become a competent editor
3. Introduce them to the evolving landscape of the publishing industry and the various opportunities it offers

Course Outcome:

CO 1: Students must be able to identify the different steps and stakeholders involved in the editorial process

CO 2: Acquire a working knowledge of the mechanics of editing and proof reading and utilize the same on a practical level to create error-free, well edited texts

CO 3: Be sensitized to the legal aspects involved in editing and publishing and find gainful employment in the editing and publishing industry

COURSE OUTLINE

Module 1

Editing – definition, scope, types – developmental editing – copy editing – proofreading – on-screen copy editing –software tools– brief overview of the editing process – types of editors – interaction between author, editor and publisher – copyright laws – acknowledgements - legal issues – introduction to editing tools – concept of in house style – select terms.

Module 2

Publishing – definition and scope – brief history of the publishing industry – various publishing markets: consumer and non-consumer publishing — publishing process – key stages and participants – parts of a book– major publishing houses – the digital turn in publishing – getting started in publishing – select terms.

Module 3 (Praxis)

Essentials of language editing: sentence structures, vocabulary choice, adverb positions, cohesion and coherence, ambiguity, transitional shifts, paragraphing – copy editing: sentence length, punctuation, capitalisation, spelling standardization, titling and subtitling, MLA style sheet, typography– content editing: checking for factual accuracy, references

Module 4 (Praxis)

Proofreading (with symbols) – introduction to self-publishing platforms : Kindle Direct Publishing – Kobo – Instagram – LinkedIn publishing – Medium

Class room activities

- Practice formatting references as per MLA guidelines
- Practice proof reading and markup on sample texts
- Practice editing on sample texts – students to be able to rectify ambiguity, errors in terms of grammar, syntax, vocabulary

Suggested Reading

Butcher, Judith. et al. Butcher's Copy Editing: *The Cambridge Handbook for Editors, Copy Editors and Proof Readers*. Fourth Edition. Cambridge, CUP, 2006.

Chicago Manual of Style. 15th Edition. University of Chicago, 2003.

Clark, Giles, and Angus Phillips, eds. *Inside Book Publishing*. Sixth Edition. New York: Routledge, 2020.

Critchley, William. *The Pocket Book of Proof Reading: A Guide to Free-Lance Proof Reading and Copy Editing*. First English Books. 2007

Dunham, Steve. *The Editor's Companion: An Indispensable Guide to Editing Books, Magazines, Online Publications, and More.* Writer's Digest. 2015.

Huddleston R., and Geoffrey K. Pulia, eds. *A Student's Introduction to English Grammar*. CUP. 2005

MLA Handbook for Writers of Research Papers. Eighth edition. Modern Language Association of America. 2021

Phillips, Angus, and Michael Bhaskar, eds. *The Oxford Handbook of Publishing*. New York: Oxford UP, 2019.

E-resources:

- https://brians.wsu.edu/common-errors/

- https://aceseditors.org/resources/diversity-inclusion-resources
- https://www.rabbitwitharedpen.com/resources
- https://besteditproof.com/en/academy/proofreaders-marks-symbols
- https://www.elsevier.com/editors/perk/legal-guide-for-editors
- https://owl.purdue.edu/owl/avoiding_plagiarism/guide_overview%20.html
- Create a Book (amazon.com)
- https://www.linkedin.com/help/linkedin/answer/a522427/publish-articles-on-linkedin?lang=en
- Penguin Random House – Careers

Instructions to Teachers

This course is activity oriented. Modules III &IV designed for practical purpose. Classroom activities must be conducted to impart the students' practical knowledge in language editing and publishing. Internal evaluations shall be done in the form of extended practical activities.

Instructions to Question Paper Setters

Since this is a vocational course, students' practical knowledge must be evaluated along with their theoretical awareness.

SEMESTER IV

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Vocational Course V CG 1472 Content Writing

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: To equip students with the skills required to cope with the demands of the digital world and to make them career-ready

Objectives

1. Introduce the interdisciplinary field of web content writing and development to students.
2. Encourage students to develop specific writing skills according to the demands of the industry in tune with the digital medium.
3. Enhance the employability skills of students based on industry and marketing.

Course Outcomes

CO 1: Understand what content writing is and attain an awareness of its scope.

CO2: Gain familiarity with various digital platforms and the formats of online publications.

CO3: Strengthen content writing skills through practice tasks and gain an awareness about style and specifications in digital media platforms.

COURSE OUTLINE

Module I

Digital content writing- scope and relevance - types of content creation- articles, blogs, e-books, press releases, newsletters etc - print and web content writing - technical and marketing content development-corporate communication – role of a content writer- digital marketing and social media marketing.

Module II

Style - Expository writing, descriptive writing, narration, persuasive writing- avoiding jargon- including keywords, using informal expressions, American words and spelling-use of punctuations, bullets, numbering-style sheets.

Module III -Writing Practice

Digital platform content creation practice

Social media writing-writing for web landing pages and e commerce websites-blog writing-articles-introduction to WordPress website, linkedin profile creation, podcast creation-promotional product description-How-to Guides-digital news report writing.

-Steps to be followed

researching the topic-creating outline-writing the first draft-reviewing, editing and proofreading-unity and coherence-writing attractive headlines

Module IV

Editing and proofreading –following company stylesheets- Plagiarism-rules on plagiarism-how to write plagiarism free copies

Assignment

1. Develop content for a selected social media site in 500 words.
2. Edit and proofread the chosen texts.

Suggested Reading

Felder, Lynda. *Writing for the Web: Creating Compelling Web Content Using Words, Pictures, and Sound.* New Riders, 2012.

Female Entrepreneur India. "Content Writing Basics." YouTube, YouTube, 11 Mar. 2017, www.youtube.com/watch?v=u3jVX2EOMlU.

Gray, Sherry. "The 5 Skills You Need to Become a Successful Content Writer." *Entrepreneur, Entrepreneur,* 5 Aug. 2015, www.entrepreneur.com/article/247908 .

Handley, Ann. *Everybody Writes: Your Go-to Guide to Creating Ridiculously Good Content*. Wiley India Pvt. Ltd., 2017.

Jones, Colleen. *Clout: The Art and Science of Influential Web Content*. Pearson Education Distributor, 2011.

McCoy, Julia. *So You Think You Can Write? The Definitive Guide to Successful Online Writing.* CreateSpace Independent Publishing, 2016.

McHarry, Sarah. Wordpress to Go: *How to Build a WordPress Website on Your Own Domain, from Scratch, Even If You Are a Complete Beginner*. CreateSpace, 2016.

Penn, Joanna. *How to Make a Living with Your Writing: Books, Blogging and More*. The Creative Penn Limited, 2017.

"Prevent Content Theft." WordPress.com Support, 30 Apr. 2021, wordpress.com/support/prevent-content-theft/ .

Redish, Janice. *Letting Go of the Words: Writing Web Content That Works*. Morgan Kaufmann, 2012.

Saleh, Naveed. *The Complete Guide to Article Writing: How to Write Successful Articles for Online and Print Markets.* Writer's Digest, 2014.

Scott, David Meerman. *The New Rules of Marketing and PR How to Use Social Media, Online Video, Mobile Applications, Blogs, News Releases, and Viral Marketing to Reach Buyers Directly*. John Wiley & Sons, 2017.

Sharma, Vibha, et al. "A Career in Content Writing: 5 Easy Steps to Get Started." Mindler Blog, 28 May 2021, www.mindler.com/blog/how-to-become-a-content-writer-in-india/ .

Skrabanek, Britt, et al. "Content Writers: 10 Types and When to Use Them - Clearvoice." ClearVoice Blog, 29 June 2021, www.clearvoice.com/blog/10-types-content-writers-use/ .

"Want to Start b2b Writing? Here's Everything You Need to Know." Location Rebel, 21 Feb. 2022, www.locationrebel.com/b2b-writing/ .

"What Is Plagiarism & Why Is It Important for Blog Writing?" The Uni Square Blog, 30 Apr. 2019, blog.unisquareconcepts.com/content-writing/what-is-plagiarism-why-is-it-important-for-blog-writing/ .

All the reference books can be downloaded via this site:

https://www.pdfdrive.com/content-writing-books.html

Instructions to Teachers

This course is activity oriented and the modules are designed for practical purpose. Classroom activities must be conducted to impart the students' practical knowledge in content writing. Internal evaluations shall be done in the form of extended practical activities.

Instructions to Question Paper Setters

Since this is a vocational course, students' practical knowledge must be evaluated along with their theoretical awareness.

SEMESTER IV

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Complementary Course IV CG 1431 Literatures of Travel and Tourism

No. of Credits: 3 **No. of Instructional hours: 3 per week [Total: 54 Hours]**

Aim: To introduce learners to emerging career opportunities in the field of travel and tourism, and to facilitate development of key language skills in the area.

Objectives:

1. Develop an overview of Travel Studies and its fundamentals
2. Equip learners with skills and knowledge required to plan, produce, and present travel-related content across a variety of media.
3. Empower learners to use English efficiently in professional and academic settings related to Travel Studies

Course Outcomes:

CO1: Familiar with various forms of travel writing.

CO2: Able to effectively produce content using them.

CO3: Acquire language proficiency for professional opportunities and academic settings related to Travel and Tourism.

COURSE OUTLINE

Module 1: Introduction to Travel

What is Travel Studies - History and Evolution of Travel - Gender and Intersectional aspects of Travel - Modes of Travel (Pilgrimage to Tourism) - Development of Travel Technology - Emergence of Tourism - Interrelation between Travel and Tourism - Travel Content in Tourism

Module 2: Narrating Travel

Travel Writing - Drafting Travel Narratives - Travel as self-writing - Types - Travelogues (Prose, Articles) - Travel Blogs - Radio/Podcast narratives of travel - Travel videos/documentaries - Travel photography - Social Media Travel Content

Case Study 1: @hippie.trail (https://www.instagram.com/hippie.trail/?hl=en)

Case Study 2: Inditales: Travel Blog from India by Anuradha Goyal (https://www.inditales.com)

Module 3: Travel and Tourism Industry

Travel as Leisure - Travel and Tourism Industry - Role of Travel Agencies - Travel Guidebooks - Impact of Tourism (Economic, Socio-Cultural, Environmental) - Tourism Promotion & Marketing - Multimedia and Digital Campaigns for Travel & Tourism

Case Study 1: Young Pioneers Tours (Travel Agency that specialises in dangerous locations: https://www.youngpioneertours.com)

Case Study 2: Lonely Planet Travel Website (https://www.lonelyplanet.com)

Case Study 3: "God's Own Country" Tourism Campaign in Kerala

Suggested Reading

Youngs, Tim. *Travel Writing: a Very Short Introduction*. Oxford UP 2022.

Thompson, Carl, editor. *Routledge Companion to Travel Writing*. Routledge, 2016.

Sharply, Richard. *Travel and Tourism* (SAGE Course Companions). Sage, 2006.

Dictionary of Leisure, Travel, and Tourism: Third Edition. A & C Black, 2003.

Sigala, Marianna, Evangelos Christou, and Ulrike Gretzel. *Social Media in Travel, Tourism and Hospitality: Theory, Practice and Cases.* Ashgate, 2012.

Jones, Leo. *Welcome! Student's Book: English for the Travel and Tourism Industry*. Cambridge UP, 2005.

Wyatt, Rawdon. *Check Your English Vocabulary for Leisure, Travel and Tourism*, Second Edition. A & C Black, 2007.

SEMESTER V

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Core Course VIII CG 1541 Film Studies

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: Introduce the theoretical study of films

Objectives

1. Familiarize students with the emerging area of film studies and make them equipped to decipher the meaning of a movie.
2. Enable the students to understand the medium of cinema with an ample knowledge of the basic terminologies
3. Help them trace the evolution of the different movements in the film history

Course Outcome

CO 1: Recognize the language of films and use it creatively.

CO 2: Analyze films from both technical and non-technical perspectives

CO 3: Use film as a medium of communication and derive an interest in various careers related to film

COURSE OUTLINE

Module I The Basics

The basic understanding of the word ‗film'- film as art, business and technology – three aspects of a movie: literary, dramatic, cinematic–- a brief history – optical illusion – series photography- motion picture – projection – the evolution of narratives- studios.

Language of Cinema- Types of Shots, Angles –Camera Movements –Focus – Use of colour and lighting, Sound- Editing – Different styles of Editing -30 degree rule and 180 degree rule- Mise-en-Scene, Auteur theory- Major film genres: Western, Romance, Musical, Horror, Buddy etc.

Different stages of Production: Preproduction, Production, Postproduction – Censorship – Remakes - films in the new era - - the Digital Era – OTT platforms.

Suggested Viewing: Arrival of a Train at a Station (Lumiere), A Trip to Moon (Méliès), The Great Train Robbery (Edwin S Porter), The Birth of a Nation (D W Griffith).

Module II Major Movements in Film history

The Silent Era – Soviet Cinema – Eisenstein and Montage– German Expressionism – The New German Cinema (Fassbinder, Herzog, Wenders)- Italian Neo Realism -Beyond Neo Realism (Fellini)- French poetic realism and French New Wave – Scandinavian Cinema(Ingmar Bergman)- Spanish cinema (Luis Buñuel)- The Polish School – Japanese cinema-Third World Cinema- Classical Hollywood Cinema and after- Documentary films

Suggested Viewing: Battleship Potemkin (Eisenstein), Cabinet of Dr. Caligari (Robert Wiene), Bicycle Thieves (De Sica), The Jazz Singer, Man with a Movie Camera, Citizen Kane, The Seventh Seal.

Module III Film Studies in Context: Indian cinema

A brief history – Phalke- Indian Cinema from 30s to 60s – The golden 50s – Indian parallel cinema – the Indian masters– contemporary Indian Cinema.

History of Malayalam cinema –the beginning - New wave – Contemporary trends- Film Society movements- Remakes in Malayalam Cinema.

Suggested Viewing: Raja Harishchandra (Phalke), Pather Panchali (Satyajit Ray), Mother India, Elipathayam, Chemmeen.

Module IV Adaptation

Writing about film – A few case studies. Films for close viewing:

1. *Rashomon*
2. *Chidambaram*

Suggested Reading:

Andreu Dix. Beginning Film Studies. Manchester UP. 2008. Ascher, Steven. *The Filmmaker's Handbook*.Penguin, 2012.

Birdwell, David and Kristin Thomson. *Film Art: An Introduction*. MacGraw Hill, 2012. Clayton, Alex and Andrew Klevan.The Language and Style of Film Criticism

Cook, David A. *A History of Narrative Film.*W W Norton, 1996.

Dix, Andrew. *Beginning Film Studies*.Manchester University Press, 2013. Gokulsing, K. Moti and Wimal Dissanayake. Routledge Handbook of Indian Cinema.Routledge, 2018.

HaHayes, Susan. *Cinema Studies: The Key Concepts*.Taylor & Francis Ltd/Routledge, 2000. Katz, Steve. *Film Directing Shot by Shot: Visualizing from Concept to Screen*. Focal Press, 1991. Kristeva, Julia. Intertexuality: Theories and Practices

Monaco, James. *How to Read a Film.* Harbor Electronic Publishing, 2013. Muttam, Madhu. Manichithrathazhu Screenplay. DC Books, 2010.

Nelmes, Jill. *Introduction to Film* Studies.Routledge, 2011.

Nowell-Smith, Geoffrey. *The Oxford History of World Cinema*.OUP, 1997. Ray, Satyajit. Our Films, Their Films. Orient Blackswan, 2001.

Stam, Robert and Alessandra Raengo (ed.). *Literature and Film*.Wiley-Blackwell, 2004. Stam, Robert. Literature through Film.Taylor & Francis, 2011.

Saran, Renu.*History of Indian Cinema*.Diamond Books, 2012. Villarejo, Amy. Film Studies: The Basics. Routledge, 2013.

e-resources:

https://www.cs.ubc.ca/~udls/slides/udls-sampoorna-biswas-film-appreciation-1.pdf

https://nofilmschool.com/Film-theory-basic-terms

http://www.jccsskc.edu.hk/newweb/modules/cjaycontent/content/1112prefectPhoto/Act06/Film Appreciation.pdf

https://plato.stanford.edu/entries/film / https://youtu.be/gNoKDkGlgjw

https://cpb-ap-se2.wpmucdn.com/thinkspace.csu.edu.au/dist/5/1410/files/2015/10/Cinema-Studies-Key-Concepts-1-289afca.pdf

SEMESTER V

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Core Course IX CG 1542 Indian Literature

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: Trace the growth and development of Indian English Writing

Objectives

1. Familiarize the students with the genesis of Indian Writing in English.
2. Acquaint them with the major movements in Indian Writing in English and their historical connections.
3. Introduce them to the stalwarts of Indian Literature in English through the study of selected literary texts

Course Outcome

CO 1: Trace the historical and literary genesis and development of Indian Writing in English

CO2: Comprehensive understanding of the major movements in Indian Writing in English across varied periods and genres

CO 3: Address the plurality of literary and socio-cultural representations within Indian life as well as letters.

Module I Introduction

Colonialism- Macaulay‘s Minutes- historical context for the rise of Indian writing in English

Module II Poetry

Impact of Romanticism- Impact of Nationalism on Indian English Poetry- Aurobindo Ghose- Rabindranath Tagore- Sarojini Naidu- Nissim Ezekiel- A. K. Ramanujan- Jayantha Mahapatra- R. Parthasarathy- Give Patel- Vikram Seth- Meena Aledander- Mamang Dai- Mamata Kaliya- Eunice De Souza- Karthika Nair- Vivek Narayan- Jeet Thayil- Meena Kandasamy

1. Toru Dutt: ―A Tree of Life https://www.poetrycat.com/toru-dutt/the-tree-of-life
2. Rabindranath Tagore: ―Where the Mind is Without Fear https://allpoetry.com/where-the-mind-is-without-fear
3. Arvind Krishna Mehrotra: ―Aligarh https://www.poetryfoundation.org/poetrymagazine/poems/150263/aligarh

4. Kamala Das : ―An Introduction‖ https://www.poemhunter.com/poem/an-introduction-2/
5. Arundhathi Subramaniam: ―When Landscape Becomes Woman https://www.usawa.in/poetry/three-poems-by-arundhati-subramaniam.html
6. Shalim M. Hussain:- Golluckgonj https://www.nezine.com/info/ZWFybmZZL0htZk95SVRQeWNtcHExZz0 9/a-few-poems-by-shalim-m-hussain.html

Module III Fiction and Non Fiction

Pre independence fiction-partition fiction- Raja Rao- Mulk Raj Anand- Fiction of the Diaspora- V.S. Naipaul- Salman Rushdie- Chitra Divakaruni- Kiran Desai- Shashi Deshpande- Gita Hariharan- Arundhati Roy- Shashi Tharoor- Mukul Kesavan-Manu Joseph- Anees Salim

Short stories

1. R.K. Narayan: ― ‘Father‘s Help’
2. Jhumpa Lahiri :― ‘A Temporary Matter’

Novel

1. Easterine Kire: *A Terrible Matriarchy: A Novel*
2. Amitav Ghosh: *The Glass Palace*

Essays

1. Salman Rushdie: ―Imaginary Homelands https://www.terrain.org/wpcontent/uploads/2015/11/Rushdie1992ImaginaryHomelands.pdf

Module IV Drama

Indian Classical Drama- Modern Drama- Social Drama- Amateur Theatre- Street Theatre- Indigenous Theatre- Girish Karnad- Vijay Tendulkar- Badal Sircar- Safdar Hashmi-Mahasweta Devi- - Manjula Padmanabhan

1. Mahesh Dattani: *Dance Like a Man*

Suggested Reading

Chaudhuri, Rosinka. *A History of Indian Poetry in English*. Cambridge, Cambridge University Press, 2016

Desai, Anita. *Games at Twilight*.Random House, 2011.

De, Souza, Eunice. Ed. *These my Words* The Penguin Book of Indian Poetry. Penguin Books, 2012.

Dodiya, Jaydising. *Indian English Poetry Critical Perspective*.

Iyengar .R.Srinivasa.*Indian Writing in English*. Sterling Publishers Private Limited. 1983. Lahiri, Jumpa. Interpreter of Maladies.Houghton Mifflin Harcourt, 2000

Mehrotra, Arvind Krishna (ed). *A History of Indian Literature in English*. New York: Columbia University Press, 2003

Mukherjee, Meenakshi. *The Perishable Empire*.OUP. 2000.

Naik, M.K, ed. *Aspects of Indian Writing in English*. Macmillan India Limited. 1982.

---. *A History of Indian English Literature*. Sahitya Akademi. 2009. Narayan, R.K Malgudi Days.Pengin Publishing Group. 2006

Roy, Arundhati. *The God of Small Things*. Penguin Random House Private Limited, 2017 Singh, Kushwanth. Train to Pakistan. Ravi Dayal Publisher, 2013

Rushdie, Salman. *Imaginary Homelands.* Randm House, 2012 Tayil, Jeet. 60 Indian Poets. Penguin Books Limited, 2008.

e-resources

https://www.tagoreweb.in/

https://www.bookgeeks.in/best-indian-authors-and-their-novels-in-english/
https://poetsindia.com/

SEMESTER V

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Core Course X CG 1543 Criticism and Theory

No. of Credits: 4 **No. of Instructional hours: 5 per week [Total: 90 Hours]**

Aim Provide a historical and critical over view of the origin and development of literary criticism

Objectives

1. Give the students a historical overview of the critical practices from classical period to the present.
2. Introduce to them some of the significant concepts that had a seminal influence on the development of critical thought.
3. To develop in them a critical perspective and capacity to relate and compare various critical practices and schools.

Course Outcome

CO 1: Analyze and appreciate texts critically, from different perspectives and methodologies

CO 2: Appreciate Indian Aesthetics and find linkages between Western thought and Indian critical tradition.

CO 3: Gain a critical and pluralistic understanding and perspective of life

COURSE OUTLINE

Module I Western Critical Thought

Classical

Plato-Mimesis and the critique of poetry

Aristotle: Tragedy

Longinus: The Sublime

Neo Classical

Dryden: Defense of Poetry

Romantic

William Wordsworth: Definition of poetry

S.T. Coleridge: Fancy and Imagination

Victorian:

Matthew Arnold: Function of poetry, Touchstone method

Modernism:

T.S. Eliot: Theory of Impersonality, Dissociation of Sensibility, Objective Correlative, Tradition and Individual Talent

Module II Indian Aesthetics

The Evolution of Indian Poetics-Art and Aesthetics of Dramatic Experience-Bharatamuni-Natyasastra - Rasa Theory-Alamkara- Ritisiddhant- Dhwani Siddhant- Vakrokti- Auchitya-Thinai Poetics

(Mention the importance of the above schools of thought in Indian Criticism and their relation to Western Criticism like Rasa is equivalent to purgation or catharsis, Dhvani and symbolism, vibhavas and objective correlative, Alamkara and Rhetorics, Vakrokti and Ambiguity etc.)

Module III A Brief Introduction to Critical Theory

1. New Criticism - Russian Formalism
2. Structuralism(Langue/Parole, Sign-Signifier-Signified)
3. Deconstruction
4. Feminisms (Waves of Feminism, Womanism, Intersectionality, Gynocriticism)
5. Psychoanalytic Criticism: (Id, Ego, Super ego) (The Real, the Imaginary, the Symbolic)
6. Postcolonial Criticism: (Orient/Occident, Eurocentrism, Othering, Negritude, Subaltern)
7. Gender and Sexuality: (Performativity)
8. Modernism, Postmodernism (Parody and Pastiche)
9. Cultural Turn to Theory (culture is ordinary, culture and ideology)

Module IV Practical Criticism

1. Literary Forms and Devices
2. Criticism of an unseen passage (Prose OR Poetry) using any of the theories prescribed.

Suggested Reading

Barry, Peter. *Beginning Theory - An Introduction to Literary and Cultural Theory*.Fourth Ed. Manchester UP, 2017.

Cuddon, J A and M A R Habeeb. *The Penguin Dictionary of Literary Terms and Literary Theory:* Fifth Edition. Penguin: 2015.

Das, B and J M Mohanty. *Literary Criticism: A Reader*. Oxford UP, 1997.

Habeeb, M A R. *Literary Criticism from Plato to the Present: An Introduction*. Wiley-Blackwell, 2011

Lodge, David and Nigel Wood. *Modern Criticism and Theory: A Reader*. Routledge, 2014. Nagarajan, M S. *English Literary Criticism and Theory*. Hyderabad: Orient Blackswan, 2011. Pollock, Sheldon. *A Rasa Reader: Classical Indian Aesthetics*. Columbia UP, 2016.

Seturaman, V S. *Indian Aesthetics*. Laxmi Publications, 2017.

Upadhyay, Ami. *A Handbook of The Indian Poetics and Aesthetics*. Bareilly: Prakash Book Depot, 2017.

e-resources

Classical Criticism http://www.egyankosh.ac.in/bitstream/123456789/22610/1/Unit-1.pdf

Classical Criticism https://www.academia.edu/35408906/CLASSICAL_CRITICISM_A_CRITICAL_ENQUIRY

From Plato to the Present http://elibrary.bsu.az/books_400/N_33.pdf

Longinus –On the Sublime https://sites.google.com/site/zhmlit/literary-criticism/longinus-s-ideas-on-the-sublime

John Dryden https://literariness.org/2017/11/17/literary-criticism-of-john-dryden/

Criticism of Dryden http://www.eajournals.org/wp-content/uploads/Dryden-as-the-Father-of-English-Criticism.pdf

Classical and Neo classical criticism https://ddceutkal.ac.in/Syllabus/MA_English/Paper_02.pdf
Dr Johnson as a Critic

https://literariness.org/2017/12/05/literary-criticism-of-samuel-johnson/

Romantic Criticism https://ddceutkal.ac.in/Syllabus/MA_English/Paper_07.pdf

Romantic Criticism
http://studymaterial.unipune.ac.in:8080/jspui/bitstream/123456789/4853/1/Romantic%20Criticism.pdf

Wordsworth‘s theory of poetry
https://dducollegedu.ac.in/Datafiles/cms/ecourse%20content/B.A.%20(Hons)%20ENG%20PAPER%209%20WORDSWORTH_S_THEORY_OF_POETRY_IN_THE_LYR.pdf

Coleridge as critic
https://dducollegedu.ac.in/Datafiles/cms/ecourse%20content/B.A.%20(Hons)%20ENG%20PAPER%209%20Coleridges_Biographia_Literaria_1817.pdf

Matthew Arnold as critic https://www.lsj.org/literature/essays/arnold Arnold and High culture https://sites.udel.edu/britlitwiki/matthew-arnold/

T S Eliot as critic https://sites.google.com/site/nmeictproject/presentations/4-1-introduction-t-s-eliot-as-a-critic

Indian Aesthetics https://www.openart.in/general-topics/indian-aesthetics/

A Student‘s Handbook of Indian Aesthetics
https://www.cambridgescholars.com/download/sample/63790

Rasa Theory

https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004120632194631nishi_Rasa_Theory.pdf

The Rasa Theory https://sg.inflibnet.ac.in/bitstream/10603/126482/9/09_chapter%203.pdf

Rasa- Indian Aesthetic Theory https://globalphilosophyresources.com/2017/08/10/rasa-indian-aesthetic-theory/

Literary Theory https://courses.lumenlearning.com/introliterature/chapter/introduction-to-critical-theory/

Held, D. (1980). Introduction to critical theory: Horkheimer to Habermas. Berkeley: University of California Press.

Literary Theory http://ekladata.com/Tn8NJwPeVe21wsE0MuX7LyFQ6Gg/Literary-Theory_an-overview.pdf

Literary Theory http://elibrary.bsu.az/books_400/N_92.pdf

Literary theory https://mthoyibi.files.wordpress.com/2011/05/literary-theory_an-introduction_terry-eagleton.pdf

Practical criticism
https://www.danielxerri.com/uploads/4/5/3/0/4530212/teaching_practical_criticism.pdf

Practical criticism http://egyankosh.ac.in/bitstream/123456789/22635/1/Unit-1.pdf https://iep.utm.edu/literary/ (What is Literary Theory) https://courses.lumenlearning.com/suny-britlit1/chapter/literary-criticism/ (Literary Criticism)

http://site.iugaza.edu.ps/ahabeeb/files/2012/02/An_Introduction_to_Literature Criticism_and_Theory.pdf (Introduction to Literary Theory and Criticism)

https://ayushnanda.com/history-indian-aesthetics-brief-notes (History of Indian Aesthetics)

https://www.cambridgescholars.com/download/sample/63790 (A Student‘s Handbook of Indian Aesthetics)

https://www.slideshare.net/m_b2011/comparative-aesthetics (Comparison between Indian and Western Aesthetics)

SEMESTER V

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Vocational Course VI CG 1571 Theatre Studies

No. of Credits: 3 **No. of Instructional hours: 3 per week [Total: 54 Hours]**

Aims: To provide an application level approach to world theatre

Objectives

1. Introduce the students to the application of fundamental theories in play texts
2. Familiarize the students with the theatrical elements of a play
3. Encourage the students to produce a play

Course Outcome

CO1: Develop a culture of theatre in students

CO2: Help students in applying theories and contexts in play texts

CO3: Enhance creativity in students by helping them in the production of a play

COURSE OUTLINE

Module 1: Identification of Theatre forms and their analysis

Awareness regarding Origin of Drama, major Greek playwrights, Chorus, miracle, morality, mystery plays, Aristotle's theory of drama, Rasa theory and Indian Theatre

Identification and analysis of various theatre forms like Elizabethan Stage, Restoration Theatre, Epic Theatre, Problem Play, Theatre of the Absurd, Sanskrit Theatre, Modern Indian Theatre, Diaspora Theatre, Theatre of Anger, Feminist Theatre, Environmental theatre

Module 2: Application of Theories and Themes in Theatre

Students are encouraged to analyse selected play texts by applying Theories of Aristotle, Bharata, Classical Theatre and folk theatre – Analysis of the treatment of various themes like love, patriotism, alienation, scientific temper, existentialism, sexuality, myth, crossing of borders, diaspora etc.- an awareness may be given regarding institutions and groups like School of Drama, Sangeetha Nataka Academy, Professional and Amateur Groups in Kerala and India like Rangasankara, Diaspora Theatre Groups like Teesri Duniya in Canada etc.

Module 3: Theatrical Tools and Techniques

Theatrical tools and techniques may be identified and their use may be analysed by the students like mask, curtain, stage setting, dialogue, costume, songs, lighting, dance, movement of the body parts, facial expressions, use of technology etc.

Module IV – Stage Praxis

This module can be given as project or for internal evaluation in groups or on individual basis- Writing Scripts – Enacting– Executing the production of a play – Preparing stage setting, properties, make up and music – End result may be the production of various play texts/performances from the class.

Suggested Reading

Awasthi, Suresh. *Performance Tradition in India*. National Book Trust, 2001. Banks, R.A. Drama and Theatre Arts. Hodder Arnold H&S, 1985.

Bhatia, Nandi, editor. *Modern Indian Theatre: A Reader*. Oxford University Press, 2009.

Butcher, Samuel Henry.*The Poetics of Aristotle.* Create Space Independent Publishing Platform, 2017.

Esslin, Martin. *The Theatre of the Absurd*. Bloomsbury Academic, 2015.

Keith, Berriedale. *The Sanskrit Drama in its Origin, Development Theory and Practice*. Motilal, 1992.

Menon, A. Sreedhara. *Social and Cultural History of Kerala*. Sterling Publishers, 1979. Nicholson, Helen. Teaching Drama. Continuum, 2007. (pages 11-18)

Pikering, Kenneth. *Key Concepts in Drama and Performance*. Palgrave, 2005.

Storey, Ian C. and Arlene Allan. *A Guide to Ancient Greek Drama*.Wiley Publishers, 2014.

Instructions to Teachers

This course is designed to have a practical awareness and experience of theater. Classroom activities must be conducted to impart the students practical knowledge in various styles, kinds, methods and techniques of theater.

Instructions to Question Paper Setters

Since this is a vocational course, students' practical knowledge must be evaluated along with their theoretical awareness.

SEMESTER V

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Vocational Course VII CG 1572 English Language Teaching

No. of Credits: 3 **No. of Instructional hours: 3 per week [Total: 54 Hours]**

Aim: To introduce students to teaching of English as a second language.

Objective

1. Comprehend the concepts in language teaching.
2. Understand the important psychological principles behind second language acquisition.
3. Understand different approaches and methods of teaching English as second Language.

Course Outcome

CO1: Understand the theoretical basis of language teaching, and apply it to the actual teaching process

CO2: Be able to assess critically the implications of the various approaches, methods, techniques

CO3: Have the ability to develop material for teaching, to plan lessons and conduct them effectively

COURSE OUTLINE

Module I

History of English Language Teaching in India – Key concepts in ELT – Acquisition/ Learning – Teaching/ Learning – micro teaching– Audio-visual aids – language lab. Bilingualism/ Multilingualism – English as a global language – ESL, EFL–L1, L2 – Interlanguage – Native speaker varieties and other Englishes

Module II

Theories of second language acquisition: Behaviourism – Watson – Pavlov's Classical Conditioning –Skinner's Operant Conditioning – Cognitivism – Noam Chomsky-Language Acquisition Device – Krashen Monitor Hypothesis-Input Hypothesis-Affective Filter Hypothesis – Constructivism – Piaget, Vygotsky, Bruner– Zone of Proximal Development (ZPD) – Scaffolding.

Module III

Approaches and Methods: Structural Approach – Oral Approach – Situational Approach –Communicative Approach – Eclectic Approach – Grammar-Translation Method – Bilingual Method – Direct Method – Silent Way- Community Language Learning – Communicative Language Teaching – Task-Based Teaching – Content-Based Language Teaching, ESP, CLIL – Postmethod pedagogy- using ICT- Blended Learning

Module IV

Planning and Evaluation: Two-column Lesson Plans for teaching language skills, prose, poetry, and grammar – Testing and Evaluation – internal and external evaluation – Types of tests-Achievement and Diagnostic tests – Types of Questions-Essay, annotation, short questions, multiple choice questions.

Suggested Reading

Baruah, T. C. *The English Teacher's Handbook*. New Delhi: Sterling, 2009.

Huebener, Theodore. *Audio-Visual Techniques in Teaching Foreign Languages*. New York UP,

1967.

Larsen-Freeman, Diane. *Techniques and Principles in Language Teaching*. OUP, 2003.

Leonard, David C. *Learning Theories, A-Z.* Greenwood Publishing Group, 2002.

Paliwal, A. K. *English Language Teaching*. Jaipur: Surabhi Publications, 1998.

Richards, J. C. & Theodore S. Rodgers. *Approaches and Methods in Language Teaching.* CUP,

2007.

Stern, H. H. *Fundamental Concepts of Language Teaching*. OUP, 2003.

Instructions to Teachers

Since this is a vocational course students should be given a practical awareness of language teaching through practice sessions.

Instructions to Question Paper Setters

Since this is a vocational course, students' practical knowledge must be evaluated along with their theoretical awareness.

SEMESTER V

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Vocational Course VIII CG 1573 Language for Advertising and Marketing

No. of Credits: 3 **No. of Instructional hours: 3 per week [Total: 54 Hours]**

Aim: Specific Skill Development

Objectives

1. Understand the field of Advertising
2. Comprehend opportunities and challenges in Advertising sector
3. Examine the scope for making advertising a future career

Learning Outcomes

CO 1; Prepare a primary advertising model

CO 2: Application of skills.

CO 3: To give students an appreciation of Advertising and Marketing Communications development focusing on the CLIENT's perspective

COURSE OUTLINE

Module 1

Advertising – Definition - evolution of advertising - functions and effects of advertising - Apex Bodies of Advertising: AAAI, ASCI, TAM, NARB, NARC, BARC; Structure, Functions and Roles. Ad Agency: research and planning including Types of advertisement: Classified-display, Local-regional-national-international Ad, consumer corporate ad, industrial-trade-retail Ad, PSA ads, government-private, outdoor, surrogate Ad

Module 2

Print ads- ad copy-parts of a print ads- white space-bleed-gutter - kicker- lay out-copy writing-classifieds-advertorials- display ads -double page spreads - gatefolds - samples - vouchers - sponsorships - inserts- jacket newspaper ads

*Radio ads- drive time- day part- ad campaigns- clutter - commercials-jingles- simulcast

*TV ads- product placement- embedded marketing- direct response advertising- banners- logos - -celebrity endorsement -pre-test

*Internet marketing- SEM- SEO- CPC- ROI- email marketing- Pop ads- Viral marketing- Buzz marketing- guerilla advertising- social media marketing- social media influencer- marketing through vlog and blog

*Mobile advertising- overlay ads -vignette ads-anchor ads.

In page ads-matched content

In-feed ads

In-article ads

Module 3

Advertising and Society: Impact of Ads on Children, Portrayal of Women in Ads- gendered marketing- femvertising- gender inclusive-gender neutral- advertising- Marketing strategy- Social Impact, Psychological Impact- Rational vs. Emotional Advertising. Green advertising- green washing.

Module 4

* Writing scripts for print ads- radio ads- preparing story board for tv ads.

Producing a one-minute PSA (Public service announcement)/Ad, Film/Pop-up

visit a private or public sector organization-consumerism and marketing.

Classroom activities

Group assignments will be evaluated based on analytical skills, creativity, persuasiveness and logic flow.

Instructions to Teachers

This paper is activity oriented and the last module is completely designed for practical purpose. Classroom activities must be conducted to impart the students practical knowledge in advertising and marketing. Internal evaluations must be done in the form of extended practical activities.

Instructions to Question Paper Setters

Since this is a vocational course, students' practical knowledge must be evaluated along with their theoretical awareness. Hence, 50% of questions from Part III and IV must comprise questions evaluating practical knowledge.

SEMESTER V

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Open Course CG 1551.1 English for Communication

No. of Credits: 2 **No. of Instructional hours: 3 per week [Total: 54 Hours]**

Aim To excel in communicative capabilities

Objectives

1. Help the students overcome their inhibitions about speaking in English about their day-to-day life and learning experiences within and outside college
2. Develop them into clear, unpretentious and effective communicators, both in speech and in writing
3. Give them the rudiments of grammar, with an emphasis on the correct usage of the language in various contexts

Course Outcome

CO 1: Learners majoring in some subject other than English will have a working knowledge of the type of English that is required in real life situations, especially the globalized workplace.

CO 2: Well trained to write clear, well-framed, polite but concise formal letters and e-mails for a variety of purposes

CO 3: Acquire some of the soft-skills that go hand in hand with English –namely, the ability to prepare for an interview and face it confidently, the ability to participate boldly a group discussion and contribute meaningfully to it, the ability to make a simple and interesting presentation of 5-10 minutes before a mixed audience on anything that they have learnt in the previous semesters of the UG programme

NOTE TO COURSE INSTRUCTORS AND QUESTION PAPER SETTERS

This course does not have any ―Core reading material. A list of useful reference books and other resources has been provided, but it must be emphasized that none of them should be used exclusively, in the manner of core books. Instead the teacher and students must exercise their discretion and take whatever is useful from them.

Module I Talking about Oneself

One‘s basic details –academic career from Plus 2 onwards One‘s home village or locality- Family members and what they do- Interests/hobbies- Abilities and strengths (with illustrative examples/anecdotes) - Weaknesses (with illustrative examples/anecdotes)

Brief narrative with a few ―highlights of things learnt during the first 2 years of the degree programme (this could include curricular and co-curricular things such as participation in NCC or NSS or some club)

Aims and ambitions in life (both career and social aims)

Any one person who inspires or (in the past) inspired/used to inspire the student and proved to be a role-model for her/him

A memorable experience in the life of the student and why it is so memorable BALL GAME FOR BREAKING DOWN INHIBITIONS

- This may be played as often as possible with a small basketball or volleyball.
- The teacher and all the students in class stand in a circle around a cleared space either indoors or outdoors.
- The teacher throws the ball to a student randomly loudly saying, ―My name is …….. (her name) I come from (her home village/locality).
- The student has to repeat those sentences substituting the teacher‘s name and place with her own and throw the ball back at the teacher. If she gets it correctly, the teacher throws the ball to the next student. If not the teacher repeats the utterance with a stress on the word/part to be corrected and throws the ball back to the same person.
- This is to be repeated till the student gets it right and also speaks in a voice loud enough to be heard by everybody.

Writing about Oneself

1. Basic Grammar: Gender Agreement, Number Agreement, Subject-Verb Agreement, Use of Articles and Tenses

2. Exercises –Note: Students need not remember the names of the tense forms but they must know develop the ability to use them correctly. Teachers handling this course can take 3 or more items from Module I and make the students write about them in a simple, conversational style. This writing can then be checked for gender and number agreement as well as the proper use of articles and tense forms and feedback can be given with a view to reinforcing their ability to write grammatically.

Module II Communicating with Others

1. INTRODUCING OTHERS

Introducing a classmate to an audience mentioning their basic details, good qualities, interests and achievements and also narrating some shared experience or something that one has found striking about them

Researching a celebrity and introducing a classmate as if he/she were that person

NOTE: The number of classmates and ―celebrities‖ introduced like this by each student can be fixed depending on the number of students in the class and the time available.

Compeering a programme

2. ROLE PLAY

Opening and concluding conversations with familiars and strangers A student talking to a bank manager enquiring about study loans A traveler asking for help at a railway enquiry counter

A tourist asking for information at an enquiry counter about places to visit in a new state, hotel rates, how to get to those places, etc.

A citizen journalist reports on some special event or untoward situation happening near him/ her in the background

3. GROUP DISCUSSION on one or more of the following:

Some issue of common concern from the students‘ lives A recent news item

A recent film Guidelines

The first 2 rounds of discussion may be on non-controversial topics and the discussion group may be given some preparation time; the next 2 should be spontaneous and on slightly more controversial topics. The class may be split into 2 (or 4) groups. While one group is carrying on the discussion, another group of people may be posted to observe them. Each participant should have a watcher unknown to him/her, who will make notes on that person and give them to the teacher for a feedback. Points to be watched shall be –the student‘s level of participation, body language, voice, manner, confidence level and overall contribution to the discussion. Through this method the principles of healthy group discussion can be ―derived‖ and taught. Observer students should be required to take notes during discussion and the teacher should guide them in refining their notes.

4. INTERVIEW

A brief recapitulation of how to prepare a CV or resume (since the students would have done this in their 1st semester)

How to write an application letter to go with it

Preparation for an interview: researching the subject/organization, the responsibilities on the job one is seeking –things to do on the previous day

Non-Verbal factors: Dress, punctuality, body language, eye contact, sitting posture

Types of interview questions: fact seeking, searching or opinion seeking, confirmatory, open and closed questions

Ways of disagreeing politely with the panelists, refusing to take provocations, asking for clarifications

What to do before and during a telephonic interview

Module III Letters, Mails and Notices

1. Drawing up brief notices for various events
2. Basic elements of an email and some points of netiquette
3. Formal letters and emails for the following purposes:
   Applying for a job, Seeking information, Ordering a product, Making enquiries and bookings, Making a complaint, Giving negative feedback tactfully, Asking for help, Apologizing for mistakes made, Thanking people for services/help received, Writing a proposal for a grant/ project/ scholarship (basic structure)

Fine Tuning One's English

1. What is Mother-tongue Interference and why does it happen? –Speech sounds in English that are NOT found in Malayalam –some English sounds/words commonly mispronounced by Malayalis
2. 2-3 sessions of listening to British speech –2 -3 sessions of listening to American speech
3. Getting the most out of a dictionary –how to look for a word –some common words with multiple meanings (all widely used) –meaning of _connotation', _pejorative', _dialect' _slang', _expletive' and _profanity' with an example each
4. Making a 5-10 minute presentation on any topic chosen by the student and approved by the teacher
5. Writing for Social Media platforms and creating content for various purposes targeted at Social Media readers/ viewers
6. Personal blog writing

Suggested Reading

Basic Communication Skills (book with CD). P. Kiranmai Dutt and Geetha Rajeevan. Foundation Books, CUP, 2011: Part I and III. Price: 150/

Essential English Grammar: A self-study reference and practice book for elementary students of English (with answers) 2nd Edition. Raymond Murphy. CUP, 2010.

The Craft of Business Letter Writing. Matthew M. Monippally. Tata McGraw Hill, 2006: Especially Part I and II (Chapters 1-6), Chapter 9 and 10 in Part III and the Appendix, ―Rogues' Gallery‖.

E-Mailing (book with CD).Louise Pile. Viva Books, 2009.

Communication for Business: A Practical Approach (4th Edition). Shirley Taylor. Pearson Education, 2006: Relevant Chapters in Units 3, 4, 5, 6, 8 and 18.

A Dictionary of Contemporary English (New Edition with DVD ROM). Pearson Longman, 2009.

e-resources:

1. www.grammar-monster.com
2. Powerpoint Presentation in www.wikipedia.org on English spelling
3. BBC World resources on learning English

SEMESTER V

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Open Course CG 1551.2 Film Appreciation

No. of Credits: 2 **No. of Instructional hours: 3 per week [Total: 54 Hours]**

Aim Introduce the world of movies and sensitize its representative politics

Objectives

1. Enable the students from various disciplines to decipher the meaning of a movie
2. Familiarize students with the emerging area of film studies
3. Make them aware of the evolution of the filmic medium.

Course Outcome

CO 1: Decipher the meaning of a movie

CO 2: Watch, understand and analyze films from a critical perspective

CO 3: Equip them to be resourceful to find a career in areas related to film

COURSE OUTLINE

Module I Evolution and Key concepts

Defining film – A brief history (Lumiere brothers and the beginning) - Language of Cinema – Types of Shots, Angles – Camera Movements –180 degree Rule – 30 degree rule- Focus – Use of colour and lighting, sound- music- Editing – Different styles of Editing - Mise-en-Scene, Auteur theory- Major film genres–Famous Adaptations - Different stages of Production – Censorship.

Module II Major Movements and the Masters (Discuss only the basics and the major film makers)

Soviet Cinema and Montage - German Expressionism- Italian Neo Realism- French Poetic Realism and French New Wave- Third World cinema- Documentary films- Short films- The Digital world- OTT platforms

Famous Directors: Alfred Hitchcock, Charlie Chaplin, Ingmar Bergman, Andrei Tarkovsky, Luis Buñuel, Akira Kurosawa, Satyajit Ray.

Module III Indian and Malayalam Cinema

Beginning of Indian cinema – Dada SahebPhalke – Golden age of Indian cinema – Satyaji Ray – popular Bollywood cinema – beginning and growth of Malayalam cinema – parallel cinema in Malayalam – AdoorGopalakrishnan – contemporary Malayalam cinema.

Practical Sessions: Script Analysis and Writing Reviews

Writing about film – the basics of film review – analyse the films based on the theoretical approaches in the above modules.

Case studies – Script Analysis and Review

The Titanic

Mother India

Manichithrathazhu

Suggested Reading

Alex Clayton and Andrew Klevan – The Language and Style of Film Criticism 2011. Amy Villarejo. Film Studies: The Basics. Routledge, 2013.

Andrew Dix. Beginning Film Studies.Manchester University Press, 2013. Geoffrey Nowell-Smith: The Oxford History of World Cinema. OUP, 1997. James Monaco – How to Read a Film. Harbor Electronic Publishing, 2013. Jill Nelmes: Introduction to Film Studies. Routledge, 2011.

Madhu Muttam: Manichithrathazhu Screenplay. DC Books, 2010. Renu Saran. History of Indian Cinema. Diamond Books, 2012

Robert Stam. Literature through Film.Taylor & Francis, 2011.

Robert Stam and Alessandra Raengo (ed.). Literature and Film.Wiley-Blackwell, 2004.

Steve Katz: Film Directing Shot by Shot: Visualizing from Concept to Screen. Focal Press, 1991. Steven Ascher. The Filmmaker's Handbook.Penguin, 2012.

Susan Hayward. Cinema Studies: The Key Concepts. Taylor & Francis Ltd/Routledge, 2000.

e-resources:

https://www.cs.ubc.ca/~udls/slides/udls-sampoorna-biswas-film-appreciation-1.pdf
https://nofilmschool.com/Film-theory-basic-terms

http://www.jccsskc.edu.hk/newweb/modules/cjaycontent/content/1112prefectPhoto/Act06/Film Appreciation.pdf

SEMESTER VI

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Core Course XI CG 1641 Gender Studies

No. of Credits: 4 **No. of Instructional hours: 5 per week [Total: 90 Hours]**

Aim: Introduce and problematize gender constructs.

Objectives

1. Recognize the patriarchal bias in the formation of history and knowledge
2. Explore the historical variables that have contributed towards the social norms of gender and sexuality
3. Understand the significance of making gender an integral concept of social analysis

Course Outcome

CO 1: Analyse the ways in which gender, race, ethnicity class, caste and sexuality construct the social, cultural and biological experience of both men and women in all societies.

CO 2 : Interrogate the social constructions of gender and the limiting of the same in to the male-female binary in its intersections with culture, power, sexualities and nationalities

CO 3: Recognize and use the major theoretical frames of analysis in gender studies in relation to the sustainable goals of development

Module I Introduction to Gender Studies

Gender, Patriarchy- Family- Identities- Essentialism- Difference- Ideology- Intersectionality- Feminisms-Womanism-Dalit Feminism-Islamic Feminism

1. bell hooks. ―Feminist Politics: Where we Stand‖ Feminism is for Everybody: Passionate Politics. London: Pluto, 2000: pp.1-6. https://excoradfeminisms.files.wordpress.com/2010/03/bell_hooks-feminism_is_for_everybody.pdf
2. Judith Lorber. ―The Social Construction of Gender. https://ieas.unideb.hu/admin/file_9695.pdf
3. Vijila Chirappad: ―Wasteland (poem) https://feminisminindia.com/2018/01/11/5-dalit-women-poets/

Module II Gender and Sexuality

Body-Sexualities-Performativity-Heterosexuality-Sexual Orientation-Non-normative Sexualities-Desire-Heteronormativity-Homosexuality-LGBTQI-Queer-Transgender-Pride Parade-Posthuman Orientation.

1. A. Revathi. *The Truth about Me: A Hijra Life Story* (Life Narrative)
2. Margaret Atwood: ― 'Helen of Troy Does Countertop Dancing' (poem) https://poets.org/poem/helen-troy-does-countertop-dancing
3. Kalki Subramaniam: ― Breaking Binaries, Establishing Identity TEDxDumas https://www.youtube.com/watch?v=_j1NzEGMNdo

Module III Gender and Culture

Culture, Modernity, Consumption, Sexual Economies, Commodity Culture

1. Nivedita Menon: ―India: Section 377: How Natural is Normal? http://www.sacw.net/SexualityMinorities/nivedita01Jan2004.html
2. Maya Angelou: ― 'Phenomenal Woman' (poem) https://www.poetryfoundation.org/poems/48985/phenomenal-woman
3. Meena Kandasamy: ― 'Mascara'(poem) https://www.poemhunter.com/poem/mascara-4/

Module IV: Gender, Power and Human Rights

Power, Sexual Politics, Discourse, Sexual Citizenship, Discrimination, Human Rights, Gender Justice

1. Alice Walker: *Meridian* (Novel)
2. Mahaswetha Devi: *Draupadi* (Short Fiction)
3. Mayilamma:Chapter 13. ―Protest: The First Year (Pages 55 – 59) Jyothibai Pariyadathu *Mayilamma: The Life of a Tribal Eco-warrior*. Orient Blackswan, 2018.

Suggested Reading

Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity*. New York: Routledge, 1990.

Cranny-Francis,Anne. Wendy Waring, Pam Stavropoulos, Joan Kirkby. *Gender Studies Terms and Debates.*Macmillan, 2017.

Delap, Lucy. *Feminisms: A Global History*. Penguin, 2020. Foucault, Michel. History of Sexuality.Penguin Books: 1977

Kate, Millet. *Sexual Politics*. New York: Doubleday. 1969.

Kumar, A. *The History of Doing*, New Delhi: Kali for Women,1998.

Marao, Lori, J. *Fifty-One Key Feminist Thinkers*. Taylor and Francis, 2016.

Naples, Nancy A. *Companion to Women's and Gender Studies*. Wiley, 2020. Roth, Benita. Separate Roads to Feminism. CUP,2004.

Sullivan, Nikki. *A Critical Introduction to Queer Theory*.NYU, 2003.

e-resources

https://kalkisubramaniam.com/

https://www.e-ir.info/2017/02/06/online-resources-feminism/
https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)30239-9/fulltext
https://plato.stanford.edu/entries/feminist-philosophy/

http://www.gender.cawater-info.net/knowledge_base/rubricator/feminism_e.htm
https://guides.lib.purdue.edu/c.php?g=352219&p=2375079

SEMESTER VI

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Core Course XII CG 1642 Linguistics and Structure of English Language

No. of Credits: 4 **No. of Instructional hours: 5 per week [Total: 90 Hours]**

Aim Understand the language Structure of the English Language

Objectives

1. Give the students a preliminary idea regarding the nature, function and scope of languages, in general
2. Sensitize the students to the specificities of the oral and written dimensions of English.
3. Appreciate Linguistics as a branch of learning with its own defined material and methodology

Course Outcome

CO 1: Be able to analyse actual speech in terms of the principle of linguistics

CO 2: Improve the accent and pronunciation of the language

CO 3: Introduce the students to internationally accepted forms of speech and writing in English.

COURSE OUTLINE

Module I: Linguistics

Introduction - Nature and scope of Linguistics – Types of Linguistics – Historical Linguistics, Phonetics, Phonology, Morphology, Syntax, Semantics and Pragmatics, Lexicography Approaches to the study of language – Diachronic and Synchronic – Prescriptive and Descriptive Language as a system of signs – Sign, Signifier and Signified, Langue and Parole, Competence and Performance, Syntagmatic and Paradigmatic axes.

Varieties of Language – Dialect, Register, Pidgin and Creole. Significance of Received Pronunciation (RP)

Module II Phonetics and Phonology

Phonetics – definition – types – Articulatory, Acoustic and Auditory.

Speech mechanism – Organs of speech – Speech sounds – classification - Vowels , Cardinal vowels, Consonants – three part labelling

Phonology – Phonemes – Allophones and their distribution

Syllable structure – Suprasegmental features - Stress – word stress and sentence stress – Strong and weak forms - Rhythm –Juncture –Intonation – Assimilation – Elision

Transcription (sentences and passages) – IPA

Module III Morphology and Syntax

Morphology – Morphemes – classification – Free and Bound – Roots and Affixes – Lexical and Grammatical – Inflectional and Derivational - Allomorphs and their distribution

Syntax – Word classes – Form class and Function class – Formal features

Traditional Grammar – Structural and Functional study of grammatical categories – Grammaticality and Acceptability

Structural grammar – Introduction to IC Analysis – Phrase Structure (PS) Grammar – Transformational Generative (TG) Grammar

Module IV Linguistics in Ancient India

Major practitioners – Panini - Ashtadhyayi – Karaka theory, Katyayana – Va:rttika , Patanjali – Mahabhasya, Bharthruhari – Vakyapadiya – Sphota theory

Influence on Modern Linguistics

Suggested Reading

Balasubramanian, T. *A Textbook of English Phonetics for Indian Students*.Second Edition. Madras: Macmillan, 2013. Print.

Chalker, Sylvia. *The Little Oxford Dictionary of English Grammar.* Oxford: OUP, 1995. Print. Davidappleyard.com/English/pronunciation.htm.Web

Hocket, F. Charles. *A Course in Modern Linguistics*. New Delhi: Macmillan, 1958. Print.

Jones, Daniel. *English Pronouncing Dictionary*.Seventeenth Edition. Cambridge, CUP, 2006. Print.

SEMESTER VI

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Vocational Course IX CG 1671 Screen Writing and Subtitling

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aims: Introduce a specific skill

Objectives

1. To introduce to students the concepts of script and subtitle
2. To familiarise them with various types of scriptwriting
3. To help them pursue the various techniques of screenwriting and audio-visual translation.

Course Outcome

CO1: Understand the concepts and techniques of scriptwriting and subtitling

CO2: Undertake writing scripts to build a genuine interest in the field and focus on a career in screenwriting.

CO3: Analyse the audio-visual material provided and overcome the challenges in translating cultural symbols in the source language.

Module 1 – Screenwriting

Script – definition – features – examples – different kinds of script, film, TV, web series, videogames – formats – Master scene script – Dialogue and description – plot – forms of script – spec script – commission – feature – assignment.

Screenplay analysis - Links to screenplays for reading.

Script of the feature film: *12 Years a Slave* https://imsdb.com/scripts/12-Years-a-Slave.html

Original, unproduced short scripts https://www.simplyscripts.com/original-short-scripts.html#google_vignette

Module 2 – Subtitling

Audio-visual translation – concepts – types – multimedia localization.

Subtitle – subtitler – importance – common errors in subtitling – processes of subtitling – terms – SDH – SRT – aspects of translation – basic principles – subtitle software – audio-visual mechanics –impact of subtitle on world cinema.

Revoicing Techniques - Dubbing – Voice-Over translation

Module 3 – Screenplay Practice

Conduct classroom activities of writing screenplays for ads, short films of less than 20 minutes, single episodes of TV and Web series. (both individual and group activities may be conducted according to the interest and taste of the students)

Suggested screenplays for reading

Ritesh Joginder Batra – *The Lunchbox* (2013)

Florian Zeller and Christopher Hampton – *The Father* (2020)

K. G. George and S. L. Puram Sadanandan – *Yavanika* (1982)

Syam Pushkaran – *Maheshinte Prathikaram* (2016)

Module 4 – Audio-visual Translation Practice

Conduct classroom activities of subtitling such as writing subtitles of short videos of less than 30 minutes, etc.

Suggested films for analysing subtitles

Geethu Mohandas – *Kelkkunnundo* (2009)

Adoor Gopalakrishnan – *Vidheyan* (1993)

Suggested Reading

Aronson, Linda. *Scriptwriting Updated*. Allen & Unwin, 2000.

Baker, Mona. *In Other Words: A Coursebook on Translation*. Routledge, 1992.

Bogucki, Łukasz and Mikołaj Deckert (eds.). *The Palgrave Handbook of Audiovisual*

Translation and Media Accessibility. Palgrave Macmillan, 2020.

Chaume, Frederic. *Audiovisual Translation*: Dubbing. St Jerome, 2012.

Cowgill, Tinda J. *Writing Short Films*. Lone Eagle, 2005.

Field, Syd. *The Definitive Guide to Screenwriting*. RHUK, 2003.

---. Screenplay: *The foundations of screenwriting*. Dell Books, 1984.

---. *The Screenwriter's Workbook*. Dell Books, 1984.

Luis Perez-Gonzalez, editors. *The Routledge Handbook of Audiovisual Translation*. Routledge, 2018.

Mercurio, Jim. *Craft of Scene Writing: Beat by Beat to a Better Script*. Lindan Publishing, 2019.

Raheja, Dinesh and Jitendra kothari. Kaagaz ke Phool: *The Original Screenplay*. Om Books International, 2014

Seger, Linda. *Making a Good Script Great*. Samuel French, 1994.

Trotter, David: *Screenwriter's Bible*. Silman James Press, 2019.

E resources

For more information on various types of scripts.

https://www.studiobinder.com/blog/best-short-films/

https://www.scriptreaderpro.com/best-screenplays-to-read/

https://www.youtube.com/watch?v=tkK9hqAoMQE

https://www.youtube.com/watch?v=cnXiN1iVgBQ

https://gamia-archive.fandom.com/wiki/List_of_longest_video_game_scripts

http://dcac.du.ac.in/documents/E-Resource/2020/Metrial/23RatikaAnand1.pdf

https://termcoord.eu/2018/05/audiovisual-translation-dubbing-or-subtitles/

https://www.researchgate.net/publication/300855510_Introduction_Audiovisual_translation_comes_of_age

https://www.youtube.com/watch?v=GjGhQMg436U

https://www.youtube.com/watch?v=8N_e_10cyts

Script of the film *Jellikettu*

https://www.filmcompanion.in/fc-pro/scripts/download-the-script-of-lijo-jose-pellisserys-jallikattu/

Script of the film *12 Years a Slave*

https://imsdb.com/scripts/12-Years-a-Slave.html

Script of the animation film *Finding Nemo*

https://imsdb.com/scripts/Finding-Nemo.html

Sample transcripts

https://gotranscript.com/our-transcription-samples

Sample subtitles

https://gotranscript.com/captions-and-subtitles-samples

Classroom activities/Topics for Internal Assessment

The following activities can be allotted to groups or pairs of students as per the situation and the taste of the students.

1. Divide the students into four or five groups. Give a one line subject , for example , " grief " for them to work on a script of 5 minutes duration. You can also ask them to perform their script in class, once the proper script is written.
2. Divide the class into groups and assign them genres like comedy, tragedy, horror etc. Provide them with a situation like " At the railway station " and ask each group to build the scene and prepare a 3-minutes script in the genres assigned to them.
3. Clippings from films can be given where the students may be asked to provide subtitles in other language(s).
4. A passage can be given narrating an incident and students may be asked to write down a script (including dialogues) based on it.
5. When this script is ready, the students may be asked to perform dubbing and voice-over translation based on their script.
6. They may be asked to provide voice overs for introducing any short film. This can be done either in English or any regional language they are comfortable with.
7. A topic/theme may be given for preparing the script for documentary. It will also help them to practice voice-over translation and subtitling.
8. Scenes from films may be taken by group of students and they may do on the spot dubbing to another language (English to Malayalam or Malayalam to English).

Instructions to Teachers

This paper is activity oriented and the last two modules are designed exclusively for practical purpose. Classroom activities may be conducted in order to impart the students' practical

knowledge in screenwriting and subtitling. Internal assessments must be done in the form of extended activities such as script writing and subtitling.

Instructions to Question Paper Setters

Since this is a vocational course, students' practical knowledge must be evaluated along with their theoretical awareness. Hence, 50% of questions from Part III and IV must include questions assessing practical knowledge.

SEMESTER VI

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Vocational Course X CG 1672 Public Relations and Corporate Communication

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: Introduce a career oriented course focusing on the public/ corporate sector.

Objectives

1. Familiarise students with areas and principles of PR activity.
2. Enable them to acquire the basic skills required for corporate communication and public relations.
3. Enable them to articulate and project a positive image of the company/product/policies.

Course Outcome

CO 1: Produce effective, sensitive and ethical public relation and communication skills beneficial to the institution.

CO 2: Conduct public relation campaigns through press releases and other interactive methods with special focus on corporate communication.

CO 3: Help them find employment in the public/corporate sector.

COURSE OUTLINE

Module I

Introduction to public relations- meaning, definition, functions- types of publics- public opinion- labour rights and human rights- Dos and donts of public relations -building trust with stake holders- persuasion and negotiation- propaganda- lobbying- advertising-major areas of PR activity.

Group activity:

1) Creating sales promotion ads for social media (oral presentation)

2) Designing simple ads for the company (promo ads for goods and services, job ads etc.)

Module II

Importance of Corporate Communication- Corporates: definition-tools and techniques of corporate communication-traditional and new media tools-work team communication- cross cultural communication-crisis communication-business etiquette

Module III

Verbal and nonverbal communication- Listening and barriers to listening- strategies to overcome them-speaking planning and audience awareness-paralinguistic features- Importance of nonverbal communication-personal appearance- facial expression- body language- posture-gestures- eye contact-voice-

Group activity:

practice exercises on how to deal with tough clients using soft skills.

Module IV

Practice Exercises: Business conversations, mock interviews, telephone conversations, group discussion, debate and oral presentations, making mission and vision statements, writing business reports, writing press release, business letters, email, memos, minutes of meetings, circulars, persuasive letters, news items/extracts from contemporary newspapers on social issues/ corporate issues for paragraph writing to test analytical and problem solving skills. A report based on a one-day visit to a firm as assignment.

Suggested Reading

Fernando, A. C. *Business Ethics and Corporate Governance*. Pearson, 2012. Wilcox, Dennis L., Phillip H. Ault, et al. *Public Relations: Strategies and Tactics.* Pearson, 2003.

Kumar, Keval J. *Mass Communication in India*. Jaico Publishing House, 2012.

Raman, Meenakshi, Sangeeta Sharma. *Technical Communication: Principles and Practice.* Oxford, 2011.

Sharma, R. C., Krishna Mohan. *Business Correspondence and Report Writing.* Tata McGraw-Hill, 2008.

Lesikar, Raymond V. , John D. Pettit et al. Lesikar's *Basic Business Communication*. Irwin, 1993.

Ober, Scot. *Contemporary Business Communication* . Cengage Learning Inc., 2007.

Samson, T., Susan Alexander et al. *Effective Business Communication*. Cambridge UP, 2020.

Alston, Philip. Ed *Labour Rights as Human Rights,* OUP, 2005.

Panda, B.K., Sukanta Sarkar. *Violation of Human Rights*, Kalpaz Publications, 2015.

e-resources

https://youtu.be/A4qi66iTWxo

https://www.youtube.com/watch?v=LV0IIPrpS5A

https://youtu.be/F3muOFrLaxQ

Note to teachers

The course aims at skill development of students. An activity oriented approach is to be strictly adopted. The segments that require practice may be delivered through student-centred activities under the supervision of the teacher. Group activities should be given priority, rather than individual activities. The teacher has to note down common errors and provide suggestions for improvement.

Instructions to Question Paper Setters

Since this is a vocational course, students' practical knowledge must be evaluated along with their theoretical awareness.

SEMESTER VI

Career Related First Degree Programme 2(a) in English

& Communicative English (CBCSS)

Industry Based Elective Course CG 1661.1 Proof Reading and Copy Editing

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: Introduce a skill and career oriented course

Objectives

1. Familiarize students with the concepts of copy- editing and impart basic copy-editing skills.
2. Give exposure to the practice of copy editing
3. Open up areas of further possibilities regarding choice of career.

Course Outcome

CO 1: Gain Through knowledge of the theoretical and practical knowledge of copy editing

CO 2: Copy-edit non–technical materials of moderate difficulty and produce consistently well-organized written discourse.

CO 3: Find employment in the editing field as copy-editors, sub-editors and web editors.

COURSE OUTLINE

Module I

Proof Reading- close reading- points to remember- punctuation-grammar-spelling- common mistakes-structure- formatting- proof reading practice- repeated proofs

Module II

Copy Editing- scope and need - various typescripts - electronic - conversion of manuscripts - copy-editing - preliminary steps- interacting with the author - creation of self-contained, well-edited copies and books - coherence and consistency - the question of copyrights - acknowledgements and other legal issues - incorporating illustrations - copy-editing blurbs and titles and cover descriptions - dealing with multi-authorship.

Module III

The problem of style - the concept of in-housestyle - in-house style manuals - the question of grammar – abbreviations – concord – nouns - proper nouns – punctuation – spelling – ambiguity-

dates – money measurements - a brief understanding of the make-up of a standard book - preliminary pages - indexing a book - bibliographical references - special books like scientific and technological books - On-screen copy editing – definition - scope - different types - technical issues involved - legal and safety concerns - software tools.

Module IV

Practice- Proof reading and Copy Editing

Suggested Reading

Butcher, Judith, et al. *Butcher's Copy-editing*, Fourth Edition. New Delhi:

Chicago Manual of Style, 15th Edition of Manual of Style. University of Chicago, 2003.

Greenbaum, Sidney and Janet Whitcut, *Longman Guide to English Usage*. Harmondsworth: Penguin,1996.

Huddleston, R and Geoffrey K. Pulia, *A Student's Introduction to English Grammar*. CUP, 2005.

New Hart's Rules; *The Handbook of Style for Writers and Editors*. Oxford University Press, 2005.

New Oxford Dictionary for Writers and Editors: The Essential A to Z Guide to the Written Word. OUP, 2005.

Suttcliffe, Andrea J, Ed., *The New York Public Library Writer's Guide to Style and Usage.* Macmillan, 2000.

Turtoa, ND and Heaton, JB.*Dictionary of Common Errors*.Longman, 1998.

Instruction to teachers

Train the students to proof read and edit. Provide practice exercises.

Instruction to Question Paper Setters

Kindly ask questions that would evaluate proof reading and editing skills.

SEMESTER VI

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Industry Based Elective Course CG 1661.2 Professional Communication Practice

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: To empower the students with professional skills for modern workplace and for the techno-digital world through holistic practical learning.

Objectives

1. Update knowledge about the competency framework of modern professional organisations.
2. Identify gaps in their skills matrix and bridge them through strategized praxis.
3. Improve their recruitability, employability and entrepreneurship quotient.
4. Think critically and act ethically in the workplace and in digital spaces.

Course Outcome

CO 1: Develop the skill ecosystem of the students

CO 2: Mold ethical consciousness

C O 3: Be able to meet the demands of the industry and professional options

COURSE OUTLINE

Module I: Oral Communication for the Workplace

Professional language — Words, phrases and expressions to use while introducing a topic for deliberation, giving opinion, agreeing and disagreeing, appreciating, summarising, clarifying, interrupting, apologising etc.

Leadership language — Diplomatic language to use for persuasion, negotiation, mediation, assertion, motivation etc.

Hospitality language — Customer empathetic language for client service executives, guest-contact personnel, master of ceremonies etc.

Marketing Language — language of salesmanship

Module II: Non-Verbal Communication

Vocalics — non-verbal use of voice — pitch, rate, volume, tone, prosody-

Kinesics — the science of body language — gestures, postures, facial expressions — Oculesics — eye behaviour.

Proxemics — spatial communication — maintaining zone distances — pandemic-informed proxemics — digital proxemics.

Haptics — communication via touch for functional and social purposes — haptic rules in different contexts and cultures.

Chronemics — time perception and management — multitasking — monochronic and polychronic approaches

Physical Appearance — personal grooming — Chromatics — communication through the use of colour — Olfactics — smell as communication.

Module III: Introduction to Modern Assessment Methods

Personality Assessment — SWOT analysis — personality types — personality quizzes to gauge aptitude, emotional intelligence, conscientiousness, peer cooperation etc.

Psychometric Assessment — different types of reasoning test (numerical, verbal, inductive, deductive, spatial, situational, abstract etc.)

Interview Skills — answering stock interview questions about self and family, strengths and weaknesses, likes and dislikes, justifying candidature, core values, professional goals, remuneration etc.

Online Profile Management — maintaining formal profiles in employment oriented online services and professional networks like LinkedIn.

Module IV: Values, Ethics and Etiquette

Workplace ethics and values — gender and cultural sensitivity, green ethics — humility, approachability, accountability, considerate behaviour, critical thinking, social responsibility.

Social Etiquette — uncivilised conduct in movie theatres, trains and other public spaces, defacing public property, shaming others, disrespecting personal space and time, gatecrashing events — pandemic protocol — physical distancing, public hygiene

Digital Media Etiquette — responding to and acknowledging messages promptly— spamming messaging groups — indiscriminate use of emoji, GIFs and stickers — abuse of social media anonymity — shaming, verbal abuse, hate posts. — share with discretion — respecting intellectual property

Information and media literacy — misinformation, disinformation — fake news, pseudoscience, deepfakes — source seeking, fact checking, critical thinking — online fact checking methods and tools

Virtual Meeting/Online Interview Etiquette — ensuring necessary hardware and internet connection, formal display picture and username, appropriate attire, proper background and setting, muting microphone and camera, raising hand to speak etc.

Classroom Practice

- Group discussions on relevant topics
- Role-play workplace scenarios — aggrieved customer, disgruntled employees etc.
- Informal speaking opportunities to settle the nerves
- Online profile creation (LinkedIn)
- Personality quizzes
- Fact checking practice using online tools

Suggested Reading

Bovée, Courtland L. and John V. Thill. *Business Communication Essentials: Fundamental Skills for the Mobile-Digital-Social Workplace.* Pearson, 2020.

Chaturvedi, P. D. and Mukesh Chaturvedi. *The Art and Science of Business Communication: Skills, Concepts, Cases, and Applications.* Pearson, 2017.

Ghosh, B. N. Ed. *Managing Soft Skills for Personality Development*. McGraw-Hill, 2012.

Lata, Pushp and Sanjay Kumar. *English for Effective Communication*. OUP, 2013.

Sen, Madhucchanda. *An Introduction to Critical Thinking*. Pearson, 2010.

Sharma, Prashant. *Soft Skills: Personality Development for Life Success*. BPB, 2019.

Suresh Kumar E., P. Sreehari and J. Savithri. *Communication Skills and Soft Skills: An Integrated Approach.* Pearson, 2011.

Zimdar, Melissa and Kembrew McLeod. Eds. *Fake News: Understanding Media and Misinformation in the Digital Age*. MITP, 2020.

e resources

https://www.indiatoday.in/education-today/grammar-vocabulary/story/phrases-to-be-used-at-workplace-office-vocabulary-1647692-2020-02-18

https://www.mindtools.com/pages/article/newTMC_05.htm

https://blogs.lse.ac.uk/medialse/2020/06/17/fake-news-covid-19-and-digital-literacy-do-what-the-experts-do/

https://www.mdpi.com/2078-2489/12/5/201/htm

Instruction to Teachers

Continuous assessment shall be done on the basis of any/all of the following

- Individual formal presentations using digital tools (maximum 15 minutes)
- Mock Interview

Instructions to Question Paper Setters

Theoretical questions shall not be asked from Module I and Module III for end-semester examination.

Career Related First Degree Programme 2(a) in English

&Communicative English (CBCSS)

Industry Based Elective Course CG 1661.3 Academic Writing

No. of Credits: 3 **No. of Instructional hours: 4 per week [Total: 72 Hours]**

Aim: Develop Writing Skill

Objectives

1. Familiarize the students with the concepts of academic writing and basics of documentation
2. Provide hands-on experience in researching, organizing, drafting, and revising
3. Introduce the concept of ethics and the problems with plagiarism
4. Provide an introduction to research methodology

Course Outcome

CO1: Comprehend the concept of academic writing CO2: Improve academic writing skills

CO2: Learn to become responsible scholars

CO3: Undertake research writing and documentation with better perception

COURSE OUTLINE

Module I

Introduction to Academic Writing

Differences between academic and non-academic writing – types of academic writing (expository, descriptive, persuasive, analytical, critical/evaluative, and reflective) – characteristics of academic writing (clarity, coherence, conciseness, objectivity, data accuracy, formal style) – genres of academic writing (essay, research paper, case study, literature review, project report, proposal, and dissertation/thesis) - academic writing ethics – plagiarism – popular documentation styles – MLA (Modern Language Association), APA (American Psychology Association), Chicago Manual of Style.

Module II

Mechanics and conventions of writing

The elements of writing – grammar, spelling, punctuation, vocabulary (Academic Word List [AWL]) – how to use a thesaurus– strategies for writing effectively – identification of topic and purpose – critical thinking – audience analysis – developing a personal style

The process of writing – prewriting (brainstorming, clustering/mind-mapping, understanding the question/topic and purpose, note making) – drafting and revising – ensuring structural and thematic consistency – editing and proofreading.

Module III

Models of Academic Writing (Practical Exercises)

Essays – academic articles – Statements of Purpose (SoP) – covering letter and résumé – formal emails – academic reports – book and film reviews – survey questionnaire – survey report – précis – paraphrase – IELTS and TOEFL academic and general writing segments – abstract/synopsis writing – project/research proposals

Module IV Practice

Academic Writing Practice- Writing Samples

Suggested Reading

Bailey, S. *Academic Writing: A Handbook for International Students*. Routledge, 2017. Effective Academic Writing Series. OUP.

Geyte, Els Van. *Writing: Learn to Write Better Academic Essays.* Collins, 2013. Griffin, Gabriele. Research Methods for English Studies, Rawat, 2019.

Hewings, M. *Cambridge Academic English*. CUP, 2012.

Inside Reading: *The Academic Word List in Context* Series. OUP.

Jordan, R. R. *Academic Writing Course: Study Skills in English*. Longman, 2003. Kothari, C. R. Research Methodology: Methods and Techniques. New Age International

Publishers, 2016.

McCarthy, Michael, and Felicity O'Dell. *Academic Vocabulary in Use*. CUP, 2016. MLA Handbook. Modern Language Association of America, 2016.

Oshima, Alice, and Ann Hogue. *Introduction to Academic Writing*. Pearson Education, 2006. Sinha, M. P. Research Methods in English. Atlantic, 2019.

Zemach, Dorothy E., and Lisa A Rumisek. *Macmillan Writing Series*. Macmillan.

SEMESTER VI

FIRST DEGREE PROGRAMME (CBCS System)

Common guidelines for Project/Dissertation

B.A. ENGLISH LANGUAGE AND LITERATURE: EN 1643

Credits: 4 Total Instructional hours: 3 per week [Total: 54 hours]

A. Guidelines for Teachers:

1. The Project/Dissertation should be done under the direct supervision of a teacher of the department, preferably the Faculty Advisor for the sixth semester. However the work of supervising the Projects should be distributed equally among all the faculty members of the department.

2. The teaching hours allotted in the sixth semester for the Project/Dissertation [i.e., 3 hours/week] is to be used to make the students familiar with Research Methodology and Project writing.

3. A maximum of five students will work as a group and submit their project as a [single] copy for the group. The members of a group shall be identified by the supervising teacher. Subsequently each group will submit a project/dissertation and face the viva individually/separately.

4. The list containing the groups and its members should be finalized at the beginning of the sixth semester.

5. Students should identify their topics from the list provided in consultation with the supervising teacher or the Faculty Advisor of the class [Semester 6] as the case may be. The group will then collectively work on the topic selected.

6. Credit will be given to original contributions. So students should not copy from other projects.

7. There will be an external evaluation of the project by an External examiner appointed by the University. This will be followed by a viva voce, which will be conducted at the respective college jointly by the external examiner who valued the projects/dissertations and an internal examiner. All the members within the group will have to be present for the viva voce. The grades obtained [for external evaluation and viva voce] will be the grade for the project/dissertation for each student within that group.

8. The Project/Dissertation must be between 20 and 25 pages. The maximum and minimum limits are to be strictly observed.

9. A Works Cited page must be submitted at the end of the Project/Dissertation.

10. There should be a one-page Preface consisting of the significance of the topic, objectives and the chapter summaries.

11. Two copies have to be submitted at the department by each group. One copy will be forwarded to the University for valuation and the second copy is to be retained at the department.

B. General guidelines for the preparation of the Project:

- Paper must of A4 size only.
- One side Laser Printing.
- Line Spacing: double.
- Printing Margin: 1.5 inch left margin and 1 inch margin on the remaining three sides. 119
- Font: Times New Roman only.
- Font size: Main title -14/15 BOLD & matter - 12 normal.
- The project need be spiral-bound only.
- Paragraphs and line spacing: double space between lines [MLA format].
- Double space between paragraphs. No additional space between paragraphs.
- Start new Chapter on a new page.
- Chapter headings (bold/centred) must be identical as shown: Chapter One

Introduction

- Sequence of pages in the Project/Dissertation:

i. Cover Page.

ii. First Page.

iii. Acknowledgement, with name & signature of student.

iv. Certificate (to be signed by the Head of the Dept and the Supervising Teacher).

v. Contents page with details of Chapter Number, Chapter Heading & Page Numbers.

- Specimen copies for (i), (ii), (iv) and (v) will be sent to the colleges.

- Chapter divisions: Total three chapters. Preface

Chapter One: Introduction - 5 pages Chapter Two: Core chapter - 15 pages

Chapter Three: Conclusion - 5 pages.

Works Cited

[Numbering of pages to be done continuously from Chapter One onwards, on the top right hand corner]

C. Specific guidelines for preparation of Project:

1. Only the Title of the Project Report, Year and Programme/Subject should be furnished on the cover page of the University copy of the Project. The identity of the College should not be mentioned on the cover page.

2. Details like Names of the Candidates, Candidates' Codes, Course Code, Title of Programme, Name of College, Title of Dissertation, etc. should be furnished only on the first page.

3. Identity of the Candidate/College should not be revealed in any of the inner pages.

4. The pages containing the Certificate, Declaration and Acknowledgement are not to be included in the copy forwarded to the University.

5. The Preface should come immediately before the Introductory Chapter and must be included in all the copies.

D. Selection of Topics:

Students are permitted to choose from any one of the following areas/topics. Selection of topics/areas has to be finalized in the course of the first week of the final semester itself with the prior concurrence of the Faculty Advisor / Supervisor:

1. Post-1945 literature. This must not include the prescribed work/film coming under Core study. [Works/films other than the prescribed ones can be taken for study]

2. Analysis of a film script.

3. Analysis of advertisement writing [limited to print ads]. Study should focus on the language aspect or be analyzed from a theoretical perspective [up to a maximum of 10 numbers].

4. Analysis of news from any of these news stations/channels: AIR, Doordarshan, NDTV, Headlines Today, Times Now, BBC, and CNN. [News from 5 consecutive days highlighting local, regional, national, international, sports, etc]

5. Celebrity Interview: from film, politics, sports and writers [Only one area or one personality to be selected].

6. Studies on individual celebrities in the fields of arts and literature. Example: a Nobel Prize winner, a dancer/singer/musician/film star, etc, of repute [Only one personality to be selected].

7. Studies based on any 5 newspaper editorials or articles by leading international or national columnists like Thomas Friedman, Paul Krugman, Anees Jung, etc.

8. Compilation and translation of any 5 folk stories of the region.

9. Analysis of the language used in email and sms. The study should focus on the language aspect used in such modes of messaging, limiting to 10 pieces of email/sms. [Reference: David Crystal Txtng: the GR8 Dbt. OUP, 2008]

10. Studies on popular folk art forms like Koodiyattam, Theyyam, Pulikali, Chakyar Koothu, Nangyar Koothu, Kalaripayattu, Kathakali, Mohiniyattam, Maargamkali, Oppanna, etc. [Only one art form to be selected].

11. Study on any 5 popular songs in English. Songs of popular bands like the ABBA, Boney M, Backstreet Boys, Beatles, Pink Floyd, Rolling Stones, Westlife, Boyzone, etc can be selected.

12. Study based on the life and works of one Nobel Prize winner in literature.

E. Details of Course Contents:

(1) Academic writing: The following areas are to be made familiar to the students during the course of the 3 instructional hours/week set aside for the same in the sixth semester:

(a) Selecting a Topic

(b) Compiling a Working Bibliography

(c) Writing Drafts

(d) Plagiarism and Academic Integrity

(e) Mechanics of Writing

(f) Methods of quoting texts:

(g) Format of the Research Paper

Reference text: M.L.A. Handbook 8th Edition.

(2) Documentation of sources in the works cited page(s): Samples of different types of sources will be provided.

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UNIVERSITY OF KERALA

POST GRADUATE PROGRAMMES IN CHEMISTRY

(Revised Syllabi under Semester System with effect from 2016 Admission)

PREAMBLE

The syllabi of M.Sc programmes in Chemistry offered in the affiliated colleges of the University under Semester system have been revised and the revised syllabi are to be effective from 2016 admission. There are four independent PG programmes in Chemistry, namely **M.Sc**. **Programme in Branch III - Chemistry**, **M.Sc. Programme in Branch IV - Analytical Chemistry and M.Sc. Programme in Branch V - Applied Chemistry and Branch VI Medicinal Chemistry**. All these four PG programmes are equivalent in all respect for employment and higher studies. Each of these four PG programmes shall extend over a period of two academic years comprising of four semesters, each of 450 hours in 18 weeks duration. The syllabi and scheme of examinations of these four programmes are detailed below. The theory courses of the first three Semesters and the practical courses of the first two semesters of the four programmes are common, and therefore, the examinations of these four PG programmes are to be conducted with common question papers for the first three semesters by a common Board of Examiners. These syllabi are effective from 2016 admission in affiliated colleges of the university.

M.Sc. PROGRAMME IN BRANCH III - CHEMISTRY

(Revised syllabus under semester system with effect from 2016 admission)

SYLLABUS AND SCHEME OF EXAMINATION

Course No. and Title	Hours per week		Duration of ESA in hours	Marks for CA	Marks for ESA	Total marks
	L	P				
SEMESTER I*						
CH 211 Inorganic Chemistry I	5		3	25	75	100
CH 212 Organic Chemistry I	5		3	25	75	100
CH 213 Physical Chemistry I	5		3	25	75	100
CH 214 Inorganic Practicals I		3	(To be continued in Semester II)			
CH 215 Organic Practicals I		3	(To be continued in Semester II)			
CH 216 Physical Practicals I		4	(To be continued in Semester II)			
			Total marks for semester 1			300
*Distribution of teaching hours/week: Theory- 15 hours, Practicals- 10 hours (1 hour for Seminar)						
SEMESTER II*						
CH 221 Inorganic Chemistry II	5		3	25	75	100
CH 222 Organic Chemistry II	5		3	25	75	100
CH 223 Physical Chemistry II	5		3	25	75	100
CH 214 Inorganic Practicals I		3	6	25	75	100
CH 215 Organic Practicals I		3	6	25	75	100
CH 216 Physical Practicals I		4	6	25	75	100
	Total marks for Semester II					600
*Distribution of teaching hours/week: Theory- 15 hours, Practicals- 10 hours (1 hour for Seminar)						

SEMESTER III*						
CH 231 Inorganic Chemistry III	5		3	25	75	100
CH 232 Organic Chemistry III	5		3	25	75	100
CH 233 Physical Chemistry III	5		3	25	75	100
CH 234 Inorganic Practicals II		3	(To be continued in Semester IV)			
CH 235 Organic Practicals II		3	(To be continued in Semester IV)			
CH 236 Physical Practicals II		4	(To be continued in Semester IV)			
			Total marks for semester III			300
*Distribution of teaching hours/week: Theory- 15 hours, Practicals- 10 hours (1 hour for Seminar)						
SEMESTER IV*						
CH 241Chemistry of Advanced Materials	5			25	75	100
CH 242(a) Inorganic Chemistry IV**						
CH 242(b) Organic Chemistry IV **	5		3	25	75	100
CH 242(c) Physical Chemistry IV **						
CH 234 Inorganic Practicals II		3	6	25	75	100
CH 235 Organic Practicals II		3	6	25	75	100
CH 236 Physical Practicals II		4	6	25	75	100
CH 243(a) Dissertation	5				70	70
CH 243(b) Visit to R & D Centre					5	5
Comprehensive viva-voce					25	25
	Total marks for Semester IV					600
	Grand total (for semesters I-IV)					1800

*Distribution of teaching hours/week: Theory- 10 hours, 5 hours for discussion on project (1 hour for Seminar) **Each student has to choose either (a), (b), (c) as elective in accordance with the Dissertation chosen.

M.Sc. PROGRAMME IN BRANCH III CHEMISTRY

(Revised syllabus Under Semester System w.e.f. 2016 Admissions)

SEMESTER I

CH 211 INORGANIC CHEMISTRY I

Total 90 h

Unit I Coordination chemistry-I: Theories of metal complexes 18 h

Types of ligands and complexes. Isomerism: Structural, geometrical and optical isomerism. Crystal field theory: Splitting of d orbitals in octahedral, tetragonal, square planar, tetrahedral, trigonal bipyramidal and square pyramidal fields. Jahn-Teller theorem, evidence for JT effect, static and dynamic JT effect. Crystal field stabilization energy (CFSE) and its calculations. Octahedral Site Stabilization Energy. Factors affecting the splitting parameter. Spectrochemical series. Evidence of covalency in Metal-Ligand bond, introduction to Ligand field theory. Molecular orbital theory. Sigma and pi bondings in complexes. MO diagrams of octahedral and tetrahedral complexes with and without pi bonds. Experimental evidence of pi bond on the stability of sigma bond. Nephelauxetic effect.

Unit II Analytical principles 18 h

Evaluation of analytical data: Accuracy and precision. Standard deviation, variance and coefficient of variation. Student ‘t’ test, ‘Q’ test, and ‘F’ test. Confidence limits. Errors: Classification, distribution, propagation, causes and minimization of errors. Significant figures and computation rules. Correlation analysis: Scatter diagram. Correlation coefficient,r. Calculation of r by the method of least squares. Volumetric methods: Classification of reactions in volumetry. Theories of indicators. Acid-base, redox, adsorption, metallochromic indicators. Complexometric titrations: Titration using EDTA-direct and back titration methods. Precipitation titrations. Redox titrations. Titrations in non-aqueous solvents. Organic reagents used in gravimetry: Oxine, dimethylglyoxime and cupferron. Principle and instrumentation of TG, DTA and DSC. Factors affecting TG and DTA curves. Applications of TG DTA and DSC in the study of metal complexes.

Unit III Molecular symmetry **18 h**

Symmetry and Character table: Symmetry elements and symmetry operation. Matrix representation of symmetry operations. Character of a matrix. Conditions for a set of elements to form a group. Point groups. Multiplication of operations. Group multiplication table. Similarity transformation and classification of symmetry operation, Matrix representation of point group. Reducible and Irreducible representations. The Great Orthogonality theorem. Rules derived from GOT (proof not required). Setting up of character table of C_{2v}, C_{3v} and C_{2h} groups. Direct product representations. Reduction formula, reduction of reducible representation to IRs. Transformation properties of atomic orbitals. Hybridisation: identification of atomic orbitals taking part in hybridisation of triangular planar, square planar, trigonal bipyramidal, square pyramidal and tetrahedral molecules. Molecular symmetry and optical activity.

Unit IV Isopoly and heteropoly acids, Noble gases, interhalogens **18 h**

Preparation, properties and structure of isopoly acids of Mo,W and V and Heteropoly acids of Mo and W. Preparation and properties of Xenon fluorides and Krypton compounds ($KrCl_4$, KrF_4, KrF_2, $KrBr_6$, $Kr_2Cr_2O_7$, $KrCrO_4$ & KrO_2), structure of XeF_2 (MO theory only) . Preparation, bonding and uses of inter halogen compounds. Properties and structure of aluminosilicates and zeolites, shape selectivity. Preparation, properties and applications of silicones.

Unit V Chemistry of Natural Environmental Processes **18 h**

The chemistry of processes in atmosphere; Composition of the atmosphere. Automobile pollutants and the catalytic converter. Photochemical smog. Chemistry of the stratosphere. Catalytic destruction of ozone. Depletion of the ozone layer. Hazards of common air pollutants on the human health. The Chemistry of processes in hydrosphere; The hydrologic cycle. Cycling and purification. The unique properties of water. Acid base properties. CO_2 in water. Alkalinity. O_2 consuming waste. DO, BOD and COD. The chemistry of processes in Lithosphere; Redox status in soil. pE, pH predominance diagrams for redox sensitive elements. Acidity in soil materials. Acid neutralization capacity and the quantification of the soil acidity. Ion speciation in soil solution. Cation exchange capacity and exchange phase composition.

References

1. F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, John Wiley and Sons, 6th edition, 1999.
2. J. E. Huheey, Inorganic Chemistry- Principles of Structure and Reactivity, Harper Collins College Publishing, 4th edition, 2011.
3. K. F. Purcell and J. C. Kotz, Inorganic Chemistry, Saunders, 1977.
4. S. F. A. Kettle, Physical Inorganic Chemistry, Oxford University Press, 1st edition, 1998.
5. Shriver and Atkins, Inorganic Chemistry, Oxford University Press, 2010.
6. A.I. Vogel, A Text Book of Quantitative Inorganic Analysis, Longman, 5th edition, 1989.
7. D. A. Skoog, D. M. West and F. J. Holler, Fundamentals of Analytical Chemistry, Saunders College Publishing, 7th edition, 1996.
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10. A.S.Kunju and G. Krishnan, Group Theory and its Applications in Chemistry, PHI Learning, 2010.
11. R.L.Carter, Molecular Symmetry and Group Theory, John Wiley& Sons,1998
12. E.James Girard, Principles of Environmental Chemistry, Jones and Bartlett Publishers, 3rd Edition, 2013
13. H.V. Jadhav, Elements of Environmental Chemistry, Himalya Publication House, 2010
14. E. Michael Essington, Soil and water Chemistry, CRC Press, 2nd edition, 2015

CH 212 ORGANIC CHEMISTRY-I

Total 90 h

Unit I Stereochemistry of organic compounds 18h

Nomenclature of organic compounds - Cyclic, fused polycyclic and bridged polycyclic hydrocarbons, Bridged and fused hydrocarbon systems, Spirocyclic hydrocarbon systems, Heterocyclic systems containing Nitrogen and Oxygen.

Introduction to molecular symmetry and chirality, Axial Chirality, Planar Chirality and Helicity, Relative configuration, Stereochemical nomenclature, *R* and *S*, *E* and *Z*. Prostereoisomerism, stereotopicity and stereoprojections. Non-carbon chiral centres – Nitrogen, phosphorus and sulfur as chiral centres.Axial stereochemistry:Atropisomerismand its designation, *M* and *P* configurations. Stereoselectivity: enatioseelctetivity, diastereeoselectivity and stereoconvergence. Basic introduction to chiral separation methods and estimation of enantiomeric excess.

Conformational analysis of alkanes and cycloalkanes, Biased systems. Effect of conformation on reactivity of cyclohexanes– conformation of decalin.

Introduction to ORD, CD- their application in assigning configuration.Sector rules such as octant and axial haloketone rules. Cotton effect.

Chiral drugs: Ibuprofen, Methyldopa, and Thalidomide – Structure, chirality and activity (Basic concepts only)

Unit II Structure, reactivity and intermediates 18 h

Reaction coordinates- difference between transition state and intermediates, Homolytic and heterolyticbond fissions. Formation and structure of carbocations, carbanion and free radicals, Stability of intermediates, influence of field effect, inductive, mesomericand steric effects on controlling stability if carbocations, carbanions and carbon-centered radicals. Influence of structural features on acidity, basicity and reactivity of organic compounds. Alkyl, aralkyl and allylic cations –influence of substituents. General reactions of carbocations, carbanions and free radicals.Introduction to radical ions. Formation, structure, stability and chemical reactions of carbens, nitrenes and arynes.

Unit III Substitution reactions **18 h**

Nucleophilic substitution at sp^3carbon - S_N1 and S_N2 mechanisms.Walden inversion, stereochemistry.Effect of solvent,leaving group and substrate structure on rates of S_N1 and S_N2 substitutions.Neighbouring group participation, Non-classical carbocations, Competition between S_N^1 and S_N^2reactions.S_N1', S_N2', S_Ni mechanism.

Mechanism of esterification and ester hydrolysis-acid catalysed and base catalysed reactions. Aromatic Substitution reactions - Electrophilic substitution: mechanism and evidence- Reactions involving nitrogen, sulphur, carbon, halogen and oxygen electrophiles. Directive and rate controlling factors in aromatics with one or more substituents.

Aromatic Nucleophilic Substitution reactions - S_N1, S_NAr, benzyne and $S_{RN}1$ mechanism and evidence with examples.

Unit IV Elimination and addition reactions **18h**

Elimination reactions leading to C=C bond formation and their mechanisms. E1, E2 and E1CB mechanisms.Stereoaspects of C=C bond formation. Effect of leaving group and substrate structure.Hoffmann and Saytzeff elimination.Cis elimination.Stereoaspects of the addition of H_2O, X_2, HX, and boranes to C=C systems.Effect of substituents on the rate of additions. Cis and trans hydroxylation of cycloalkenes. Nucleophilic addition to activated C=C systems. Structure of the transition state in the addition reactions. Michael addition:mechanism with evidence. Addition to Carbon-Heteroatom multiple bonds: Aldol condensation (normal, crossed and directed), Perkin, Stobbe, Knoevenagel, Darzen, Reformatsky and benzoin condensations. Grignard, Cannizzaro, Wittig and Wittig-Horner reactions.Application of Cram's rule, Felkin-Ann model.

Unit V Reagents in organic synthesis **18h**

Applications of hydrogenation catalysts, hindered boranes, bulky metal hydrides. $NaCNBH_3$ DIBAL, Li trialkylborohydrides, tri-*n*-butyltin hydride, diimide, Lindlar catalysts and aluminium alkoxide. Rosenmund reduction and McFadeyan-Stevens reaction. Oxidation using SeO_2, lead tetraacetate, ozone, peracids, DDQ, manganese (1V) oxide, silver carbonate and Cr(V1) reagents. Swern oxidation, Moffatt oxidation, allylic and benzylic

oxidation.Sommelet reaction.Elbs reaction.Oxidative coupling of phenols.Chemo and regioselectivity in reductions and oxidations.

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18. R. O. C. Norman and J. M. Coxon, "Principles of organic synthesis," CRC Press, 1993.

CH213 PHYSICAL CHEMISTRY –I

90 h

Unit 1- Quantum Chemistry I 18 h

Classical mechanics and its limitations, need of quantum mechanics, concept of matter wave,de Broglie relation and its experimental proof, uncertainty principle and its consequences.

Postulates of Quantum Mechanics

State function postulate:Born interpretation of the wavefunction, well behaved functions, orthonormality of wave functions. Operator postulate: operator algebra, linear and nonlinear operators, Laplacian operator, commuting and non-commuting operators, Hermitian operators and their properties, eigen functions and eigen values of an operator. Eigen value postulate: eigen value equation, eigen functions of commuting operators. Expectation value postulate. Postulate of time-dependent Schrödinger equation, Quantization of angular momentum, quantum mechanical operators corresponding to angular momenta (Lx, Ly, Lz and L^2)-commutation relations between these operators.

Application of Quantum mechanics to Exactly Solvable Model Problems

Translational motion: free particle in one-dimension, particle in a box with infinite potential barrier- one dimensional box, three dimensional box and cubical box - degeneracy -particle with finite potential barriers-one potential barrier,two finite barriers, potential barriers of definite thickness-Quantum mechanical tunneling (Qualitative concept only)

Vibrational motion: one-dimensional harmonic oscillator (complete treatment), Hermite equation (solving by method of power series), Hermite polynomials, recursion relation, wave functions and energies-important features, Harmonic oscillator model and molecular vibrations.

Symmetric and antisymmetric wave functions, Pauli's antisymmetry principle, the postulate of spin. Spin orbitals. Spin-orbit coupling.

Vector atom model- Term symbols, explanation of spectral lines (for sand pblocks only)

Unit II Surface Chemistry and Catalysis 18 h

The Gas- solid inter phase,types of adsorption. Heat of adsorption and its determination, differences betweenchemisorption and physisorption. Adsorption isotherms-classical,

Freundlich and Langmuir isotherms. Thermodynamic and statistical derivation of Langmuir adsorption isotherm. Multilayer adsorption- the BET theory and Harkins- Juratheory.

Adsorption from solutions: Gibb's adsorption equation and its verification. Adsorption with dissociation. Adsorption with interaction between adsorbate molecules.

Different types of surfaces,Properties of surface phase. Thermodynamics of surface. Surface tension of solutions. Surfactants andmiscelles.Examination of surfaces using low energy electron diffraction, photoelectron spectroscopy, ESCA, scanning probe microscopy, Auger electron spectroscopy , SEM andTEM.

Surface films-different types, surface pressure and its measurement,surface potential and its measurementsand interpretation.Measurement of surface area of solids - Harkins – Jura absolute method, entropy method andthe point B method. Use of Langmuir, BET and Harkins – Jura isotherms for surface areadetermination.

Catalysis: Mechanism and theories of homogeneous and heterogeneous catalysis. Enzymecatalysis, bimolecular surface reactions. Langmuir – Hinshelwood mechanism, instrumental methods of catalyst characterization- diffraction and thermal methods,spectroscopic and microscopic techniques.

Unit 1II: Classical Thermodynamics 18 h

Entropy- dependence of entropy on variables of a system (S,T and V; S,T and P). Thermodynamic equations of state. Criteria for equilibrium and spontaneity, Euler's relation, Gibbs and Helmholtz free energy, Maxwell relations and significance, temperature dependence of free energy, Gibbs Helmholtz equation and its applications.

Partial molar quantities: chemical potential, Gibbs-Duhem equations, determination of partial molar properties –partial molar volume and partial molar enthalpy.

Fugacity- relation between fugacity and pressure, determination of fugacity of a real gas, variation of fugacity with temperature and pressure. Fugacity of liquid mixtures, fugacity of mixture of gases, Lewis Randall rule.

Activity, activity coefficients, dependence of activity on temperature and pressure. Determination of activity and activity coefficients of electrolytes and non electrolytes

Thermodynamics of mixing, Duhem-Margules equation, Konowaloff'srule, Henry's law, excess thermodynamic functions- Determination of excess enthalpy and volume.

Chemical affinity and thermodynamic functions, effect of temperature and pressure on chemical equilibrium- van't Hoff reaction isochore and isotherm.

Unit IV Chemical kinetics **18 h**

Theories of reaction rates: Collision theory and its failure,. Transition state theory-Eyring equation. Comparison of the two theories. Thermodynamicformulation of the reaction rates. potential energysurfaces

Theories of unimolecular reactions- Lindemann theory,Lindemann-Hinshelwood mechanism, qualitative idea of RRKM theory,

Kinetics of complex reactions-parallel reactions,opposing reactions,consecutive reactions and chain reactions, steady state treatment, kinetics of H_2-Cl_2 and H_2-Br_2 reactions, decompositions of ethane , acetaldehyde and N_2O_5. Rice-Herzfeld mechanism, branching chain reactions Hinshelwood mechanism of chain reactions and explosion.

Fast reactions: Relaxation method, relaxation spectrometry, flow method, shockmethod, fast mixing method, field jump method, pulse method, Flash photolysis and NMRmethod.

Reactions in solution: Factors affecting reaction rates in solutions, effect ofdielectric constant and ionic strength, cage effect, Bronsted-Bjerrum equation,primary and secondary kinetic salt effect, influence of solvent on reaction rates,significance of volume of activation, linear free energy relationship. Hammet equation and Taft equation.

Photochemistry: Effect of radiation on the rate of reaction,Jebalonski diagram, Laws of photochemistry. Quantumyield. Experimental determination of quantum yield.Fluorescence and phosphorescence, Quenching of fluorescence, Stern-Volmer equation.

Unit V Gaseous and liquid state **18 h**

Maxwell's distribution of molecular velocities,influence of temperature on molecular velocities, types of molecular velocities-average velocity and most probable velocity and its determination from Maxwell's equation

Transport phenomena in gases-viscosity of gases, Chapman equation, determination of viscosity of gases, calculation of mean free path, Thermal conductivity, diffusion, Degrees of freedom of gaseous molecules - Transilational, Rotational and vibrational. Equation of state of real gases-van der Waal's equation, Other equation of states—Radlich-Kwong equation, Clausius equation, Virial equation, second virial coefficient and determination of diameter of a molecule.

Inter molecular forces—dipole-dipole interaction, induced dipole- dipole, induced dipole-induced dipole interactions

Liquid state Liquid vapour equillibria, vapour pressure- methods of measuring vapour pressure - barometric method and dynamic method - equation of state for liquids, structure of liquids, X-ray diffraction of liquids-vacancy model for a liquid, pair correlation function, surface tension , determination of surface tension, drop weight method and drop number method, viscosity, determination of coefficient of viscosity using Ostwald viscometer.

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CH 214 –INORGANIC CHEMISTRY PRACTICALS -1

Total 125 h

1. Separation and identification of rare/less familiar cations such as Ti, W, Mo, Th, Zr, V, U and Li
2. Volumetric estimation using EDTA, ammonium vanadate, ceric sulphate etc.
3. Colorimetric estimation of Cr, Fe, Mn, Ni, Cu etc.
4. Preparation of metal complexes: selection can be made from the following or any other from the existing literature.

    - $[Co(NH_3)_6]Cl_3$
    - $[Cu(NH_3)_4]SO_4$
    - $K_3[Cr(C_2O_4)_3]$
    - $K_3[Fe(C_2O_4)_3]$
    - Cis and trans isomers of $[Co(en)_2Cl_2]Cl$
    - $[Cr(en)_3]Cl_3$

References

1. A. I. Vogel, A Text Book of Quantitative Inorganic Analysis, Longman, 4th edition, 1978.
2. A. I. Vogel, A Text Book of Qualitative Inorganic Analysis, Longman 5th edition, 1979.
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4. W. G. Palmer, Experimental Inorganic Chemistry, Cambridge University, 1959.

CH 215 ORGANIC PRACTICALS-1

Total 125 h

A . Separation and identification of organic compounds

1. Quantitative wet chemistry separation of a mixture of two components by solvent extraction

2. TLC of the purified samples along with the mixture in same TLC **plates (component 1 with mixture and component 2 with mixture on separate TLC plate) and** calculation of $R_f$values- Reporting and recording TLC in standard formats- preparation of sample solution, adsorbent, dimensions of the plate, saturation time, developing time, visualization and detection, R_f Value, Drawing - in the form of a table.

B. Separation of a mixture of by column chromatography (not for End semester evaluation)

1) Malachite green and methylene blue 2) *o*-nitroaniline and *p*-nitroaniline.

C. Preparation of compounds by two stages.

Recording/downloading UV,IR,^{1}H NMR and ^{13} C NMR and EI mass spectra of synthesized compounds.
TLC analysis- stage 1 reactants and products on TLC plate 1 and stage 2 reactants and products on plate 2)- Record TLC in standard format as in separation

All preparations must be restricted to 1 g level

Nitration

1) Acetanilide- ⟶ *p*-nitroacetanilide ⟶ *p*-nitroaniline

2) Methylbenzoate ⟶ methyl *m*-nitrobenzoate ⟶ *m*-nitrobenzoic acid

Bromination

3) Acetanilide- ⟶ *p*-bromoacetanilide ⟶ *p*-bromooaniline

Aldol condensation- Synthesis of heterocycles

4) benzaldehyde ⟶ Dibenzylideneacetone ⟶ 1,5-Diphenyl-3-styryl-2-pyrazoline

Diazocoupling

5) Aniline ⟶ Diazoaminobenzene ⟶ *p*-aminoazobenzene

Rerrangement

6) Pthalic anhydride - ⟶ Pthalimide ⟶ anthranilic acid

Synthesis of Dyes

7) N,N-Dimethylaniline ⟶ N,N-dimethyl-4-nitrosoaniline - ⟶ methylene blue

The board of examiners have to select either TLC of separated components *OR* TLC of preparation for an examination.But both TLC examinations are to be practiced and entered in the record of experiments

References

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2. D. L. Pavia, G. M. Lampman, G. S. Kriz and R. G. Engel, "A microscale approach to organic laboratory techniques," Wadsworth Publishing, 5th Edition, 2012.
3. R. K. Bansal, "Laboratory manual of organic Chemistry," Wiley Eastern, 1994
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5. F. G. Mann and B. C. Saunders, "Practical Organic Chemistry," Pearson Education, 2009
6. J. B. Cohen, "Practical organic chemistry," Forgotten Books, 2015
7. P. F Shalz, *Journal of Chemical Education* **1996**, *173*: 267.
8. Monograph on green laboratory experiments, DST, Government of India, pp 1-79.
9. For spectral data of organic compounds, see: http://sdbs.riodb.aist.go.jp/sdbs/cgi-bin/direct_frame_top.cgi.

CH 216 PHYSICAL PRACTICALS –I 125 h

Adsorption

Freundlich and Langmuir isotherms for adsorption of acetic/oxalic acid on active charcoal.

Determination of concentration of acetic/ oxalic acid.

Kinetics

Determination of rate constant of acid hydrolysis of methyl acetate.

Determination of Arrhenius parameters.

Determination of concentration of given acid.

Determination of rate constant of the saponification of ethyl acetate and evaluation of Arrhenius parameters.

Determination of rate constant of reaction between $K_2S_2O_8$ and KI.

Study the kinetics of iodination of acetone in acid medium.

Phase rule

Solid-liquid equilibria

Construction of phase diagram and determination of the composition of unknown mixture (naphthalene/biphenyl, naphthalene/benzophenone, naphthalene/diphenyl amine)

Construction of phase diagram with congruent melting point- naphthalene/metadinitrobenzene

Partially miscible liquid pairs- CST of phenol-water system.

Effect of impurities (KCl/ NaCl/ succinic acid) on the miscibility temperature of phenol-water system and hence the determination of concentration of given unknown solution.

Three component system- Construction of ternary phase diagram of acetic acid chloroform-water system and hence the composition of given homogeneous mixture. Construction of tie-line.

Distribution law

Distribution coefficient of ammonia between chloroform and water.

Determination of equilibrium constant of copper- ammonia complex by partition method or coordination number of Cu^{2+} in copper-ammonia complex.

Distribution coefficient of benzoic acid between toluene and water.

Distribution coefficient of iodine between hexane and water/$CHCl_3$ and water/ CCl_4 and water

Determination of the equilibrium constant of the reaction $KI + I_2 \leftrightarrow [KI_3]$ and hence the concentration of given KI in hexane and water/$CHCl_3$ and water/ CCl_4 and water.

Determination of hydrolysis constant of anilinium hydrochloride.

Dilute Solutions

Determination of K_f of solid solvent, molar mass of non-volatile solute, mass of solvent and composition of given solution (Solvent- Naphthalene/Biphenyl/ Benzophenone etc. Solute- Naphthalene/ Biphenyl/ Diphenylanmine etc)

Determination of vant Hoff's factor for benzoic acid in Naphthalene.

Determination of atomicity of sulphur.

Transition temperature

Determination of K_T of salt hydrate, molar mass of solute, mass of salt hydrate and composition of given solution (Solvent- $Na_2S_2O_3.5H_2O/CH_3COONa.3H_2O$, Solutes glucose,sucrose, urea)

Thermochemistry

Determination of the concentration of given strong acid/alkali.

Thermometric titration of NaOH Vs standard HCl.

Heat of displacement of Cu^{2+} by Zn.

Determination of the heat of ionisation of acetic acid.

References

1) V. D. Athawal, "Experimental Physical Chemistry", New Age International, 1st edn., 2001.

2) B. P. Levitt and J.A. Kitchener,"Findlay's Practical Physical Chemistry",Longmans, London, 9th edn.,1973.

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5) R.C.Das and Behera, "Experimental Physical Chemistry", Tata McGraw Hill, 1983.

6) B.Viswanathan, "Practical Physical Chemistry",Viva Publications, 2012.

7) P.S.Sindhu, "Practicals in Physical Chemistry-A Modern Approach", MacMillanIndia, 2005.

8) D. P. Shoemaker, C. W. Garland & J. W. Nibler. "Experiments in Physical Chemistry

First Semester M.Sc. Degree Examination – Model question paper
Branch – Chemistry
CH 211 : INORGANIC CHEMISTRY- I
(2016 Admission Onwards)
(Common for CH/CL/CA/CM 211)

Time : 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a), (b)** and **(c)** from **each** question carries **2** marks

1. a) What is meant by Nephelauxetic effect?

   b) Explain linkage isomerism with suitable example.

   c) What is meant by crystal field stabilization energy?

2. a) What do you mean by significant figure? How many significant figures are in the following?

   i) 0.0026
   ii) 6.023×10^{23}

   b) What are metallochromic indicators? Give an example.

   c) In a volumetric experiment the volumes of the titrant used are 9.98, 9.99, 9.98, 9.95, 10.00 and 10.02 mL. Calculate the standard deviation.

3. a) Identify the symmetry elements present in the following and assign the point group i) H_2O ii) HCl

   b) Explain improper axis of symmetry.

   c) What is meant by character table.

4. a) Explain the term ‘shape selectivity’.

   b) Give the preparation of $KrCl_4$ and KrO_2.

   c) What are zeolite? Explain their use as water softeners.

5. a) Brief the role of catalytic converters in automobiles.

   b) Explain the formation of photochemical smog.

   c) Mention the different regions of atmosphere. **(2x10= 20 marks)**

SECTION B

Answer either among **(a) or (b)** from **each** question carries **5** marks

6. a) State and illustrate Jahn Teller effect.

   b) Explain the crystal field theory of octahedral complexes.

7. a) Give a brief note on scatter diagram and its significance.

   b) Explain the titrations in non-aqueous solvents.

8. a) Construct the multiplication table for the symmetry operations of NH_3 molecule.

   b) State and explain orthogonality theorem.

9. a) Give an account of inter halogen compounds.

   b) Write a short note on silicones.

10. a) List out the major pollutants. Outline how they affect human health?

    b) Describe how we can quantify soil acidity.

(5x5= 25 marks)

SECTION C

Answer **any three** questions. **Each** question carries **10** marks

11. Explain the bonding in octahedral complexes with and without pi bonds using MO Theory.
12. Briefly explain the principle, instrumentation and applications of TG and DTA.
13. Construct the character table for C_{2v} and explain.
14. Write a short note on the preparation and properties of heteropoly acids of Mo and W.
15. What are Pourbaiux diagrams? Outline its role in explaining the chemistry of processes in lithosphere. **(10x3= 30 marks)**

FIRST SEMESTER MSc.DEGREE EXAMINATION

BRANCH - CHEMISTRY

CH/CL/CA/CM212: Organic Chemistry-I

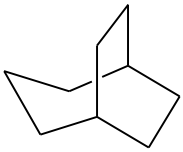
(2016 admission)

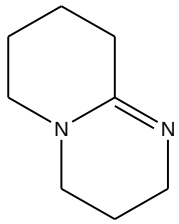
Time: 3 hours **Maximum marks:75**

Section A

Answer any two among (a), (b) and (c) from each question. Each sub question carries 2 marks

1 a) Write IUPAC names of the following.

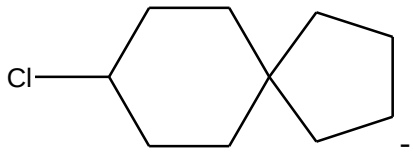




b) Indicate the element of symmetry present in each of the following molecules.

i)*trans*-1,4-dichlorocyclohexane-

ii)



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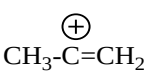
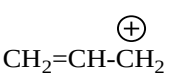
c)What is atropisomerism?

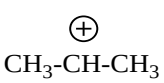
2. a) How arynes are formed?

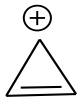
b)*p*-Nitroaniline is less basic than *m*-nitroanile, explain.

c)Arrange the following carbocations in order of increasing stability and give reasons.









3. a) What is SNi reaction?

b) Alkaline hydrolysis of $Et_2NCH(Cl)CH_2CH_3$ produces $Et_2NCH(Et)CH_2OH$. Account for this observation

c) Write two examples of non classicalcarbocations.

4 a) How would you prepare trans-1,2-dihydroxycyclohexane from cyclohexene?

b)Write the mechanism of benzoin condensation.

c) How can the E1CB pathway be distinguished from the kinetically indistinguishable E2 pathway?

5 a) Write two important reaction of $NaCNBH_3$

b) Explain the importance of DDQ in organic synthesis.

c) Explain Swern Oxidation **(2x10= 20 marks)**

Section B

Answer either (a) or (b) from each question. Each sub question carries 5 marks

6 a) Compare ORD and CD and explain their relationship

b) Write a note on stereochemistry of nitrogen compounds

7 a) Explain the Felkin-Ann model with an example

b)How carbenes are generated? Explain its structure and properties

8 a) Explain why anti Markonikoff's addition is not exhibited by HCl or HI when reacted with 1-butene?

b) After standing in aqueous acid *R*-2-butanol is found to have lost its optical activity. Account for this observation.

9 a) Write a note on cis and trans hydroxylation of alkenes

b) State Crams rule.Explain it with suitable example

10 a)Write a note on oxidation using SeO_2

b) Explain briefly the role of Lead tetra acetate in organic synthesis (**5x5= 25 marks)**

Section C

Answer **any three** questions. **Each** question carries **10** marks

11. Give a brief account on stereoselectivity, enantiomeric excess and chiral separation.

12 Explain the following

a. S_NAr mechanism , b) Orientation effect in aromatic electrophilic substitution

13. Discuss the following
a) competition between S_N1 and S_N2 b) Stereochemistry of nucleophilic substitution

14. Describe the following

a) Mechanism with evidences of aldol condensation

b) Wittig reactions and applications

15. Write a note on a) Sharpless asymmetric epoxidation

b) Chemoselectivity in reduction reactions **(10x3= 30 marks)**

First Semester M.Sc. Degree Examination (Model Question Paper)

Branch-III Chemistry
Branch-IV: Analytical Chemistry
Branch-V: Applied Chemistry
CH 213/CL 213/CA 213 : Physical Chemistry- 1
(2016 Admission Onwards)
I

Time: 3 h Max.Marks:75

Section A

Answer any two from **a,b,c**, of each question. Each sub question carries **2** marks.

(10 x 2 = 20 marks)

1. (a)Calculate de Broglie wave length of mass 1 mg moving with a velocity of 10 m s^{-1}

   (b) What is an operator? Give example.

   (c) Write spectroscopic term symbol for the ground state of O atom

2. (a) What is the principle of photoelectron spectroscopy?

   (b) Write the B.E.T theory of multilayer adsorption kjhh

   (c) Write the different types of adsorption? Explain

3. (a) Define chemical potential

   (b) State Lewis –Randall rule of fugacity

   (c) Write Konowaloff's rule

4. (a) How is nmr spectroscopy made use of in the study of fast reactions?

   (b) What is steady state approximation?

   (c) Define quantum yield

5. (a) What is the effect of temperature on the distribution of molecular velocities of a gas? Explain.

   (b) Calculate the root mean square velocity of nitrogen at 27^0C

   (c) Write the virial equation of state. Explain the terms

Section B

Answer either **a** or **b** of each question. Each question carries **5** marks.

(5 x 5 = 25 marks)

6. (a) Explain Quntaum mechanical Tunneling

   (b) Write kinetic energy operator. Show that it is a Hermition operator

7. (a) Write any two methods for the determination of surface area of a solid

   (b) Explain Langmuir-Hinshelwood mechanism of surface catalysed reaction

8. (a) Define fugacity. Write the method for the determination of fugacity of a gas

   (b) Derive Gibbs Duhem equation

9. (a) Explain Jabalonski diagram

   (b) Derive the rate law for the decomposition of N_2O_5

10. (a) Calculate the viscosity of O_2 at 25^0C. The molecular diameter is 3.6A

    (b) Write any one method for the determination of surface tension of liquid

Section C

Answer any **three** questions. Each question carries **10** marks.

(3 x 10 = 30 marks)

11. Apply Schrodinger Wave equation for a simple harmonic oscillator. Find eigen values and eigen functions

12. Explain any two methods using for surface analysis

13. Write a brief account of the methods for the determination of activity coefficient of electrolytes and non electrolytes

14. Explain chain reactions. Discuss Seminoff Henshelwood theory of branching chain reactions

15. Discuss viscosity of a gas and Chapman equation. How can we calculate mean free path and collision diameter from viscosity determination

SEMESTER II

CH 221 INORGANIC CHEMISTRY –II

Total 90 h

Unit I Sulphur, nitrogen, phosphorus and boron compounds 18 h

Sulphur-nitrogen compounds: Tetrasulphur tetranitride, disulphur dinitride and polythiazyl S_xN_y compounds. S-N cations and anions. Sulphur-phosphorus compounds: Molecular sulphides such as P_4S_3 , P_4S_7 , P_4S_9 and P_4S_{10} . Phosphorous-nitrogen compounds: Phosphazines. Cyclo and linear phosphazines. Boron-nitrogen compounds: Borazine, substituted borazines and boron nitride. Boron hydrides: Reactions of diborane. Structure and bonding. Polyhedral boranes: Preparation, properties, structure and bonding. The topological approach to boron hydride structure. *Styx* numbers. Importance of icosahedral framework of boron atoms in boron chemistry. Closo, nido and arachno structures.Wade's rules. Carboranes and metallocarboranes.

Unit II Coordination chemistry-II: Spectral and magnetic properties of transition metal complexes 18 h

Electronic spectra of metal complexes- Term symbols of d^n system, Racah parameters, splitting of terms in weak and strong octahedral and tetrahedral fields. Correlation diagrams for d^n and d^{10-n} ions in octahedral and tetrahedral fields (qualitative approach), *d-d* transition, selection rules for electronic transition-effect of spin orbit coupling and vibronic coupling Interpretation of electronic spectra of complexes- Orgel diagrams, Tanabe-Sugano diagrams, Calculation of *Dq , B* and β (Nephelauxetic ratio) values, charge transfer spectra. Magnetic properties of complexes-paramagnetic and diamagnetic complexes, molar susceptibility, Gouy's method for the determination of magnetic moment of complexes, spin only magnetic moment. Temperature dependence of magnetism. Temperature Independent Paramagnetism (TIP). Spin state crossover, Antiferromagnetism-inter and intra molecular interaction. Application of magnetic measurements in the determination of structure of transition metal complexes.

Unit III Crystalline state **18 h**

Crystal systems and lattice types. Bravais lattices. Crystal symmetry- Introduction to point groups and space groups. Miller indices. Reciprocal lattice concept. Close packed structures: BCC, FCC and HCP. Voids. Coordination number. Crystal binding: Molecular, covalent, metallic and hydrogen bonded crystals. X- Ray diffraction by crystals: Function of crystals. Transmission grating and reflection grating. Braggs equation. Diffraction methods: Powder and rotating crystal. Indexing and determination of lattice type and unit cell dimensions of cubic crystals. Crystal defects: Perfect and imperfect crystals. Point, line and plane defects. Thermodynamics of Schottky and Frenkel defects. Colour centers in alkali halide crystals. Defect clusters. Extended defects: Crystallographic shear structure and stacking faults. Dislocations and crystal structure. Structure of compounds of AX (Zinc blende, Wurtzite) , AX_2 (Rutile, fluorite, antifluorite), A_mX_2 (Nickel arsenide), ABX_3 (Perosvskite, Ilmenite). Spinels. Inverse spinel structures.

Unit IV Lanthanides and actinides **18 h**

Lanthanides: Characteristic properties. Electronic configurations and term symbols. Occurrence and extraction. Separation techniques. Oxidation states. Spectral and magnetic properties. Shapes of f orbital and their splitting in cubic ligand field. Lanthanide complexes as shift reagents. Actinides: Occurrence and general properties. Extraction of thorium and uranium. Electronic configuration and term symbol. Oxidation states. Spectral and magnetic properties. Comparative properties of lanthanides and actinides. Trans-uranium elements and their stabilities. Applications of lanthanide and actinide compounds. Comprehensive study of the beach sands of Kerala and their important components such as monazite, ilmenite, zircon and sillimanite.

Unit V Solid state chemistry **18 h**

Electronic structure of solids. Free electron theory, band theory. Refinements to simple band theory, k space and Brillouin zones. Conductors, insulators and semiconductors. Band structure of conductors, insulators and semiconductors and their applications. Intrinsic and extrinsic semiconductors, doping of semiconductors and conduction mechanism, the band gap, temperature dependence of conductivity, carrier density and carrier mobility in semiconductors, Superconductivity, Photoconductivity, Photovoltaic effect. Colour in

inorganic solids. Dielectric properties. Dielectric materials. Ferroelectricity, pyroelectricity, piezoelectricity and ionic conductivity. Applications of ferro, piezo and pyroelectrics.

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1. F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, John Wiley and Sons, 6th edition, 1999.
2. J. E. Huheey, Inorganic Chemistry- Principles of Structure and Reactivity, Harper Collins College Publishing, 4th edition, 2011.
3. S. F. A. Kettle, Physical Inorganic Chemistry, Oxford University Press, 1st edition, 1998.
4. A. R. West, Solid State Chemistry and its Applications, Wiley Eastern, 1990.
5. H. J. Emeleus and A. G. Sharp, Modern Aspects of Inorganic Chemistry, Van Nostrand, 4th edition,1973.
6. L. V. Azaroff, Introduction to Solids, Mcgraw-Hill, 1960.
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12. A. Earnshaw, Introduction to Magnetochemistry, Academic Press, 1968.

CH 222 ORGANIC CHEMISTRY- II

Total 90 h

Unit I Physical organic chemistry 18 h

Reactivity in relation to molecular structure and conformation.Steric effects.*F* strain.Ortho effect, Bond angle strain.Linear free energy relationships.The Hammett equation and its applications.Taft equation.Solvent polarity and parameters.Y, Z and E parameters and their applications.Primary and secondary kinetic isotope effects.Salt effects and special salt effects in SN reactions.Kinetic and thermodynamic control of reactions. Energy profiles, Hammond postulate. Principle of microscopic reversibility.Marcus theory.Methods of determining reaction mechanisms. Phase transfer catalysis and its applications.

Unit II Molecular rearrangement and transformation reactions 18h

Types of organic rearrangements: Anionic, cationotropic, prototropic, free radical, carbene and nitrene intermediates. Mechanism with evidence of Wagner-Meerwein, Pinacol, Demjanov, Hofmann, Curtius, Schmidt, Lossen, Beckmann, Wolf, Fries, Fischer-Hepp, Hofmann-Martius, von-Richter, Orton, Bamberger, Smiles, Dienone-phenol, Benzilic acid, Benzidine, Favorskii, Stevens, Wittig, Sommelet-Hauser, Bayer-Villiger rearrangements.

Unit III Aromaticity and symmetry controlled reactions 18 h

Aromaticity and antiaromaticity.Homo, hetero and non-benzenoid aromatic systems. Aromaticity of annulenes, mesoionic compounds, metallocenes, cyclic carbocations, carbanions.

Symmetry properties of MOs. Classification of pericyclic reactions.Mechanism and stereochemistry of electrocyclic, cycloaddition and sigmatropic reactions. Woodward-Hoffmann rules. FO, CD and Huckel-Mobius analysis of electrocyclic, cycloaddition and sigmatropic reactions.FO analysis of [1, j] and [3, 3] migrations. 1,3-dipolar cycloaddition. Stereo aspects of Diels-Alder reaction and Cope re arrangement.Intramolecular Diels-Alder, Retro Diels-Alder, Alder-ene, retro-ene andcheletropicreactions.Synthetic applications of Diels-Alder reactions.Fluxional molecules.

Unit IV Organic photochemistry **18 h**

Photochemical processes**.**Energy transfer, sensitization and quenching. Singlet and triplet states and their reactivity. Photoreactions of carbonyl compounds, enes, dienes and arenes.Norrish Type I and Type II reactions of acyclic ketones. Free radical reactions:Patterno-Buchi and Barton reactions, photo-Fries and Di-π methane rearrangements. Photoreactions of Vitamin D. Photosynthesis, photochemistry of vision.Singlet oxygen generation and their reactions.Introduction to chemiluminescence.Applications of photochemistry.

Unit V Chemistry of natural products and biomolecules **18 h**

Introduction to primary and secondary metabolites in plants.Extraction methods of chemical constituents from plants, such as fractionation using solvents, specific extraction of alkaloids and supercritical fluid extraction.Characterizations of isolated compounds (terpenes, sterols, alkaloids, carbohydrates, flavonoids and poly phenols) by colour reactions and spray reagents.Biosynthesis of terpenes from mevalonic acid and sterols from squalene. Structure elucidation of ocimene, classification of pigments, structure elucidation of β-carotene. Structural differences between a triterpene and a sterol.Synthesis of quercetin, synthesis of testosterone, androsterone, estrone and progesterone.Determination of carbon skeleton of alkaloids (Hofmann, Emde and Von Braun degradation methods).Structural elucidation of ephedrine, nicotine, atropine.

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1. L. M. Harwood, “Polar rearrangements,” Oxford University Press 1995.
2. M. B. Smith, “March’s advanced organic chemistry,” 7th Edition, Wiley, 2013.
   J. Clayden, N. Greeves, and S. Warren, “Organic Chemistry,” 2ndEdition, Oxford University Press, 2012.
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CH 223 PHYSICAL CHEMISTRY –II 90 h

Unit I

Quantum Chemistry II

18 h

Rotational motion: Cartesian and spherical polar coordinates. The wave equation in spherical polar coordinates - particle on a ring, the phi equation and its solution, wave functions in the real form. Non-planar rigid rotor (or particle on a sphere)-separation of variables, the phi and the theta equations and their solutions, Legendre and associated Legendre equations, Legendre and associated Legendre polynomials. Spherical harmonics (imaginary and real forms)-polar diagrams of spherical harmonics.

Quantum Mechanics of Hydrogen-like systems-Potential energy of hydrogen-like systems. The wave equation in spherical polar coordinates: separation of variables-R, theta and phi equations and their solutions, wave functions and energies of hydrogen-like systems. Orbitals-radial functions, radial distribution functions, angular functions and their plots**.** Wave equation for multielectron systems**.** Hartree-Fock Self- Consistent Field (HF-SCF) method for atoms, Hartree-Fock equations (derivation not required) & the Fock operator.

Unit II Spectroscopy –I **18 h**

Microwave spectroscopy: Rotational spectrum, intensity of spectral lines, calculation of internuclear distance. Non-rigid rotors and centrifugal distortion. Rotational spectra of polyatomicmolecules-linear and symmetric top molecules. Introduction to instrumentation.

Vibrational Spectroscopy: Vibrational spectra of harmonic and anharmonic oscillator.Selection rules. Morse curve, fundamentals and overtones. Determination of force constant.Rotational fine structure, P,Q,R branches of spectra.Vibrational spectra of polyatomic molecules: Normal modes, classification of vibrationalmodes into stretching (asymmetric, symmetric), bending, parallel and perpendicularvibrations. Finger print region and group frequencies. Introduction to FTIR andinstrumentation.

Raman spectroscopy: Raman scattering, polarisability and classical theory of Ramanspectrum. Rotational and vibrational Raman spectrum. Raman spectra of polyatomicmolecules. Complementarity of IR and Raman spectra. Mutual exclusion principle.Introduction to instrumentation. Laser Raman spectrum.

Electronic spectra. Electronic spectra of diatomic molecules. Vibrational coarse structure androtational fine structure of electronic spectrum. Franck-Condon principle. Types of

electronictransitions. Fotrat diagram. Predissociation. Calculation of heat of dissociation.Electronic spectra of polyatomic molecules: Electronic transition among molecular orbitalsand absorption frequencies. Effect of conjugation. Introduction to instrumentation.Simultaneous determination of two components.

Unit III Applications of Thermodynamics 18 h

Thermodynamics of irreversible processes: Simple examples of irreversible processes. General theory of non equilibrium processes The phenomenological relations. Onsager reciprocal relation. Generalized equation for entropy production, Entropy production from heat flow, matterflow and current flow. Application of irreversible thermodynamics to diffusion. Thermal diffusion, Thermo osmosis and thermomolecular pressure difference. Electro kinetic effects, the Glansdorf- Pregogine equation. Far from equilibrium region. Principle of minimum entropy production, Le-Chatelier Bra(u)wn Principle.

Three component systems: Graphical representation. Three component liquid systems with one pair of partially miscible liquids. Influence of temperature. Systems with two pairs and three pairs of partially miscible liquids.

Solid- Liquid systems: Two salts and water systems- no chemical combination, double salt formation, one salt forms a hydrate, double salt forms hydrate, Isothermal evaporation.

Unit IV Statistical Mechanics –I 18 h

Microstates. Concept of ensembles Canonical and Grand canonical ensemble. Classical distribution of particles-Maxwell Boltzmann distribution.

Bose-Einstein statistics, Bose-Einstein distribution. Thermodynamic probability, Bose Einstein distribution function. Examples of particles. Theory of Para magnetism. Bose Einstein condensation, Liquid Helium. Super cooled liquid.

Fermi- Dirac Statistics. Fermi- Dirac distribution, examples of particles Fermi-Dirac distribution functionThermionic emission. Relation between Maxwell Boltzmann, Bose Einstein and Fermi -Dirac Statistics.

.**Unit V Electrochemistry** 1 **18 h**

Ionics- Ions in solution. Deviation from ideal behaviour. Ionic activity. Ion-solventinteraction. Born equation. Ion-ion interaction. Strong electrolytes Debye-Huckel theory of strong electrolytes,Onsager equation. Limitation of the model Conductance at highfrequencies and high potentials –Wein effect--Activity coefficient and its determination.

Ionic strength, Debye-Huckel limiting law. Equation for appreciable concentration. Osmotic coefficient. Activities in concentrated solutions. Ion associations. Ion transport.

Electrodics: Different type of electrodes. Origin of electrode potential, Electrochemical cells, Concentration cells and activity coefficient determination. Liquid junction potential. evaluation of thermodynamic properties, the electrode double layer, Electrode-electrodeinterface. Theory of multilayer capacity. Electrocapillarity. Lippmann potential and membrane potential.

Electrokinetic phenomena. Mechanism of charge transfer at electrode- electrolyte interface. Electrolysis. Current- potential curve. Dissolution, deposition and decomposition potentials.Energy barriers at metal –electrolyte interface. Different types of overpotentials. Butler-Volmer equation. Tafel and Nernst equation. Rate determining step in electrode kinetics. The hydrogen and oxygen over voltage. Theories of overvoltage.

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20. P.W.Atkins, “Physical Chemistry”, Oxford University Press, 1978.
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SECOND SEMESTER MSc.DEGREE EXAMINATION

Branch:Chemistry

(Common for CH/CL/CA/CM 221)

(Under Semester System w.e.f 2016 Admissions)

CH 221- INORGANIC CHEMISTRY-II

Time:3 h **Max marks:75**

SECTION-A

Answer any two among (a), (b), and (c) from each question. Each sub-question carries 2 marks.

1. a) Classify the following as closo, nido, arachno or hypho.

   1) B_5H_9 2) B_5H_{11} 3) B_6H_{12} 4) B_9H_{15}.

   b) Which sulphur –nitrogen compound is known as 'one-dimensional' metal? Why is it called so?

   c) Why are $P_4N_4Cl_8$ puckered and $P_4N_4F_8$ planar?

2. a) How would you distinguish between ferro magnetic and anti ferromagnetic material?

   b) Explain non-crossing rule.

   c) The effective magnetic moment of a complex is 4.90 BM. Calculate the no: of unpaired electron per unit complex.

3. a) What is the type of defect observed in AgBr crystals? Why?

   b) Give one example each for molecular, covalent, metallic and H-bonded crystals.

   c) Differentiate between H-centre and v-centre in NaCl crystals.

4. a) Write any two differences between 4f and 5f orbitals.

   b) Give the term symbols for Eu^{3+} and Lu^{3+}.

   c) Explain why Actinides have greater tendency for complex formation than lanthanides?

5 . a) What is band gap?

   b) Draw the first Brillouin zone for a primitive cubic lattice?

   c) Conductivity of metals decreases with increase of temperature. Explain.

[2 x 10 = 20 marks]

SECTION-B

Answer either (a) or (b) of each question carries 5 marks.

6. a) How is diborane prepared? Discuss the structure and bonding in diborane.

   b) Write a note on metallocarboranes.

7. a) Describe the Guoy's method to determine magnetic susceptibility . How are these measurements used to calculate effective magnetic moments?

   b) Even though d-d transitions are forbidden, why such transitions occur in many transition metal complexes? Illustrate with examples.

8. a) Distinguish between spinels and inverse spinels with suitable examples.

   .b) Write briefly on line and plane defects in solids.

9. a) Briefly discuss the basis of the ion-exchange method for the separation of Lanthanides.

   b) Compare the spectral and magnetic properties of Lanthanides and Actinides.

10. a) With suitable examples explain the phenomenon of photoconductivity. What are its applications?

    b) Write a short note on the applications of ferro, piezo and pyroelectrics.

[5x 5 = 25 marks]

SECTION-C

Answer any three questions and each question carries 10 marks.

11. How is Borazine prepared? Discuss its structure and compare the bonding with phosphazene molecule.

12 . Write an account on the selection rules and characteristics of d-d transition and application of each electronic spectra in elucidating the structure of metal complexes.

13 . Discuss briefly on the packing of atoms and ions in solids.

14. a) Correlate the oxidation states and ionic radii with electronic configuration of lanthanides.

    b) Write a short note on the beach sands of kerala.

15. Discuss the salient features of band theory of solids and compare it with the free electron theory of solids.

[10x3 = 30 marks]

SECOND SEMESTER MSc.DEGREE EXAMINATION

BRANCH - CHEMISTRY

CH/CL/CA/CM222: Organic Chemistry-II

(Under Semester System w.e.f 2016 Admissions)

Time-3 hours **Maximum marks :75**

Section A

Answer any two among a), b) and c) from each question.
Each sub-question carries ,2 marks.

1. a) Give the mechanism of rearrangement of aryl hydroxylamines to aminophenols.

   b)Describe Stevens rearrangement.

   c)Show the mechanism involved in the rearrangement of an unsubstituted amide to a primary amine.

2. a) Explain why cyclodecapentaene with 10 π electrons is not aromatic.

   b)Write briefly on Homoaromaticity.

   c) State Woodward Hoffmann rules.

3. a) Explain Phosphorescence.

   b) Write a short note on Norrish type I reaction.

   c) Describe anyone method of generation of singlet oxygen.

4. a) Explain von Braun reaction.

   b)Show the products formed when Quercetin is treated with dimethyl sulphate followed by boiling with ethanolic KOH.

   c)Draw the structure of CholesteroI.

5. a) Explain Taft equation

   b) Describe salt effect in substitution reaction

   c) State Marcus theory

[2x10=20 marks]

Section B

Answer either a) or b) of each question, and each question carries 5 marks.

6. a) Discuss the mechanism and applications of Baeyer Villiger reaction.

   b) Discuss the mechanism of Benzidine rearrangement. Also write proof to support the mechanism.

7. a) Explain the acidity of Cyclopentadiene and Cycloheptatriene.

b) Explain briefly Claisen rearrangement.

8. a) Briefly explain Barton reaction.

b) Explain the photochemistry of olefins.

9. a) Discus the structure elucidation of Carotene.

b) Briefly describe the biosynthesis of terpenes.

10. a) Explain kinetic and thermodynamic control in reactions involving ketones.

b)Explain the reason for the difficulty in the hydrolysis of 2, 6 - disubstituted benzoic acid esters.

[5x5=25 marks]

SECTION-C

Answer **any three** questions and **each** question carries 10 marks.

11. i) Discuss the mechanism and applications of Beckmann rearrangement.

ii) Discuss the similarity in the intermediates of Curtius, Schmidt and Lossenrearrangements.

12 Explain briefly on

i) Sigmatropic reactions

ii) 1, 3 - Dipolar and Ene reactions.

13.Discuss the following:

i) Photochemistry of vision

ii) Photoreaction of Vitamin D.

14. Explain the following:

i) Structure of Estrone.

ii) Chemical, spectroscopic and chiroptical methods for establishing carbon skeleton.

15. Discuss the following:

i) Principles and applications of phase transfer catalysis.

ii) Methods of determination of reaction mechanism.

[10x3=30 marks]

Second Semester M.Sc. Degree Examination (Model Question Paper)

Branch-III Chemistry

Branch-IV: Analytical Chemistry

Branch-V: Applied Chemistry

CH 223/CL 223/CA 223 : Physical Chemistry- II

(2016 Admission Onwards)

Time : 3 Hours **Max mark : 75**

Section A

Answer any two among **(a)**, **(b)** and **(c)** from each question. **Each** sub-division carries **2** marks .

1. a) Set up the Schrodinger equation for a rigid rotator.
   b) Give plots of (a) radial probability distribution functions of 2S orbital and (b) angular plot of $2P_x$ orbital.
   c) Write the expression for fock operator and explain the terms
2. a) What are overtones? Why are they weak?
   b) State and explain the rule of mutual exclusion with one example.
   c) State Franck-Condon principle.
3. a) Explain the terms 'Force' and 'Flux' with reference to irreversible thermodynamics.
   b) Show the influence of temperature on the miscibility curve in a three component system forming a pair of partially miscible liquids.
   c) What are the conditions under which linear relations are valid to understand irreversible processes.
4. a) Derive ideal gas law from translational partition function.
   b) Explain the term canonical ensemble.
   c) Electron would never follow Maxwell Boltzmann statistics. Why?
5. a) What is Lippmann potential? How does it arise?
   b) Calculate the mean activity coefficient of 0.01M $BaCl_2$ in water at 25^oC.
   c) Explain the origin of concentration overpotential.

(10 X 2 = 20 Marks)

Section- B

Answer either **(a)** or **(b)** of each question and each question carries **5** marks

6. a) Explain self-consistent field method to solve many electron systems.

b) Write the Schrodinger equation for hydrogen atom in polar coordinates and separate the variables.

7. a) Explain the principle and application of Laser Raman Spectrum.
   b) Explain the origin of P and R branches in rotational-vibrational spectrum.
8. a) Derive generalized equation for entropy production from heat flow.
   b) Give the Onsagar-reciprocal relations. What are its applications?
9. a) Apply Fermi-Dirac statistics to understand paramagnetism in solids.
   b) Derive the expression for partition function for particle executing (i) free linear motion and (ii) free linear harmonic vibration.
10. a) Derive Debye-Huckel limiting law.
    b) Discuss the various models for electrical double layer.

(5 X 5 = 25 Marks)

Section-C

Answer **any three** questions and **each** question carries **10** marks

11. (i) Apply Schrodinger equation for particle in a ring. Find eigen values and eigen functions.
    (ii) Show that any two associated Legendre functions satisfy orthonormality condition.
12. (i) Give an account of rotation spectra of diatomic molecules. Explain the effect of nonrigidity of the bond on the spectra.
    (ii) How is the rotational spectrum of a diatomic molecule affected by isotopic substitution?
13. (i) Draw the phase diagram of a three component liquid system with three pairs of partially miscible liquids. Explain.
    (ii) How would you understand (a) thermo osmosis and (b) thermal diffusion from irreversible thermodynamics?
14. Derive the expression for the distribution function of a Boson and Bose-Einstein condensation.
15. (i) Derive Butler-Volmer equation. Deduce the expression for the low and high field limits of this equation.
    (ii) Discuss the application of Debye-Huckel Onsagar equation as applied to strong electrolytes and point out its limitations.

(10 x 3 = 30Marks)

SEMESTER III

CH 231 INORGANIC CHEMISTRY- III

Total 90 h

Unit I Organometallic compounds 18h

Nomenclature of organometallic compounds. Hapto nomenclature. 18 and 16 electron rule, isoelectronic and isolobal analogy. Types of metal complexes. Metal carbonyls, bonding in metal carbonyls. Bonding in metal nitrosyls and cyanides. Synthesis, structure and bonding of polynuclear carbonyls with and without bridging. Complexes with linear π donor ligands: Olefins, acetylenes, dienes and allyl complexes. Complexes with cyclic π donors: Cyclopentadiene, benzene complexes, structure and bonding of ferrocene and dibenzenechromium complexes (MO treatment). Oxidative addition and reductive elimination, insertion and elimination reactions Catalysis by organometallic compounds: Alkene hydrogenation using Wilkinson's catalyst, hydroformylation of olefins using cobalt catalyst and polymerization reaction by Ziegler-Natta catalyst. Fluxional molecules.

Unit II Coordination chemistry-III: Reactions of metal complexes 18 h

Energy profile of a reaction - Thermodynamic and kinetic stability, Stability of complex ions in aqueous solutions: Formation constants. Stepwise and overall formation constants. Factors affecting stability of complexes. Determination of stability constants: spectrophotometric, polarographic and potentiometric methods. Stability of chelates. Thermodynamic explanation, macrocyclic effects. Classification of ligand substitution reactions -kinetics and mechanism of ligand substitution reactions in square planar complexes, trans effect- theory and synthetic applications. Kinetics and mechanism of octahedral substitution- water exchange, dissociative mechanism, associative mechanism- Eigen-Wilkins mechanism, Eigen-Fuoss equation, base hydrolysis, racemisation and isomerisation reactions. Electron transfer reactions: Outer sphere mechanism- Marcus theory, inner sphere mechanism- Taube mechanism. Photochemical reactions- substitution and redox reactions of Cr(III) , Ru(II) , and Ru(III) complexes. Photo-isomerisation and photo-aquation reactions of metal complexes

Unit III Bioinorganic chemistry **18 h**

Essential and trace elements in biological systems, structure and functions of biological membranes, mechanism of ion transport across membranes, sodium-potassium pump. Photosynthesis, porphyrin ring system, chlorophyll, PS I and PS II. Synthetic model for photosynthesis. Role of calcium in biological systems. Oxygen carriers and oxygen transport proteins- haemoglobin and myoglobin. Non-haeme iron-sulphur proteins involved in electron transfer-ferredoxin and rubredoxin. Iron storage and transport in biological systems- ferritin and transferrin. Redox metalloenzymes-cytochromes, peroxidases and superoxide dismutase and catalases. Nonredox metalloenzymes- CarboxypeptidaseA-structure and functions. Nitrogeases, biological nitrogen fixation. Vitamin B_{12} and coenzymes. Toxic effects of metals(Cd, Hg, Cr and Pb).

Unit IV Spectroscopic Methods in Inorganic Chemistry **18 h**

Infrared spectra of coordination compounds. Structural elucidation of coordination compounds containing the following molecules/ ions as ligands- NH_3, H_2O, CO, NO, OH^-, $SO4^{2-}$, CN^-, SCN^-, NO_3^-, NO_2^- CH_3COO^- and X^- (X= halogen). Changes in ligand vibration on coordination with metal ions. Vibrational spectra of metal carbonyls- CD and ORD spectra of metal complexes. ESR spectra : Application to Cu(II) complexes and inorganic free radicals such as PH_4, F_2^- and $[BH_3]^-$. Nuclear Magnetic Resonance Spectroscopy :The contact and pseudocontact shifts, some applications including biological systems, an overview of NMR of metal nuclides with emphasis on $_{31}P$ and $_{19}F$ NMR. Mossbauer Spectroscopy : Application of the technique to the studies of iron and tin complexes.

Unit IV Nuclear chemistry **18 h**

Nuclear structure, mass and charge. Nuclear moments. Binding energy. Semiempirical mass equation. Stability rules. Magic numbers. Nuclear models: Shell, Liquid drop, Fermi gas, collective and optical models. Equation of radioactive decay and growth. Half life and average life. Radioactive equilibrium. Transient and secular equilibria. Nuclear reactions: Direct nuclear reactions, heavy ion induced nuclear reactions, photonuclear

reactions. Neutron captures cross section and critical size. Nuclear fission as a source of energy, Nuclear chain reacting systems. Principle of working of the reactors of nuclear power plants. Breeder reactor. Nuclear fusion reaction, stellar energy. Principles of counting technique such as G.M. counter, proportional, ionization and scintillation counters. Cloud chamber.

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CH232 ORGANIC CHEMISTRY-III

Total 90 h

Unit IUV-Vis and IR Spectroscopy and Mass spectrometry 18h

Electronic transitions and analysis of UV spectra of enes, enones and arenes.Woodward-Fieser rules.Effect of solvent polarity on UV absorption.Principle of characteristic group frequency in IR.Identification of functional groups and other structural features by IR, Hydrogen bonding and IR bands.Sampling techniques.Mass spectrometry- EI, CI, FAB, Electrospray and MALDI ion sources.Magnetic, High resolution (Double focusing), TOF and quadrupole mass analysers.Characteristic EIMS fragmentation modes and MS rearrangements. Mass spectral fragmentation patterns of long chain alkanes, alkenes, alkynes, alcohols, ethers, thiols, aromatic compounds, aldehydes, ketones, acids, amides, nitro, amino and halo compounds.

Unit II NMR spectroscopy and structural elucidation 18h

Theory of NMR spectroscopy, chemical shifts, anisotropic effects and coupling constant.Spin-spin interactions in typical systems. First order and higher order spectra. Simplification methods of complex spectra by high field NMR, shift reagents, chemical exchange and double resonance. ^{13}C NMR chemical shifts. Applications ofNOE, DEPT, and 2Dtechniques such as COSY, HSQC, HMQC and HMBC. Spectral interpretation and structural elucidation. Solving of structural problems on the basis of numerical and spectrum based data.

Unit III Organic synthesis 18 h

C-C and C=C bond forming reactions. Mannich, Reimer-Tiemann, Synthesis of small rings.Simmons-Smith, Vilsmeier-Haack, Ullmann and Chichibabin reactions. Ring formation by Dieckmann, Kostanecki, Thorpe, Pschorr and acyloin condensations. Stork enamine, Shapiro, Peterson, Heck, Stille, Ritter and Prilezhaev reactions.Reduction and oxidation in synthesis.Catalytic hydrogenation.Alkali metal reduction, Birch reduction, Clemmensen reduction and Wolff-Kishner reduction, Huang-Minlon modification.Boranes,LAH and

sodiumborohydride as reductants.Hydrogenation, Oppenauer oxidation, Jones oxidation.Applications of HIO_4, OsO_4 and mCPBA.Organo palladium catalysts -Heck, Negishi, Sonagashiraand Suzuki coupling

Unit IV Methods in organic synthesis 18 h

Retrosynthetic analysis and disconnection approach. Synthetic strategy and synthons.Regioselectivity in enol and enamine alkylation.Stereospecific and steroselective synthesis, Sharpless asymmetric epoxidation, Chiral pool, chiral auxiliary, Chiral reagents, BINAP, Mitsunobu reaction. 1,3-dipolar cycloaddition in the construction of rings. Olefin synthesis by extrusion reactions.Olefin metathesis – first and second generation Grubbs' catalysts.Umpolung concept, functional group equivalents.Reductive coupling reactions.Epoxide to alkene.Introduction to combinatorial synthesis.Electrochemical reduction of organohalogen, nitro and carbonyl compounds.Electrochemical Kolbe oxidation.Protecting group strategy: Tetrahydropyranyl, silyl, *t*-butyl, trichloroethyl, acetal and thioacetal as hydroxyl, thiol, carboxyl and carbonyl protecting groups in synthesis.

Unit V Separation techniques 18 h

Classification of chromatographic methods.Theory of chromatography.Applications of chromatographic methods.Adsorption and partition chromatography.Paper, thin layer and column chromatographic methods.Centrifugal TLC, LC, Pressure column chromatography, HPLC and GC.Column matrices.Detectors.Affinity and chiral separations using HPLC.Normal and ultra-centrifugation.Gel and Capillary electrophoresis and their applications.Solvent extraction.Extraction using supercritical liquid CO_2, Craig's technique of liquid-liquid extraction.

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2. W. Kemp, "Organic spectroscopy,"3rd Edition, Palgrave Macmillan, 1991
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14. D. J. Holme and H. Perk, “Analytical Biochemistry,” 3rd Edition, Prentice Hall, 1998.

CH 233 Physical Chemistry -III **90 h**

Unit I Chemical Bonding **18 h**

Approximate methods: method ofVariation - Variation theorem and its proof. Linear variation functions. Secular equations and secular determinants.Perturbation method-Successive correction to an unperturbed problem. Detailed treatment of first order non-degenerate case only.

Treatment of molecules- The Born- Oppenheimer approximation- LCAO-MO Theory- MO theory of H_2 and H_2^+. MO treatment of other homo diatomicmolecules Li_2, Be_2, B_2, C_2, O_2 and F_2. MO treatment of hetero diatomic molecules LiH,CO, NO and HF. Spectroscopic term symbols for homo diatomic molecules.

Valance bond theory of diatomic molecules H_2, O_2 and F_2. Comparison of MO and VB theories, Quantum mechanical treatment of SP, SP^2 and SP^3Hybridisation.HMO theory of conjugated systems. Bond order and charge density calculations,Free valance.Application of HMO method to ethylene, allyl system, butadiene and benzene.

Unit II Computational Chemistry **18 h**

Introduction to computational chemistry: as a tool and its scope. Potential energy surface-stationary point, saddle point or transition state, local and global minima.Slater and Guassian functions and its properties. **Basis sets** : minimal, double zeta, triple zeta basis sets, contracted basis sets, Pople's style basis sets and their nomenclature.Basis functions-Roothan's concept, Slater type orbitals (STO) and Gaussian type orbitals (GTO).Slater determinants

Quantum mechanical computational methods-Ab initio methods: Introduction to SCF. Wave functions for open shell state, RHF, ROHF and URHF. (no calculation). Electron correlation and introduction to post HF methods.

Semiempirical methods. Huckels and extended Huckel methods. Strengths and weaknesses. PPP, ZDO and CNDO approach. (Mentioning only).

Density functional theory- Hohenberg-Kohn theorems, Exchange co-relational functional. (Only the basic principles and terms to be introduced).

Non-quantum mechanical computational methods-Molecular mechanics: Force fields, bond stretching, angle bending, torsional terms, non-bonded interactions, electrostatic

interactions and the corresponding mathematical expressions. Names of some commonly used force fields.

Construction of Z-matrix for simple molecules. H_2O, H_2O_2, H_2CO, CH_3CHO, NH_3 and CO_2.

Unit III Spectroscopy II **18 h**

Resonance spectroscopy: Nuclear Magnetic resonance Spectroscopy, Nuclear spin.Interaction between nuclear spin and applied magnetic field. Proton NMR . Population of energy levels. Nuclear resonance. Chemical shift. Relaxation methods. Spin-spin coupling.Fine structure. Elementary idea of 2D and 3D NMR. Introduction to instrumentation.

ESR spectroscopy: Electron spin. Interaction with magnetic field. Kramer's rule. The g factor. Determination of g values. Fine structure and hyperfine structure. Elementary idea of ENDOR and ELDOR.

Mossbauer spectroscopy: Basic principles. Doppler effect, chemical shift, recording of spectrum, application. Quadrupole effect.

NQR spectroscopy - Principle and application

Photoelectron spectroscopy. Introduction to UV photoelectron and X-ray photoelectron spectroscopy.

Unit IV Statistical Mechanics II **18 h**

Molecular partition functions. Translational (1D, 2D and 3D), vibrational, rotational and electronic partition functions. Total partition functions Langevin function and its use for the determination of dipole moment and molecular energies

Relation ship between Partition functions and thermodynamic properties, The principle of equipartition of energy. Chemical equilibrium. Law of mass action. Transformation of the equilibrium expressions. Statistical derivation.Thermodynamic probability and entropy.

Equipartition principle Quantum theory of heat capacity. Calculation of heat capacity of gases, limitation of the method. Heat capacity of solids. Dulong and Petit's law, Kopp's law, Classical theory and its limitation. The vibrational properties of solids. Einstein theory of heat capacity. The spectrum of normal modes. Limitations of Einstein's theory. The Debye theory, the electronic specific heat.

Unit V Electro Analytical and Spectrophotometric methods. 18 h

Potentiometric methods: Reference electrodes and indicator electrodes. The hydrogen,calomel, Ag-AgCl electrode. The glass electrode- its structure, performance and limitations.Measurement of pH. Potentiometric titrations- redox and precipitation titrations.

Electrogravimetry: Principle and method. Determination of Copper. Separation of metal ions.

Conductometry: Principle and method. Conductometric titrations.

Coulometry: Principle andmethod. Coulometric titrations.

Voltametry: principle and method of polarography, cyclicvoltammetry, stripping voltammetry and amperometry.

Flame emission and atomic absorption spectrometry. Instrumentation for AAS. The flame characteristics. Atomiser used in spectroscopy. Hollow cathode lamp. Interference in AAS. Application of AAS.

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CH 234- Inorganic Chemistry Practicals -II **Total-125 h**

1. Estimation of simple mixture of ions (involving quantitative separation) by volumetric and Gravimetric methods.
2. Analysis of typical alloys and ores
3. Ion exchange separation of binary mixtures.
4. Spectral Interpretation of metal complexes using IR, UV-Vis. spectral data. Supplementary information like metal estimation, CHN analysis, conductivity measurements and magnetic measurements to be provided to the students. Assessment is based on arriving at the structure of the complex and assignment of IR spectral bands.
5. Interpretation of TG and DTA curves of metal oxalate hydrates. Assessment is based on the identification of various stages.

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12. N. B. Hanna, Solid State Chemistry, Prentice Hall, 1967.

CH 235 ORGANIC PRACTICALS-II Total 125 h

A.**Volumetric estimation** of
1) Aniline 2) Phenol 3) glucose 4) Ascorbic acid 5) Aspirin

B). **Colorimetric estimation**
6) paracetamol with potassium ferricyanide
7protein by biuret method
8) Ascorbic acid by folin-phenol reagent or phosphotungstic acid methods

C). **Spectral identification**
9) UV, IR, ^{1}H NMR, ^{13}C NMR, EI mass spectral identification of Organic compounds from a library of organic compounds (Each students have to record the spectral analysis of a minimum of 40 compounds)

D. Separations of mixtures by Paper Chromatography
10) Identification of amino acids

E) Single stage preparation of organic compounds by green chemistry

11) Preparation of *p*-bromoacetanilide using CAN
12) Radical coupling – 1,1-Bis-2-napthol
13) Synthesis of dihydropyrimidinone
14)Synthesis of dibenzalacetone- with lithium hydroxide
15) Photoreduction of benzophenone to benzopinacol (not for end semester evaluation)

The board of examiners have to choose the combination of a volumetric estimation, a colorimetric estimation, a green synthesis OR paper chromatography and spectral analysis. The choice of experiments should change every year.

References

1. B. S. Furniss, "Vogel's text book of practical organic chemistry," 5th Edition, Longman, 1989.
2. D. L. Pavia, G. M. Lampman, G. S. Kriz and R. G. Engel, "A microscale approach to organic laboratory techniques," Wadsworth Publishing, 5th Edition, 2012.
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6. J. B. Cohen, "Practical organic chemistry," Forgotten Books, 2015
7. P. F Shalz, *Journal of Chemical Education* **1996**, *173*: 267.
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9. For spectral data of organic compounds, see: http://sdbs.riodb.aist.go.jp/sdbs/cgi-bin/direct_frame_top.cgi

CH 236 PHYSICAL PRACTICALS –II 125 h

Conductometry

Determination of strength of strong and weak acids in a mixture

Determination of strength of a weak acid.

Determination of solubility product of a sparingly soluble salt ($PbSO_4$, $BaSO_4$ etc.)

Hydrolysis of NH_4Cl or CH_3COONa or aniline hydrochloride

Determination of order of reaction, rate constant and energy of activation for saponification of ethyl acetate

Precipitation titrations.

Determination of critical micellar concentration (CMC) of sodium lauryl sulphate from measurement of conductivities at different concentrations.

Equivalent conductance at infinite dilutions and verification of Kohlrausch's law.

Determination of Onsager constants.

Potentiometry

Determination of emf of Daniel cell.

Determination of the emf of various $ZnSO_4$ solutions and hence the concentration of unknown $ZnSO_4$ solution.

Determination of valency of mercurous ion.

Determination of temperature dependence of EMF of a cell

Determination of stoichiometry and formation constant of silver-ammonia complex.

Determination of activity and activity constant of electrolytes.

Determination of thermodynamic constants of reactions.

pH metric titrations.

Acid alkali titrations using Quinhydrone electrode.

Titrations(double) involving redox reactions – Fe^{2+} Vs $KMnO_4$, $K_2Cr_2O_7$, $Ce(NH_3)SO_4$ and KI Vs $KMnO_4$

Determination of strengths of halides in a mixture.

Determination of pH of buffer solutions and hence to calculate the E^0 of quinhydrone electrode

Spectrophotometry

Verification of Beer-Lambert’s law.

Absorption spectra of conjugated dyes.

Determination of concentration of potassium dichromate and potassium permanganate in a mixture.

To study the complex formation between Fe^{3+} and salicylic acid.

Determination of pKa of an indicator.

Polarimetry

Measurement specific rotation of glucose.

Determination of specific rotation of sucrose

Determination of unknown concentration of glucose solution. and rate constant of its hydrolysis in presence of HCl

Polarography :

Determination of half wave potential E ½ and unknown concentration of Cd^{2+} ion.

Determination of concentrations of metal ions in a mixture.

Surface tension

Determination of surface tension of various liquids (water-ethanol, water-glycerol, water-sorbitol, nitrobenzene- toluene) by Stalagmometric method (drop number/ drop weight)

Determination of parchors of molecules and various groups.

Determination of concentration of a mixture.

Determination of surface tension and parachor of liquids using double capillary method. Variation of surface tension with concentration. Unknown concentration of a mixture. Interfacial tension. Determination of surface excess and area per molecule.

Viscosity: Viscosity of liquids and mixtures of liquids. Verification of Kendall's equation. Composition of unknown mixtures. Determination of molecular masses polymers by viscosity measurements.

Refractometry

Determination of molar refraction of pure liquids

Determination of concentration of KCl solution/glycerol solution

Determination of solubility of KCl in water.

Determination of molar refraction of solid KCl

Study the stoichiometry of potassium iodide-mercuric iodide complex.

Determination of concentration of KI solution.

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1) V. D. Athawal, "Experimental Physical Chemistry", New Age International,1st edn., 2001.

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Third Semester M.Sc. Degree Examination – Model question paper

Branch – Chemistry

CH/CL/CA 231 : INORGANIC CHEMISTRY- III

(2016 Admission Onwards)

Time : 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a), (b)** and **(c)** from **each** question carries **2** marks

1. a) Draw the structure of $Rh_4(CO)_2$.

   b) How do sigma allyl complexes differ from pi allyl complexes?

   c) What are fluxional molecules?

2. a) What are the factors affecting the stability of complexes?

   b) Explain Macrocyclic effect?

   c) What is anation reaction? Give an example.

3. a) Why electron transfer process in photosynthesis is called an uphill process?

   b) Explain the mechanism of oxygen binding in haemocyanin.

   c) What is Na^+ - K^+ pump? How does it function?

4. a) What is group frequency concept? Illustrate with example.

   b) Why are solid samples used for recording Mossbauer spectra?

   c) What is Dopplar broadening? Explain with an example.

5. a) Explain binding energy.

   b) What is compound nucleus? How is it formed?

   c) Give a note on breeder reactors.

(2x10= 20 marks)

SECTION B

Answer either among **(a) or (b)** from **each** question carries **5** marks

6. a) What are metal carbonyls? Explain the structure and bonding in $Ni(CO)_4$

   b) Discuss the mechanism of polymerization of Zeigler- Natta catalyst.

7. a) Explain Trans effect with suitable examples.

b) Give an account of photochemical reactions of complexes.

8. a) Discuss the role of calcium in blood clotting process.

b) Explain the structural features of haemoglobin.

9. a) How does IR spectroscopy help for the structural elucidation of complexes containing ammonia and water as ligands.

b) Explain CD and ORD spectra of complexes.

10. a) Distinguish between Transient and Secular equilibria.

b) What is meant by half life period? How is it related to decay constant? The $t_{1/2}$ of a radio nuclide is 20 years. If a sample of this nuclide has an initial activity of 8000 disintegrations per minute today, what will be its activity after 80 years?

(5x5= 25 marks)

SECTION C

Answer **any three** questions. **Each** question carries **10** marks

11. Explain the bonding of ferrocene by MO Theory.
12. Briefly explain outer sphere and inner sphere mechanism of electron transfer reactions
13. i) Discuss the function of PS-I and PS-II in photosynthetic activity.

    ii) Outline the probable mechanistic pathways Nitrogenase activity in nitrogen fixation.
14. i) Discuss the application of ESR spectroscopy to Cu(II) complexes.

    ii) Explain how Mossbauer spectroscopy helps to the studies of iron and tin complexes

15. Discuss about different types of nuclear reactions with suitable examples.

(10x3= 30 marks)

THIRD SEMESTER M.Sc.DEGREE EXAMINATION

BRANCH - CHEMISTRY

CH/CL/CA232: Organic Chemistry-III

(2016 admissiononwards)

Time-3 hours Maximum marks :75

Section A – Answer any two among (a), (b) and (c) from each question.

Each sub question carries 2 marks

1 a) Explain how CH stretching vibrations of sp, sp^2, sp^3 hybridised carbon varies.

b) Polar solvents usually produces a red shift in the $\pi \rightarrow \pi$ transition explain.

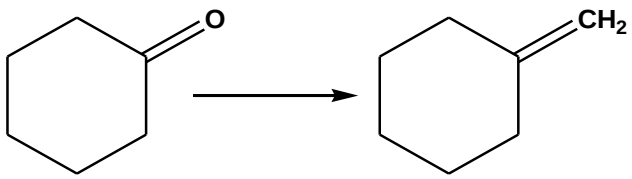
c) Explain how the presence of bromine atom in a molecule can be detected by mass spectrum.

2 a) Explain why acetylenic hydrogens are more upfield than vinylic hydrogens.

b) What multiplicities are observed for the signals of off resonance decoupled ^{13}C spectrum of 2-chloropropene?

c) Account for the fact that splitting is observed between Hydrogens "a" and b in 2-methyl propene $(CH^a_3)_2C=CH^b_2$ and not in neo pentylchloride $(CH^a_3)_3CH^b_2$ Cl.

3 a) Suggest a method for conversion



b) What is Clemmensonreduction

c) What are enamines? Write one synthetic application of enamine

4 a) Explain the use of silyl group as protecting group in organic synthesis.

b) Explain the term combinatorial synthesis

c) What is umpolung?

5 a) What is the principle of chromatography

b) What is paper chromatography? How is it helpful in identifying various alpha amino acids?

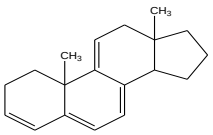
c) Outline the applications of Gel electrophoresis.

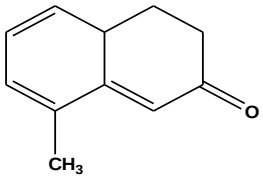
(2x10= 20 marks)

Section B

Answer either (a) or (b) from each question. Each sub question carries 5 marks

6 a) By using Woodward Fieser rules calculate the λ max values

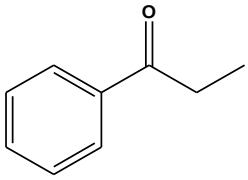




b) How IR spectrum can be used to distinguish

i) Primary amine from primary amide ii)) Ethyl benzene from o-xylene

7 a) Deduce the identity of the compound $C_9H_{10}O$ that has an IR absorption at 1688 cm-1 and 1 H NMR signals at 1.22 (triplet, 3 H), 2.98 (quartet) and 7.28-7.95 (multiplet, 5H).Assign the data

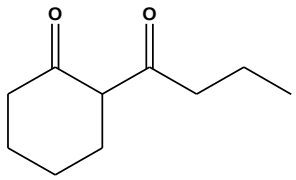


b) Explain the paramagnetic anisotropy of alkenic, aldehydic and aromatic protons.

8 a) Discuss Vilmeier-Hack reaction.

b) Write short notes on important metal hydrides used as reducing agents in organic synthesis

9 a) Explain the regioselective synthesis of the following compound from cyclohexanone



b) Discuss the synthesis of β-hydroxy ketones and aldehydes usingumpolung

10 a)Explain the principle of gas chromatography and ion exchange chromatography. What type of substances are analysed using the above?

b) Describe the principle and instrumentation of HPLC**(5x5= 25 marks)**

Sectiion C

Answer any three questions.Each question carries 10 marks

11. Discuss the functional group and finger print regions in the IR spectrum. How the IR spectrum is useful in distinguishing the inter and intra molecular hydrogen bonding

12. Write short notes on

i) DEPT spectra, ii) Nuclear Overhauser effect, iii) Shift reagents in NMR,
iv) Double resonance NMR

13. Explain the following named reactions with mechanism and example
i) Mannich reactions ii) Robinson annulations reactions iii) Suzuki coupling

14. Explain olefin metathesis and Mitsonubu reaction with applications of each

15. With a schematic diagram explain the principle, instrumentation, and applications of GC

(10x3= 30 marks)

THIRD SEMESTER M Sc. CHEMISTRY DEGREE EXAMINATION

BRANCH – CHEMISTRY

CH/CL/CA CH 233 – Physical Chemistry III

(2016 admission ownwards.)

Time : 3 Hours Max. Marks : 75

Section A

Answer any two among (a), (b) and (c) from each question.

Each sub question carries 2 marks

1) A) Arrange O_2, O_2^+, O_2^- in the increasing order of stability. Justify your answer
   B) Write briefly about "Perturbation theory"
   C) Explain the more dipole moment in ethyl chloride than in chlorobenzene.
2) A) Construct the z-matrix of CH_3CHO.
   B) Name any two chemistry related software.
   C) Write the determinantal wavefunction for the configuration $1S_2$ 2Pz
3) A) Write the expression for chemical shift in Mossbauer spectroscopy and explain the terms.
   B) Calculate the ESR frequency of an unpaired electron in a magnetic field 0.33 Tesla. Given for free electron g=2, $\beta=9.273\times10^{-27}$ J/T
   C) Explain the basic principle of X-ray photoelectron spectroscopy.
4) A) Calculate the value of ln6! with and without Stirling's theorem. Find the difference between the values if any. Comment on the result.
   B) What is meant by the law of equipartition of energy?
   C) State and explain Dulong Petit's law. Explain its limitations.
5) A) What are the requirements for choosing a reference electrode?
   B) Define half wave potential. Explain its significance.
   C) Why do we use three electrodes in cyclic voltametry.

(2x10= 20 marks)

Section B

Answer either (a) or (b) from each question. Each sub question carries 5 marks

6) A) Derive the expression for the bond angle and wave function in sp^2 hybridisation.
   B) Apply HMO theory to butadiene molecule and discuss the molecular orbitals and their corresponding energy levels.

7) A) Differentiate between Slater type orbitals and Gaussian type orbitals
   B) What is potential energy surface? Explain its significance.
8) A) Write a brief account of 2D-NMR spectroscopy.
   B) What is Kramer's degeneracy? Discuss.
9) A) B) Give comparison between Bose-Einstein, Maxwell-Boltzmann and Fermi-Dirac statistics.
   B) Explain briefly how heat capacity of gases can be calculated?
10) A) Explain the working of glass electrode.
   B) Discuss the advantages and disadvantages of amperometric titrations.

(5x5= 25 marks)

Section C

Answer any three questions.Each question carries 10 marks

11) Write a note on the secular equations.
12) Discuss Density functional theory and give its advantages and limitations.
13) Explain the principle and applications of NQR spectroscopy.
14) Derive Einstein's heat capacity equation for solid.
15) Describe the theory and instrumentation of AAS. **(10x3= 30 marks)**

SEMESTER IV

CH 241-Chemistry of Advanced materials

Unit I Introduction to Nanomaterials **18 h**

Nanomaterials: 0D, 1D, 2D and 3D nanomaterials-fundamental physicochemical principles - size dependence of the properties of nanomaterials- quantum confinement

Synthesis of nanomaterials-Sol-Gel, colloidal precipitation, co-precipitation, hydrothermal, vapour deposition, and sonochemical method.

Metal nanoparticles: Size control, characterization, and properties (optical, electronic, magnetic) Surface Plasmon resonance and its applications, role in catalysis, alloy nanoparticles.

Unit II The basic tools and applications of nanotechnology **18 h**

Basic principles and applications of Scanning electron microscopy (SEM), transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM) and Energy Dispersive X-ray Spectroscopy (EDAX)-Powder X-ray diffraction and determination of particle size- UV-Visible spectroscopy and determination of band gap-Application of IR spectroscopy in the analysis of nanomaterials.

Carbon nano structures: Fullerenes: C60, C80 and C240. Synthesis, Properties and applications (mechanical, optical and electrical) of C60. Functionalisation and reactivity of carbon nanotubes.

Nanosensors: Nanosensors based on quantum size effects, electrochemical sensors and nano bio sensors. [Refer Pradeeps Nano; The essentials]. Nano tweezers, Applications of nano technology in effluent treatment and photo catalysis.

Unit III Polymerization processes **18 h**

Free radical addition polymerization - kinetics and mechanism. Chain transfer. Molecular weight distribution and molecular weight control. Cationic and anionic polymerization: Kinetics and mechanism. Step growth polymerization - Linear Vs cyclic polymerization. Other methods of polymerization - bulk, solution, melt, suspension, emulsion and dispersion techniques. Polymer stereochemistry: Configuration and conformation. Tacticity. Chiral polymers.Polymer characterization-Molecular weights - Methods for

determining molecular weights - static, dynamic, viscometry, light scattering and GPC. Crystalline and amorphous states-glassy and rubbery States. Glass transition temperature and crystalline melting of polymers. Degree of crystallinity - X-ray diffraction. Thermal stability of polymers- Application of DSC.

Unit IV Speciality Polymers **18 h**

Industrial Polymers: carbon chain and hetero chain polymers- synthesis and applications-Polymeric reagents, catalysts and substrates

Conducting polymers - Synthesis & applications of polyacetylenes, polyanilines, polypyrroles & polythiophines. Photoresponsive and photorefractive polymers. Polymers in optical lithography - Drug delivery - Drug carriers - Polymer based nanoparticles. Polymer based LEDs, lithium-polymer batteries, Liquid crystalline polymers - Main chain and side chain liquid crystalline polymers. Phase morphology.

Unit V Smart materials **18 h**

Piezoelectric,magnetostrictive, halochromic, electrochromic,thermochromic, magnetocaloric and thermoelectric materials. Chemistry behind photochromism in spiropyrans, spirooxazines, diarylethenes, azobenzenes, quinones. Examples for Photochromic Coordination Compounds.

Shape-memory polymers, pH-sensitive polymers, Temperature-responsive polymers, dielectric elastomers, self-healing polymers and concept of mechanophores, polymorphism in polycaprolatone, introduction to ferrofluids, concept of pseudoelasticity.

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13. J. Mohd Jani , M. Leary, A. Subic and M. Gibson , Materials & Design, 2014, 56, 1078–1113
14. R. Metzger et al, Intelligent Materials, RSC Publishing,2007
15. M. V. Gandhi, B. D. Thompson, Smart Materials and Structures, Springer Science & Business Media, 1992
16. M. Schwartz, Smart Materials, CRC Press, 2008.
17. Encyclopaedia of Smart Materials, John Wiley and Sons (available online)

CH 242 (a) INORGANIC CHEMISTRY IV

Total 90 h

Unit I Applications of group theory 18 h

Hybrid orbitals and molecular orbitals for simple molecules. Transformation properties of atomic orbitals. Hybridisation schemes for σ and π bonding with examples. MO theory for AB_n type molecules. Molecular orbitals for regular octahedral, tetrahedral and metal sandwich compounds. Ligand field theory: Splitting of d orbitals in different environments using group theoretical considerations. Construction of energy level diagrams. Correlation diagram. Method of descending symmetry. Tanabe-Sugano diagrams. Selection rules for electronic spectra. Molecular orbitals in octahedral complexes. Formation of symmetry adapted group orbitals of ligands. MO diagram. Symmetry and selection rules: Symmetry properties of common orbitals. Application of character tables to infrared and Raman spectroscopy. Infrared and Raman active modes for C_{2v}, C_{3v} and D_{4h}

Unit II Supramolecular Chemistry 18 h

Concepts and language. Molecular recognition: Molecular receptors for different types of molecules, design and synthesis of co receptors and multiple recognition. Strong, weak and very weak Hydrogen bonds. Utilisation of H-bonds to create supramolecular structures. Use of H bonds in crystal engineering and molecular recognition. Supramolecular reactivity and catalysis. Transport processes and carrier design. Supramolecular devices. Supramolecular photochemistry, supramolecular electronic, ionic and switching devices Some examples of self- assembly in supramolecular chemistry.

Unit III Metal-metal bonds and metal clusters 18 h

Metal-metal bonds: Factors affecting the formation of metal-metal bond. Dinuclear compounds of Re , Cu and Cr, metal-metal multiple bonding in $(Re_2X_8)^{2-}$, Trinuclear clusters, tetranuclear clusters, hexanuclear clusters. Polyatomic zintl anion and cations. Infinite metal chains. Metal carbonyl clusters. Anionic and hydrido clusters. LNCCs and HNCCs. Isoelectronic and isolobal relationships. Hetero atoms in metal clusters: Carbide

and nitride containing clusters. Electron counting schemes for HNCCs. Capping rule. Chalcogenide clusters. Chevrel phases.

Unit IV Selected topics in Bioinorganic Chemistry 18 h

Copper on biochemical systems. Oxidase activity, super oxide dismutase activity. Electron transport in biology. Structure and function of copper proteins in electron transport process. Oxygen transport copper proteins. Hemocyanin- copper transport, copper enzymes-Azurin, plastocyanin. Inorgnic medicinal chemistry. Metals in medicine. Metal deficiency and diseases. Toxic effects of metals. Effect of deficiency and excess of essential metal ions. Toxicity due to non essential elements and speciation. Detoxification mechanism. Role of lithium and aluminium in biological systems. Chelation therapy and chemotherapy. Anticancer drugs and vanadium based diabetics drugs.

Unit V Acids and Bases and Non-aqueous Solvents 18 h

Acid base concept in non aqueous media-HSAB concept, solvent effects, linear free energy relationship-mechanism and methods of determination, super acids, Reactions in non-aqueous solvents. Ammonia - solutions of metals in liquid ammonia. Protonic solvents: anhydrous sulfuric acid, hydrogen halides. Aprotic solvents: non-polar solvents, non-ionizable polar solvents, polar solvents undergoing autoionization, liquid halogens, inter halogen compounds, oxy halides, dinitrogen tetroxide, sulphur dioxide.

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CH 242 (b) - ORGANIC CHEMISTRY-IV

Unit I Organometallic chemistry 18 h

Preparation of organo Mg, Al, Li, Cu, Zn, Cr, Fe, Ce and sulphur stabilised compounds. Grignard reagents in organic synthesis. Alkylation, oxirane addition, carbon dioxide addition, carbonyl addition, enone addition (1,2- and 1,4-additions), reduction, conjugate addition and enolisation reactions. Selectivity in Grignard reactions. Reactions of organo Li reagents, Li exchange reaction, its use in the preparation of RLi compounds, addition to C=O, COOH and $CONR_2$, Li dialkylcuprates (Gilman reagent)-preparation and reaction with alkyl halides, aryl halides andenones. AlkynylCu(1) reagents, Glaser coupling. Dialkylcadmiumcompounds- preparation and reaction with acyl halides. Benzenetricarbonyl chromium- preparation and reaction with carbanions.Tebbe'sreagent, Silane carbanion and its reactions.

Unit II Molecular recognition and supramolecular chemistry 18 h

Introduction to supramolecular chemistry.One-pot reactions.The concepts of molecular recognition, host, guest and receptor systems. Forces involved in molecular recognition. Hydrogen bonding, ionic bonding, π-stacking, Van der Waalsand hydrophobic interactions.Introduction to molecular receptors.Tweezers, cryptands and carcerands.Cycophanes, cyclodextrins and calixarenes- typical examples. Non-covalent interactions in biopolymer structure organization. Role of self-organization and self-association in living systems. Importance of molecular recognition in DNA and protein structure, their function and protein biosynthesis. Supramolecular systems like Organic zeolite, Clathrate hydrates of gases, Helicates, Nanotubes, liquid crystals, nanotechnology and other industrial applications of supramolecular chemistry.

Unit III Medicinal chemistry 18 h

Combinatorial organic synthesis, introduction, methodology, automation, solid supported and solution phase synthesis, study of targeted or focused libraries and small molecule libraries, Application- drug discovery.

Drug design and development-Discovery of a drug, a lead compound. Development of drug-

Pharmacophore identification, modification of structure, structure-activity relationship, structure modification to increase potency. The Hammet equation, Taft equation and lipophilicity. Computer assisted drug design. Receptors and drug action. Natural products and drug development. Different classes of drugs with examples.Synthesis of paracetamol, phenobarbital, diazepam, sulphamethoxazole, benzylpenicillin, chloramphenicol.

Unit IV Chemistry of biopolymers and polymers **18 h**

Peptide bond formation methods. SPPS, Mechanism, Amino and carboxy protection in SPPS.Synthesis of tripeptides, A, G, C, T, U, adenosine, ADP and ATP.Automated polypeptide and oligonucleotide synthesis.Structure organization of proteins and poly nucleotides. Protein sequencing by Edmans method.Protein denaturation. Structure of polysaccharides including starch, cellulose, glycogen and chitin. Synthesis of stereo regular polymers. Ziegler-Natta catalyst. Polymers in organic synthesis- supports, reagents and catalysts. Biodegradable polymers.

Unit V Green chemistry **18 h**

Twelve principles of green chemistry.Green chemical strategies for sustainable development- Reaction mass balance, atom economy evaluation for chemical reaction efficiency, green solvents, reaction media- Synthesis under water, solventless, fluorous and ionic liquid media. Synthesis using scavenger resins, catalysis and biocatalysis. Green computation.Green processes-.Microwave synthesis- fundamentals of microwave synthesis-Two Principal Mechanisms for Interaction with matter- The Microwave Effect with examples - Single-Mode and Multimode Microwave cavities.Microwave technology-Techniques and applications.Sonochemical synthesis. Applications of sonication in the synthesis of organic compounds

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CH 242 (c) PHYSICAL CHEMISTRY IV

Total 90 h

Unit I Applications of group theory 18 h

Spectroscopic applications: Transition moment integral transition moment operator. Vanishing matrix element. Symmetry selection rule for IR, Raman and electronic spectra. Dipole and polarizability transition moment operator. Identification of IR and Raman active normal modes in molecules coming under various point groups such as C_{2v}, C_{3v},C_{4v}, D_{3h}, T_d and O_h. Mutual exclusion and complementarity principle of IR and Raman spectra and their use in the identification of molecular structures. Probability of overtone and combination bands. Identification of allowed and forbidden electronic transitions in carbonyl groups. Vibronic transitions.

Application to MO theory: Symmetry adapted LCAO-MO theory of π-bonded hydrocarbons. Projection operator and its use in the construction of wave functions of π-molecular orbitals, secular equations and use of symmetry for simplifying the calculations of energy and wave functions of ethylene, butadiene and carbocyclic systems such as benzene and naphthalene.

Unit II Exactly solvable systems. 18 h

Simple Harmonic Oscillator: Wave equation for ID harmonic oscillator. Complete solution and their properties. Three dimensional Harmonic oscillator. Potential energy in three dimension and Schrodinger wave equation in Cartesian coordinate. Separation of variables and solution of the equation for energy and wave function. Degeneracy.

Rigid rotor: Schrodinger equation in polar Coordinate. Angular momentum operator for rigid rotor. Separation of variables and complete solution for phi and theta equations. Legendre polynomials and associated Legendre functions. Normalisation of associated Legendre functions and evolution of the values of orbital angular momentum quantum number. Recursion relations. Rigid rotor wave function and energy.

The Hydrogen atom: Schrodinger wave equation in polar coordinate. Separation of variables and complete solution of the radial part. The associated Laguarre polynomial. Normalisation. The evolution of the value of the principal quantum number. The spherical harmonics and the

radial part of the wave function. The total wave function of H atom. The wave functions of Hydrogen like atomic orbitals and explanations for the shapes of various orbitals.

Angular momentum, angular momentum operators(L_x,L_y,L_z and L^2) and their commutation properties. Spherical harmonics as eigen functions of angular momentum operator L_z and L^2. Ladder operator method for angular momentum. Space quantisation.

Unit III Approximate method I 18 h

Schrodinger wave equation for He atom and anharmonic oscillator and difficulty to get the exact solution. The Variation method: Variation theorem and its proof. The variation integral and its properties. Variational parameters. Trial wave functions, Illustration of trial wave functions for calculation of H atom and particle in a 1D box as examples.

Trial functions as linear combination of orthonormal functions, linear combinations of functions containing variational parameters as trial functions. Setting up of secular determinants. Variation methods of normal state of He . The SCF method, SCF and variation method. Strength and limitation of the method.

Unit IV Approximate method II 18 h

The perturbation method. The generalised perturbation method. The idea of successive correction to unperturbed systems. First order perturbation. Correction of wave function and energy . Theory of non-degenerate level perturbation.The normal Helium atom. The first order perturbation of the degenerate level. The hydrogen atom. Second order perturbation theory. Correction for wave function and energy. Stark effect.
Time dependant wave equation: Variation in the state of a system with time. Emission and absorption of radiation. The Einstein‟s transition probability and its calculation. Selection rules and intensity of spectrum for harmonic oscillator , rigid rotor and hydrogen atom.

Unit V Computational methods 18 h

Computational methods as potential tools for practicing chemistry. Potential energy surface, saddle point, local minima and global minima. Geometry optimisation. Exchange and overlap integrals. Difficulty in evaluating them with H-like wave functions. Slater Type functions(STO), approximation of STO with Gaussian type functions. Contracted Gaussians.

Basis sets: minimal basis set, split valance basis set, polarised basis set and diffused basis set.

Model chemistry and notations.

Geometry input- in terms of Cartesian coordinates and internal coordinates. Z-matrix, construction of z-matrices of simple molecules H_2, H_2O, H_2O_2, H_2CO,CH_3CHO, CH_4, C_2H_6 and with dummy atom, CO_2, NH_3,C_6H_6.

Molecular mechanics method: Force fields, potential energy expressions for bond stretching, bending, torsion, non-bonded interactions, electrostatic interaction and H-bonding. Setting up of force field expressions. Method of parameterisation. Use of molecular mechanics. Brief introduction to commonly using force fields(MM3, MMFF, AMBER and CHARMM) and Softwares.

Ab-initio method: Hartree-Fock Self Consistent Field method. Slater determinant. Post Hartree-Fock methods- Configuration Interaction(CI) and Moller Plesset(MP)methods.

Semiempirical method: Basic principle of the method. Its variants, ZDO,CNDO and INDO. Density Functional method: Functional. Hohenberg-Kohn theorems. Kohn-Sham orbitals. Basic idea of Local Density(LD) approximation, Generalised Gradient approximation and hybrid (BLYP, B3LYP) methods.

Comparative study of Molecular Mechanics, Ab-initio method, Semi-empirical method and DFT method of computations.

References

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12 E. Lewars, "Computational Chemistry- Introduction to the Theory and Applications of Molecular and Quantum Mechanics", Springer.

13 D.Young,"Computational Chemistry", A Practical Guide", Wiley.

CH 243(a) DISSERTATION

Each of the students has to carry out original research in a topic in accordance with the Elective paper chosen for Semester IV under the guidance and supervision of a teacher in the concerned Department of the College.

Instructions to Question Papers Setters

The Syllabus of each theory has five units. While setting the question papers, equal weight is to be given to each of the Units for choosing the questions. Each question paper is of 3 hours duration and has three Sections, namely Section A, Section B and Section C constituting a total 75 marks as detailed.

Section A Five questions, one from each Unit containing three short answer questions marked (a), (b), and (c), each of which has 2 marks. One has to answer any two of (a), (b) or (c) from each of the five questions. (2x10=20 marks)

Section B Five questions, one from each unit containing two short essay questions marked (a) and (b), each of which has marks. One has to answer either (a) or (b) from each of the five questions. (5x5=25 marks)

Section C Five essay questions, one from each unit having 10 marks. One has to answer any three questions from the five questions asked.(10x3=30 marks)

Structures should be in chemdraw or ISIS/ draw

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION

Branch : CHEMISTRY
(Under Semester System w.e.f 2016 Admissions)
CH 241-Chemistry of Advanced materials

Time: 3 h Max. Marks: 75

Section A

(Answer any two among (a), (b) and (c) from each question. Each sub question carries 2 marks)

1	a)	What is surface plasmon resonance?
	b)	What is meant by quantum confinement?
	c)	What are alloy nanoparticles?
2	a)	What is EDAX?
	b)	What are fullerenes?
	c)	What are nano tweezers?
3	a)	What do you mean by chain transfer in polymerization process?
	b)	What is meant by tacticity of a polymer?
	c)	What is GPC?
4	a)	What are conducting polymers?
	b)	Name any two polymeric reagents.
	c)	What are photo responsive polymers?
5	a)	What are piezo electric materials?
	b)	What are halochromic materials?
	c)	Write examples of any two photochromic coordination compounds.

[2 x 10 = 20 marks]

Section B

(Answer either (a) or (b) of each question E ach question carries 5 marks)

6	a)	Explain the relation between size and properties of nano-materials.
	b)	Explain CVD method for preparing nano particles.
7	a)	Explain the use of powder XRD in determination of particle size of nano materials.

b) Explain how SWCNTs and MWCNTs are synthesized.

8 a) Explain the kinetics of free radical addition polymerization.

b) Explain DSC method for determination of Glass transition temperature.

9 a) Explain in detail the synthesis of polyacetylenes.

b) Explain in detail the synthesis of polythiophenes.

10 a) Explain the concept of pseudo elasticity.

b) Write a note on shape-memory polymers. [5x 5 = 25 marks]

Section C

(Answer any three question and each question carries 10 marks)

11 Explain in detail SEM and TEM.

12 Explain in detail nano synthesis using Sol-Gel and Hydrothermal methods

13 Explain determination of molecular weights by viscometry and light scattering methods.

14 Explain the application of Polymers in catalysis.

15 Write a note on the chemistry behind photochromism in spiroprans, spirooxazines, diarylethenes and azobenzenes. [10x3 = 30 marks]

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION

Branch:Chemistry

(Under Semester System w.e.f 2016 Admissions)

CH 242(a)- INORGANIC CHEMISTRY-IV

Time:3 hrs Max marks:75

SECTION-A

Answer any two among (a), (b),and (c) from each question. Each sub-question carries 2 marks.

1. a) What is the point group of NO^{3-}? How does it's symmetry change when complexed as unidentate ligand?

   b) Give the splitting of d-orbitals in a square pyramidal geometry?

   c) Demonstrate that C 3 and C 3 2 belong to the same class in C 3v point group.

2. a) What is meant by macrocyclic effect?

   b) Give any two examples of self-assembly in supramolecular chemistry.

   c) What are the 3 basic functions of supramolecular species?

3. a) What are anionic clusters? Give examples.

   b) Explain Wade's rules to calculate the no: of frame work electrons in crystals.

   c) Clusters of $Co(CO)_{12}$ and $Co_3FeH(CO)_{12}$ are isolobal to each other. Explain.

4. a) What is cisplatin? What is it's importance?

   b) What is the role of Lithium in biological systems?

   c) Write any two diseases caused by the deficiency of copper in the body.

5 .a) Give examples of room –temperature molten salts that could be used as non-aqueous solvents?

   b) What is meant by leveling effect of solvent?

   c) Which species would act as a base in (1) BrF_2 and (2) liq SO_2. Why?

[2 x 10 = 20 marks]

SECTION-B

Answer either (a) or (b) of each question carries 5 marks.

6. a) Give the salient features of Tanabe-Sugano diagram taking d 5 ion as an example.

   b) Discuss the application of group theory in arriving at the selection rules for the electronic spectrum of metal complexes.

7. a) Explain the importance of supramolecular chemistry in the field of catalysis.

b) What are the advantages and applications of supramolecular chemistry in Nanotechnology?

8. a) Explain the concept of Chevrel phases.

b) What are LNCC's? Give eg: Discuss their structures.

9. a) The toxicity of metals have been variously correlated with their (1) electronegativity , (2) insolubility of sulphides and (3) stability of chelates. Discuss.

b) What are dismutation reactions? Give eg: What type of metal is in superoxide dismutase?

10. a) What are the advantages and disadvantages of using aprotic solvents as non-aqueos solvents?

b) Write a note on the reactions in liquid HF.

[5x 5 = 25 marks]

SECTION-C

Answer any three questions and each question carries 10 marks.

11. Deduce the normal modes of trans-N_2F_2 molecule and predict the IR and Raman activity of the modes. Given the character table for C_{2h}.

C_{2h}	E	C_2	i	σ_h		
A_g	1	1	1	1	R_z	x^2,y^2,z^2,xy
B_g	1	-1	1	-1	R_X,R_Y	xz,yz
A_u	1	1	-1	-1	z	
B_u	1	-1	-1	1	x,y	

12. Discuss with suitable eg: the different types of interaction in supramolecular compounds.

13. Discuss and draw the structure and bonding of $[Re_2Cl_8]^{2-}$.

14. Explain the structure and functions of hemocyanin and plastocyanin.

15. Write a detailed account of the reactions in the following non-aqueous solvents:

(1) NH_3 and (2) N_2O_4.

[10x3 = 30 marks]

FOURTH SEMESTER MSc.DEGREE EXAMINATION

BRANCH - CHEMISTRY

CH242 (b): Organic Chemistry-IV

(Under Semester System w.e.f 2016 Admissions)

Time-3 hours Maximum marks :75

Section A

Answer any two among (a), (b) and (c) from each question. Each sub question carries 2 marks

1. a) Describe any one method for preparation of organo zinc reagents.
   b) Describe the preparation of benzenetricarbonyl chromium.
   c) Write short note on Tebbe reagent.
2. a) Explain host-guest system with an example
   b) Explain the importance of Hydrogen bonding in molecular recognition
   c) What are cryptands?
3. a) Draw the structure of benzyl pencillin and diazepam
   b) What is in vitro and in vivo analysis of drugs?
   c) What is meant by lead in drug analysis?
4. a) Write the examples of amino protecting groups .How it can be deprotected?
   b) What is the difference between nucleotide and nucleoside?
   c) How cellulose is different from chitin?
5. a)What is biodiesel?
   b) What is meant by sonochemical synthesis? Give an application.
   c) Write few examples of green solvents. [2 x 10 = 20 marks]

Section B

Answer either (a) or (b) from each question. Each sub question carries 5 marks

6. a) What is Tebbe reagent? How it is prepared? Mention any two applications
   b) llustrate the uses of Grignard reagent in organic synthesis.
7. a) Write short note on a) Molecular tweezers, b) Calixarene c) cyclodextrins
   b) Explain the structure and importance of cyclodextrins
8. a) Describe the synthesis-of paracetamol

b) Explain a) pharmacophore b) lead compound with examples

9 a) Explain the role of polymers in organic synthesis.

b) Write any two techniques used in protein sequencing

10 a) Explain atom economy with aldol condensation as example.

b) Write a note on sonochemistry in organic synthesis. [5x 5 = 25 marks]

Section C

Answer ant three questions.Each question carries 10 marks

11. Write notes on the preparation and application of the following:

a) Dialkyl Cd compounds. b)Benzenetricarbonyl chromium.

12. Describe the importance of molecular recognition in DNA and protein structure.

13. Explain the structure-activity relation in the development of drugs.

14. Write an SPPS method for synthesis of Phe-ala-gly, explaining each step and advantages of SPPS

15. Explain the twelve basic principles of green chemistry.

[10x3 = 30 marks]

FOURTH SEMESTER MSc.DEGREE EXAMINATION

(Branch III Chemistry)

CH 242 (c) Advanced Physical Chemistry

(2016 Admission Onwards)

Time: 3hrs Max. Marks: 75

Section – A

*Answer any two among **a, b** and **c** from each question.*

*Each sub question carries **2 marks.***

1 a) What is transition moment integral?

b) Write projection operator $\hat{P}_{A_1}$ for C_{2v} point group.

c) Find the symmetry species of the asymmetric mode of vibration of H_2O molecule. C_{2v} character table is given.

2 a) Write down the Hamiltonian for Li^{2+}?

b) What are Hermite polynomials? Write first three.

c) What are spherical harmonics. Write two examples.

3 a) State and explain variation theorem.

b) Briefly explain SCF method.

c) Give the secular determinant for the system whose wave function is $\psi = a_1\phi_1 + a_2\phi_2 + a_3\phi_3 + a_4\phi_4$

4 a) What do you meant by slater determinant? Illustrate using He atom.

b) What is Stark effect?

c) The potential energy of an anharmonic oscillator is $V(x) = \frac{1}{2}kx^2 + \frac{1}{6}\gamma x^3$. Find the first order correction to the energy by perturbation method.

5 a) Explain the terms local minima and global minima.

b) What does the notation 3-21 G stand for?

c) How is a double zeta set obtained? **(2x 10 =20 marks)**

Section – B

*Answer either **a** or **b** from each question. Each question carries **5 marks.***

6 a) Find the IR and Raman active vibrations of NH_3. ? C_{3V} character table is given.

b) From symmetry consideration account for the low intensity of n-π* transition in HCHO

7 a) Find the commutator of $\hat{L}x$ and $\hat{L}y$.

b) Set up the Schrodinger equation for H atom in spherical polar coordinate, separate the variables and find the phi solution.

8 a) State and prove variation theorem.

b) Find the ground state energy of a particle confined in a one dimensional box of length L, using the trial wave function $\psi = x(L-x)$.

9 a) Find the ground state energy of He by first order perturbation method.

b) What is Stark effect? Rationalize using first order perturbation method.

10 a) Write the Z-matrices of CH_4 and H_2O.

b) Outline the procedure used for performing ab initio calculations

(5 x 5= 25 marks)

Section – C

*Answer **any three**. Each s question carries **10 marks**.*

11 Using group theoretical principles find the π-molecular orbitals of butadiene and arrive at their energy expressions. (use C_{2v} character table)

12 Obtain the complete solution of the simple harmonic oscillator.

13 a) Explain briefly the basis of the Self-consistent field theory

b) Find the ground state energy of H atom by variation method using the trial function $\phi = e^{-ar}$, where a is the variational parameter.

14 Discuss the perturbation method and set up expression for the first and second order corrections.

15 What are the wave function based approaches in computational chemistry? What are its advantages and disadvantages (**3x10 = 30 marks**)

C_{2V}	E	C_2	σ_{xz}	σ_{yz}		
A_1	1	1	1	1	z	x^2,y^2,z^2
A_2	1	1	-1	-1	Rz	xy
B_1	1	-1	1	-1	X, Ry	xz
B_2	1	-1	-1	1	Y, Rx	yz

C_{3V}	E	$2C_3$	$3\sigma_v$		
A_1	1	1	1	z	x^2+y^2, z^2
A_2	1	1	-1	Rz	
E	2	-1	0	(x,y) (Rx,Ry)	(x^2-y^2, xy)(xz,yz)

UNIVERSITY OF KERALA

SCHEME AND SYLLABI OF

COMPLEMENTARY CHEMISTRY COURSES FOR OTHER FIRST DEGREE PROGRAMMES UNDER CBCSS

(PHYSICS, GEOLOGY, BOTANY, ZOOLOGY, HOMESCIENCE, BIOCHEMISTRY & MICROBIOLOGY)

2020 ADMISSION ONWARDS

COMPLEMENTARY CHEMISTRY COURSES UNDER CBCSS

OFFERED TO OTHER MAJORS

INDEX

UNIVERSITY OF KERALA

COMPLEMENTARY CHEMISTRY COURSES

(OFFERED TO FIRST DEGREE PROGRAMMES)

The Complementary Chemistry Syllabus has been designed to motivate students of other majors of **PHYSICS, GEOLOGY, BOTANY, ZOOLOGY, HOMESCIENCE, BIOCHEMISTRY & MICROBIOLOGY** towards chemistry with a potential to contribute to the academic and industrial requirements of the society, in hand with their major discipline. The new, updated syllabus is in accordance with the OUTCOME BASED EDUCATION (OBE) which aim at acquiring advanced knowledge in different branches of Chemistry, in an interdisciplinary way. The **CORSE OUTCOME (CO)** for each course is specified as **CO1, CO2** etc in terms of cognitive levels achieved by each course.

Complementary Courses in Chemistry aim at certain Programme Specific Outcome (PSO) in consistent with those of the major courses.

PSO1: Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, out look and scientific temper (GOOD LAB PRACTICES)

PSO2: Develop skill in safe handling of chemicals and glass wares, take precaution against accidents and follow safety measures.

PSO3: Avoid random usage of dangerous chemicals and Use chemicals in a critical way

PSO 4: Acquire a comprehensive knowledge of Chemistry, its impact on human, society and the environment to lead a better life in harmony with nature.

DISTRIBUTION OF HOURS AND CREDITS

TOTAL NUMBER OF SEMESTERS -4

COMPLEMENTARY CHEMISTRY LECTURE COURSES-4

COMPLEMENTARY CHEMISTRY LAB COURSE-1

(Two hours/week in all semesters, One Semester–18 Weeks)

TOTAL CREDITS–14

Semester	Hours per week		Number of Credits	*Course Code	Instructional Hours
	Theory	Lab			
1	2	2	2	CH1131 .1	2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .1	2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .1	3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .1 CH1432 .1	3×18 =54 2×18 = 36

*Applicable to Physics Major

GENERAL ASPECTS OF EVALUATION

MODE OF EVALUATION COMMON TO COMPLEMENTARY COURSES

Evaluation of each course shall involve Continuous Evaluation (CE) with 20 marks and End Semester Evaluation (ESE) with 80 marks.

CONTINUOUS EVALUATION FOR LECTURE COURSES (CE)

The Continuous evaluation will have 20 marks and will be done continuously during the semester. CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) Assignment /seminar and

(iii) Test

Components for CE marks

No	Component	Marks
1	Attendance	5
2	Assignment / Seminar	5
3	Tests	10
Total		**20**

EVALUATION OF THE ASSIGNMENTS AND SEMINAR

The topic selection by the student for assignments/seminar will be with the approval of the course teacher

The assignment can be

1. A report of about 4-6 pages in A4 size paper
2. The topic can be presented either as oral or as power point for 10 minutes duration using audio-visual aids if available. The seminar is to be conducted within the contact hour allotted for the course.
3. Preparing Charts on assigned topic
4. Making static or working models.

The submitted report /chart /models should be submitted for assignment marks

QUESTION PAPER PATTERN FOR CONTINIOUS EVALUATION TEST

1. The theory examination has a duration of 1.5 hours
2. Each question paper has three parts: A, B , C
3. Section A contains ten questions. Each question carries1mark. The questions may be in the forms – one word/one sentence.
4. Section B contains twelve questions. Out of these twelve questions, the students have to answer 7 questions. Each question carries 2 marks. Each answer should contain four points. (Short Answer type).
5. Section C contains nine questions of which the candidate has to answer 4 questions. Each question carries 4 marks. The answer must contain 8 points (Short Essay type).

Question paper should contain 20% hard, 60% medium and 20% easy questions

Question Paper Pattern for CE Test		
Question No	Type of Question	Marks
Section A: 1-10	All / one word/one sentence	1X10=10
Section B: 11-22	7out of 12; Short Answer	7 X2=14
Section C: 23-31	4 out of 9; Short Essay	4 X4= 16
TOTAL	1 out of 2; Essay	40 marks

CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation for LAB COURSE will have 20 marks. The ESE of LAB COURSE will be done only in the IV semester. But the correspondinding CE are calculated from all the semesters in which there is attendance for laboratory sessions.

No	Component	Marks
1	Attendance	5
2	Lab test	5
3	Lab report/Record	5
4	Punctuality	5
Total		**20**

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EVALUATION OF THE RECORD

On completion of each experiment, a report should be submitted to the course teacher. All experiments should be recorded as Lab report in a bound volume. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures and tables of data collected, equations, calculations, graphs, and other diagrams and the final results. The Certified RECORD is compulsory for the LAB COURSE ESE.

CE for Laboratory Record		
No.	**Sub component**	**Marks**
1	Punctual submission and Neat presentation	All four sub-components present &
2	Record of more than 90% experiments in the	

	syllabus	satisfactory 5
3	Calculations and absence of errors/mistakes	Only three : 4
4	Accuracy of the result	Only two : 3 Only one :2

LAB RECORD of experiments certified by the tutor and HoD should be submitted for verification by the External Examiner at the ESE.

END SEMESTER EVALUATIONS (ESE)

QUESTION PAPER PATTERN &

GUIDELINE FOR QUESTION PAPER SETTERS

1. The theory examination has a duration of 3 hours
2. Each question paper has four sections: A, B , C and D
3. Section A contains ten questions. Each question carries1mark. The questions may be in the forms – one word/one sentence. Students have to answer all questions.
4. Section B contains twelve questions of which the students have to answer eight questions. Each question carries 2 marks. Each answer should contain four points. (Short Answer type).
5. Section C have nine questions of which the candidate has to answer only six questions. Each question carries 4 marks. The answer must contain 8 points (Short Essay type).
6. Section D contains four questions of which the candidate has to answer any two. Each question carries **three subdivisions** amounting to a total of 15 marks.
7. The total marks for the entire questions to be answered is 80marks.
8. Question paper should contain 20% Remember, 60% Understanding and 20% application level according to OUTCOME BASED EVALUATION. Question paper setter shall submit a detailed scheme of evaluation along with question paper.

Question Paper Pattern for Test		
Question No	Type of Question	Marks
Section A: 1-10	10 one word/one sentence	10
Section B: 11-22	8 out of 12; Short Answer	16
SectionC: 23-31	6 out of 9; Short Essay	24
Section D: 32-35	2 out of 4; Essay	30
Total		**80 marks**

ESE FOR LAB COURSES

THE SCHEME OF EXAMINATION FOR LAB COURSES MAY BE FRAMED BY THE PRACTICAL CHEMISTRY BOARD OF EXAMINERS.

SYLLABUS OF COMPLEMENTARY CHEMISTRY COURSES

(FOR PHYSICS MAJORS)

DISTRIBUTUIN OF HOURS & CREDITS

Semester	Hours/Week		No. of Credits	Course Code	Instructional Hours
	Thoery(L)	Lab(P)			
I	2		2	CH1131.1	2x18=36
		2	-		2x18=36
II	2		2	CH1231.1	2x18=36
		2	-		2x18=36
III	3		3	CH1331.1	3x18=54
		2	-		2x18=36
IV	3		3	CH1431.1	3x18=54
		2	4	CH1432.1	2x18=36

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARY CHEMISTRY

FOR PHYSICS MAJORS

2020 Admission onwards

SEMESTER	I
COURSE	1
COURSE NAME	THEORETICAL AND ANALYTICAL CHEMISTRY
COURSE CODE	CH1131.1
CREDIT	2
L-T-P	2-0-2
TOTAL HOURS	36

CO No.	**COURSE OUTCOME** ***Upon completion of this course, students,***	**Cognitive Level**
1	Discuss the rules for filling electrons in atomic orbitals	U
2	Correlate stability of atom with electronic configuration	U
3	Discuss theories of chemical bonding and their limitations	U
4	Predict geometry of molecules from the type of hybridisation	U,A
5	Recognise fundamentals of thermodynamics and the predict spontaneity of reactions	U,A
6	Derive thermodynamic properties of systems in equilibrium	A

7	Critically select suitable indicators for acid base and redox titrations	E,A
8	Appreciate the application of common ion effect and solubility product in precipitation and intergroup separation of cations	A
9	Discuss the basic principles of paper chromatography and thin layer chromatography	U
10	Solve numerical problems on bond order, molarity, normality and Lattice energy	A

R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I –PERIODIC CLASSIFICATION OF ELEMENTS (9hrs)

Quantum numbers and their significance,
Concept of orbitals. Orbital wise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, stability of filled and half filled orbitals
Electronic configuration and classification of elements in to s,p,d and f blocks.
Periodic properties, Ionisation energy, Electronegativity and Electron affinity. Diagonal relationship.
Important characteristics of representative elements: valency, oxidation states, ionic and covalent bond formation
Important characteristics of transition elements : variable valency and oxidation states, formation of Complex compounds.

MODULE II - CHEMICAL BONDING (9hrs)

Energetic of bond formation – Types of Chemical bonds – Energetics of ionic bond formation – Lattice energy – Born Haber Cycle - Fajan's rules.
Polarity of covalent bond its relation with electronegativity
Electro negativity scales – Paulings and Mullikan's approaches, factors influencing polarity Dipole moment – its relation to geometry.
Hydrogen bond – inter and intra molecular – its consequences on boiling point,volatility and solubility.

Concept of Hybridisation– SP, SP^2, SP^3, dSP^2, dSP^3, SP^3d^2, and SP^3d^3 with examples
Explanation of bond angle in water and ammonia- VSEPR theory, geometry of molecules with bond pairs of electrons , bond pairs and lone pairs of electrons, limitations of VSEPR Theory.
A brief review of molecular orbital approach, LCAO method – bond order, bond distance and stability of O_2,O_2^{2+},O_2^{2-},NO,NO+,CO and HF.

MODULE–III: THERMODYNAMICS (9hrs)

First law of thermodynamics, mathematical form, intrinsic energy, enthalpy, reversible, process and maximum work, work of expansion of an ideal gas in reversible isothermal process.

Heat capacity of gases at constant volume and constant pressure, derivation of $C_P - C_V = R$.

Second law of thermodynamics, entropy and free energies

Significance of $\Delta G, \Delta H$ and available work

Criteria of equilibrium, and spontaneity on the basis of entropy and free energy – Gibbs-Helmholtz equation.

MODULE IV: ANALYTICAL PRINCIPLES (9 Hrs)

Analytical methods in Chemistry – Principles of volumetric analysis, primary standard, standard solution, Calculation of normality,molality and molarity of solutions

Theory of acid - base titrations: Strong acid-Strong Base, Strong acid-weak base, Weak acid Strong base and weak acid-strong base (Explanation with titration curves)

Redox titrations: Permanganometry-Fe2+ and KMnO4 and Dichrometry-Fe2+ and K2Cr2O7, Theory of acid – base and redox indicators.

Inorganic qualitative analysis, common ion effect- solubility product- precipitation and inter group separation of cations. Salting out process

Chromatography- principle and applications of paper and thin layer chromatography.

Text books/References

1. B.R Puri, L R Sharma K C Kalia, Principles of Inorganic Chemistry, Sobhanlal Nagin Chand&Co. New Delhi
2. Manas chanda,Atomic structure and Chemical bonding in molecular spectroscopy,Tata Mc Graw Hill
3. S Glasstone ,Thermodynamics for Chemists,Affiliated Eat West Publishers
4. J D Lee, Concise Inorganic Chemistry, ELBS
5. R P Rastogi and R R Misra, An Introduction to Thermodynamics
6. D.A Skoog, D M West, F J, Holler, S R Crouch, Fundamentals of Analytical Chemistry,8th Edn., Brookes/Cole, Thomson Learning,Inc, USA,2004
7. B K Sharma, Chromatography, Goel Publishing House, Meerut

UNIVERSITY OF KERALA
I Semester B.Sc Degree Examination Model Question Paper
Complementary Chemistry for Physics Major

Course code CH1131.1 Credit 2
THEORETICAL AND ANALYTICAL CHEMISTRY

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. Give the electronic configuration of Copper (atomic umber 29)
2. The quantum numbers n = 2 and l = 1 corresponds to which orbital?
3. What are the shapes of molecules with sp and sp^3 hybridization?
4. Calculate the bond order of H_2 molecule.
5. What do you mean by solubility product?
6. Give the mathematical expression for first law of thermodynamics.
7. What is the significance of entropy?
8. Define Molality.
9. Which indicator you suggest for the volumetric titration of NH_4OH by HCl?
10. Name a primary standard substance for estimation of NaOH.

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. Give one example each for the stability of Half filled and fully filled atomic orbitals.
12. Write down the MO configuration of O_2 molecule.
13. Define lattice energy.
14. What are the limitations of VSEPR Theory?
15. What are polar and non polar covalent bonds?

16.Mention the rules for adding electrons to molecular orbitals?

17.Explain redox titrations with an example.

18.How would you prepare 100ml of 0.05M Mohr's salt solution?

19.Why is methyl orange not a suitable indicator for the titration of weak acid with strong base?

20.What is the application of Gibbs Helmholts equation?

21.What is the principle of paper chromatography?

22. What is the theory of pH indicators?

(1x10=10 marks)

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. Discuss the Born Haber cycle for the formation of NaCl.

24. Identify the hybridization in H_2O and NH_3. How will you account for the geometry of these molecules?

25. Give an account of acid base indicators.

26. Discuss the theory of Acid – Base indicators.

27. Explain the energetic of ionic bond formation.

28. Define hybridization. Mention the types of hybridization involved in SF6, PCl5, BF3.

29. Explain Born-Haber Cycle considering the formation of NaCl as an example.

30. Write a note on spontaneity of a chemical reaction.

31. Explain briefly the principle and application of thin layer chromatography.

(4x6=24 marks)

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32. (a) Discuss the basis of periodic classification into different blocks.

(b)What are quantum numbers? Give its significance.

(c) Explain various rules regarding electronic configuration. (5+5+5)

33. a) Define heat capacity of gases at constant temperature and pressure.

How are they related ?

b) What are the criteria for equilibrium? Discuss.

c) Discuss on the work of expansion of an ideal gas in reversible isothermal process. (5+5+5)

34. (a) Write a note on Hydrogen bonding and its consequences.

(b) How electronic configuration of molecules related to molecular behavior? Explain.

(c) Explain Fajan's Rule. (5+5+5)

35. (a) Discuss the titration curves for the titration of strong acid with strong base and weak acid with strong base.

(b) Explain the theory of redox indicators.

(c) Calculate the concentration in terms of normality and molarity of a solution of 8g of NaOH in 100 mL NaOH solution. (5+5+5)

(15x2=30 marks)

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARY CHEMISTRY

FOR STUDENTS OF PHYSICS MAJORS

2020 Admission onwards

SEMESTER	**II**
COURSE	**2**
COURSE NAME	**PHYSICAL AND INDUSTRIAL CHEMISTRY**
COURSE CODE	**CH1231.1**
CREDIT	**2**

L-T-P	2-0-2
TOTAL HOURS	**36**

CO No.	COURSE OUTCOME *Upon completion of this course, students,*	Cognitive Level
1	Define enthalpies of formation, combustion, neutralization, solution and hydration reactions	R,U
2	Apply Hess's law for thermo chemical calculations	A
3	Predict the effect of temperature pressure and concentration on a system in equilibrium based on Le Chatelier principle	U
4	Classify acidic and basic compounds in accordance with different concepts.	U
5	Suggest method for determination of pH	A
6	Discuss petrochemicals and their applications	
7	Realise the depletion of petroleum products and the need for alternate sources of energy.	U
8	Recognise the necessity of sustainable development	U
9	Appreciate the role of solar energy in photosynthesis and discuss methods of solar energy harvesting	U
10	Become responsible in the consumption of natural resourses and avoid factors affecting the harmony of nature from the equilibrium concept.	A
11	Discuss and the Illustrate general methods and techniques in metallurgy	U,A
12	Predict methods of concentration, extraction metals from their ores	A
13	Discuss the applications of Van Arkel method and zone refining in metallurgy	U

R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I: THERMO CHEMISTRY (9hrs)

Enthalpies of formation, combustion, neutralization, solution and hydration.

Relation between heat of reaction at constant volume and constant pressure, variation of heat of reaction with temperature. Kirchoff's equation,

Hess's law as an application of First law of thermodynamicsand its application Bond dissociation energies and bond energies of different types of bonds, their calculation and enthalpies of reaction. (Numerical problems to be worked out)

MODULE II : CHEMICAL AND IONIC EQUILIBRIUM (9 hrs)

Reversible reactions – K_P, K_C, and K_X and their inter relationships – Free energy change and chemical equilibrium (thermodynamic derivation) Influence of pressure and temperature on the following reactions.

(i) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (ii) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ (iii) $2SO_2 + O_2 \rightleftharpoons 2\,SO_3$

Le Chatelier's principle and the discussion of the above reactions on its basis.

Concepts of Acids and Bases, Arhenius, Lowry-Bronsted, and Lewis concepts.

HSAB Principle. Levelling effect.

pH and its determination by potentiometric method.

Buffer solutions – Henderson equation, Acidic and basic buffers-examples.

Hydrolysis of salts – degree of hydrolysis and hydrolytic constant,

Derivation of relation between Kw and Kh for salts of strong acid – weak base, weak acid - strong base and weak acid – weak base.

MODULE III : PETROCHEMICALS AND ALTERNATE SOURSES (9hrs)

Petrochemicals:Introduction,Natural gas-CNG,LNG and LPG.

Coal: classification based on carbon content- Carbonisation of coal

Crude oil: constitution and distillation, composition and uses of important

Fractions

Ignition point, flash point and octane number-cracking

Usage and depletion of petroleum products.

Need for alternative fuel and Green Chemistry approaches for sustainable development:

Introduction, Solar energy harvesting- photosynthesis

Photo voltaic cell, conventional solar cells, nano structured solar cells,

Hydrogen as the future fuel

MODULE IV : METALLURGY (9 Hrs)

General principles of occurrence and extraction of metals

Concentration of ores- roasting, calcination and smelting

General Methods of extracting metal from concentrated ore, examples

Electro metallurgy-Metallurgy of Aluminium, Sodium-Pyrometallurgy

Refining of crude metals: Distillation, Liquation, electrolytic and zone refining

Chromatographic techniques and vapour phase refining (Mond's process and Van Arkel process)

Metallurgy of titanium, cobalt, nickel, thorium and uranium.

TEXT BOOKS /REFERENCES

1. B.R Puri, L R Sharma K C Kalia, Principles of Inorganic Chemistry , S. Chand & Co. New Delhi
2. B.R Puri, L R Sharma M S Pathania, Principles of Inorganic Chemistry , Vishal Publishing Co. New Delhi 2013
3. B K Sharma,H. Gaur, Industrial chemistry, Goel Publishing House, New Delhi
4. K S Tewari,N K Vishnoi, Organic Chemistry, 3rd Edn. Vikas Publishing House

UNIVERSITY OF KERALA
II Semester B.Sc Degree Examination Model Question Paper
Complementary Course for Physics Major

Course code CH 1231.1 Credit 2
PHYSICAL AND INDUSTRIAL CHEMISTRY

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. Write one example for an exothermic reaction
2. Name a natural way of harvesting solar energy.
3. Mention two different forms in which natural gas is available.
4. What do you mean by ionic product of water?
5. Semi conductor grade Silicon is made by the technique--------
6. Identify the Lewis acid (HCl, NaOH, ,BF3,NH3)
7. Name the chemicals which can form an acidic buffer.
8. What is meant by carbonization of coal?
7. Give one example each for a Proton donor and a proton acceptor.
8. Name an oxide ore and a sulphide ore
9. What is the advantage of photovoltaic cell?
10. What is the application of Van Arkel method?

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. One mole of an ideal gas at 25oc is allowed to expand isothermally and reversibly form a volume of 10 liters to 20 liters. Calculate the work done by the gas?
12. Give one application of first law of thermodynamics.
13. Write the relation between ΔG, ΔH and ΔS. What is the condition for spontaneity of a process?
14. Calculate the enthalpy of hydrogenation, C_2H_4 (g) + H_2(g) ⟶ C_2H_6 (g).
    Given that bond energy of H-H= 433kJ, C=C =615kJ and C-C= 347kJ and C-H = 413kJ.
15. What is bond dissociation energy?
16. What is isochoric process?
17. What are the characteristics of equilibrium constant?
18. What is enthalpy of hydration?
19. What is a reversible process? Give an example.
20. Define Lewis acid and base
21. What is ionic product of water.
22. What is the importance of pyrometallurgy?

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. Calculate the bond energy of HBr bond,given that the enthalpy of formationof HBr is -36.2kJmol^{-1}. The bond energies of H-H and Br-BR bond are 431kJmol^{-1} and 188kJmol^{-1} respectively.
24. Write a note on HSAB principle.
25. Differentiate between ignition point and flash point.
26. Discuss n Mond's process and Van Arkel method.
27. Write a note on nanostructured solar cells.
28. How will you differentiate between liquation and distillation processes in metallurgy?

29. Give an account of crude oil, its distillation products and theur applications.

30. Comment on the use of hydrogen as a future fuel.

31. What is smelting? Give an example

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32. a) Explain pH determination by potentiometric method
    (b) Differentiate between hard and soft acid
    (c) Write a note on leveling effect of solvents on acids. (5+5+5)

33. (a) Discuss the effect of pressure , temperature and concentration and mention the optimum conditios in the following reaction under equilibrium
    i) dissociation of $PCl5$ into PCl_3 and Cl_2
    ii) formation of SO_3 from $SO2$ and O_2
    (b) Illustrate the role roasting and calcinations in metallurgy. (5+5+5)

34. (a) Discuss on spontaneity or feasibility of a process.

    (b) State and explain Hesse's law.
    (c) When one mole of ethanol melts at its melting point, the entropy change is $29.4JK^{-1}$ mol^{-1}. If enthalpy of fusion of ethanol is 4.6 $kJmol^{-1}$, what is the melting point of ethanol?

35. (a) Discuss metallurgy of titanium
    (b) Compare between aluminothermy and hydrometallurgy.
    (c) Write notes on concentration of an oxide ore and a sulphide ore?

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARY CHEMISTRY

FOR STUDENTS OF PHYSICS MAJORS

2020 Admission onwards

SEMESTER	**III**
COURSE	**3**
COURSE NAME	**PHYSICAL CHEMISTRY**

COURSE CODE	**CH1331.1**
CREDIT	**3**
L-T-P	**3-0-2**
TOTAL HOURS	**54**

CO No.	COURSE OUTCOME *Upon completion of this course, the students will:*	Cognitive Level
1	Discuss on electrochemical cells and emf measurements	U
2	Apply the principles of physical Chemistry in Catalysis and photochemistry	A
3	Draw unit cells and structure of crystals	U
4	Understand the effect of temperature on molecular velocities of gases	R
5	Calculate cell emf and electrode potentials	A
6	Construct electrochemical cells	A
7	Classify between Photochemical reactions	U
8	Relate electrolyte concentration with emf	E

R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE 1: GASEOUS STATE 9HRS

Maxwell's distribution of molecular velocities (No derivation) average, most probable and rms velocities, collision number and collision frequency, mean free path, deviation of gases from ideal behaviour – Boyle temperature, derivation of vander waals constants and critical constants – Law of corresponding states – reduced equation of state, Joule Thomson effect, liquefaction of gases – Linde's and claude's processes

MODULE II – CRYSTALLINE STATE 9HRS

Isotropy and anisotropy – symmetry elements in crystals – the seven crystal systems. Miller indices, Bravais lattices, primitive, bcc and hcc of cubic crystals – Representation of lattice planes of simple cubic crystal - Density from cubic lattice

dimension – calculation of Avogadro number - Bragg equation, diffraction of Xrays by crystals – single crystal and powder method. Detailed study of structures of NaCI and KCl crystals.

MODULE III - ELECTRO CHEMISTRY 9HRS

Transport number – definition, determination by Hittorfs method and moving boundary method, application of conductance measurements. Conductometric titrations involving strong acid – strong base, strong acid – weak base, weak acid – strong base and weak acid – weak base.

EMF – Galvanic cells, measurement of emf, cell and electrode potential, IUPAC sign convention, Reference electrodes, SHE and calomel electrode, standard electrode potential, Nernst equation, anion and cation reversible electrodes, redox electrode with examples, quinhydrone electrode, glass electrode concentration cell without transference, potentiometric titration, Fuel cells – H_2 – O_2 and hydrocarbon – O_2 type.

MODULE IV – CATALYSIS AND PHOTOCHEMISTRY 9HRS

General Characteristics of catalytic reactions. Different types of catalysis – examples – theories of catalysis (Outline of intermediate compound formation theory and adsorption theory). Enzyme catalysis – Michaelis-Menten mechanism.

Photo Chemistry: - Laws of Photo Chemistry, Grothus – Drapter law, Beer Lambert's law, Einstein's laws, quantum yield, H_2 – Cl_2 reaction, H_2 – Br_2 reaction – Fluorescence and phosphorescence, chemiluminescence and photo sensitization.

MODULE – V: CHEMICAL KINETICS 9 HRS

Rates of reaction, various factors influencing rates of reactions – order and molecularity – Zero, first, second and third order reaction, derivation of integrated rate equation, fractional life time, units of rate constants, influence of temperature on reaction rates. Arrhenius equation, calculation of Arrhenius parameters – collision theory of reaction rates.

MODULE VI- GROUP THEORY 9 HRS

Group theory- elements of symmetry- proper and improper axis of symmetry- plane of symmetry-center of symmetry- identity elements, combination of symmetry elements-point group- C_{2v}, C_{3v} and D_{3h}- group multiplication table of C_{2v}- determination of point group of simple molecules like water, NH_3, BF_3

REFERENCES

1. B.R.Puri,L.R. Sharma and M.S.Pathania, Principles of Physical Chemistry, 46 th Edn Vishal Publishing Co. NewDelhi
2. J E Huheey, ,E A Keiter, R L Keiter, O K Medhi, Inorganic Chemistry, 4th Edn.Pearson
3. F A Cotton and Wilkinson,Advanced Inorganic Chemistry, John Wiley, New York
4. P L Soni, O P Dharmarsha,U N Dash,Textbook of Physical Chemistry, 23rd Edn, Sultan Chand & Sons, NewDelhi,2011
5. Gurudeep Raj ,Advanced physical chemistry
6. L V Azaroff, Introduction to solids
7. N B Hannay ,Solid state chemistry
8. F Daniel and R A Alberty ,Physical chemistry
9. A Salahuddin kunju and G krishnan Group theory and its applications in chemistry-

UNIVERSITY OF KERALA
III Semester B.Sc Degree Examination Model Question Paper
Complementary Course for Physics Major

Course Code CH1331.1 Credit 3
PHYSICAL CHEMISTRY

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. What is the ratio of observed molar volume to ideal molar volume is?
2. Define Boyle temperature?
3. How many unit cell are possible in cubic crystal?

4. Why amorphous solids are said to be isotropic?
5. In a Galvanic cell electron flows from …… to ……
6. What is the potential of SHE.
7. What is the quantum yield of H_2-Cl_2 reaction?
8. Define chemiluminescence
9. What is the order of the reaction with rate constant $2x10^{-2}$ $molL^{-1}s^{-1}$
10. NH_3 belongs to which point group?

SECTION B

*(Answer **any eight** questions. Each question carries **2** mark)*

11. Define critical temperature and explain its significance?
12. What is virial equation of states?
13. Explain the term Space lattice and Unit cell.
14. Both NaCl and KCl have fcc structures but Kcl behaves towards X-rays like simple cubic lattice. Why?
15. What is liquid junction potential? How can it be eliminated?
16. What are reference electrodes? Give their significance?
17. State Einstein's law of photochemical equivalence?
18. What is meant by chemiluminescence?
19. What is meant by autocatalysis?
20. Define order and molecularity of areaction?
21. A substance decomposes following first order kinetics. The half life period of a reaction is 35 minutes. What is the rate constant of the reaction?
22. What is meant by point group?

SECTION C

*(Answer **any six** questions. Each question carries **4** mark)*

23. What is the law of corresponding states? How is it derived from the vander waal's equation?
24. Calculate the constants a and b, if Tc=31^0C, Pc=72.8atm and R=0.082lit atm/K?
25. What are the Miller indices? How are they detrmined?
26. EMF of a standard Daniel Cell is 1.01832 V at 298K. Temperature coefficient of the cell is $-5x10^{-5}$V/K. Calculate ΔG, ΔH, and ΔS of the cell reaction?
27. Write a brief note on Calomel electrode?

28. State and explain Beer-Lambert's law? What are its limitations?

29. Explain pseudo order reactions with suitable examples?

30. Give the group multiplication table for C_{2V}

31. Explain the different symmetry elements?

SECTION D

*(Answer **any two** questions. Each question carries **15** mark)*

32. (i) Explain Linde's and Claude's method of liquefaction of gases?

    (ii)Do all gases obey gas laws? Discuss some experimental results to explain the deviation and point out the causes which account for this behavior?

    (iii) explain the terms: collision frequency and collision diameter.

33. (i) Derive Bragg's equation for the diffraction of of X-rays by crystal lattice? How is this equation used in elucidating the crystal structure?

    (ii) In fcc lattice of NaCl the distance between Na^+ and Cl^- ions is 281 pm and the density of NaCl is 2.165g/cm^3. Compute Avogadro's no. from the given data. The molar mass of NaCl is 58.5g/mol.

    (iii) Assign the point groups of the molecule BF_3 and H_2O

34. (i) Write a brief note on fuel cells? (ii) State and explain Nernst equation (iii) Explain the principle of potentiometric titrations?

35. (i) What is catalysis? What are the general characteristics of catalyst? (ii) Derive an expression for rate constant of a first order reaction? (iii) Explain the influence of temperature on reaction rates?

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARY CHEMISTRY

FOR STUDENTS OF PHYSICS MAJORS

2020 Admission onwards

SEMESTER	**IV**
COURSE	**3**
COURSE NAME	**SPECTROSCOPY AND ADVANCED MATERIALS**
COURSE CODE	**CH 1431.1**

CREDIT	**3**
L-T-P	**3-0-2**
TOTAL HOURS	**54**

CO No.	COURSE OUTCOME *Upon completion of this course, the students will:*	Cognitive Level
1	Discuss the principle and applications of rotational, vibrational, electronic and NMR spectroscopy.	U
2	Illustrate isomerism, geometry and bonding in co ordination complexes	A
3	Appreciate the use of co ordination compounds in qualitative and quantitative analysis	U
4	Solve numerical problems relating to nuclear chemistry	R
5	Appreciate the use of biodegradable polymers	A
6	Apply the importance energy and environment conservation	U
7	Get insight to the emerging area of nano and advanced materials	A

R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I - SPECTROSCOPY 9hrs

Regions of electromagnetic spectrum – different units to represent energy such as erg, joule, calorie, cm^{-1}, Hz and eV, their interconversions – interaction of radiation with matter, different types of energy levels of molecules – rotation, vibration and electronic levels. Rotation spectroscopy Microwave spectrum of diatomic molecules – expressions for rotational energy, selection rule – frequency separation and determination of bond length – vibrational spectrum – harmonic oscillator, equation for frequency of vibration, expression for vibrational energy, selection rule, frequency separation, calculations of force constant,

Electronic spectroscopy –types of transition and regions where they absorb.

MODULE II- SPECTROSCOPY- II 9 hrs

Raman spectroscopy – stokes and anti stokes lines, quantum theory of Raman spectrum – advantages and disadvantages of Raman spectrum, rotational Raman spectrum, selection rules and frequency separation. Vibrational Raman spectrum – Complementary with IR spectrum, mutual exclusion principle, NMR spectroscopy, principle of NMR spectroscopy, nuclear spin, interaction with external magnet, energy spacing, transition between nuclear energy levels in hydrogen nucleus, low resolutionspectrum, chemical shift, spin – spin coupling – fine structure spectrum, application to simple molecule

MODULE III COORDINATION CHEMISTRY 9 hrs

Double salts and complex salts, Werner's coordination theory, Types of ligands,
Chelating ligands- bidentate and polydentate- EDTA, Stability of chelates
Valence bond theory of bonding in octahedral and tetrahedral complexes, Drawbacks of valence bond theory
Crystal field theory of octahedral and tetrahedral complexes, examples
high and low spin complexes, magnetic properties ,applications of co ordination compound in qualitative and quantitative volumetric analysis.

MODULE IV – NUCLEAR CHEMISTRY 9 hrs

Nuclear Chemistry – stability of Nucleus – n/p ratio,radioactivity, artificial transmutation and artificial radio activity. Detection of radio activity by Wilson's cloud chamber and Geiger Muller Scintillation counter – units of radio activity – curie and rutherford – Radio Carbon dating , Rock dating, Neutron activation analysis Applications in agriculture and medicine. A brief study of pathological and genetic damage due to radiation , Dosimetry – Units – rad, gray and Roentgen. Fricke dosimeter and ceric sulphate dosimeter.

Mass defect, binding energy, atomic fission and fusion

MODULE V :CHEMISTRY OF NANO MATERIALS 9 hrs

Evolution of Nano science – Historical aspects – preparations containing nano gold in traditional medicine, Lycurgus cup – Faraday's divided metal etc.
Nanosystems in nature.
Preparation of Nano particles – Top – down approach and bottom – top approach, sol – gel synthesis, colloidal precipitations, Co- precipitation, combustion technique.

Properties of nano particles: optical, magnetic and mechanical properties.
Tools for measuring nano structure – XRD, Atomic force Microscopy (AFM), Scanning Tunneling Microscopy (STM), and Scanning Electron Microscopy (SEM) Transmission Electron Microscopy (TEM) . Applications of nano materials in electronics, robotics, computers, sensors, mobile electronic devices, Medical applications (use Au, Ag,ZnO and ZnO_2 as examples)

MODULE VI- ADVANCED MATERIALS 9hrs

Magnetic materials-classification- applications and examples
Piezo electric and pyroelectric materials, examples
Conducting polymers- polyacetylene- ploy anilines- synthesis- applications
Bio degradable polymers: PLA, PGA and PHBV
Polymeric sulphur nitrogen compounds $(SN)_x$ as one dimensional conductors.
Photoconducting polymers-examples-super conducting materials
Liquid crystals – mesomorphic state, types of liquid crystals, applications and examples.
Ceramics: Introduction, types of clay products, properties and applications

REFERENCE

1. C.N.Banwell, Fundamentals of molecular spectroscopy, Tata Mc GRaw Hill CO. Ltd.
2. B R Puri, L R Sharma and K C Kalia, Principles of Inorganic Chemistry, Mile stone Publishers. New Delhi
3. G M Barrow, Physical Chemistry,5th Edn.Tata Mc Graw HillEducation, NewDelhi,2006
4. J E Huheey, ,E A Keiter, R L Keiter, O K Medhi, Inorganic Chemistry, 4th Edn.Pearson
5. F A Cotton and Wilkinson,Advanced Inorganic Chemistry, John Wiley, New York
6. V R Gowarikar,Polymer Chemistry, New Age International (P) Ltd. New Delhi 2010
7. T Pradeep, A Text book of Nanoscience and Nanotechnology,Mc Graw Hill, New Delhi

UNIVERSITY OF KERALA
IV Semester B.Sc Degree Examination Model Question Paper
Complementary Course for Physics Major

Course code CH1431.1 Credit 3
SPECTROSCOPY AND ADVANCED MATERIALS

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark*

1. Which of the following give pure rotational spectrum: H_2, N_2, CO_2, HCl?

2. What is Rayleigh scattering?
3. What is the selection rule for vibrational transition?
4. What is the condition for a molecule to be NMR active?
5. What is Wilkinson's catalyst?
6. What is nano shells?
7. Write an example for a chelate.
8. What are the ores of titanium?
9. Name the nano meterial used in semiconductors?
10. What are ferromagnetic materials?

SECTION B

*(Answer **any eight** questions. Each question carries **2** mark)*

11. What is Born Oppenheimer approximation?
12. The force constant of HF molecule is 970Nm-1. Calculate the fundamental vibrational frequency as well as the zero point energy?
13. What is Raman Effect? What is the cause of Raman effect?
14. Explain the terms shielding and deshielding with regard to NMR spectroscopy.
15. What is chemical shift?
16. Explain the effect of solvent in UV spectroscopy.
17. What is the difference between a double salt and a complex compound?
18. $[Fe(CN)_6]^{3-}$ paramagnetic. Why?
19. Give an example for artificial transmutation of elements
20. What is half life?
21. What is STM and its basic principle?
22. Explain the synthesis of polyaniline from aniline.

SECTION C

*(Answer **any Six** questions. Each question carries **4** mark)*

23. Why are anti-stokes lines intense than the stokes lines in the Raman spectrum?
24. Taking the example of HCl show how rotation of the molecule causes dipole moment fluctuations?
25. State and illustrate the Frank-Condon principle.
26. Define the terms: Bathochromic shift, Hypsochromic shift, hyperchromic shift, hypochromic shift.
27. Discuss Werner's theory of coordination compounds.
28. Explain the formation of low spin and high spin complexes with the help of crystal field theory.
29. Write a note on Geiger Muller counter.
30. Explain the properties of nano particles.
31. Give a short note on superconducting materials.

SECTION D

*(Answer **any two** questions. Each question carries **15** mark)*

32. (i) Derive an expression for allowed energies of rotational levels ina diatomic molecule.
    (ii) Show that for a rigid diatomic rotor the moment of inertia is given by $I= \mu r^2$.

    (iii) Discuss the quantum theory of Raman spectroscopy

33. (i) Explain the underlying principle in an NMR spectrum.
    (ii)What are the different kinds of protons indicated in an NMR spectrum. How do they produce their characteristics signals?

    (iii)How can the NMR method be used to distinguish between the structures of

    1-propanol and 2-propanol?

34. (i) Give an account of crystal field theory?
    (ii) What are applications of coordination compounds in qualitative analysis?

    (iii) Radio carbon in wood decays with a half life of 5770 years. What is the rate constant (in $year^{-1}$) for the decay? What fraction would remain after 11540 years?

35. (i) Explain the applications of nanomaterials in electronic and robotics.
    (ii) Explain working principle of SEM and TEM.

    (iii)Give a note radio active disintegration series.

UNIVERSITY OF KERALA
SYLLABUS OF LAB COURSE IN CHEMISTRY
FOR STUDENTS OF PHYSICS MAJORS

2020 Admission onwards

SEMESTER	**I,II,III &IV**
COURSE	**5**
COURSE TITLE	**COURSE V : LAB COURSE FOR PHYSICS**
COURSE CODE	**CH 1432.1**
CREDIT	**2**

L-T-P	**0-0-2**
TOTAL HOURS	**36**

CO No.	COURSE OUTCOME *Upon completion of this course, the students*	Cognitive Level
1	Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, out look and scientific temper (GOOD LAB PRACTICES)	E.U
2	Develop skill in safe handling of chemicals, take precaution against accidents and follow safety measures	A
3	Develop skill in observation , prediction and interpretation of reactions	U,A
4	Apply the principle of common ion effect and solubility product in the identification and separation of ions	A
5	Develop skill in weight calculation for preparing standard solutions	A
6	Perform volumetric titrations under acidimetry-alkalimetry, permanganometry, dichrometry, iodimetry-iodometry,cerimetry, argentometry and complexometry	A
7	Determine physical constants	A

I. REACTIONS OF THE FOLLOWING CATIONS:

Hg^{+}, Pb^{2+}, Ag^{+}, Hg^{2+}, Bi^{3+}, Cd^{2+}, As^{3+},b^{3+}, Sn^{2+}, Sn^{4+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Cd^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+} and NH_4^{+}.

II. SYSTEMATIC ANALYSIS OF TWO CATIONS IN A MIXTURE

The cations must be provided in solutions. A student must analyze at least ten mixtures containing two cations each.

III. VOLUMETRIC ANALYSIS

A. Acidimetry and Alkalimetry

a. Preparation and standardization of 0.05N HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

c. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. HCl

d. Preparation and standardization of 0.05N NaOH using oxalic acid as primary standard

e. Estimation of a strong acids using standardized NaOH

f. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

B. Permanganometry

a. Standardisation of $KMnO_4$ by oxalic acid sodium oxalate and Mohr's salt

b. Estimation of oxalic acid / sodium oxalate

c. Estimation of Mohr's Salt.

d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodometry and Iodimetry

a. Standardization of sodium thiosulphate using std. potassium dichromate.

b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

IV. GRAVIMETRIC ANALYSIS

a. Estimation of water of hydration in barium chloride crystals.

b. Estimation of barium chloride solution.

V. DETERMINATION PHYSICAL CONSTANTS (NOT FOR ESE)

a. Determination of boiling points of common solvents (b.pt range 100^0C- 130^0C)
b. Determination of melting points of organic substances (m.pt range 100^0C- 130^0C)

SYLLABUS OF COMPLEMENTARY CHEMISTRY COURSES

FOR FIRST DEGREE PROGRAMME IN GEOLOGY

Complementary Courses -4 Total Credits – 14

(One Semester – 18Weeks

Semester	Hours/Week		No. of Credits	Course Code	Instructional Hours
	Thoery (L)	Lab (P)			
I	2		2	CH1131.2	2x18=36
		2	-		2x18=36
II	2		2	CH1231.2	2x18=36
		2	-		2x18=36
III	3		3	CH1331.2	3x18=54
		2	-		2x18=36
IV	3		3	CH1431.2	3x18=54
		2	4	CH1432.2	2x18=36

UNIVERSITY OF KERALA
SYLLABUS OF COMPLEMENTARY COURSE

FOR STUDENTS OF GEOLOGY MAJORS

2020 Admission onwards

SEMESTER	**I**
COURSE	**1**
COURSE NAME	**THEORETICAL CHEMISTRY**
COURSE CODE	**CH1131.2**
CREDIT	**2**
L-T-P	**2-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students will:*	**Cognitive Level**
1	Differentiate particle nature and wave nature of matter	U
2	Associate wave concept with microscopic matter	A
3	Understand the relevance of periodic classification of elements	U
4	List various chemical bonds	R
5	Apply the VSEPR theory to explain the geometry of molecules	A
6	Comprehend the meaning of stability of nucleus	U
7	Summarise the applications of radioactivity	U
8	Relate the analytical principles while doing qualitative and quantitative analyses	E

MODULE I –ATOMIC STRUCTURE **9 Hrs**

Atomic spectrum of Hydrogen – different series, Rydberg equation

Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation.

Schrodinger wave equation (no derivation, mention only) - concept of orbitals, the four quantum numbers and their significances.

Orbital wise electron configuration, energy sequence rule – Pauli's Principle, Hund's rule, stability of filled and half filled orbitals

MODULE II - CHEMICAL BONDING **9 Hrs**

Energetics of bond formation – Types of Chemical bonds – Energetics of ionic bond formation – Lattice energy – Born Haber Cycle - Fajan's rules.

Polarity of covalent bond -its relation with electronegativity – electro negativity scales – Paulings and Mullikan's approaches, factors influencing polarity , dipole moment – its relation to geometry.

Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility.

Hybridisation and structure of molecules – sp, sp^2 ' sp^3 , dsp^2 , dsp^3 , sp^3d^2 , and sp^3d^3 hybridisation with examples- Explanation of bond angle in water and ammonia -

VSEPR theory, geometry of molecules with bond pairs of electrons only, geometry of molecules containing bond pairs and lone pairs of electrons, limitations- A brief review of molecular orbital approach

LCAO method – bond order, bond distance and stability of O_2, O_2^{2+} ,O_2^{2-} ,NO,NO^+,CO and HF.

MODULE–III: RADIOACTIVITY **9 Hrs**

Radioactive equilibrium (qualitative idea only)-

Detection of radio activity by Wilson's cloud chamber and Geiger Muller Scintillation counter –

Units of radio activity – Curie and Rutherford –

Radio Carbon dating, Rock dating, Neutron activation analysis -Applications in agriculture and medicine.

A brief study of the biological effects of radiation such as pathological and genetic damage

Dosimetry – Units – Rad, Gray ,Roentgen. Ferrous and Ceric sulphate dosimeters

Nuclear Chemistry – stability of Nucleus – n/p ratio, artificial transmutation and radio activity, mass defect, binding energy, atomic fission and fusion.

MODULE IV: ANALYTICAL PRINCIPLES **9 Hrs**

Analytical methods in Chemistry –

Principles of volumetric analysis, primary standard, standard solution, normality and molarity, theory of acid - base titration, permanganometric and dichrometric titration, theory of acid – base and redox indicators.

Inorganic qualitative analysis- common ion effect- solubility product- precipitation of cations

Chromatography- principle and applications of paper and thin layer chromatography.

REFERENCES

1. Manas Chanda, Atomic structure and chemical bonding with introduction to molecular spectroscopy
2. Puri, Sharma and Kalia, Inorganic chemistry-
3. E S Gilreath, Fundamental concepts of inorganic chemistry-
4. Malik,Tuli, Madan, Selected Topics in Inorganic chemistry, S Chand.
5. F A Cotton, G Wilkinson and P L Guas ,Basic inorganic chemistry-
6. Arnicker ,Elements of nuclear chemistry-
7. A I Vogel, Text book of qualitative analysis-
8. A I Vogel, Text book of quantitative inorganic analysis-
9. Day and Underwood, Quantitative analysis: Laboratory manual

UNIVERSITY OF KERALA

I Semester B.Sc Degree Examination Model question paper

Complementary Course for Geology Major

Course Code CH1131.2 Credit 2

THEORETICAL CHEMISTRY

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. Write the electronic configuration of Chromium?
2. Name the principle according to which an orbital can accommodate only two electrons?
3. What is the shape of IF_7 molecule?
4. Write the hybridization of Boron in BF_3?
5. What is the bond order of O_2^+ ?

6. Emission of ------ from a radioactive element does not bring any change in charge or mass.

7. What is the principle of radiocarbon dating?

8. What is the result of the beta emission of group 15 element?

9. A useful indicator for the titration of acetic acid versus sodium hydroxide is --------.

10. Calculate the normality of 10% NaOH solution.

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. State Hund's rule.

12. Give the general equation for the frequency of the lines in the Balmer series for hydrogen?

13. Write the Schrodinger wave equation and explain the terms?

14. NH_3 and CH_4 have sp^3 hybridization. Shapes of these molecules are different. Why?

15. Distinguish between intermolecular and intra molecular hydrogen bonding?

16. The bond energy of NO^+ is larger than that of NO. Why?

17. Define Soddy's group displacement law.

18. The half life period of Ra^{226} is 1620 years. Calculate the value of K for its decomposition in $years^{-1}$?

19. What are beta rays? Which element is formed when beta particle is emitted from Cl-38?

20. Phenolphthalein is not suitable for the titration of strong acid against weak base. Why?

21. How would you prepare 100ml of 0.05M Mohr's salt solution?

22. What are primary standards? Give two examples.

SECTION C

*(Answer any **six** questions. Each question carries 4 mark)*

23. Why is Bohr model of atom considered inadequate?

24. Explain hydrogen spectrum?

25. Explain why CO_2 and CCl_4 molecules are non polar but $CHCl_3$ molecule is polar?

26. Explain the shape of SF_6 molecule.

27. Water exists as liquid at room temperature while H_2S is a gas at the same temperature. Account for the reason.

28. Explain neutron activation analysis and its application?

29. Write a note on (i) Geiger-Muller counter and (ii) Wilson cloud Chamber.

30. Explain the principle and application of paper chromatography?

31. Explain the theory of redox indicators.

SECTION D

*(Answer any **two** questions. Each question carries 15 mark)*

32. (i) What are quantum numbers? Give the significance of each? (5 marks)

    (ii) Write the postulates of Bohr model of atom? (5 marks)

    (iii) Define Aufbau principle with example and explain the stability of half-filled and fully filled orbital? (5 marks)

33. (i) Write a short note on Born- Haber cycle?

    (ii) Draw and explain the MO diagram for O_2 molecule.

    (iii) Describe the different approaches of electronegativity?

34 (i) Derive an equation for the decay constant of a radioactive material.

    (ii) If at the end of 67.5 years only 3.125% of a radioactive material remains without decay. What is the half life of the decay?

    (iii) Give an example each for proton, neutron and deuteron induced reactions.

35. (i) What are acid base indicators?

    (ii) Explain the use of indicators in acid base titrations.
    (iii) Discuss the titration curves for the titration of strong acid – strong base and weak acid –strong base?

UNIVERSITY OF KERALA
SYLLABUS OF COMPLEMENTARY COURSE

FOR STUDENTS OF GEOLOGY MAJORS

2020 Admission onwards

SEMESTER	**II**
COURSE	**2**
COURSE NAME	**PHYSICAL CHEMISTRY**
COURSE CODE	**CH1231.2**
CREDIT	**2**
L-T-P	**2-0-2**
TOTAL HOURS	**36**

CO No.	COURSE OUTCOME *Upon completion of this course, the students,*	Cognitive Level
1	Apply laws of thermodynamics	R
2	Relate spontaneity with entropy and free energy	E
3	Define enthalpy of reactions	R
4	Apply Hess's law	A
5	Illustrate Le Chatelier's principle and predict the effect of pressure and temperature on reactions	A
6	Categorize compounds into acids and bases	A
7	Solve numerical problems on pH and thermodynamic proprties	U,A

MODULE I –THERMODYNAMICS **9 Hrs**

First law of thermodynamics- mathematical form- intrinsic energy- enthalpy- reversible, process and maximum work- work of expansion of an ideal gas in reversible isothermal process

Heat capacity of gases at constant volume, at constant pressure, derivation of $C_P - C_V = R$

Second law of thermodynamics- entropy and free energies- significance of $\Delta G, \Delta H$ and available work – criteria of equilibrium and spontaneity on the basis of entropy and free energy – Gibbs-Helmholtz equation

MODULE II - THERMOCHEMISTRY **9 Hrs**

Enthalpies of formation, combustion, neutralization, solution and hydration-

Relation between heat of reaction at constant volume and constant pressure

Variation of heat of reaction with temperature- Kirchoff's equation

Hess's law and application – bond dissociation energies and bond energies of different types of bonds, their calculation and enthalpies of reaction

MODULE III – CHEMICAL EQUILIBRIUM 9 Hrs

Reversible reactions – K_P, K_C, and K_X and their inter relationships –
Free energy change and chemical equilibrium (thermodynamic derivation) –
van't Hoff reaction isotherm and isochore -
Influence of pressure and temperature on the following reactions.

(i) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (ii) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ (iii) $2SO_2 + O_2 \rightleftharpoons 2\ SO_3$

Le Chatelier's principle and the discussion of the above reactions on its basis

MODULE IV–IONIC EQUILIBRIUM 9 Hrs

Concepts of Acids and Bases-ionization of weak electrolytes-Influence of solvent on acid strength – leveling effect –
pH and its determination - potentiometric method-
Buffer solutions and calculations of the pH- Henderson equation -
Hydrolysis of salt – degree of hydrolysis and hydrolytic constant, derivation of relation between Kw and Kh for salts of strong acid – weak base, weak acid - strong base and weak acid – weak base

REFERENCES

1. Puri, Sharma and Pathania, Principles of Physical Chemistry
2. Gurudeep Raj, Advanced physical chemistry
3. S Glastone ,Thermodynamics for chemists
4. Glastone and Lewis, Elements of Physical Chemistry
5. K L K Kapoor, A text book of Physical Chemistry
6. P C Rakshit Physical Chemistry

UNIVERSITY OF KERALA

II Semester B.Sc Degree Examination Model question paper

Complementary Course for Geology Major

Course Code CH1231.2 Credit 2

PHYSICAL CHEMISTRY

(2020 Admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. What is a reversible process?

2. Write the first law of thermodynamics.
3. What is an isochoric process?
4. What is standard enthalpy of formation?
5. Write one example for an exothermic reaction.
6. What is enthalpy of hydration?
7. What is rate constant?
8. What is the significance of ΔG?
9. What is common ion effect?
10. What is the P^H of 0.01M HCl?

SECTION B

*(Answer **any eight** questions. Each question carries **2** marks)*

11. One mole of an ideal gas at 25oc is allowed to expand isothermally and reversibly form a volume of 10 liters to 20 liters. Calculate the work done by the gas?
12. State the first law of thermodynamics. What are its limitations?
13. Write the relation between ΔG, ΔH and ΔS. What is the condition for spontaneity of a process?
14. Calculate the enthalpy of hydrogenation, $C_2H_4\,(g) + H_2(g) \longrightarrow C_2H_6\,(g)$.Given that bond energy of H-H= 433kJ, C=C =615kJ and C-C= 347kJ and C-H = 413kJ.
15. Define Enthalpy of formation.
16. What is bond dissociation energy?
17. State Le Chatlier principle.
18. What is isochoric process?
19. What are the characteristics of equilibrium constant?
20. Define Lewis acid and base.
21. What is meant by levelling effect?
22. What is ionic product of water?

SECTION C

*(Answer **any six** questions. Each question carries **4** mark)*

23. What do you understand by heat capacity of a system? Show from thermodynamic considerations that Cp - Cv = R.
24. Derive Gibb's Helmohtz equation.
25. In a certain process 675 J of heat is absorbed by a system while 290 J of work is done on the system. What is the change in internal energy for the system?

26. State and explain Hesse's law.

27. Derive relation between heat of reaction at constant volume and constant pressure.

28. Calculate the equilibrium constant for a reaction at 25^0C. ΔG^0=20kcal.

29. Predict the effect of pressure on the dissociation of PCl_5.

30. What is meant by Buffer solution? Give an example of acidic and basic buffer solution? Explain its mechanism?

31. Write Henderson equation. What is its significance?

SECTION D

*(Answer **any two** questions. Each question carries **15** mark)*

32. (i) Derive an expression for work done in the reversible isothermal expansion of an ideal gas.

    (ii) Define

    (a) Work function

    (b) Gibbs free energy function

    (c) Entropy

    (d) Internal energy

33. (i) State Kirchhoff's equation. Indicate how it can be used to evaluate ΔH of a reaction from heat capacity data of reactants and products.

    (ii) Calculate the heat of formation of CO_2. Given that CO (g)+H_2O (l) $\Longleftrightarrow$ CO_2 (g)+ H_2(g); ΔH=0.7 kcal. Heat of formation of H_2O (l) and CO (g) are -68.3 and -26.4 $kcalmol^{-1}$ respectively.

34. (i) Derive van't Hoff equation.

    (ii) Derive relation between Kp and Kc.

    (iii) The equilibrium constant of a reaction doubles on raising the temperature from 25^0C to 35^0C. Calculate ΔH^0 of the reaction?

35. (i) Define pH of a solution. Calculate the pH of 0.2M acetic acid in 0.5M sodium acetate at 298K. Dissociation constant of acetic acid at 298K is 1.8 $x10^{-5}$?

    (ii) Write a note on salt hydrolysis?

UNIVERSITY OF KERALA
SYLLABUS OF COMPLEMENTARY COURSE

FOR STUDENTS OF GEOLOGY MAJORS

2020 Admission onwards

SEMESTER	III
COURSE	3
COURSE TITLE	PHYSICAL AND INORGANIC CHEMISTRY
COURSE CODE	CH1331.2
CREDIT	3
L-T-P	3-0-2
TOTAL HOURS	54

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students,*	**Cognitive Level**
1	Understand gaseous state	U
2	Interpret the deviation of real gases from ideal behaviour	U & E
3	Get an insight on crystal structure	A
4	Draw and Make crystal models of NaCl & KCl crystals	C
5	Understand chemical cycles of Carbon, Sulphur, Nitrogen and Phosphorous	U
6	Comprehend the properties of various anions, in particular, oxides	A
7	Differentiate true solution, colloidal solution and suspension	E
8	Understand the properties of colloids and their application	U

MODULE I – GASEOUS STATE (9 Hrs)

Maxwell's distribution of molecular velocities (no derivation), average, most probable and RMS velocities

collision number and collision frequency, mean free path

deviation of gases from ideal behaviour – Boyle temperature, derivation of Vander Waal's constants and critical constants

Law of corresponding states – reduced equation of state,

Joule Thomson coefficient, liquefaction of gases –Linde's and Claudes process.

MODULE II –CRYSTALLINE STATE (9 Hrs)

Isotropy and anisotropy – symmetry elements in crystals –

seven crystal systems – Miller indices, Bravais lattices, primitive, bcc and fcc lattices of cubic crystals

Bragg equation - diffraction of X rays by crystals – single crystal and powder method

Detailed study of structure of NaCl and KCl crystals

Liquid crystals – mesomorphic state, types of liquid crystals, application and examples

MODULE III– CHEMICAL CYCLES AND GROUP PROPERTIES (9 Hrs)

Carbon, Sulphur, Nitrogen, Phosphorous and hydrologic cycle

Group properties (reactions) of anions in common minerals – Carbonate, Sulphate, Phosphate, Sulphides and Fluorides

Classification of oxides – Acidic, Basic, Amphoteric and neutral

MODULE IV: SURFACE CHEMISTRY AND COLLOIDS (9 Hrs)

Adsorption – types of adsorption of gases by solids, factors influencing adsorption, Freundlich adsorption isotherm – Langmuir adsorption isotherm (derivation not required)

Colloids- True solution, colloidal solution and suspension

Classification of colloids: Lyophilic, lyophobic, macromolecular, multimolecular and associated colloids with examples

Purification of colloids by electro dialysis and ultra filtration

Properties of colloids: Brownian movement – Tyndall effect – Electrophoresis

Origin of charge and stability of colloids – Coagulation - Hardy Schulze rule – Protective colloids - Gold number

Emulsions- Applications of colloids: Cottrell precipitator – purification of water, coagulation, reverse osmosis, electro dialysis, delta formation, medicines, cleaning action of detergents and soaps.

MODULE V INORGANIC POLYMERS (9 Hrs)

General properties of inorganic polymer-

phosphazenes – preparation of linear and cyclo phosphazene with examples, properties, and application

silicones – general methods of preparation and properties examples

applications of Silicones, Silicone rubber, silicone resins

MODULE VI SOIL AND WATER CHEMISTRY (9 Hrs)

Soil – Composition, mineral matter in soil process of soil formation, weathering – physical (mention), chemical (detail) + biological (mention)

Saline and alkaline soil (brief explanation) Rocks – different types (Igneous, sedimentary and Metamorphic.)

Analysis of lime stone qualitative treatment only

Water Analysis Water quality parameters COD, BOD, main quality characteristics of water (alkalinity, hardness, total solids and oxidation)

Water treatment including chemical (Precipitation, aeration, osonisation, chlorination) and physical methods of sterilization

REFERENCES

1) Rakshit Physical Chemistry
2) Puri,Sharma, Pathania Principles of Physical Chemistry
3) B.K.Sharma, Instrumental methods of Chemical Amalysis
4) Vogel's Text book of Quantitative Chemical Analysis –VI Edition

5) Manas Chanda, Atomic structure with introduction to Molecular Spectroscopy
6) N.M.Kapoor, Physical Chemistry-
7) B.K.Sharma, Soil and Noise pollution-
8. B.K.Sharma, Industrial Chemistry

UNIVERSITY OF KERALA

III Semester B.Sc Degree Examination Model question paper

Complementary Course for Geology Major

Course Code: CH1331 .2 Credit 3

(2020 Admission onwards)

PHYSICAL AND INORGANIC CHEMISTRY

Time: Three Hours **Maximum marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. Write the general formula of silica.
2. How oxides are classified?
3. Explain the term mean free path.
4. Name two classification of colloids based on solvent?
5. Explain Bravais lattices
6. Write the expression for RMS velocity.
7. What is inorganic rubber?
8. Define Brownian movement.
9. Define glass transition temperature.
10. Mention any two chemical methods of water sterilization.

SECTION B

(Answer any eight questions. Each question carries 2 marks)

11. Distinguish between most probable velocity and average velocity.

12. State law of corresponding states.
13. Differentiate between isotropy and anisotropy.
14. Find the Miller indices of a crystal plane with intercepts 2a,2b and 3c.
15. Explain COD and BOD.
16. How will you analyse limestone qualitatively?
17. What is CMC
18. Draw Langmuir adsorption isotherm
19. What is the difference between colloid and suspension?
20. Define Boyle temperature.
21. What is Bragg's equation?
22. What is Joule- Thomson coefficient?

SECTION C

(Answer any six questions. Each question carries 4 marks)

23. What are the causes for the deviation of real gases from ideality? How is it solved?
24. Explain symmetry elements in crystals.
25. Give an account of weathering with emphasis to chemical weathering.
26. What are inorganic polymers? How do they differ from organic polymers?
27. Give any one method for the preparation of silicones. What are the important applications of silicones?
28. Explain Hardy Schulze rule with the help of an example.
29. Give an account of carbon cycle.
30. Explain Linde's process of liquefaction of gases.

SECTION D

(Answer any two questions. Each question carries 15 marks)

31. (a) Explain liquid crystals with examples for each type (b) Give a detailed account on the structure of NaCl.
32. Write a note on (a) Nitrogen cycle (b) different types of rocks and (c) main quality characteristics of water.
33. Give an account of the preparation, properties and important applications of (a) silicates (b) phosphazenes.

34. (a) Write a note on different types of adsorption of gases by solids.

(b) Describe the applications of colloids.

35. (a) Write a short note on the various purification methods of water.

(a) Calculate the average velocity and root mean square velocity of a molecule in a sample of oxygen at 0 °C?

UNIVERSITY OF KERALA
SYLLABUS OF COMPLEMENTARY COURSE

FOR STUDENTS OF GEOLOGY MAJORS

2020 Admission onwards

SEMESTER	IV
COURSE	4
COURSE NAME	PHYSICAL AND ANALYTICAL CHEMISTRY
COURSE CODE	CH 1431.2
CREDIT	3
L-T-P	3-0-2
TOTAL HOURS	54

CO No.	**COURSE OUTCOME** ***Upon completion of this course, the students:***	**Cognitive Level**
1	Discuss metallurgy and metallurgical processes	U

2	Get and insight in to petro chemical industry	U
3	Explain the reaction kinetics	A
4	Understand the theories of catalysis	U
5	Couple different electrode and construct electrochemical cells	U
6	Appreciate the use of sophisticated instruments	A

MODULE I -METALLURGY **9 Hrs**

Occurrence of metals, General principles of extraction of metals from their ores:
Concentration of ores- roasting, calcinations and smelting
General methods of extracting metal from concentrated ore Electrometallurgy and Pyrometallurgy
Refining of metals : electrolytic and zone refining only.
Metallurgy of Titanium, Iron, cobalt, Nickel, Thorium, Uranium
Extraction of lanthanides

MODULE II- PETRO CHEMICALS **9 Hrs**

Introduction to crude oil, exploratory methods, constitution of crude oil, natural gas – constituents

Distillation of crude oil, separation of natural gas and different fractions

Meaning of terms such as ignition point, flash point, octane number

Types of hydrocarbon fuels and their characteristics

Cracking – catalytic cracking, hydro cracking, isomerization, reforming, sulphur, hydrogen, petroleum, coke and nitrogen compounds from petroleum.

MODULE III - CHEMICAL KINETICS **9 Hrs**

Rates of reactions, various factors influencing rates of reactions

order and molecularity - Zero, first, second and third order reactions

Derivation of integrated rate equation, fractional life time, units of rate constants Influence of temperature on reaction rates – Arrhenius equation, calculation of Arrhenius parameters – Collision theory of rates

MODULE IV- CATALYSIS AND PHOTO CHEMISTRY 9 Hrs

Theories of catalysis, outline of intermediate compound formation theory and adsorption theory

Photo Chemistry- Laws of photo Chemistry -Grotthus Draper Law, Einstein's law, Beer lambert law

Photo Chemical equivalence and quantum yield, explanation for high and low quantum yields, H_2-Cl_2 reaction, H_2-Br_2 reaction

Photosensitization and Chemiluminescence

MODULE V- ELECTRO CHEMISTRY 9 Hrs

Transport number – definition, determination by Hittorffs method and moving boundary method, application of conductance measurements

Conductometric titrations involving strong acid – strong base, strong acid – weak base, weak acid – strong base and weak acid – weak base

EMF – Galvanic cells, measurement of emf, cell and electrode potential, IUPAC sign convention, Reference electrodes, SHE and calomel electrode

Standard electrode potential, Nernst equation, anion and cation reversible electrodes, redox electrode with examples, quinhydrone electrode, glass electrode, concentration cell without transference, Potentiometric titration

Fuel cells – H_2 – O_2 and hydrocarbon – O_2 type

MODULE VI- INSTRUMENTAL METHODS OF ANALYSIS 9 Hrs

Spectral methods – Atomic Absorption Spectroscopy (AAS) principle, measurement, advantages, disadvantages, and applications

Flame Emission Spectroscopy (FES) principle, measurement,(single beam method) applications

Thermal methods: Themogravimetric analysis (TG) principle and method, Factors affecting thermogravimetric analysis, Application, Differential Thermal Analysis (DTA),

principle, method, factors affecting DTA, Applications

REFERENCES

1. Rakshit Physical Chemistry
2. Puri,Sharma, Pathania Principles of Physical Chemistry
3. B.K.Sharma Instrumental methods of Chemical Analysis
4. Vogel's Text book of Quantitative Chemical Analysis –VI Edition
5. Manas Chanda Atomic structure with introduction to Molecular Spectroscopy
6. N.M.Kapoor, Physical Chemistry
7. B.K.Sharma,Industrial Chemistry

Model Question Paper Chemistry (complementary) for Geology majors

Semester IV Course Code: CH1431.2 Course IV Credit 3

(2020 admission onwards)

PHYSICAL AND ANALYTICAL CHEMISTRY

Time: Three Hours **Maximum marks: 80**

SECTION A

Answer all questions. Each question carries 2 marks

1. Write Arrhenius equation.
2. State Beer Lambert law.
3. Explain catalytic cracking.
4. Give an example of a negative catalyst with the chemical reaction which it catalyses.
5. The rate law for a reaction is $r = k [A] [B]^2$. Write the order of the reaction.
6. Define octane n u m b e r .
7. Name two important ores of Uranium.
8. Draw the shape of graph for the titration of a strong acid Vs strong base.
9. What you meant by flash point?
10. Conductance of an electrolyte depends on ……. and ……..

SECTION B

Answer any eight questions. Each question carries 2 marks

11. What is the influence of temperature on reaction rate?
12. A substance decomposes following first order kinetics. The half life period of the reaction is 35 minutes. What is its rate constant?
13. State Einstein's law of photochemical equivalence.
14. Define quantum yield of a photochemical reaction.
15. Explain van't Hoff reaction isotherm.
16. Illustrate SHE.

17. Write the principle of AAS.
18. How do you differentiate a TG curve from a DTA curve?
19. What is smelting.
20. Distinguish between order and molecularity?
21. What is Grotthus- Draper law?
22. Explain chemiluminescence.

SECTION C

Answer any six questions. Each question carries 4 marks

23. Give the Arrhenius equation. How will you determine the Arrhenius parameters?
24. Explain photosensitization reaction with an example.
25. Explain the method used to determine transport number of an electrolite.
26. What is the principle of flame emission spectroscopy? Mention its important applications.
27. What are the general methods for refining of metals?
28. Give an account of different types of hydrocarbon fuels and their characteristics.
29. Distinguish between isotherm and isochors.
30. Explain quantum yield in terms of H_2-Cl_2 reaction.

Section D. Answer any two questions. Each question carries 15 marks

31. (a) Derive the expression for the rate constant of a first order reaction. (b) How will you express the units of rate constant for reactions of order 1, 2 and 3?
32. Write a note on (a) Extraction of lanthanides (b) Types of hydrocarbon fuels and their characteristics (c) Photosensitization.
33. Give a detailed account on the principle and applications of (a) TG and (b) DTA.
34. (a) Discuss the principle, measurement and applications of Flame Emission Spectroscopy (FES) (b) Explain Collision theory of rates.
35. (a)Explain the method used to determine transport number of an electrolyte.

    (b) A solution of silver nitrate containing 12.14 g of silver in 50 ml of solution was electrolysed between platinum electrodes. After electrolysis, 50 ml of the anode solution was found to contain 11.55 g of silver, while 1.25 g of metallic silver was deposited on the cathode. Calculate the transport number of Ag^+ and NO_3^- ions.

UNIVERSITY OF KERALA
SYLLABUS OF LAB COURSE IN CHEMISTRY
FOR STUDENTS OF GEOLOGY MAJORS

2020 Admission onwards

SEMESTER	**I,II,III &IV**
COURSE	**5**
TITLE	**COURSE V : LAB COURSE FOR GEOLOGY**
COURSE CODE	**CH 1432.2**
CREDIT	**2**
L-T-P	**2-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** ***Upon completion of this course, the students***	**Cognitive Level**
	Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, out look and scientific temper (GOOD LAB PRACTICES)	U,A
	Develop skill in safe handling of chemicals, take precaution against accidents and follow safety measures	A
	Develop skill in observation , prediction and interpretation of reactions	A
	Apply the principle of common ion effect and solubility product in the identification and separation of ions	A
	Develop skill in weight calculation for preparing standard solutions	U,E,A
	Perform volumetric titrations under acidimetry-alkalimetry, permanganometry, dichrometry, iodimetry-iodometry,cerimetry, argentometry and complexometry	A
	Determine pH of soil and water samples	A

SYLLABUS FOR LABORATORY COURSE FOR COMPLEMENTARY CHEMISTRY

(FOR GEOLOGY MAJORS)

Course Code CH1432 .2 Credit 2

Ⅳ. REACTIONS AND ANALYSIS OF CATIONS : Hg^{+}, Pb^{2+}, Ag^{+}, Hg^{2+}, Bi^{3+}, Cd^{2+}, As^{3+},b^{3+}, Sn^{2+}, Sn^{4+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Cd^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+} and NH_4^{+}.

The cations must be provided in solutions. A student must analyze at least ten mixtures containing two cations each.

II. VOLUMETRIC ANALYSIS

A. Acidimetry and Alkalimetry

a. Preparation and standardization of 0.05N HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

c. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. HCl

d. Preparation and standardization of 0.05N NaOH using oxalic acid as primary standard

e. Estimation of a strong acids using standardized NaOH

f. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

B. Permanganometry

a. Standardisation of $KMnO_4$ by oxalic acid sodium oxalate and Mohr's salt

b. Estimation of oxalic acid / sodium oxalate

c. Estimation of Mohr's Salt.

d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. **Iodometry and Iodimetry**

a. Standardization of sodium thiosulphate using std. potassium dichromate.

b. Estimation of copper in a solution

c. Estimation of iodine

E. **Complexometric titrations**

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

III. GRAVIMETRIC ANALYSIS

IV. Estimation of water of hydration in barium chloride crystals.

b. Estimation of barium chloride solution.

IV. pH DETERMINATION (NOT FOR ESE)

Measurement of pH of soil and water samples using pH meter.

COMPLEMENTARY CHEMISTRY FOR BOTANY MAJORS

Complementary Courses -4 Total Credits – 14

(One Semester – 18Weeks)

Semester	Hours/Week		No. of Credits	Course Code	Instructional Hours
	Thoery(L)	Lab(P)			
I	2		2	CH1131.3	2x18=36
		2	-		2x18=36
II	2		2	CH1231.3	2x18=36
		2	-		2x18=36
III	3		3	CH1331.3	3x18=54
		2	-		2x18=36
IV	3		3	CH1431.3	3x18=54
		2	4	CH1432.3	2x18=36

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARY CHEMISTRY

FOR STUDENTS OF BOTANY MAJORS

2020 Admission onwards

SEMESTER	**I**
COURSE	**2**
COURSE TITLE	**ANALYTICAL AND ENVIRONMENTAL CHEMISTRY**
COURSE CODE	**CH1131.3**
CREDIT	**2**
L-T-P	**2-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students* **,**	**Cognitive Level**
1	Discuss Bohr atom model and represent electronic configuration of elements	U
2	Predict structure of simple molecules based on the concept of hybridisation	A
3	Identify hydrogen bonding in relation to physical and chemical properties	U
4	List the various chemical bonds	R

5	Apply the VSEPR theory to explain the geometry of molecules	A
6	Discuss the theory of volumetric analysis	U
7	Become aware of threat of chemical pollutants air ,water and soil	A

*R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I –ATOMIC STRUCTURE (9 Hrs)

Atomic spectrum of Hydrogen – different series, Rydberg equation

Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation.

Schrodinger wave equation (no derivation, mention only) - concept of orbitals, the four quantum numbers and their significances.

Orbital wise electron configuration, energy sequence rule – Pauli's Principle, Hund's rule, stability of filled and half filled orbitals

MODULE II - CHEMICAL BONDING (9 Hrs)

Energetics of bond formation –Born Haber cycle

Hybridisation and structure of molecules – sp, sp^2, sp^3, dsp^2, dsp^3, sp^3d^2, and sp^3d^3

hybridisation with examples- Explanation of bond angle in water and ammonia

VSEPR theory with regular and irregular geometry

Hydrogen bond – inter and intra molecular – its consequences on boiling point –volatility and solubility

Partial covalent character of the ionic bond- Fajan's rules-

A brief review of molecular orbital approach-

LCAO method – bond order, bond distance and stability of O_2, O_2^{2+}, O_2^{2-}, NO, NO^+

MODULE III: ANALYTICAL PRINCIPLES (9 Hrs)

Principles of volumetric analysis- primary standard - standard solutions- normality and molarity - theory of acid - base titrations, permanganometric and dichrometric titrations, iodometric and complexometric titrations-

Theory of acid – base and redox indicators-

Beer- Lambert law- Principles of colorimetry – Estimation of Iron and phosphate

MODULE IV – ENVIRONMENTAL CHEMISTRY (9 Hrs)

Nature of environmental threats and role of chemistry-

Green house effect, ozone layer and its depletion-

Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis

Dissolved oxygen-BOD, COD

Text Books / References

1. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
2. Concise Inorganic Chemistry – J.D. Lee
3. Environmental Chemistry A. K. De
4. Modern Inorganic Chemistry A.D. Madan
5. A. I. Vogel, “Text book of Qualitative Analysis”
6. A. I. Vogel, “Text book of Quantitative Inorganic Analysis”.
7. S. K. Banerji, “Environmental Chemistry”.
8. A. K. De “Environmental Chemistry - An introduction”
9. B. K. Sharma “Air Pollution”.
10. V. K. Ahluwalia “Environmental Chemistry”
11. G.W. van Loon and S. J. Duffy “Environmental Chemistry: A global perspective”

UNIVERSITY OF KERALA
First semester B.Sc Degree Examination Model question paper
Complementary course for Botany Majors

Course Code CH1131.3 Credit 2

(2020 admission onwards)

ANALYTICAL AND ENVIRONMENTAL CHEMISTRY

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. Give the electronic configuration of Copper (atomic umber 29)
2. The quantum numbers n = 2 and l = 1 corresponds to which orbital?
3. What are the shapes of molecules with sp and sp3 hybridization?
4. Calculate the bond order of H2 molecule.
5. Give the structure of XeO3.
6. What is Lattice Energy?
7. What is meant by primary standards?
8. Define Molality.
9. What is the optimum value of DO for good water quality?
10. What is meant by BOD?

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. What is Bohr Bury's rule?

12. Write down the Schrodinger Equation and explain the terms involved.

13. Explain the failures of Bohr's theory?

14. What are the limitations of VSEPR Theory?

15. What are polar and non polar covalent bonds?

16. Mention the rules for adding electrons to molecular orbitals?

17. What are dichrometric titrations?

18. How would you prepare 100ml of 0.05M Mohr's salt solution?

19. Why is methyl orange not a suitable indicator for the titration of weak acid with strong base?

20. Which are the green house gases? Mention their sources.

21. What is reverse osmosis? How it is useful in the purification of waste water?

22. What are chief factors responsible for water pollution?

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. If the energy difference between two electronic states of hydrogen atom is 214.68 KJmol-1. What will be the frequency of light emitted when the electrons jump from the higher to the lower level?

24. Explain the stability of half filled and completely filled orbitals.

25. Give an account of permanganometric titrations.

26. Discuss the theory of Acid – Base indicators.

27. Explain the energetic of ionic bond formation.

28. Define hybridization. Mention the types of hybridization involved in SF6, PCl5, BF3.

29. Explain Born-Haber Cycle considering the formation of NaCl as an example.

30. Write a note on agricultural pollution.

31. Explain briefly the different methods for the treatment of industrial waste water.

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32. (a) Discuss Bohr Theory, highlighting its merits and demerits.

    (b)What are quantum numbers? Give its significance.

    (c) Explain various rules regarding electronic configuration.

33. (a) Discuss the titration curves for the titration of strong acid with strong base and weak acid with strong base.

    (b) Explain the theory of redox indicators.

    (c) Explain Beer's Law, Lambert's Law and Beer – Lambert Law.

34. (a) Write a note on Hydrogen bonding and its consequences.

    (b) How electronic configuration of molecules related to molecular behavior? Explain.

    (c) Explain Fajan's Rule.

35. (a) Discuss the formation and importance of ozone layer.

    (b) What is meant by pollution and pollutants? Explain the classification of air pollutants.

    (c) What are the sources of important air pollutants?

UNIVERSITY OF KERALA

Complementary Chemistry for Botany Majors

2020 Admission onwards

SEMESTER	**II**
COURSE	**2**
COURSE NAME	**INORGANIC & BIOINORGANIC CHEMISTRY**
COURSE CODE	**CH1231.3**
CREDIT	**2**
L-T-P	**2-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students,*	**Cognitive Level**
1	Understand the biological and environmental aspects of organic compounds	U
2	Comprehend the meaning of stability of nucleus	R
3	Summarise the applications of radioactivity	U
4	Predict the properties of transition metal complexes	A
5	Apply complexation reactions in qualitative and quantitative analysis	U

6	Appreciate biological processes like photosynthesis, respiration etc	E
7	Realise the use of trace elements in biochemical processes	A

R-Remember, U-Understand, A-Apply, E-Evaluate

MODULE I :ORGANOMETALLICS (9 Hrs)

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications

Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses

Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture

Environmental aspects of Organometallic compounds

MODULE II NUCLEAR CHEMISTRY (9 Hrs)

Natural radioactivity, modes of decay, Geiger–Nuttal rule-

Artificial transmutation and artificial radioactivity-

Nuclear stability, n/p ratio, mass defect and binding energy, nuclear fission and nuclear fusion-

Applications of radioactivity- ^{14}C dating, rock dating, neutron activation analysis and isotope as tracers

MODULE III - COORDINATION CHEMISTRY (9 Hrs)

Nomenclature, Coordination number and geometry - chelates – isomerism – structural and stereo isomerism

Valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – colour and magnetic properties of transition metal complexes

Application of metal complexes in qualitative and quantitative analysis

MODULE IV – BIO INORGANIC COMPOUNDS (9 Hrs)

Metalloporphyrins – cytochromes –

Chlorophyll - photosynthesis and respiration –

Haemoglobin and myoglobin, mechanism of O_2 – CO_2 transportation

Nitrogen fixation, carbon fixation and carbon cycle

Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems

TEXT BOOKS /REFERENCES

1. Bosolo and Johns, Co-ordination Chemistry
2. Rochoco,Chemistry of Organometallics
3. J.D. Lee ,Concise Inorganic Chemistry
4. Puri, Sharma and Kalia, "Inorganic Chemistry"
5. A.D. Madan ,Modern Inorganic Chemistry

II Semester B.Sc Degree Examination Model question paper

Complementary Course for Botany Majors

Course Code CH1231.3 Credit 2

INORGANIC AND BIOINORGANIC CHEMISTRY

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. Give the structure of Zeisel's salt.
2. Write any one of the preparation methods of organolithium compounds.
3. What is ferrocene? How is it synthesized?
4. What are alpha particles?
5. Define the term radioactivity.
6. Write the IUPAC name of $K_3[Co(NO_2)_4Cl_2]$
7. What are low spin complexes?
8. What do you mean by chelate?
9. What are metalloporphyrins?
10. Give an example of anaerobic respiration.

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. What is reformatsky reaction?
12. What is cisplatin? Give its significance.
13. How are organomercurials prepared?

14. Explain Geiger Nuttal Rule.

15. What are half life period and average life period?

16. Define mass defect and binding energy.

17. Write the postulates of Werner's Coordination Theory.

18. What are poly dentate ligands? Give an example.

19. Explain the colours of transition metal complexes.

20. Differentiate respiration and photosynthesis.

21. What are trace elements?

22. What is the role of chlorophil in photosynthesis?

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. Write a note on organotin compounds.

24. Write a brief note on the applications of organometallic compounds in agriculture and horticulture.

25. One microgram of phosphorus- 32 was injected into a living system for biological tracer studies. The half life period of P-32 is 14.3 days. How long will it take for the radioactivity to fall to 10% of the initial value?

26. Explain the relation between nuclear stability and n/p ratio.

27. Write the biological effects of radiation.

28. Suggest the structure of [NiCl4] on the basis of Valence Bond Theory.

29. Explain the magnetic properties of octahedral complexes with suitable examples.

30. Discuss briefly the biochemistry of iron toxicity and nutrition.

31. Metal ions play a variety of roles in biological systems. Explain.

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32.(a) Explain the synthesis and applications or Grignard reagent. (5 marks)

(b) What are Frankland reagents? Give its significance. (5 marks)

(c) Explain about organosilicon compounds in medicine. (5 marks)

33.(a) Explain carbon dating and rock dating. (5 marks)

(b) Give the principle of neutron activation analysis. (5 marks)

(c) Explain the terms nuclear fission and fusion with suitable examples. (5 marks)

34.(a) Write a note on Crystal Field Theory. (5 marks)

(b) Explain the applications of complexes in qualitative analysis. (5 marks)

(c) Write a brief note on isomerism in coordination complexes. (5 marks)

35.(a) Give brief outline of carbon cycle. (5 marks)

(b) Explain nitrogen Fixation. (5 marks)

(c) Write a short note on hemoglobin. (5 marks)

UNIVERSITY OF KERALA

COMPLEMENTARY CHEMISTRY FOR BOTANY MAJORS

2020 Admission onwards

SEMESTER	**III**
COURSE	**4**
COURSE TITLE	**PHYSICAL CHEMISTRY**
COURSE CODE	**CH1331.3**

CREDIT	**3**
L-T-P	**3-0-2**
TOTAL HOURS	**54**

CO No.	COURSE OUTCOME *Upon completion of this course, the students,*	Cognitive Level
1	Classify reactions on the basis of order and molecularity	A
2	Understand the effect of temperature on reaction rates	U
3	Understand the theories of catalysis	U
4	Categorize compounds into acids and bases	U
5	Discuss the principle and application of UV and NMR spectroscopy.	U & A
6	Understand the properties of colloids and their application	U

*R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I - CHEMICAL KINETICS **9 Hrs**

Rates of reactions, various factors influencing rates of reactions

order and molecularity - Zero, first, second and third order reactions

Derivation of integrated rate equation, fractional life time, units of rate constants Influence of temperature on reaction rates – Arrhenius equation, calculation of Arrhenius parameters – Collision theory

Catalysis- Different types of catalysis- intermediate compound formation theory and adsorption theory

MODULE II–IONIC EQUILIBRIUM **9 Hrs**

Concepts of Acids and Bases-ionization of weak electrolytes-Influence of solvent on acid strength – leveling effect –

pH and its determination - potentiometric method-

Buffer solutions and calculations of the pH- Henderson equation -

Hydrolysis of salt – degree of hydrolysis and hydrolytic constant, derivation of relation between Kw and Kh for salts of strong acid – weak base, weak acid - strong base and weak acid – weak base

MODULE II–SOLUTIONS **9 Hrs**

Completely miscible liquid pairs, vapour pressure - composition curve, boiling point-composition curve- ideal and non ideal solutions, fractional distillations, azeotropes

Partially miscible liquids - CST, phenol- water, nicotine-water system- Effect of impurities on miscibility and CST,

Immiscible liquid pairs, steam distillation- Distribution law and its limitations, applications of solvent extractions.

MODULE IV - UV AND NMR SPECTROSCOPY **9 Hrs**

UV-Visible Spectroscopy- absorption, types of electronic transitions, effect of conjugation-

Concept of chromophore, auxochrome, bathochrome, hypochromic shifts, hyperchromic and hypochromic effects.

UV-Visible spectra of enes - Calculation of λmax

Applications of UV spectroscopy - conjugation, functional group and geometrical isomerism

Principle of NMR, nuclear spin, chemical shift, spin-spin coupling, τ and δ, PMR of simple organic molecules $CHBr_2CH_2Br$, CH_3CH_2Br and CH_3CH_2OH

Principle of MRI

MODULE V DILUTE SOLUTIONS **9 Hrs**

Molarity, molality and mole fraction

Colligative property – relative lowering of vapour pressure – elevation in boiling point – depression in freezing point – osmotic pressure – experimental determination of osmotic pressure – Isotonic solution – reverse osmosis - abnormal molecular mass - van't Hoff factor.

(Numerical Problems to be worked out)

MODULE VI COLLOIDS- **9 Hrs**

Colloidal state- Types of colloids

Preparation of colloids-Purification of colloids – ultra filtration and electrodialysis, Kinetic, optical and electrical properties of colloids

Ultra microscope, Electrical double layer and zeta potential

Coagulation of colloids, Hardy-Schulz rule

Micelles and critical micelle concentration, sedimentation

Application of colloids – Cottrell precipitator, purification of water and delta formation

REFERENCES

1. Chatwal,Gurdeep.R Organic Chemistry of Natural Products, , Himalaya Publications
2. Puri Shrama Pathania Principles of Physical chemistry, , Vishal
3. P.S. Kalsi,Chemistry of natural products, New Age International Private Ltd
4. Y.R Sharma, Elementary organic spectroscopy, S chand & Company
5. B.R.Puri, R.L.Sharma & Pathania Principles of Physical Chemistry, Vishal Publishing
6. B.S. Bahl., G.D. Tuli & Arun Bahl ,Essentials of Physical Chemistry, , S.Chand & Co., N Delhi.
7. R.L. Madan, G.D. Tuli Simplified Course in Physical Chemistry, , S.Chand & Co.
8. B.K .Sharma ,Chromatography, GOEL Publishing house, Meerut

UNIVERSITY OF KERALA

III Semester B.Sc Degree Examination Model question paper

Complementary course for Botany Majors

Course Code CH1331.3 Credit 3

PHYSICAL CHEMISTRY

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. What are the units of rate constants for first and second order reactions?
2. Give one example of a reaction in which order and molecularity have different values.
3. Define pH.
4. State Hardy-Schulze rule.
5. Distinguish between lypophilic colloids and lypophobic colloids.
6. Define chemical shift.
7. Explain chromophore with an example.
8. What is meant by a buffer solution? Give one example each for acid buffer and basic buffer solution.
9. What is meant by the term ideal solution?
10. Define Van't Hoff factor.

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. What are the factors which affect the rate of a chemical reaction?
12. Write down the expression that gives the dependence of the rate constant of a chemical reaction on the absolute temperature and explain the terms involved.
13. Explain briefly Lewis concept of acids and bases with two examples
14. What is zeta potential? How does it arise?

15. What is critical micelle concentration? Discuss the structure of micelles in polar and non polar media
16. Tetra Methyl Silane (TMS) is chosen as a reference compound in NMR studies. Give reasons
17. What are the different types of electronic transitions?
18. Differentiate between molarity and molality.
19. A solution containing 7g of a non volatile solute in 250g of water boils at 373.26 K. Find the molecular mass of the solute.(Kb for water is 0.52K/m)
20. Explain the terms: Degree of hydrolysis and hydrolysis constant.
21. Explain reverse osmosis.
22. Calculate the mole fraction of alcohol, C_2H_5OH and water in a solution made by dissolving 9.2g of alcohol in 18g of water.

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. What is energy of activation? What happens to the energy of activation in presence of a catalyst?
24. Explain Half life period of a reaction. A first order reaction has a specific reaction rate of 2.31×10^{-3} s^{-1}. Calculate the half life period of the reaction.
25. Calculate the pH of a buffer solution containing 0.2 mole of NH_4Cl and 0.1mole of NH_4OH per litre. Kb for NH4OH = 1.85×10^{-5}.
26. Derive the relation between K_h, K_w and K_a.
27. Give an account of applications of colloids
28. Explain ultra filtration and electro-dialysis techniques used for the purification of colloids
29. Which of the following will show spin- spin coupling in their NMR spectra? If coupling is observed, give the spin multiplicity : (a) $ClCH_2CH_2Cl$ (b) CH_3COCH_3 (c) CH_3CHO (d) $ClCH_2CH_2I$
30. What is osmotic pressure? How will you determine the molecular mass of a substance with this method?
31. Explain the principle of Fractional Distillation

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32. (a)Differentiate between Molecularity and order of a reaction with examples (5 marks)

    (b) Discuss the Kinetic, optical and electrical properties of colloids (5 marks)

    (c) Explain the protective action of colloids(5 marks)

33. (a) Which of the following has the highest osmotic pressure: 0.1M sucrose, 0.1M acetic acid, 0.1M KCl and 0.1M Na_2SO_4 all in water? Why?

    (b) Why do you get abnormal molecular masses of the substances by using colligative properties of the solution.

    (c) Discuss in detail about the determination of molecular mass of a non volatile compound from elevation in boiling point and depression in freezing point

34. (a) Discuss the factors responsible for deviation from Raoult's law by taking suitable examples.

    (b) Define critical solution temperature. Explain systems having upper and lower CST using examples

    (c) Explain the applications of UV spectroscopy

35. (a) Discuss the advantages of Bronsted-Lowery concept over Arrhenius concept and also the limitations of the Bronsted-Lowery concept.

    (b) The salt of strong acid and strong base does not undergo hydrolysis. Explain.

    (c) Explain the underlying principle in an NMR spectrum and interpret the low resolution NMR spectrum of ethanol molecule.

UNIVERSITY OF KERALA

Complementary Chemistry for Botany Majors

SEMESTER	**IV**
COURSE TITLE	**ORGANIC CHEMISTRY**
COURSE CODE	**CH1431.3**
CREDIT	**3**
L-T-P	**3-0-2**
TOTAL HOURS	**54**

CO No.	COURSE OUTCOME *Upon completion of this course, the students,*	Cognitive Level
1	Discuss the principle and applications of chromatography and electrophoresis	U
2	Classify amino acids, proteins, carbohydrates and vitamins. Identify and distinguish the structure of amino acids, peptides, proteins and nucleic acids.	U
3	Summarise the concept of optical isomerism.	U and A
4.	Categorise crude drugs and explain the method of evaluating crude drugs.	U
5.	Draw the structure of aminoacids, carbohydrates, simple optical isomers	R
6.	Explain the preparation and reactions of amino acids and carbohydrates	U
7.	Discuss the extraction process and general properties of natural products -oils, fats, terpenes and alkaloids.	U

*R-Remember, U-Understand, A-Apply

MODULE I - CHROMATOGRAPHY **9 Hrs**

Outline study of adsorption and partition chromatography-

Principle and applications of paper, thin layer, ion exchange and gas chromatography

Principle, instrumentation and applications of HPLC

Rf and Rt value of various chromatographic techniques

Electrophoresis – Principle and application of Zone and Capillary electrophoresis

MODULE II - STEROCHEMISTRY 9 Hrs

Optical Isomerism : Chirality and elements of symmetry; DL notation and Enantiomers

Optical isomerism in glyceraldehydes, lactic acid and tartaric acid

Diastereoisomers and mesocompounds

Cahn-Ingold-Prelog rules – R-S notations for optical isomers with one and two asymmetric carbon atoms

Racemic mixture, resolution and methods of resolution

MODULE III - AMINO ACIDS AND PROTEINS 9 Hrs

Amino acids: - Classification, structure and stereochemistry of amino acids Essential and non essential amino acids, zwitter ion, isoelectric point

General methods of preparation and reactions of amino acids

Peptides: structure and synthesis-Carbobenzoxy and Sheehan method

Proteins: - Structure of proteins, denaturation and colour reactions

Nucleic acids: - Classification and structure of DNA and RNA- Replication of DNA, Genetic Codes-Translation- Transcription

MODULE IV - OILS, FATS, ALKALOIDS, VITAMINS AND TERPENES 9 Hrs

Oils and Fats: Occurrence and extraction-Analysis of oils and fats-saponification value, iodine value and acid value

Alkaloids: - Extraction and structural elucidation of conine and importance of quinine, morphine and codeine

Terpenes: Classification- Isoprene and special isoprene rule-Isolation of essential oils-

citral and geraniol (No structural elucidation)

Vitamins: - Classification and structure, functions and deficiency diseases (structures of vitamin A, B1 and C but no structural elucidation).

MODULE V - CARBOHYDRATES 9 Hrs

Classification- Configuration of glyceraldehyde, erythrose, threose, ribose, 2-deoxy ribose, arabinose, glucose, fructose and mannose

Preparation and properties of glucose and fructose (oxidation, reduction and reaction with phenylhydrazine only)

Pyranoside structures of glucose and fructose, furanoside structure of fructose (structure elucidation not expected)

Mutarotation and epimerization- Conversion of glucose into fructose and viceversa

Structure of starch and cellulose (structure elucidation not expected)

MODULE VI - PHYTOCHEMICALS AND CRUDE DRUGS 9 Hrs

Pharmacognacy – Scope and importance, scheme for pharmacognotic studies of crude drugs

Phytochemicals. Crude drugs: Morphological, pharmacological and chemical classification

Collection and processing of crude drugs – collection and harvesting, drying, garbling, packing

Processing of drugs: Method of preparation – decotion, maceration and infusion

Methods of drug evaluation: Moisture content, volatile content, solubility, optical rotation, ash values and extracting, spectroscopic analysis, chromatographic method and foreign organic matter (Mention only)

Phytoconstituents of therapeutic values: Carbohydrates, glycosides (saponin glycosides and cardiac glycosides), alkaloids (quinoline, isoquinoline, indole alkaloids and steroidal alkaloids) volatiles oils and phenols (Mention its sources, important compounds in each class and therapeutic importance)

Text Books / References

1. Organic Chemistry of Natural Products, Chatwal, Gurdeep.R, Himalaya Publications
2. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd

3. Chromatography, .B.K .Sharma, GOEL Publishing house, Meerut
4. Pharmacognosy, A.Roseline, MJP publishers, 2011.
5. A textbook of Organic Chemisty, K.S.Tewari, N.K.Vishnoi and S.N.Mehrotra, Vikas Publishing House (Pvt) Ltd., New Delhi.
6. Modern Organic Chemistry, S.C.Sharma and M.K.Jain, Vishal Publishing Company, New Delhi.
7. Stereochemistry of Organic Compounds: Principles and Applications, D.Nasipuri, New Age International Publizhers, New Delhi.

IV Semester B.Sc Degree Examination Model question paper

Complementary course for Botany Majors

Course Code CH1431.3 Credit 3

ORGANIC CHEMISTRY

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. What is meant by Rf value?
2. Define Racemic mixture.
3. Represent the configurations of D and L glyceraldehyde.
4. Give two examples of essential amino acids.
5. Describe a colour test for proteins.
6. Define Iodine value.
7. Name a phytochemical.
8. State Special isoprene rule?
9. Write an example for volatile oil .
10. Give the deficiency disease of Vitamin C.

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. Give the principle of adsorption chromatography.
12. What is meant by denaturation of proteins.
13. Discuss the importance of Morphine.
14. Which of the following are optically active ? Why?

    (i) 2-chloropropane (ii)2-chlorobutane (iii)3-chloropentane
15. Give four differences between enantiomers and diastereoisomers.
16. Write a note on the different types of RNA and its functions.
17. How are alkaloids extracted from natural sources?
18. Give the classification of Vitamins.
19. What happens when glucose is treated with Br_2 water?
20. Define moisture content and extraction value.
21. Name four anticancer compounds from plants.
22. Explain saponification.

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. Discuss the optical isomerism of tartaric acid.
24. Write a note on DNA replication.
25. Give the synthesis of Tryptophan.
26. Comment on zwitter ion and isoelectric point.
27. Determine the R & S notations of meso tartaric acid and L- glyceraldehyde.
28. Give a brief account on Thin Layer Chromatography.
29. Write a note on the methods of isolation of terpenoids.
30. Describe the structure of starch and cellulose.
31. Mention the source and therapeutic value of the alkaloid phytoconstituent.

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32. (a)Explain Ion exchange Chromatography.

    (b)Elucidate the structure of Coniine.

(c)Describe the structure of DNA.

33. (a)Discuss briefly the structure of Protein.

    (b)Explain Sheehan's method of peptide synthesis.

    (c)What are crude drugs? Discuss its classification

34. (a)What is resolution? Explain any three methods of resolution.

    (b)What are meso compounds? Are they optical active? Explain with a suitable example.

    (c)Discuss the isolation, structure and uses of geraniol.

35. (a) Diffrenciate mutarotation and epimerization

    (b) Define Oils and fats and discuss the different methods of extraction.

    (c)Discuss on the pyranoside structure of glucose and furanoside structure of fructose.

UNIVERSITY OF KERALA
SYLLABUS OF LAB COURSE IN CHEMISTRY
FOR STUDENTS OF BOTANY MAJORS

2020 Admission onwards

SEMESTER	**I,II,III &IV**
COURSE NAME	**COURSE V : LAB COURSE FOR BOTANY**
COURSE CODE	**CH 1432.3**
CREDIT	**2**
L-T-P	**0-0-2**
TOTAL HOURS	**36**

CO No.	COURSE OUTCOME *Upon completion of this course, the students*	Cognitive Level
1	Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, out look and scientific temper (GOOD LAB PRACTICES)	R,U,A
2	Develop skill in safe handling of chemicals, take precaution against accidents and follow safety measures	U,A
3	Develop skill in observation, prediction and interpretation of reactions	U,A
4	Prepare organic compounds, Purify and recrystallise	U,A
5	Develop skill in weight calculation for preparing standard solutions	E,A
6	Perform volumetric titrations under acidimetry-alkalimetry, permanganometry, dichrometry, iodimetry-iodometry,cerimetry, argentometry and complexometry	A
7	Conduct chromatographic separation of mixtures	A

SYLLABUS FOR LABORATORY COURSE

FOR COMPLEMENTARY CHEMISTRY FOR BOTANY MAJORS

Course Code CH1432 .3 Credit 2

I.QUALITATIVE ANALYSIS

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given. A student has to analyse at least twelve organic compounds.

II.ORGANIC PREPARATIONS

1. Acetanilide from aniline
2. Metadinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

III.VOLUMETRIC ANALYSIS

A. Acidimetry and Alkalimetry

a. Preparation and standardization of 0.05N HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

c. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. HCl

d. Preparation and standardization of 0.05N NaOH using oxalic acid as primary standard

e. Estimation of a strong acids using standardized NaOH

f. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

B. Permanganometry

a. Standardization of $KMnO_4$ by oxalic acid/sodium oxalate and Mohr's salt

b. Estimation of oxalic acid/sodium oxalate

c.Estimation of Mohr's salt

d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodimetry and Iodometry

a. Standardisation of sodium thiosulphate using std potassium dichromate

b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

IV.GRAVIMETRIC ANALYSIS

1. Estimation of water of hydration in barium chloride crystals
2. Estimation of barium in barium chloride solution.

V.CHROMATOGRAPHY

TLC of simple organic compounds- cresol, napthol, nitrobenzene

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st} ,2^{nd} , 3^{rd} and 4^{th} semesters

COMPLEMENTARY CHEMISTRY FOR ZOOLOGY MAJORS

This Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

COMPLEMENTARY COURSES -4

TOTAL CREDITS – 14

ONE SEMESTER =18 WEEKS

Semester	Hours per week		Number of Credits	Course Code	Instructional Hours
	Theory	Lab			
1	2	2	2	CH1131 .4	2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .4	2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .4	3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .4 CH1432 .4	3×18 =54 2×18 = 36

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARY COURSE

FOR STUDENTS OF ZOOLOGY MAJORS

2020 Admission onwards

SEMESTER	**I**
COURSE	**1**
COURSE NAME	**THEORETICAL CHEMISTRY**
COURSE CODE	**CH1131.4**
CREDIT	**2**
L-T-P	**2-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students,*	**Cognitive Level**
1	Differentiate particle nature and wave nature of matter	U
2	Associate wave concept with microscopic matter	A
3	Understand the relevance of periodic classification of elements	U
4	Descibe the various tupes of chemical bonds	R
5	Apply the VSEPR theory to explain the geometry of molecules	E,A
6	Comprehend different segments of titrations	U

7	Apply the principles of colorimetry to estimate ions and elements	A
8	Recognize the factors affecting environment and solutions for it	E

R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I –ATOMIC STRUCTURE **9 Hrs**

Atomic spectrum of Hydrogen – different series, Rydberg equation

Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation.

Schrodinger wave equation (no derivation, mention only) - concept of orbitals, the four quantum numbers and their significances.

Orbital wise electron configuration, energy sequence rule – Pauli's Principle, Hund's rule, stability of filled and half filled orbitals

MODULE II - CHEMICAL BONDING **9 Hrs**

Energetics of bond formation –Born Haber cycle

Hybridisation and structure of molecules – sp, sp^2, sp^3, dsp^2, dsp^3, sp^3d^2, and sp^3d^3

hybridisation with examples- Explanation of bond angle in water and ammonia

VSEPR theory with regular and irregular geometry

Hydrogen bond – inter and intra molecular – its consequences on boiling point –volatility and solubility

Partial covalent character of the ionic bond- Fajan's rules-

A brief review of molecular orbital approach-

LCAO method – bond order, bond distance and stability of O_2, O_2^{2+},O_2^{2-},NO,NO^+

MODULE III: ANALYTICAL PRINCIPLES **9 Hrs**

Principles of volumetric analysis- primary standard - standard solutions- normality and molarity - theory of acid - base titrations, permanganometric and dichrometric titrations, iodometric and complexometric titrations-

Theory of acid – base and redox indicators-

Beer- Lambert law- Principles of colorimetry – Estimation of Iron and phosphate

MODULE IV – ENVIRONMENTAL CHEMISTRY **(9 Hrs)**

Nature of environmental threats and role of chemistry-

Green house effect, ozone layer and its depletion-

Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis

Dissolved oxygen-BOD, COD

Text Books / References

1. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
2. Concise Inorganic Chemistry – J.D. Lee
3. Environmental Chemistry A. K. De
4. Modern Inorganic Chemistry A.D. Madan
5. A. I. Vogel, "Text book of Qualitative Analysis"
6. A. I. Vogel, "Text book of Quantitative Inorganic Analysis".
7. S. K. Banerji, "Environmental Chemistry".
8. A. K. De "Environmental Chemistry - An introduction"
9. B. K. Sharma "Air Pollution".
10. V. K. Ahluwalia "Environmental Chemistry"
11. G.W. van Loon and S. J. Duffy "Environmental Chemistry: A global perspective"

I Semester B.Sc Degree Examination Model question paper
Complementary course for Zoology Majors
Course Code CH1131.4 Credit 2
THEORETICALCHEMISTRY
(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. Give the electronic configuration of Copper (atomic umber 29)
2. The quantum numbers n = 2 and l = 1 corresponds to which orbital?
3. What are the shapes of molecules with sp and sp3 hybridization?
4. Calculate the bond order of H2 molecule.
5. Give the structure of XeO3.
6. What is Lattice Energy?
7. What is meant by primary standards?
8. Define Molality.
9. What is the optimum value of DO for good water quality?
10. What is meant by BOD?

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. What is Bohr Bury's rule?
12. Write down the Schrodinger Equation and explain the terms involved.
13. Explain the failures of Bohr's theory?
14. What are the limitations of VSEPR Theory?
15. What are polar and non polar covalent bonds?

16. Mention the rules for adding electrons to molecular orbitals?

17. What are dichrometric titrations?

18. How would you prepare 100ml of 0.05M Mohr's salt solution?

19. Why is methyl orange not a suitable indicator for the titration of weak acid with strong base?

20. Which are the green house gases? Mention their sources.

21. What is reverse osmosis? How it is useful in the purification of waste water?

22. What are chief factors responsible for water pollution?

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. If the energy difference between two electronic states of hydrogen atom is 214.68 KJmol-1. What will be the frequency of light emitted when the electrons jump from the higher to the lower level?
24. Explain the stability of half filled and completely filled orbitals.
25. Give an account of permanganometric titrations.
26. Discuss the theory of Acid – Base indicators.
27. Explain the energetic of ionic bond formation.
28. Define hybridization. Mention the types of hybridization involved in SF6, PCl5, BF3.
29. Explain Born-Haber Cycle considering the formation of NaCl as an example.
30. Write a note on agricultural pollution.
31. Explain briefly the different methods for the treatment of industrial waste water.

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32. (a) Discuss Bohr Theory, highlighting its merits and demerits.

    (b)What are quantum numbers? Give its significance.

(c) Explain various rules regarding electronic configuration.

33. (a) Discuss the titration curves for the titration of strong acid with strong base and weak acid with strong base.

(b) Explain the theory of redox indicators.

(c) Explain Beer's Law, Lambert's Law and Beer – Lambert Law.

34. (a) Write a note on Hydrogen bonding and its consequences.

(b) How electronic configuration of molecules related to molecular behavior? Explain.

(c) Explain Fajan's Rule.

35. (a) Discuss the formation and importance of ozone layer.

(b) What is meant by pollution and pollutants? Explain the classification of air pollutants.

(c) What are the sources of important air pollutants?

UNIVERSITY OF KERALA

SYLLABUS FOR COMPLEMNTARY CHEMISTRY OF FOR ZOOLOGY MAJORS

2020 Admission onwards

SEMESTER	II
COURSE	2
COURSE NAME	INORGANIC CHEMISTRY
COURSE CODE	CH1231.4
CREDIT	2
L-T-P	2-0-2

TOTAL HOURS	36

CO No.	COURSE OUTCOME *Upon completion of this course, the students,:*	Cognitive Level
1	Understand the biological and environmental aspects of organic compounds	U
2	Comprehend the meaning of stability of nucleus	R
3	Summarise the applications of radioactivity	U
4	Predict the properties of transition metal complexes	A
5	Understand the applications of metal complexes	U
6	Learn to appreciate biological processes like photosynthesis, respiration etc	E
7	Discuss the biochemistry of trace elements	U,E

R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I :ORGANOMETALLICS **9Hrs**

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications

Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses

Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture

Environmental aspects of Organometallic compounds

MODULE II NUCLEAR CHEMISTRY **9Hrs**

Natural radioactivity, modes of decay, Geiger–Nuttal rule-

Artificial transmutation and artificial radioactivity-

Nuclear stability, n/p ratio, mass defect and binding energy, nuclear fission and nuclear fusion-

Applications of radioactivity- ^{14}C dating, rock dating, neutron activation analysis and isotope as tracers

MODULE III - COORDINATION CHEMISTRY 9Hrs

Nomenclature, Coordination number and geometry - chelates – isomerism – structural and stereo isomerism

Valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – colour and magnetic properties of transition metal complexes

Application of metal complexes in qualitative and quantitative analysis

MODULE IV – BIO INORGANIC COMPOUNDS 9Hrs

Metalloporphyrins – cytochromes –

Chlorophyll - photosynthesis and respiration –

Haemoglobin and myoglobin, mechanism of O_2 – CO_2 transportation

Nitrogen fixation, carbon fixation and carbon cycle

Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems

References

6. Co-ordination Chemistry – Bosolo and Johns
7. Chemistry of Organometallics – Rochoco.
8. Concise Inorganic Chemistry – J.D. Lee

9. Puri, Sharma and Kalia “Inorganic Chemistry”
10. Modern Inorganic Chemistry A.D. Madan

UNIVERSITY OF KERALA

II Semester B.Sc Degree Examination Model question paper

Complementary course for Zoology Majors

Course Code CH1231.4 Credit 2

INORGANIC CHEMISTRY

(2020 Admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. Give the structure of Zeisel’s salt.
2. Write any one of the preparation methods of organolithium compounds.
3. What is ferrocene? How is it synthesized?
4. What are alpha particles?
5. Define the term radioactivity.
6. Write the IUPAC name of $K_3[Co(NO_2)_4Cl_2]$
7. What are low spin complexes?
8. What do you mean by chelate?
9. What are metalloporphyrins?

10. Give an example of anaerobic respiration.

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. What is reformatsky reaction?

12. What is cisplatin? Give its significance.

13. How are organomercurials prepared?

14. Explain Geiger Nuttal Rule.

15. What are half life period and average life period?

16. Define mass defect and binding energy.

17. Write the postulates of Werner's Coordination Theory.

18. What are poly dentate ligands? Give an example.

19. Explain the colours of transition metal complexes.

20. Differentiate respiration and photosynthesis.

21. What are trace elements?

22. What is the role of chlorophil in photosynthesis?

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. Write a note on organotin compounds.

24. Write a brief note on the applications of organometallic compounds in agriculture and horticulture.

25. One microgram of phosphorus- 32 was injected into a living system for biological tracer studies. The half life period of P-32 is 14.3 days. How long will it take for the radioactivity to fall to 10% of the initial value?

26. Explain the relation between nuclear stability and n/p ratio.

27. Write the biological effects of radiation.

28. Suggest the structure of [NiCl4] on the basis of Valence Bond Theory.

29. Explain the magnetic properties of octahedral complexes with suitable examples.

30. Discuss briefly the biochemistry of iron toxicity and nutrition.

31. Metal ions play a variety of roles in biological systems. Explain.

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32.(a) Explain the synthesis and applications or Grignard reagent. (5 marks)

(b) What are Frankland reagents? Give its significance. (5 marks)

(c) Explain about organosilicon compounds in medicine. (5 marks)

33.(a) Explain carbon dating and rock dating. (5 marks)

(b) Give the principle of neutron activation analysis. (5 marks)

(c) Explain the terms nuclear fission and fusion with suitable examples. (5 marks)

34.(a) Write a note on Crystal Field Theory. (5 marks)

(b) Explain the applications of complexes in qualitative analysis. (5 marks)

(c) Write a brief note on isomerism in coordination complexes. (5 marks)

35.(a) Give brief outline of carbon cycle. (5 marks)

(b) Explain nitrogen Fixation. (5 marks)

(c) Write a short note on hemoglobin. (5 marks)

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARY CHEMISTRY FOR ZOOLOGY MAJORS

2020 Admission onwards

SEMESTER	**III**
COURSE	**3**
COURSE NAME	**ORGANIC CHEMISTRY**
COURSE CODE	**CH1331.4**
CREDIT	**3**
L-T-P	**3-0-2**
TOTAL HOURS	**54**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students,*	**Cognitive Level**
1	Classify carbohydrates, aminoacids, proteins, nucleic acids, lipids, polymers and drugs.	**U**
2	Summarize optical, geometrical and conformational isomerism Draw the structure of simple carbohydrates	U
3	Discuss the structure of proteins	U
4	Explain the synthesis of amino acids, peptide,drugs	U

5	Predict absolute configuration of stereo centers	A

R-Remember, U-Understand, A-Apply

MODULE I – STEREOCHEMISTRY **9 Hrs**

Optical isomerism – chirality, Enantiomers, racemisation- Optical isomerism of lactic and tartaric acid- Resolution and methods of resolution

Relative and absolute configuration, Enantiomeric excess, asymmetric synthesis

Geometrical isomerism, geometrical isomerism in maleic and fumaric acid, E and Z nomenclature-Aldoximes and ketoximes

Conformational isomerism-Rotation about carbon – carbon single bond, conformation of ethane, butane cyclohexane, axial and equatorial bonds

MODULE II – CARBOHYDRATES **9Hrs**

Classification. Configuration- glyceraldehyde, erythrose, threose, ribose, 2-deoxy ribose, arabinose, glucose, fructose and mannose

Preparation and properties of glucose and fructose

Pyranoside structures of glucose and fructose, furanoside structure of fructose (structure elucidation not expected)

Mutarotation and epimerization

Properties and structure of sucrose. (structure elucidation not expected)

Structure of starch and cellulose (Elementary idea only)

MODULE III – AMINO ACID AND PROTEINS **9 Hrs**

Classification and properties of aminoacids

Synthesis of glycine, alanine and tryptophan

Polypeptides and proteins, peptide linkage, peptide synthesis

Primary,secondary, tertiary and quarternary structure of proteins

Test for proteins

Enzymes – Characteristics, catalytic action, theory of enzyme catalysis – Michaelis – Menton theory- Co-enzymes

MODULE IV– NUCLEIC ACIDS AND LIPIDS **9 Hrs**

RNA, DNA – their biological role, hydrolysis of nucleoproteins, elementary idea regarding the structure of nucleic acids

Replication of DNA- Transcription and Translation - Genetic code

Lipids – Classification oils, fats and waxes, iodine value and saponification value, properties of oils and fats – phospholipids

MODULE V – POLYMERS **9 Hrs**

Classification with example – natural and synthetic polymers – condensation and addition polymerization- Elastic fibres, thermoplastics and thermosetting plastics

Terpenes – classification, isoprene rule, essential oils, elementary study of citral and geraniol (structure elucidation not required)

Rubber - structure – Vulcanisation of rubber – synthetic rubber – neoprene, butyl rubber, Buna S, Buna N

MODULE VI – DRUGS **9 hours**

Classification of drugs- analgesic, antipyretic, antibiotic, hypnotics, sulphadrugs, antacids, antimalarials

Mode of action of sulpha drugs

Synthesis of aspirin, sulphaguanidine, Paracetamol

Drugs of plant origin- anticancer compounds from plants

UNIVERSITY OF KERALA

III Semester B.Sc Degree Examination Model question paper

Complementary course for Zoology Majors

Course Code CH1331.4 Credit 3

ORGANIC CHEMISTRY

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1) Give an example of a Sulpha drug.
2) Write the structure of aspirin.
3) Draw the most stable conformer of cyclohexane.
4) Write the epimer of D-Glucose.
5) What are polysaccharides?
6) What are zwitter ions?
7) Relationship between the base sequence in DNA and the amino acid sequence in protein is known as ……..
8) Write the structure of tryptophan.
9) Name the monomer of natural rubber.
10) Name the purine bases present in DNA.

SECTION B

*(Answer **any 8** question. Each question carries 2 Marks)*

11) What is atropisomerism?
12) How will you prepare sulfaguanidine?
13) What is asymmetric synthesis? Illustrate.
14) Explain racemisation.
15) What is inversion of cane sugar?
16) What are copolymers?
17) Explain saponification value.
18) What is zwitter ion?
19) Draw the structure of D-Arabinose, D-Ribose, L-Glyceraldehyde and L-Erythrose.
20) What are phospholipids?
21) Name the products of hydrolysis of nucleoproteins.
22) What do you understand by the term Buna-N?

SECTION C

*(Answer **any 6** question. Each question carries 4 Marks)*

23) Write a note on the mode of action of sulpha drugs.
24) Explain the E & Z notation of geometrical isomers with examples.
25) Explain mutarotation and epimerization.

26) Explain the following denaturation and colour reactions of protein.

27) Explain isoprene and special isoprene rule

28) What are lipids? Give examples. Enumerate their functions.

29) Describe the synthesis of Paracetamol.

30) What are enzymes? Give their general characteristics.

31) What is iodine value? Write its importance.

SECTION D

*(Answer **any 2**question. Each question carries 15 Marks)*

32) (a) What are drugs? How are they classified

(b)Explain enzyme catalysis using Michaelis – Menton theory

(c) Assign the R and S configuration of D- & L- Lactic acid. (6+4+5

33) (a) What is resolution? Explain any two methods.

(b) Explain the geometrical isomerism in maleic and fumaric acid.

(c) Discuss the ring structure of glucose. (5+5+5)

34) (a) Explain two methods of synthesizing peptides.

(b) Discuss primary and secondary structure of proteins.

(c) Comment on the structure of starch and cellulose. (5+5+5)

35) (a) Describe the classification of oils.

(b) Discuss the structure of DNA.

(c) How glucose reacts with the following (i) Br_2 water (ii) Phenylhydrazine (iii) CH_3OH and dry Conc.HCl.

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARY CHEMISTRY FOR ZOOLOGY MAJORS

SEMESTER	**IV**
COURSE	**4**

COURSE NAME	**PHYSICAL CHEMISTRY**
COURSE CODE	**CH1431.4**
CREDIT	**3**
L-T-P	**3-0-2**
TOTAL HOURS	**54**

CO No.	COURSE OUTCOME *Upon completion of this course, the students,*	Cognitive Level
1	Classify reactions on the basis of order and molecularity	U
2	Discuss different concepts of acids and bases	R,U
3	Understand different techniques used for the study of colloids	U
4	Calculate rate and order of reactions	E,A
5	Review the principles underlying the working of sophisticated instruments	U

*R-Remember, U-Understand, A-Apply

MODULE I - CHEMICAL KINETICS **9 Hrs**

Rates of reactions, various factors influencing rates of reactions

Order and molecularity - Zero, first, second and third order reactions

Derivation of integrated rate equation, fractional life time, units of rate constants Influence of temperature on reaction rates – Arrhenius equation, calculation of Arrhenius parameters – Collision theory

Catalysis- Different types of catalysis- intermediate compound formation theory and adsorption theory

MODULE II–IONIC EQUILIBRIUM 9 Hrs

Arrhenius, Lowry- Bronsted concepts of Acids and Bases- Kw & pH

pH of strong acid and weak acid Ka & Kb,

Mechanism of Buffer action- Henderson equation –pH of Buffer

Hydrolysis of salt – degree of hydrolysis and hydrolytic constant

MODULE III- COLLOIDS 9 Hrs

Colloidal state- Types of colloids

Preparation of colloids-Purification of colloids – ultra filtration and electrodialysis, Kinetic, optical and electrical properties of colloids

Ultra microscope, Electrical double layer and zeta potential

Coagulation of colloids, Hardy-Schulz rule

Micelles and critical micelle concentration, sedimentation

Application of colloids – Cottrell precipitator, purification of water and delta formation

MODULE IV - SPECTROSCOPY 9 Hrs

UV-Visible Spectroscopy- absorption, types of electronic transitions, effect of conjugation-

Concept of chromophore, auxochrome, bathochrome, hypochromic shifts, hyperchromic and hypochromic effects.

UV-Visible spectra of enes - Calculation of λmax

Applications of UV spectroscopy - conjugation, functional group and geometrical isomerism

Principle of NMR, nuclear spin, chemical shift, spin-spin coupling, τ and δ, PMR of simple organic molecules $CHBr_2CH_2Br$, CH_3CH_2Br and CH_3CH_2OH

Principle of MRI

MODULE V- INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS 9 Hrs

Principle – instrumentation and applications of Atomic absorption spectroscopy- flame emission spectroscopy

Thermal methods - thermogravimetry (TG) - Differential thermal analysis (DTA)

Gas Chromatography- HPLC

Introduction to zone electrophoresis and capillary electrophoresis

MODULE VI SOLUTIONS 9 Hrs

Liquid-Liquid system:- Completely miscible, ideal and non-ideal mixtures

Raoult's law, vapour pressure- composition and temperature-composition curves, fractional distillation, deviation from Raoult's law

Azeotropic mixtures, partially miscible liquid system, critical solution temperature, Conjugate layers, example for upper, lower and upper cum lower CST, Theory of steam distillation

Text Books /References

1. Organic Chemistry of Natural Products, Chatwal,Gurdeep.R, Himalaya Publications
2. Principles of physical chemistry, Puri Shrama Pathania, Vishal
3. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
4. Elementary organic spectroscopy, Y.R Sharma, S chand & Company
5. Principles of Physical Chemistry, B.R.Puri, R.L.Sharma & Pathania, Vishal Publishing
6. Essentials of Physical Chemistry, B.S. Bahl., G.D. Tuli & Arun Bahl , S.Chand & Co., New Delhi.
7. Simplified Course in Physical Chemistry, R.L. Madan, G.D. Tuli , S.Chand & Co.
8. Chromatography, B.K .Sharma, GOEL Publishing house, Meerut

UNIVERSITY OF KERALA

IV Semester B.Sc Degree Examination Model question paper

Complementary course for Zoology Majors

Course Code CH1431.4 Credit 3
PHYSICAL CHEMISTRY
(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. What are the units of rate constants for first and second order reactions?
2. Give one example of a reaction in which order and molecularity have different values.
3. Define P^H.
4. State Hardy-Schulze rule.
5. Distinguish between lypophilic colloids and lypophobic colloids.
6. Define chemical shift
7. Explain chromophore with an example.
8. What is meant by a buffer solution? Give one example each for acid buffer and basic buffer solution.
9. What is meant by the term ideal solution?
10. Write a short note on zone electrophoresis

SECTION B

*(Answer **any 8** question. Each question carries 2 Marks)*

11. What are the factors which affect the rate of a chemical reaction?
12. Write down the expression that gives the dependence of the rate constant of a chemical reaction on the absolute temperature and explain the terms involved.
13. Explain briefly Lewis concept of acids and bases with two examples
14. What is zeta potential? How does it arise?
15. What is critical micelle concentration? Discuss the structure of micelles in polar and nonpolar media
16. Tetra MethyL Silane (TMS) is chosen as a reference compound in NMR studies. Give reasons
17. What are the different types of electronic transitions?
18. Explain the working of Hollow Cathod Lamp
19. What is the difference between GC and HPLC?
20. Explain the terms Degree of hydrolysis and hydrolysis constant.
21. What are the conditions at which the solutions deviate from ideal behaviour?
22. Calculate the mole fraction of alcohol, C_2H_5OH and water in a solution made by dissolving 9.2g of alcohol in 18g of water.

SECTION C

*(Answer **any 6** question. Each question carries 4 Marks)*

23. What is energy of activation? What happens to the energy of activation in presence of a catalyst.
24. Explain Half life period of a reaction. A first order reaction has a specific reaction rate of $2.31 \times 10^{-3}\ s^{-1}$. Calculate the half life period of the reaction.
25. Calculate the pH of a buffer solution containing 0.2 mole of NH_4Cl and 0.1mole of NH_4OH per litre. Kb for NH4OH = 1.85×10^{-5}.
26. Derive the relation between K_h, K_w and K_a.
27. Give an account of applications of colloids
28. Explain ultra filtration and electrodialysis techniques used for the purification of colloids

29. Which of the following will show spin- spin coupling in their NMR spectra? If coupling is observed, give the spin multiplicity : (a) $ClCH_2CH_2Cl$ (b) CH_3COCH_3 (c) CH_3CHO (d) $ClCH_2CH_2I$

30. Briefly explain TGA taking suitable example

31. Explain the principle of Fractional Distillation

SECTION – D

(*Answer **any 2** question. Each question carries 15 marks*)

32. (a)Differentiate between Molecularity and order of a reaction with examples

(b) Discuss the Kinetic, optical and electrical properties of colloids

(c) Explain the protective action of colloids

33. (a) Discuss the principle and applications of AAS

(b) Distinguish between AAS and FES

(c) Explain the applications of TGA and DTA

34. (a) Discuss the factors responsible for deviation from Raoult's law by taking suitable examples.

(b) Define critical solution temperature. Explain systems having upper and lower CST using examples

(c) Explain the applications of UV spectroscopy

35. (a) Discuss the advantages of Bronsted-Lowery concept over Arrhenius concept and also the limitations of the Bronsted-Lowery concept.

(b) The salt of strong acid and strong base does not undergo hydrolysis. Explain.

(c) Explain the underlying principle in an NMR spectrum and interpret the low resolution NMR spectrum of ethanol molecule.

UNIVERSITY OF KERALA
SYLLABUS OF LAB COURSE IN CHEMISTRY
FOR STUDENTS OF ZOOLOGY MAJORS

2020 Admission onwards

SEMESTER	**I,II,III &IV**
COURSE TITLE	**COURSE V : LAB COURSE FOR ZOOLOGY**
COURSE CODE	**CH 1432.4**
CREDIT	**2**
L-T-P	**0-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	**Cognitive Level**
	Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, out look and scientific temper (GOOD LAB PRACTICES)	R,U,A
	Develop skill in safe handling of chemicals, take precaution against accidents and follow safety measures	U,A
	Develop skill in observation, prediction and interpretation of reactions	U,A
	Prepare organic compounds, Purify and recrystallise	U,A
	Develop skill in weight calculation for preparing standard solutions	E,A
	Perform volumetric titrations under acidimetry-alkalimetry, permanganometry, dichrometry, iodimetry-iodometry,cerimetry, argentometry and complexometry	A
	Conduct chromatographic separation of mixtures	A

SYLLABUS FOR LABORATORY COURSE FOR COMPLEMENTARY CHEMISTRY

(FOR ZOOLOGY MAJORS)

Course Code CH1432 .3 Credit 2

I. QUALITATIVE ANALYSIS

A. Reactions of organic compound
B. (aromatic – aliphatic,
C. saturated – unsaturated,
D. detection of elements
E. Detection of functional group

glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters.

II. Systematic analysis with a view to identify the Only monofunctional compounds are to be given. A student has to analyse at least twelve organic compounds.

III. ORGANIC PREPARATIONS

1. Acetanilide from aniline
2. Metadinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

IV. VOLUMETRIC ANALYSIS

A. Acidimetry and Alkalimetry

a. Preparation and standardization of 0.05N HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

c. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. HCl

d. Preparation and standardization of 0.05N NaOH using oxalic acid as primary standard

e. Estimation of a strong acids using standardized NaOH

f. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

B. Permanganometry

a. Standardization of $KMnO_4$ by oxalic acid/sodium oxalate and Mohr's salt

b. Estimation of oxalic acid/sodium oxalate

c.Estimation of Mohr's salt

d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodimetry and Iodometry

a. Standardisation of sodium thiosulphate using std potassium dichromate

b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

V. GRAVIMETRIC ANALYSIS

1. Estimation of water of hydration in barium chloride crystals
2. Estimation of barium in barium chloride solution.

VI.CHROMATOGRAPHY

TLC of simple organic compounds- phenol, napthol, nitrobenzene

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in semesters I-IV

COMPLEMENTARY CHEMISTRY FOR HOMESCIENCE MAJORS

DISRIBUTION OF HOURS AND CREDITS

Semester	Hours/Week	No. of	Course Code	Instructional

	Thoery(L)	Lab(P)	Credits		Hours
I	2		2	CH1131.5	2x18=36
		2	-		2x18=36
II	2		2	CH1231.5	2x18=36
		2	-		2x18=36
III	3		3	CH1331.5	3x18=54
		2	-		2x18=36
IV	3		3	CH1431.5	3x18=54
		2	4	CH1432.1	2x18=36

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMNTARY COURSE FRO HOMESCIENCE MAJORS

2020 Admission onwards

SEMESTER	**I**
COURSE	**1**
COURSE NAME	**INORGANIC AND ANALYTICAL CHEMISTRY**
COURSE CODE	**CH1131 .5**
Credit	**2**
TOTAL HOURS	**36**
L-T-P	**2-0-2**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Discuss the Bohr atom model and represent electronic configuration of elements	U	
2	Discuss the theory of volumetric analysis	U	

3	Explain radioactivity and its applications	A	
4.	Applies the importance of radioactivity in terms of energy and environment conservation.	A	
5.	Classify organometallics	U	
6.	Identify the importance and impact of organometallics.	U	

Re-Remember, Un-understand, Ap-apply

MODULE I –ATOMIC STRUCTURE (9 Hrs)

Atomic spectra of hydrogen,-different series, Rydberg equation. Bohr theory-postulates –statement of Bohr energy equation –derivation of spectral frequency from Bohr equation-Schrodinger wave equation(mention only), concepts of orbitals, the four quantum numbers and their significance- Orbital wise electron configuration, energy sequence rule, Pauli's principle, Hund's rule, stability of filled and half filled orbitals.

MODULE II- ANALYTICAL PRINCIPLES (9 Hrs)

Principles of volumetric analysis, primary standards, Standard solutions, normality and molarity, numerical problems, theory of acid base titrations, permanganometric and dichrometric titrations, theory of acid base and redox indicators.(Numerical problems are to be worked out) .

MODULE III- RADIOACTIVITY AND NUCLEAR CHEMISTRY (9Hrs)

Radioactive decay series, Radioactive equilibrium, Average life, Half life detection of radio activity-Geiger Muller Counter, Wilson cloud chamber, Units of radioactivity-Curie and Rutherford, Units of radiations. Nuclear Chemistry-stability of nucleus, n/p ratio, artificial transmutation and radioactivity, mass defect, binding energy, Applications of radio activity- in medicine, agriculture and archeology. Biological effects of radiation, pathological and genetic damage.

MODULE IV- ORGANOMETALLICS AND BIOMOLECULES (9 Hrs)

Organometallic compounds –Definition and classification, Biological , medicinal and environmental aspects organo mercury, boron, silicon and arsenic compounds. Biomolecules – Metallo porphyrins, Haemoglobin and Myoglobin. Structure and Physiological functions.

References

1. Concise Inorganic Chemistry J. D. Lee

2. Inorganic Chemistry Puri and Sharma

3. Chemistry of Organometallics Rochow

4. Organic Chemistry Vol 2 I.L. Finar

5. Chemistry of natural products Vol. 1 Gurdeep Chatwal

6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

7. Modern Inorganic Chemistry R D Madan

II Semester Complementary Chemistry Model Question paper

(for Homescience Majors)

Course Code-CH1131 .5 Credit 2

INORGANIC AND ANALYTICAL CHEMISTRY

Time : Three Hours **Total marks : 80**

Section – A

Answer all questions. Each question carries 1 mark

1. Give the relationship between wavelength, frequency and velocity of electromagnetic radiation?
2. What is the Rydberg equation for calculating the wave number of radiation?
3. Give Schrodinger equation which describes the behaviour of electron in an atom?
4. Indicator used for the titration between strong base and weak acid?
5. Give two examples of primary standard?
6. What is meant by transmutation?
7. Name two units of radioactivity?
8. What is meant by half life period?
9. Give two examples of Organomercuric comounds in medicine ?
10. What are organometallic comounds? (1×10=10 marks)

Section – B

Answer any eight. Each question carries 2 marks

11. Explain the Hund's rule with a suitable example?
12. Draw the shapes of d-orbitals?
13. What is meant by normality and molarity?
14. Why HCl is not used in Permanganomertic titration?
15. 50 ml of 0.25N NaOH required 40 ml aqueous HCl solution, calculate the normality of HCl solution?
16. What is binding energy?
17. What is meant by radio carbon dating??
18. Name four radioactive elements used in medicine?
19. What are organo boron compounds? Give one example?
20. What are anti tumour drugs??
21. What are biomolecules? Give two examples?
22. What are silatranes? (8 x 2 = 16 marks)

Section – C

Answer any six. Each question carries 4 marks

23. i)Explain the wave nature of material objects? ii) What is uncertainty principle?
24. Explain the concepts of orbitals?
25. Explain the theory of acid base titrations?
26. Write a note on dichromatic titration?
27. Write the stability of nucleus with respect to n/p ratio ?
28. What is meant by biological effect of radiation?
29. How will you detect radioactivity by Wilson cloud Chamber?
30. What are the functions of Haemoglobin?
31. Write a note on Organoarsenic compounds in medicine? (6 x 2 = 24 marks)

Section – D

Answer any two. Each question carries 15 marks

32. a) Derive the Bohr frequency equation?(5marks)
    c) Discuss the atomic spectra of hydrogen atom.(5 marks)

    b) Explain quantum numbers. (5 marks)

33. a)Write notes on Acid base indicators? (5 marks)
    b)Explain the Permanganometric titration? (5mark)

    c) Calculate the weight required to prepare the following solutions (i) N/5 aqueous solution of sodium carbonate in 250ml (ii) M/5 aqueous solution of sodium carbonate

in 100 ml.

34. a)What are the applications of radioactivity in medicine and agriculture? (6marks)
b) Write notes on radioactive decay series? (5mark)

c) A living plant acquires definite fraction of ^{14}C nuclei in its carbon content. If a freshly cut piece of wood gives 16.1 counts per minute per gram and an old wooden bowl gives 9.6 counts per minute per gram of carbon, calculate the age of the wooden bowl. The half life of ^{14}C is 5770 years.

35. a) Write in detail the classification of organometallic compounds with examples? (5 marks)

b) Explain the biological aspects of myoglobin? (5marks)

c) Discuss the structure of Haemoglobin. (5 marks) (2 x 15 = 30 marks)

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMNTARY COURSE FRO HOMESCIENCE MAJORS

2020 Admission onwards

SEMESTER	**II**
COURSE	**2**
COURSE NAME	**ORGANIC CHEMISTRY**
COURSE CODE	**CH1231 .5**
CREDIT	**2**
TOTAL HOURS	**36**
L-T-P	**2-0-2**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive Level
1	Identify and represent the structure of simple carbohydrates	U
2	Assign role of vitamins and hormones for different biological activities	U

3	Identify the deficiency diseases caused by vitamins and hormones	A
4.	Classify carbohydrates, vitamins, amino acids and enzymes.	A
5.	Discuss the structure of proteins.	U

Re-Remember, Un-understand, Ap-apply.

MODULE I: CARBOHYDRATES (9hrs)

Classification, configuration of glyceraldehydes, erythrose, threose, ribose,2- deoxy ribose, arabinose, glucose, fructose and mannose. Reactions of glucose and fructose. Pyranoside structures of glucose and fructose Furanoside structure of fructose (structure elucidation not expected), muta rotation, epimerization, conversion of glucose into fructose and vice versa.

MODULE II VITAMINS (9hrs)

Classification, source, physiological function and deficiency diseases caused by Vitamin A1(retinol), A2(axerophthol), Vitamin B-B1 (thiamine), B2(riboflavin and folic acid), B5(niacin), B6(Pyridoxine), B12 (Cyano cobalamine) Vitamin C (ascorbic acid),–Vitamin,D2 (ergocalciferol), Vitamin E (Tochopherols), Vitamin H(biotin) and Vitamin K.

MODULE III :AMINOACIDS AND PROTEINS (9hrs)

Classification. synthesis of glycine, alanine, phenyl alanine and aspartic acid, zwitter ion, isoelectric point,, reactions of aminoacids, peptide linkage, peptide synthesis, polypeptides, primary, secondary, tertiary and quarternary structure of proteins, classification, biological importance and tests for proteins.

MODULE IV: ENZYMES AND HORMONES (9hrs)

Enzymes- Characteristics, classification, factors influencing enzyme action, mechanism of enzyme action, Michaelis –Menton theory, enzyme inhibitors.

Hormones- Introduction, functions and abnormalities due to oxytocin, thyroxin,

glutathione, progesterone, estrogens, cortisone, corticosterone, adrenalin

Text Books/References

1. Fundamentals of Biochemistry A.C. Deb
2. Biochemistry Rastogi

3. Chemistry of Organometallics Rochow
4. Organic Chemistry Vol 2 I.L. Finar
5. Chemistry of natural products Vol. 1 Gurdeep Chatwal
6. The Text Book of Organic Chemistry P.L Soni, H.M. Chowla
7. Modern Inorganic Chemistry R D Madan

Model Question paper
II Semester Complementary Chemistry Model Question Paper
(For Home Science Majors)
Course Code CH1231 .5 Credit 2
2020 Admission onwards
ORGANIC CHEMISTRY

Time : Three Hours **Total marks : 80**

Section – A

Answer all. Each question carries 1 mark.

1. Write the name of a neutral aminoacid?
2. Give the name of an essential aminoacid?
3. What is peptide linkage?
4. Give the name of a monosaccharide?
5. Write one reaction of glucose?
6. What is a carbohydrates?
7. Give the other name of oxytocin?
8. Give the name of two enzymes?
9. Give two functions of enzymes?
10. Which vitamin is called anti haemorrhagic vitamin? (10 x 1 = 10 marks)

Section – B

Answer any eight. Each question carries 2 marks

11. What are peptides?
12. What is Zwitter ion?
13. What is the building block of proteins?
14. Give a test for protein?
15. What are enzyme inhibitors?
16. What is a substrate?
17. What is optimum temperature for enzyme action?

18. What are hormones?
19. Draw the structure of vitamin A?
20. What is epimerization?
21. What is Mannose?
22. What is mutarotation? (8 x 2 = 16 marks)

Section C

Answer any six. Each question carries 4 marks

23. What is the reaction of amino acid with nitrous acid?
24. Explain the isoelectric point of an aminoacid?
25. Give the method of synthesis of glycine?
26. What are the factors affecting enzyme action?
27. Give the functions and deficiency diseases of vitaminC ?
28. What is Michaeli's Menton theory of enzyme action?
29. Write a note on Furanoside structure of fructose?
30. How will you convert glucose into fructose?
31. Write configuration of glyceraldehydes and erythrose? (6 x 4 = 24 marks)

Section – D

Answer any two. Each question carries 15 marks

32. a) Explain the primary, secondary and tertiary structure of protein. (10 marks)
    b) Describe any one method of synthesizing aspartic acid (5 marks)

33. a) What are vitamins? How are they classified? (3marks)
    b) Discuss the physiological functions of vitamin A1, B2, B12, C and D (8 marks)

    c) Listout the different sources of vitamins (4 marks)

34. a) Discuss the functions of the following hormones (i) thyroxin, (ii) glutathione (iii)

    progesterone (6 marks)

    b) List out and explain the abnormalities due the deficiency of the following hormones

    (i) estrogens (ii) cortisone (iii) adrenalin. (6 marks)

    c) Discuss on enzyme inhibitors. (3 marks)

35. Discuss:

    (a) classification of carbohydrates. (3 marks)

    (b) pyranose structure of glucose. (5 marks)

    (c) Reaction of glucose with (i) Bromine water (ii) Tollen's reagent (iii) phenyl hydrazine. (6 marks)

(2 x 15 = 30marks)

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMNTARY COURSE FRO HOMESCIENCE MAJORS

2020 Admission onwards

SEMESTER	**III**
COURSE	**3**
COURSE NAME	**ORGANIC CHEMISTRY -II**
COURSE CODE	**CH1231 .5**
CREDIT	**3**
TOTAL HOURS	**54**
L-T-P	**3-0-2**

Semester-III

Complementary Course No. - 3

Course Code-CH1331 .5 – Organic Chemistry- II
Total: 54 hours

Credit-3 **L-T-P 3-0-2**

Course Outcomes

CO No.	**Expected Course Outcomes** Upon completion of this course, the students	Cognitive Level	PSO No.
1	**Understand the chemistry of simple heterocyclics**	**Un**	
2	**Give an insight about the role of chemistry in the world of dyes**	**Un**	
3	**Develop an understanding about the phytochemicals like alkaloids and terpenes**	**Ap**	
4.	**Appreciate the achievements of polymer molecule in the field of medicine & food packaging**	**Ap**	

5.	**Classify drugs and polymers**	**Un**	

Re-Remember, Un-understand, Ap-apply.

MODULE 1:HETEROCYCLICS (9hrs)

Introduction, Classification and nomenclature. Preparation, physical properties, acidic and basic character, aromatic character, addition , substitution, oxidation and resonance structures of pyrrole, furan, thiophene and pyridine. Purine and pyrimidine bases.

Module 2: Terpenes (9hrs)

Introduction, isolation, occurrence, isoprene rule, classification.

Physical and chemical properties and uses of citral, geraniol, menthol and camphor.

An elementary idea of the structure of natural rubber, synthetic rubber, Buna-N, Buna-S, Neoprene and Thiokol.

Module 3: Alkaloids (9hrs)

Occurrence, classification, general methods of isolation. General methods of determining structure: Functional nature of oxygen containing groups – identification of hydroxyl group, carboxyl group, oxo group, ester group, methoxyl group, methylenedioxyl group. Functional nature of nitrogen containing groups – identification of primary, secondary and tertiary amino groups, Hoffmann exhaustive methylation . Structure and physiological actions of coniine, nicotine, quinine, morphine and codeine (structure elucidation is not expected).

Module 4: Medicinal Chemistry (9hrs)

Chemo therapy- Drugs-Classification based on application. Elementary study of analgesics,

antipyretics, antibiotics, antimalarials. sulphadrugs, mode of action of sulphadrugs.

Synthesis of aspirin and paracetamol

Module 5: Polymers (9hrs)

Natural and synthetic polymers, preparation and uses of vinyl polymers-PE, PVC, PVA, PS, PVF, PMMA, PTFE, Synthetic fibres-Nylon, Nylon 66,Terylene, Poly ethyl teraphthalate, polymers in medicine, surgery and food package.

Module 6: Colour and constitution, Dyes (9hrs)

Colours, complimentary colours, Theories of colour and constitution - chromophore-auxochrome theory, modern theory of colours. Classification of dyes on the basis of

structure and application. Preparation and uses of para red and methyl orange, phenolphthalein and fluorescein , Alizarin, malachite green.

REFERENCES:

1.Essentials of Physical Chemistry	B S Bahl GD Thuli Arun Bahl
2. Analytical chemistry	S M Khopkar
3. Chemistry of natural products Vol. 1	Gurdeep Chatwal
4. Text Book of Organic Chemistry	P.L Soni, H.M. Chowla
5. Organic ChemistryVol 1 & 2	I.L. Finar
6. Text Book of Organic Chemistry	Arun Bahl & B S Bahl
7. Polymer Chemistry	B.K Sharma
8. Inorganic Polymer Chemistry	G S Misra
9. Inorganic Chemistry	Puri and Sharma

III Semester Complementary Chemistry Model Question paper

(for Homescience majors)

Course - III , Course Code-CH1331 .5

ORGANIC CHEMISTRY - II

Time : Three Hours **Total marks : 80**

Section – A

Answer all questions. Each question carries1 mark

1.Give two examples for nitrogen containg heterocyclics.

2. Draw the structure of furan and thiophene.
3. An alkaloid present in hemlock herb.
6. Give an example for a drug used as an antipyretics.
7. What are antimalarials?
8. What are complementary colours?
9. Explain chromophore with an example.
10. Draw the structure of citral.
11. How many isoprene units are in sesquiterpenes ?
12. Write any two uses of PVC. (1×10=10 marks)

Section – B

Answer any eight. Each question carries 2 marks

13. Explain any one method of preparation of furan.
14. Write the names of purine bases present in nucleic acids.
15. What are drugs?
16. Name two antibiotics.
17. How will you prepare phenolphthalein?
18. What is mordant dye? Give an example
19. What is Buna rubber?
20. Write the reaction of citral with silver oxide.
21. Draw the structure of morphine.
22. How is the functional nature of OH analysed in alkaloids ?
23. What is Bakelite?
24. Give the structure of Nylon 66. (2×8 =16 marks)

Section – C

Answer any six. Each question carries 4 marks

25. Compare the basic character of pyridine and pyrrole.
26. Write a note on the classification of heterocyclics.
27. What are analgesics? Give examples. Discuss any one method to synthesis a commonly used analgesics.
28. Explain the isomerism shown by citral and geraniol.
29. What is Hoffmann exhaustive methylation?
30. Write the structure and physiological actions of nicotine.
31. Write the synthesis and uses of fluorescein.
32. How is polystyrene synthesized?
33. Write a note on polymers in medicine and surgery. (4×6=24 marks)

Section – D

Answer any two. Each question carries 15 marks

34.a) Write a short note on the aromatic character of five membered heterocyclics. (5marks)

b) What happens when thiophene is treated with (i) H_2/Pd (ii) Maleic anhydride.

Explain using chemical equation.(5 marks)

c) How pyridine is synthesized? Discuss the nuclephilic substitution reactions of

pyridine. (5 marks)

35. a) What are terpenes? Discuss isoprene and special isoprene rule. (5 marks)

b) Describe (i) the general method of isolation of terpenes (ii) classification of terpenes

(5mark)

c) Comment on the classification and isolation of alkaloids (5 marks)

36. a)What are drugs? How are they classified (5marks)

b) What are sulphadrugs? Discuss its mode of action. (5mark)

c) What is aspirin? How is it synthesized? Write its uses.(5 marks)

35. a) Discuss the classification of dyes on the basis of application. (6 marks)

b) Explain the Witt's theory of colour and constitution (6 marks)

c) Write the structure of any (i) nitro dye (ii) azo dye (iii) anthraquinone dye (3 marks)

(2 x 15 = 30 marks)

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMNTARY COURSE FRO HOMESCIENCE MAJORS

2020 Admission onwards

SEMESTER	IV
COURSE	**4**
COURSE NAME	**PHYSICAL AND SUSTAINABLE CHEMISTRY**
COURSE CODE	CH1431.5
CREDIT	3
TOTAL HOURS	54
L-T-P	3-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive Level
1	Identify the role of colloids & adsorption phenomena in everyday life	A
2	Exposed to the knowledge of Chromatographic methods useful in the analysis.	U
3	Get an overview about the chemicals used as insecticide and pestiside in agriculture field.	U
4.	Get insight to the emerging areas of chemistry - Green and Nano chemistry	U
	Become cautious of the environmental threats and take steps for sustainable development	A
5.	Impart an idea about the chemical pollutants & their detrimental effects.	U

Re-Remember, Un-understand, Ap-apply.

MODULE 1: COLLOIDS (9hrs)

Introduction, dispersed phase, dispersion medium, classification, multi molecular, macromolecular and associated colloids. Preparation - condensation and dispersion methods,

purification -dialysis and ultra filtration, properties of colloidal solution- optical, kinetic and electrical properties, coagulation, Hardy-Schultz rule, protective colloid, applications of colloidal systems, emulsions, emulsifiers and cleansing action of soap.

MODULE 2: ADSORPTION AND CHROMATOGRAPHY (9hrs)

Adsorption-Adsorbent, adsorbate, desorption, types of adsorption - physical and chemical adsorption. Applications of adsorption. Chromatography- Column, TLC, paper and gas chromatography. Applications of chromatography in the separation of proteins, amino acids and dyes.

MODULE 3: GREEN & NANO CHEMISTRY (9hrs)

Green Chemistry: Chemical Pollution and its after effects, conventional waste disposal techniques & its Limitations. History of disasters like Chernobyl Disaster, Bhopal gas tragedy. Introduction to Green chemistry, twelve Principles of green chemistry.

Nano Chemistry: Introduction to nanochemistry, Nanosystems in Nature, Preparation methods for nanomaterials – top-down & bottom up approach (mention only)- sol gel synthesis, coprecipitation, colloidal precipitation, chemical vapour deposition. General introduction to nanomaterials – Fullerenes, Carbon nanotubes. Applications of nanomaterials in medical field.

MODULE-4:**INSECTICIDES AND PESTICIDES (**9hrs)

Insecticides - classification and preparation of compounds like DDT, DDE and BHC. Methoxy chlor, malathion, parathion and carbamates(mention only).

An elementary study of antiseptics, disinfectants, pesticides, rodenticides, herbicides and fungicides.

MODULE-5:ENVIRONMENTAL CHEMISTRY –I (9hrs)

Air and soil pollution-Introduction, different types of air and soil pollution, air pollutants SO_2, SO_3, NO,.NO_2 and smog. Acid rains, CO_2, CO, Green house effect, O_3, importance of ozone layer, causes and effects of ozone layer depletion. Photochemical oxidants, PAN, hydrocarbons, particulates, dust, smog, asbestos, lead, mercury, cadmium. Control of air pollution

MODULE-6:ENVIRONMENTAL CHEMISTRY – II (9hrs)

Water pollution-Factors affecting the purity of water, sewage water, Industrial waste, agricultural pollution such pesticides, fertilizers, detergents; treatment of industrial waste, water using activated charcoal, synthetic resins, reverse osmosis and electro dialysis.

References

1. An Introduction to Medicinal Chemistry	Graham L Patrick
2. Text Book of Organic Chemistry	P.L Soni, H.M. Chowla
3. Organic Chemistry Vol 1 & 2	I.L. Finar
4. Text Book of Organic Chemistry	Arun Bahl & B S Bahl
5. Environmental Chemistry	K. Banerji
6. Environmental Chemistry - An introduction	A. K. De
7. Air Pollution	B. K. Sharma
8. Environmental Chemistry: A global perspective	G.W. vanLoon & S. J. Duffy
9. Green Chemistry Environment Friendly Alternatives	Rashmi Sanghi and M.M Srivasthava
10.NANO: The Essentials	T. Pradeep

IV Semester Complementary Chemistry Model question paper

(for Home Science Majors)

Course Code CH 1431.5 Credit 3

PHYSICAL AND SUSTAINABLE CHEMISTRY

Time: 3hr **Total mark: 80**

Section A

Answer all questions. Each question carries1 mark

1. What is meant by Brownian movement?
2. What are gels?
3. Enthalpy of adsorption is negative. True or false.
4. Name an adsorbent in paper chromatography.
5. Who is the father of Green Chemistry?
6. What is an acid rain?
7. What is a smog ?
8. What is meant by top down approach in nano synthesis?
9. What is DDT & DDE?
10. What is PAN? (1 X 10 = 10 maks)

Section B

Answer any 8 questions. Each question carries 2 marks

11. What is meant by atom economy?
12. What is sol gel synthesis?
13. What is Fullerenes?
14. Write a note on electrical double layer and zeta potential.
15. Distinguish between coagulation and peptization.
16. Write a note on Gibb's adsorption isotherm.
17. What is an aerosol? Give an example?
18. What are herbicides and fungicides?
19. What is reverse osmosis?
20. What are the uses of methoxychlor?
21. What is meant by green house effect. Name two green house gases?
22. Write about the origin of Green Chemistry. (2 x 8 = 16 marks)

Section C

Answer any 6 questions. Each question carries4 marks.

23. What are micelles? Define critical micelle concentration.
24. What is gold no? Explain protective colloid.
25. What do you understand by physical and chemical adsorption?
26. Write important applications of adsorption.
27. Comment on Bhopal tragedy
28. Discuss on nanosystems in nature.
29. Write notes on herbicides and fungicides.
30. What are the causes and effects of ozone depletion?
31. What are the limitations of conventional waste disposal methods? (6 x 4 = 24 marks)

Section D

Answer any 2 questions. Each question carries15 mark

32. (a) Briefly explain the any six principles of green chemistry.(6 marks)
    (b) Discuss the application of nanomaterials in medical field.(4 marks)

    (c) Explain sol-gel method of synthesizing nano materials. (5 marks)

33. a) Explain adsorption chromatography.(5 marks)
    b) Write a note on partition chromatography. (5 marks)

    c) Discuss the principle and procedure of TLC.(5 marks)

34. a) Explain the cleansing action of soap.
    b) Explain the Hardy-Schultz rule.

c) Discuss on (i) dialysis and (ii) ultrafiltration.

35. a) Discuss on the source of air pollution.(5 marks)
b) Describe the any two methods of water treatment. (5 marks)

c) How following compounds are prepared? (i) DDT (ii) BHC (5 marks)

(2 x 15 = 30 marks)

UNIVERSITY OF KERALA
SYLLABUS OF LAB COURSE IN CHEMISTRY
FOR STUDENTS OF HOMESCIENCE MAJORS

2020 Admission onwards

SEMESTER	**I,II,III &IV**
COURSE TITLE	**COURSE V : LAB COURSE FOR HOMESCIENCE**
COURSE CODE	**CH 1432.5**
CREDIT	**2**
L-T-P	**0-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	**Cognitive Level**
	Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, out look and scientific temper (GOOD LAB PRACTICES)	R,U,A
	Develop skill in safe handling of chemicals, take precaution against accidents and follow safety measures	U,A
	Develop skill in observation, prediction and interpretation of reactions	U,A
	Prepare organic compounds, Purify and recrystallise	U,A
	Develop skill in weight calculation for preparing standard solutions	E,A
	Perform volumetric titrations under acidimetry-alkalimetry,	A

	permanganometry, dichrometry, iodimetry-iodometry,cerimetry, argentometry and complexometry	
	Conduct chromatographic separation of mixtures	A

SYLLABUS FOR LABORATORY COURSE FOR COMPLEMENTARY CHEMISTRY

(FOR HOMESCIENCE MAJORS)

Course Code CH1432 .5 Credit 2

III. QUALITATIVE ANALYSIS

F. Reactions of organic compound
G. (aromatic – aliphatic,
H. saturated – unsaturated,
I. detection of elements
J. Detection of functional group

glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters.

IV. S

ystematic analysis with a view to identify the Only monofunctional compounds are to be given. A student has to analyse at least twelve organic compounds.

III. ORGANIC PREPARATIONS

1. Acetanilide from aniline
2. Metadinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

IV. VOLUMETRIC ANALYSIS

A. Acidimetry and Alkalimetry

a. Preparation and standardization of 0.05N HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

c. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. HCl

d. Preparation and standardization of 0.05N NaOH using oxalic acid as primary standard

e. Estimation of a strong acids using standardized NaOH

f. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

B. Permanganometry

a. Standardization of $KMnO_4$ by oxalic acid/sodium oxalate and Mohr's salt

b. Estimation of oxalic acid/sodium oxalate

c.Estimation of Mohr's salt

d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodimetry and Iodometry

a. Standardisation of sodium thiosulphate using std potassium dichromate

b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

V. GRAVIMETRIC ANALYSIS

1. Estimation of water of hydration in barium chloride crystals

2. Estimation of barium in barium chloride solution.

VI.CHROMATOGRAPHY

TLC of simple organic compounds- phenol, napthol, nitrobenzene

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in semesters I-IV

SYLLABUS OF COMPLEMENTARY CHEMISTRYY COURSES

(FOR BIOCHEMISTRY MAJORS)

DISTRIBUTUIN OF HOURS

One Semester – 18Weeks

Semester	Hours/Week		No. of Credits	Course Code	Instructional Hours
	Thoery(L)	Lab(P)			
I	2		2	CH1131.6	2x18=36
		2	-		2x18=36
II	2		2	CH1231.6	2x18=36
		2	-		2x18=36
III	3		3	CH1331.6	3x18=54
		2	-		2x18=36
IV	3		3	CH1431.6	3x18=54
		2	4	CH1432.6	2x18=36

SYLLABUS OF COMPLEMENTARY CHEMISTRY

FOR BIOCHEMISTRY MAJORS

2020 Admission onwards

SEMESTER	**I**
COURSE	**1**
COURSE NAME	**THEORETICAL CHEMISTRY**
COURSE CODE	**CH1131.6**
CREDIT	**2**
L-T-P	**2-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students ,*	**Cognitive Level**
1	Understand the relevance of periodic classification of elements	U
2	Understand the significance of quantum numbers	U
3	List the various chemical bonds	R
4	Apply the VSEPR theory to explain the geometry of molecules	A
5	Appreciate the laws of thermodynamics	U

6	Understand spontaneity	U
7	Compare the stabilities of various nuclei	E
8	Appreciate the applications of radioactivity	U

*R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I–PERIODIC TABLE AND CLASSIFICATION OF ELEMENTS 9 hours

Quantum numbers and their significance- Orbit and orbitals, shape of s, p and d orbitals, Orbital wise electron configuration, energy sequence rule, Aufbau principle, Pauli's principle, Hund's rule, stability of filled and half filled orbitals

Modern periodic law. Periodicity of elements and basis of classification of elements into s,p,d,and f block. Variation of periodic properties – atomic and ionic size, metallic and non metallic character, diagonal relationship.

MODULE II- CHEMICAL BONDING **9hours**

Energetics of bond formation, Ionic bonding, Born-Haber cycle-
Covalent bonding, hybridization and structure of molecules-sp, sp^2 ,sp^3 ,dsp^2 ,d^2sp^3 ,sp^3d^2 hybridisation with examples-
VSEPR Theory with regular and irregular geometry, explanation of bond angle in water and ammonia-
Polarity of covalent bond, its relation with electronegativity, factors influencing polarity, dipole moment, its relation to geometry-
Hydrogen bond, intra and intermolecular hydrogen bond, its consequence on BP, volatility and solubility-
Partial covalent character of ionic bond, Fajan's rule

MODULE III: THERMODYNAMICS **9hours**

Basic concepts – System – surroundings – open, closed and isolated systems
Isothermal– isochoric and isobaric process
Work – heat – energy – internal energy
Heat capacity at constant volume (Cv) and at constant pressure (Cp) – relation between Cp and Cv – First law– The second law – Enthalpy-Entropy-and Free energy
Criteria for reversible and irreversible process
Gibbs –Helmholtz equation
Concepts of spontaneous and non spontaneous processes

MODULE IV: NUCLEAR CHEMISTRY ***9 hours***

Nuclear Chemistry- stability of nucleus, n/p ratio, Radioactivity, Radioactive decay series, Radioactive equilibrium, Average life, Half life
Detection of radio activity-Geiger Muller Counter, Wilson cloud chamber
Units of radioactivity-Curie and Rutherford
Artificial transmutation and radioactivity, Units of radiations
Applications of radio activity- in archeology, medicine and agriculture.
Biological effects of radiation, pathological and genetic damage
Mass defect, binding energy, neutron activation analysis

REFERENCES

1. Concise Inorganic Chemistry -J. D. Lee
2. Inorganic Chemistry- Puri and Sharma
3. Chemistry of Organometallics- Rochow
4. Organic Chemistry Vol 2 -I.L. Finar
5. Chemistry of natural products Vol. 1-Gurdeep Chatwal
6. The Text Book of Organic Chemistry - P.L Soni, H.M. Chowla
7. Modern Inorganic Chemistry- R D Madan

First semester B.Sc Degree Examination Model question paper

Complementary course for Biochemistry Majors

CH1131.6: THEORETICALCHEMISTRY

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. Define orbital.
2. What is the geometry of SF_6?
3. Which is bigger in size, Na or Na+? Why?
4. Which is steam volatile- o-nitro phenol or p-nitro phenol?
5. $BeCl_2$ is linear. Is it polar or non polar?
6. What is meant by transmutation?
7. Name two units of radioactivity?
8. What is meant by half life period?
9. Define system.
10. What is an isochoric process? (10 x 1 = 10 marks)

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. Explain the Hund's rule with a suitable example?
12. Draw the shapes of d-orbitals?
13. How atomic size varies in a period?
14. Write the electronic configuration of Cu and Cr.
15. State Fajan's rule.
16. What is bindingenergy?
17. What is meant by radio carbon dating??
18. Name four radioactive elements used in medicine?
19. Mathematical expression for First law of thermodynamics.
20. Differentiate open and isolated systems.
21. Define entropy. What is its unit.
22. Give an example for a polar covalent bond. Explain. (8 x 2 = 16 marks)

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. How the metallic and non-metallic character of elements vary down a group and along a period.
24. What is hydrogen bonding? Explain different types of hydrogen bonding with examples.
25. Discuss Born-Haber cycle.
26. Derive the relationship between Cp and Cv.
27. Write the stability of nucleus with respect to n/p ratio?
28. What is meant by biological effect of radiation?
29. How will you detect radioactivity by Wilson cloud Chamber?
30. State and explain first and second laws of thermodynamics.
31. Discuss (i) Pauli's principle (ii) Aufbau order (6 x 4 = 24 marks)

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32. a) State and explain modern periodic law. (3 marks)
    b) Comment on the classification of elements into different blocks in the periodic table.(8 marks)
    c) Explain quantum numbers.(4 marks)
33. a) What is hybridisation? Discuss the shape of methane, ethylene and acetylene on the basis of hybridisation (10marks)
    b) Explain the structure of H_2O and NH_3 on the basis of VSEPR theory
34. a)What are the applications of radioactivity in medicine and agriculture? (6mark) b).Discuss on carbon dating? (5mark)
    c) ^{14}C in a living sample of wood is 15.4 counts per minute and that of an unknown sample is only 4.8 counts per minute. Find the age of the unknown sample.(Half life of ^{14}C = 5730 years)
35. a) Define the terms (i) internal energy (ii) enthalpy (iii) free energy (3 marks)
    b)What are spontaneous and non spontaneous processes. Give examples (4 marks)
    c) What is Gibbs-Helmholtz equation? How is it applied for predicting spontaneity of reactions? (8 marks) (2 x 15 = 30 marks)

SYLLABUS OF COMPLEMENTARY CHEMISTRY

FOR BIOCHEMISTRY MAJORS

2020 Admission onwards

SEMESTER	**II**
COURSE	**2**
COURSE NAME	**PHYSICAL AND ANALYTICAL CHEMISTRY - I**
COURSE CODE	**CH1231.6**
CREDIT	**2**
L-T-P	**2-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students* **,**	**Cognitive Level**
1	Illustrate Le Chatelier's Principle	E
2	Compare weak and strong acids	E
3	Appreciate the effect of pH in qualitative analysis	A
4	Calculate the strength of various solutions	U,A
5	Recognize various types of titrations	A
6	Apply Hess's law	A
7	Understand the strength of bonds	U

*R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I: CHEMICAL EQUILIBRIUM ***9 hours***

Reversible reactions –Equilibrium constants, Kp, Kc, and Kx and their inter relationships

Free energy change and chemical equilibrium (thermodynamic derivation not

required)

Le Chatelier's principle and the influence of pressure, temperature and concentration on the following reversible reactions at equilibrium

1. Formation of NH_3 from H_2 and N_2
2. Formation of SO_3 from SO_2 and O_2
3. Dissociation of PCl_5 to PCl_3 and Cl_2

MODULE II - IONIC EQUILIBRIUM ***9 hours***

Arrhenius, Lowry- Bronsted and Lewis concept of acids and bases, Kw and pH, pH of strong and weak acids, Ka and Kb, mechanism of buffer action, pH of buffer, Hydrolysis of salt, Degree of hydrolysis and hydrolysis constant

Solubility product, Common ion effect, application in separation of ions, Example : NH_4Cl/NH_4OH in cation analysis, salting out process

MODULE III - ANALYTICAL PRINCIPLES ***9 hours***

Principles of volumetric analysis, primary standards, Standard solutions, normality and molarity, numerical problems on calculation of strength of solutions in normality, molarity

Theory of acid base titrations, Titration curve of strong acid -strong base, weak acid - strong base and strong acid -weak base titrations and theory of acid base indicator

Redox titrations- permanganometric and dichrometric titrations, and redox indicators

MODULE IV - THERMOCHEMISTRY ***9 hours***

Enthalpies of formation, combustion, neutralization, solution and hydration

Relation between heat of reaction at constant volume and constant pressure, variation of heat of reaction with temperature-Kirchoff's equation

Hess's law and application

Bond dissociation energies and bond energies of different types of bonds

Calculation of Bond energy, bond dissociation energy and enthalpies of reaction

REFERENCES

1. Concise Inorganic Chemistry J. D. Lee
2. Inorganic Chemistry Puri and Sharma
3. Chemistry of Organometallics Rochow
4. Organic Chemistry Vol 2 I.L. Finar
5. Chemistry of natural products Vol. 1 Gurdeep Chatwal
6. The Text Book of Organic Chemistry P.L Soni, H.M. Chowla
7. Modern Inorganic Chemistry R D Madan

Second Semester B.Sc Degree Examination Model question paper

Complementary course for Biochemistry Majors

CH1231.6: PHYSICAL AND ANALYTICAL CHEMISTRY - I

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. What is reversible process?
2. Define pH.
3. What are Arrhenius acids?
4. Name an indicator used for strong acid weak base titration?
5. Give two examples primary standards?
6. What is astandard solution?
7. Define enthalpy of combustion?
8. What is Cp?
9. What is the ionic product of water?
10. Define equilibrium constant. (10 x 1 = 10 marks)

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. State Le-Chatlier principle.
12. Give the expression for the Ka of acetic acid.
13. Calculate the pH of 0.01M HCl.
14. What is degree of hydrolysis?
15. Define Lewis acid and base.
16. Differentiate between molarity and normality.
17. Calculate the weight of Na2CO3 required to prepare 250ml N/10 solution.
18. What is bond dissociation energy?
19. Why HCl is not used in permanganometry?
20. Define enthalpy of hydration?
21. What are the characteristics of chemical equilibrium?
22. Give a direct application of first law of thermodynamics in thermochemistry.

(8 x 2 = 16 marks)

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. Calculate the equilibrium constant for a reaction at 298K. (ΔG^0 = 20 Kcal)
24. Predict the effect of pressure on the dissociation of PCl_5.

25. Explain the theory of acid - base titration.
26. Comment on the Lowry-Bronsted concept.
27. Write a note on dichrometric titrations.
28. Calculate the pH of a buffer solution containing 0.2 moles of NH_4Cl and 0.1 mole of NH_4OH per liter. K_b for NH_4OH is 1.85×10^{-5}
29. Derive relation between Kh, Kw and Ka.
30. The enthalpy of formation of methane at constant pressure and at 300K is -75.83KJ. What will be the enthalpy of formation at constant volume.
31. From the following data at 298K, Calculate the bond energy of O-H bond.

    $H_2(g) \rightarrow 2\ H(g)$; $\Delta H1 = 436.08KJ$

    $O_2(g) \rightarrow 2\ O(g)$; $\Delta H2 = 495.17KJ$

    $H_2(g) + \frac{1}{2}\ O_2(g) \rightarrow H_2O\ (g)$; $\Delta H3 = -241.84KJ$ (6 x 4 = 24 marks)

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32. a) Derive relation between Kp and Kc (5 marks)
    b) Apply Le-Chatlier principle for the following equilibria
        i) $N_2 + 3\ H_2 = 2NH_3$ + heat
        ii) $2SO_2 + O_2 = 2\ SO_3$ + heat (10 marks)
33. a) What is a buffer? Explain the mechanism of buffer action (6 marks)
    b)Define the terms (i) solubility product and (ii) common ion effect(4 marks)
    c) Discuss the application of common ion effect in cation analysis (5 marks)
34. a) Write notes on acid – base indicators (6 marks)
    b)Explain ferrous iron is estimated by permanganometry (3 marks)
    c)Explain the titration curves of (i) strong acid – strong base (ii) strong acid – weak base (6 marks)
35. a) Illustate Hess's law. (6 marks)
    b)The heats of combustion of $CO_2(g)$, $H_2O(l)$ and $CH_4(g)$ are -396.2, -285.9 and -75.2KJ/mol respectively. Compute the enthalpy of combustion of methatne.(4 marks)
    c) State Kirchoff's equation. Indicate how it is used to evaluate ΔH of a reaction from heat capacity data of reactants and products. (2 x 15 = 30 marks)

SYLLABUS OF COMPLEMENTARY CHEMISTRY

FOR BIOCHEMISTRY MAJORS

2020 Admission onwards

SEMESTER	**III**
COURSE	**3**
COURSE TITLE	**PHYSICAL AND ANALYTICAL CHEMISTRY - II**
COURSE CODE	**CH 1331.6**
CREDIT	**3**
L-T-P	**3-0-2**
TOTAL HOURS	**54**

CO No.	**Expected Course Outcomes** *Upon completion of this course, the students will:*	**Cognitive Level**
1	**Understand electromagnetic spectrum and relate energy of radiations to their effect on chemical bonds**	**U,A**
2	**Appreciate different types of spectroscopy**	**U**
3	**Understand order and molecularity**	**U**
4	**Appreciate Arrhenius equation**	**A**
5	**Appreciate action of Enzymes**	**U**
6	**Understand dialysis**	**U**
7	**Comprehend the applications of colloids**	**A**
8	**Recognize the importance of Chromatography as a separation technique**	**A**
9	**Understand adsorption**	**U**

*R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I: SPECTROSCOPY–I ***9 hours***

Regions of electromagnetic spectrum interaction radiation with matter-
Different types of energy levels in molecules, rotation, vibration and electronic levels-
Various types of molecular spectra, microwave spectroscopy, spectra of diatomic molecules, expression for rotational energy, selection rules, frequency separation, equation for frequency of vibration, expression for vibrational energy, selection rule and calculation of force constant.

MODULE II: CHEMICAL KINETICS AND ENZYME CATALYSIS ***9 hours***

Chemical kinetics, rate of reactions, various factors influencing rate,

Order, molecularity, zero, first, second, third order reactions - derivation of first order kinetics - fractional life time, units of rate constants,

Influence of temperature on reaction rates, Arrhenius equation, Calculation of Arrhenius parameters

Enzyme Catalysis: Classification of enzymes.

General properties of Enzymes

Mechanism of enzyme action- Enzyme substrate interaction, Activation energy, Rate of reaction and Michaelis constant- Michaelis Mentonequation

MODULE III: COLLOIDS ***9 hours***

Colloidal state: Types of colloids, preparation of colloids-

Purification of colloids – ultra filtration and electrodialysis

Properties of colloids : Tyndal effect, , Brownian movement, electrophoresis, electro osmosis, sedimentation and streaming potential, Zeta potential

Stability of colloids, Protective colloids, Hardy- Schultz rule, gold number

Emulsion, gels, application of colloids, delta formation, medicines, sewage disposal, cleansing action of detergents and soaps, Micelles and critical micelle concentration

MODULE IV: CO ORDINATION CHEMISTRY ***9 hours***

Nomenclature, coordination number, Types of Ligands, chelates,
Geometrical, structural and stereo isomerism
Valence Bond theory, bonding in octahedral and tetrahedral complexes,
Strong and weak field ligands, high spin and low spin complexes, magnetic properties, Drawbacks of Valence Bond theory
Application of coordination compounds in qualitative analysis-Complexation reactions in inorganic mixture analysis
Application of complexes in quantitative analysis: Metal-EDTA complexes in complexation titrations and metal complexes in gravimetric analysis

MODULE V: CHROMATOGRAPHY ***9 hours***

Outline study of Adsorption and partition chromatography,

Principle and applications of column, paper, thin layer, ion- exchange and gas chromatography

Principle and applications of HPLC

Rf and Rt value of various chromatographic techniques

Paper chromatographic separation of amino acids and sugars

Separation of a mixture of dyes by column chromatography

MODULE VI: BIOPHYSICAL ANALYSIS ***9 hours***

Osmosis, osmotic pressure, isotonic solution

Determination of molar mass by osmotic pressure method, reverse osmosis

Adsorption – types of adsorption, factors influencing adsorption

Langmuir theory of adsorption

Electrophoresis, Principle and applications of Zone electro phoresis and capillary electro phoresis

REFERENCES

1. Basic Inorganic Chemistry : F. A. Cotton G. Wilkinson and P. L. Gaus, Wlley
2. Concise Inorganic Chemistry : J. D. Lee, ELBS
3. Inorganic Chemistry : J. E. Huheey
4. Coordination Chemistry : Bosolo and Johns
5. Organic Chemistry : Peter Sykes
6. Organic Chemistry : F. A. Carey, Mc Graw Hill
7. Organic Chemistry : Morrison & Boyd
8. Reaction Mechanism of Organic Chemistry : S. M. Mukherji and S. P. Singh, Mc Millan
9. Spectrscopy Y R Sharma.
10. Advanced Organic Chemistry :Jerry March

Third Semester B.Sc Degree Examination Model question paper

Complementary course for Biochemistry Majors

CH1331.6: PHYSICAL AND ANALYTICAL CHEMISTRY - II

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1. What is Rf?
2. Name the chromatographic method where the components are separated in stacks.
3. What is a colloid?
4. What is the non-linear hybridisation in octahedral complexes?
5. What are chelates?
6. What is the unit of second order rate constant?
7. What is CMC?
8. Write the selection rule for vibrational spectrum ?
9. Write an expression for force constant ?
10. What is frequency factor? (10 x 1 = 10 marks)

SECTION B

*(Answer any **eight** questions. Each question carries 2 marks)*

11. What is zero order reaction? Give an example.
12. Write the Arrhenium equation and explain the terms.
13. What are polydendate ligands? Give an example.
14. Write a note on electrophoresis.
15. State Hardy-Schule's rule.
16. Explain Tyndall effect.
17. What is paper chromatography?
18. What are the various types of molecular spectra?
19. Discuss the various types of energy level in molecule?
20. Write in brief 'ion exchange chromatography'.
21. What are isotonic solutions.
22. What is coordination number? Explain with an example. (8 x 2 = 16 marks)

SECTION C

*(Answer any **six** questions. Each question carries 4 marks)*

23. Differentiate order and molecularity.
24. Explain using valance bond theory, the bonding in tetra hedral complexes ?
25. What are high spin and low spin complexes?
26. How colloids are purified?
27. What are enzymes? Write the general properties of enzymes.
28. Give the expression for the frequency of vibration in vibrational spectroscopy and

explain the terms?

29. Explain the terms – emulstion and gel
30. What are the different types of adsorptions and the factors affecting adsorption?
31. How will you determine bond length in a molecule using microwave spectra?

(6 x 4 = 24 marks)

SECTION D

*(Answer any **two** questions. Each question carries 15 marks)*

32. a) Write a brief note on the structural isomerism in coordination complexes (6 marks)

    b) Explain the use of EDTA and dimethyl glyoxime in quantitative analysis (6 marks)

    c) Discuss the mechanism of enzyme catalysis. (3 marks)
33. a)Explain the VBT theory in octahedral complexes with examples (6 marks)

    b) Explain the magnetic properties of co-ordination compounds (5 marks)

    c) Advantages and disadvantages backs of VB theory. (4 marks)
34. a) Write a short note on adsorption and partition chromatography. (8 marks)

    b) Discuss the principle and applications of HPLC. (7 marks)
35. a)What is osmosis? How molar mass is determined by osmotic pressure method? (6 marks)

    b) Explain reverse osmosis and its application. (4 marks)

    c) Differentiate between zone and capillary electrophoresis. (5 marks)

(2 x 15 = 30 marks)

SYLLABUS OF COMPLEMENTARY CHEMISTRY

FOR BIOCHEMISTRY MAJORS

2020 Admission onwards

SEMESTER	**IV**
COURSE	**4**
COURSE TITLE	**ORGANIC CHEMISTRY AND SPECTROSCOPY**
COURSE CODE	**CH 1431.6**
CREDIT	**3**

L-T-P	**3-0-2**
TOTAL HOURS	**54**

CO No.	COURSE OUTCOME *Upon completion of this course, the students ,*	Cognitive Level
1	Relate electron displacements to stability of intermediates	**U,A**
2	Comprehend substitution reactions	**A**
3	Predict R & S notations of optical isomers	**A**
4	Assign E & Z nomenclature to geometrical isomers	**A**
5	Understand the significance of rotation about single bond	**U**
6	Understand the significance of saponification value, iodine value and acid value of oils	**U**
7	Appreciate hetero cyclic compounds and alkaloids	**U**
8	Recognize the role of organo-metallic compounds in medicine	**U**
9	Have a good understanding of different spectroscopic techniques	**U**

*R-Remember, U-Understand, A-Apply, E- Evaluate

MODULE I: MECHANISM IN ORGANIC SUBSTITUTION REACTIONS
9hours

Electron displacement in organic molecules, inductive, electromeric and mesomeric effects, hyper conjugation and steric effect

Bond fission, rate determining step

Nucleophilic substitution of alkyl halides, SN1, SN2 reactions, effect of structure on reactivity as illustrated by methyl, isopropyl and tertiary butyl groups.

Aromatic electrophilic substitution reactions (nitration, halogenations, sulphonation and Friedel Crafts alkyl and acylation) (mechanism not required), directive influence of subtituents on aromatic electrophilic substitution (-OH and -NO2 only)

MODULE II: STEREOCHEMISTRY
9hours

Optical isomerism, chirality, relative and absolute configuration, D- L notation and enantiomers

Optical isomerism in glyceraldehydes, lactic acid and tartaric acid

Diastereo isomers and meso compounds

Cahn-Ingold- Prelog rules, R-S notation for optical isomers containing one or two asymmetric carbon atoms, E and Z nomenclature in aldoximes and ketoximes

Racemic mixture, racemisation and resolution, asymmetric synthesis

Rotational isomerism, rotation about carbon – carbon single bond, conformational analysis of ethane, propane, butane. Cyclohexane, chair and boat conformations, axial and equatorial bonds (Mention only)

MODULE III: OILS, FATS, HETEROCYCLICS AND ALKALOIDS 9hours

Oils and Fats: Occurrence and extraction

Analysis of oils and fats, saponification value, iodine value and acid value

Heterocyclic systems – 5 membered, 6 membered and condensed systems

Structure of pyrrole, Furan , Thiophene and pyridine (no structural elucidation)

Electrophilic substitution in pyrrole, Furan and Thiophene Reactivity and orientation

Electrophilic and nucleophilic substitution reactions in pyridine – Basicity and reduction

Structure of purine and pyramidine bases present in nucleic acids.

Alkaloids, general method of isolation, general properties, physiological action of alkaloids

conine, morphine and nicotine(no structural elucidation expected)

MODULE IV: ORGANO METALLIC COMPOUNDS
9hours

Organo metallic compounds, Definition and classification

Grignard Reagent, preparation and synthetic applications

Ziesels salt-Bonding and Structure, preparation and use

Biological and environmental aspects of organo metallics

Organo metallics in medicine, organo mercury, boron and silicon compounds

Metal carbonyls:Iron and Nickel carbonyls, preparation- Applications – Monds Process

MODULEV:BIO INORGANIC COMPOUNDS 9 hours

Metalloporphyrins – cytochromes – chlorophyll photosynthesis and respiration –

Haemoglobin and myoglobin, mechanism of $O_2 – CO_2$ transportation

Nitrogen fixation, carbon fixation and carbon cycle

Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems

MODULE VI: SPECTROSCOPY II **9 hours**

Raman spectroscopy, stokes and antistokes lines, quantum theory of Raman spectrum, advantages and disadvantages of Raman spectrum, complementary with IR spectrum, mutual exclusion principle

NMR spectroscopy, principle of NMR spectroscopy, nuclear spin, interaction with external magnetic field, chemical shift, spin-spin coupling in ethyl bromide and ethanol, applications, Nuclear Resonance Imaging

ESR spectroscopy introduction and applications

REFERENCES

1. I. L. Finar, Organic Chemistry, Vol. I &II, Longman
2. Jerry March : Advanced Organic Chemistry
3. : Avinash Upadhyay.Kakoli Upadhyay.Nirmalendu Nath : Bio Physical Chemistry Principles and techniques
4. B K Sharma: Spectroscopy
5. Y R Sharma: Spectroscopy
6. J.E.Huheey, Inorganic Chemistry, Pearson.

IV Semester B.Sc Degree Examination Model question paper

Complementary course for Bio-Chemistry Majors

Course Code CH1431.6 Credit 3

ORGANIC CHEMISTRY AND SPECTROSCOPY

(2020 admission onwards)

Time: Three Hours **Maximum Marks: 80**

SECTION A

*(Answer **all** questions. Each question carries **1** mark)*

1.What is rate determining step?

2.Define Racemic mixture.

3. Represent the configurations of D and L glyceraldehyde.

4. Write an example for volatile oil .

5.What is Zieses' salt?

6.Define Iodine value.

7.Write an example for volatile oil .

8. Give the formula of iron and nickel carbonyls.

9. What is esr spectroscopy?

10. **The metal part in cytochrome.**

SECTION B

(Answer any eight questions. Each question carries 2 marks)

11. How benzene is nitrated? Give chemical equation.

12. What is steric effect?

13. Discuss the importance of Morphine.

14. Which of the following are optically active ? Why?

2-chloropropane (ii)2-chlorobutane (iii)3-chloropentane

15. Give two differences between enantiomers and diastereoisomers.

16. What is Mond's process?

17. How are alkaloids extracted from natural sources?

18. Write any two organosilicon compounds used in medicine.

19. State mutual exclusion principle.

20. Which compound is used as standard in nmr spectroscopy? Why?

21. What is carbon cycle?

22. Explain saponification value and acid value.

SECTION C

(Answer any six questions. Each question carries 4 marks)

23. Discuss the optical isomerism of tartaric acid.

24. Illustrate the directive influence of –NO2 group in aromatic electrophilic substitituion.

25. Distinguish between inductive and electromeric effect.

26. Comment on the classification of heterocyclics.

27. Determine the R & S notations of meso tartaric acid and L- glyceraldehyde.

28. How organometallics are classified?

29. Distinguish between Stokes and antistokes lines.

30. Discuss the role of haemoglobin and myoglobin inO2-CO2 transportation with mechanism

31. Differentiate fats and oils.

SECTION D

(Answer any two questions. Each question carries 15 marks)

32. (a)Discuss the mechanism of SN1 and SN2 reactions (6 marks)

(b)Effect of structure of alkyl group on SN1 and SN2 reactions(5 marks)

(c)What is Friedel-Crafts alkyl and acylation. (4 marks)

33. (a) Why furan undergoes electrophilic substitution at 3-position.(4 marks)

(b) Discuss the important electrophilic substitution reactions of furan (6 marks)

(c)Write the structure of purine and pyrimidine bases (5 marks)

34. (a)What is resolution? Explain any three methods of resolution. (7 marks)

(b)What are meso compounds? Are they optical active? Explain with a suitable example.(4 marks)

(c)Discuss the conformational analysis of butane. (4 marks)

35. (a) What is Grignard reagent? How is it prepared? (3 marks)

(b) How Grignard reagent is useful to synthesis primary, secondary and tertiary alcohols (3 marks)

(c)Discuss the nmr spectrum of ethyl bromide. (5 marks)

(d) Explain chemical shift (3 marks) (2 x 15 = 30 marks)

UNIVERSITY OF KERALA
SYLLABUS OF LAB COURSE IN CHEMISTRY
FOR STUDENTS OF BIOCHEMISTRY MAJORS

2020 Admission onwards

SEMESTER	**I,II,III &IV**
COURSE NAME	**COURSE V : LAB COURSE FOR BIOCHEMISTRY**
COURSE CODE	**CH 1432.6**
CREDIT	**2**
L-T-P	**0-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	**Cognitive Level**
	Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, out look and scientific temper (GOOD LAB PRACTICES)	R,U,A
	Develop skill in safe handling of chemicals, take precaution against accidents and follow safety measures	U,A
	Develop skill in observation, prediction and interpretation of reactions	U,A
	Prepare organic compounds, Purify and recrystallise	U,A
	Develop skill in weight calculation for preparing standard solutions	E,A
	Perform volumetric titrations under acidimetry-alkalimetry, permanganometry, dichrometry, iodimetry-iodometry,cerimetry, argentometry and complexometry	A
	Conduct chromatographic separation of mixtures	A

SYLLABUS FOR LABORATORY COURSE

FOR COMPLEMENTARY CHEMISTRY FOR BIOCHEMISTRY MAJORS

Course Code CH1432 .6 Credit 2

I.QUALITATIVE ANALYSIS

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given. A student has to analyse at least twelve organic compounds.

II.ORGANIC PREPARATIONS

1. Acetanilide from aniline
2. Metadinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

III.VOLUMETRIC ANALYSIS

A. Acidimetry and Alkalimetry

a. Preparation and standardization of 0.05N HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

c. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. HCl

d. Preparation and standardization of 0.05N NaOH using oxalic acid as primary standard

e. Estimation of a strong acids using standardized NaOH

f. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

B. Permanganometry

a. Standardization of $KMnO_4$ by oxalic acid/sodium oxalate and Mohr's salt

b. Estimation of oxalic acid/sodium oxalate

c.Estimation of Mohr's salt

d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodimetry and Iodometry

a. Standardisation of sodium thiosulphate using std potassium dichromate

b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

IV.GRAVIMETRIC ANALYSIS

1. Estimation of water of hydration in barium chloride crystals

2. Estimation of barium in barium chloride solution.

V.CHROMATOGRAPHY

TLC of simple organic compounds- phenol, napthol, nitrobenzene

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st} ,2^{nd} , 3^{rd} and 4^{th} semesters

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARYCHEMISTRY (FOR MICROBIOLOGY MAJORS)

(2020 admission onwards)

SEMESTER	**I**
COURSE	**1**
COURSE NAME	**GENERAL CHEMISTRY - I**
COURSE CODE	CH1131 .7
Credit	2
HOURS	36
L-T-P	2-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students,*	**Cognitive Level**
1	Discuss the Bohr atom model and represent electronic configuration of elements	R,U
2	Predict the shape of molecules	A
3	Explain the significance of hydrogen bonding	U
4	Discuss the theory of volumetric analysis	U
5	Point out the major sources of air and water pollution and its environmental impact.	U

MODULE I – ATOMIC STRUCTURE (9 HRS)

Atomic spectrum of hydrogen - different series, Rydberg equation.

Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation.

Schrodinger wave equation (mention only, no derivation), concept of orbitals.

Quantum numbers and their significances.

Orbitalwise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, Stability of filled and half filled orbitals.

Electronic configuration of lanthanides and actinides, Lanthanide contraction

MODULE II – CHEMICAL BONDING (9 HRS)

Energetics of ionic bond formation – Born-Haber cycle. Fajan's rule.

Hybridisation and shape of molecules – sp (BeCl2), sp^2(BF3) , sp^3 (CH4), sp^3d(PCl5), sp^3d^2 (SF6) and sp^3d^3 (IF7)

hybridisation with examples.

VSEPR theory, regular and irregular geometry, H2O, NH3, XeF2, XeF4.

Hydrogen bond – inter and intra molecular – its consequences on boiling point and

volatility. Importance of hydrogen bonding in biomolecules – Proteins and nucleic acids.

Ionic character of covalent bond – Polar and non polar covalent compounds.

MODULE III – ENVIRONMENTAL CHEMISTRY (9HRS)

Nature of environmental threats and role of chemistry.

Air pollution – Air pollutants and their sources, toxic effect of CO, acid rain.

Green house effect, ozone layer and its depletion.

Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents.

Treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis.

Dissolved oxygen-BOD,COD analysis.

MODULE IV – ANALYTICAL PRINCIPLES (9 HRS)

Principles of volumetric analysis – primary standard – standard solutions normality and molarity.

Theory of acid-base titrations, permagnometric and dichrometric titrations,

iodometry and complexometric titrations.

Theory of acid-base indicator – redox indicators.

Principles of colorimetry – estimation of biomolecules - glucose and chlorophyll.

Text books/References:

1. B.R.Puri, L.R.Sharma and P.S.Kalia “Inorganic chemistry”,
2. A.I.Vogel “A text book of Quantitative analysis”
3. Day & Underwood. “Qunatitative analysis: laboratory manual”:
4. G.S.Manku. “Theoretical Principles of Inorganic Chemistry”:
7. S. K. Banerji, “Environmental Chemistry”.
8. A. K. De “Environmental Chemistry - An introduction”
9. B. K. Sharma “Air Pollution”.

UNIVERSITY OF KERALA

I Semester Bsc Degree Examination Model Question Paper
Complementary Chemistry Course for Microbiology Majors

Course Code CH1131.7 Credit 2

GENERAL CHEMISTRY - I

(2020 Admission onwards)

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the electronic configuration of Copper (atomic umber 29)
2. The quantum numbers n = 2 and l = 1 corresponds to which orbital?
3. What are the shapes of molecules with sp and sp3 hybridization?
4. Identify the hybridization in $BeCl_2$.
5. Give the structure of XeF_2.
6. What is Lattice Energy?
7. What is meant by primary standards?
8. Define Molality.
9. What is the optimum value of DO for good water quality?
10. What is meant by BOD?

Section-B

Answer any 8 questions from the following. Each question carries two marks

11. What is Bohr Bury's rule?

12. Write down the Schrodinger Equation and explain the terms involved.

13. Explain the failures of Bohr's theory?

14. What are the limitations of VSEPR Theory?

15. What are polar and non polar covalent bonds?

16. Which is more volatile, o-nitro phenol or p-nitro phenol? Why?

17. What are dichrometric titrations?

18. How would you prepare 100ml of 0.05M Mohr's salt solution?

19. Methyl orange is not a suitable indicator for the titration of weak acid with strong base. Why?

20. Which are green house gases? Mention their sources.

21. What is reverse osmosis? How it is useful in the purification of waste water?

22. What are chief factors responsible for water pollution?

SECTION-C

Answer any 6 questions from the following. Each question carries four marks.

23. If the energy difference between two electronic states of hydrogen atom is 214.68 KJmol1. What will be the frequency of light emitted when the electrons jump from the higher to the lower level?

24. Explain the stability of half filled and completely filled orbitals.

25. Give an account of permanganometric titrations.

26. Discuss the theory of Acid – Base indicators.

27. Explain the energetic of ionic bond formation.

28. Define hybridization. Mention the types of hybridization involved in SF6, PCl5, BF3.

29. Explain Fajan's rule.

30. Write a note on agricultural pollution.

31. Explain briefly the different methods for the treatment of industrial waste water.

SECTION-D

Answer any 2 questions from the following. Each question carries fifteen marks.

32. (a) Discuss Bohr Theory, highlighting its merits . (6 marks)

(b)What are quantum numbers? Give its significance. (3 marks)

(c) Explain various rules regarding electronic configuration. (6 marks)

33. (a) Discuss the titration curves for the titration of strong acid with strong base and

weak acid with strong base. (6 marks)

(b) Explain the theory of redox indicators. (5 marks)

(c) State and explain Beer – Lambert Law. (4marks)

34. (a) Write a note on Hydrogen bonding . (4 maks)

(b) Discuss the consequences of hydrogen bonding. (5 marks)

(b) Account for the bond angle difference in NH3 and H2O using VSEPR theory.(5

marks)

(c) Calculate the bond order of O_2, O_2^{2+} and O_2^{2-} and arrange them in the increasing order of stability.(4 marks)

35. (a) Discuss the formation and importance of ozone layer. (5 marks)

(b) What is meant by pollution and pollutants? Describe the various air pollutants and their sources. (5 marks)

(c) What is acid rain? How is it happens? Write its impact on environment. (5 marks)

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARYCHEMISTRY (FOR MICROBIOLOGY MAJORS)

(2020 admission onwards)

SEMESTER	**II**
COURSE	**2**

COURSE NAME	GENERAL CHEMISTRY II
COURSE CODE-	CH1231 .7
Credit	2
HOURS	36
L-T-P	2-0-2

CO No.	COURSE OUTCOME *Upon completion of this course, the students,*	Cognitive Level
1	Discuss the stereochemistry of organic compounds	R,U
2	Discuss radioactivity and its applications	A
3	Summarize the chemistry of coordinate compounds	U
4	Explain the role of chlorophyll, haemoglobin, myoglobin, and elements in biological functions.	U
5	Solve numerical problems on radioactivity	U
6	Develop scientific attitudes curiosity against the biological effect of radiations	

MODULE I – STEREOCHEMISTRY (9 HRS)

Optical isomerism, chirality, enatiomers, diastereoisomers, racemisation and resolution.

Relative and absolute configuration – CIP rules (D- & L- Glyceraldehyde, D- & L- lactic acid and +,- and meso tartaric acid only)

Asymmetric synthesis, Enantiomeric excess.

Geometrical isomerism, E and Z nomenclature to Aldoximes, ketoximes, simple alkenes, maleic and fumaric acid.

Rotational isomerism. Rotation about carbon – carbon single bond,

conformation of ethane, butane, cyclohexane, axial and equatorial bonds.

MODULE II- RADIOACTIVITY AND NUCLEAR CHEMISTRY (9 HRS)

Radioactive decay series, Radioactive equilibrium, Average life, Half life.

Detection of radio activity-Geiger Muller Counter, Wilson cloud chamber.

Units of radioactivity-Curie and Rutherford, Units of radiations.

Nuclear Chemistry-stability of nucleus, n/p ratio.

Artificial transmutation and radioactivity, mass defect, binding energy.

Applications of radio activity- in medicine and agriculture.

Biological effects of radiation, pathological and genetic damage.

MODULE III- CO-ORDINATION CHEMISTRY AND SECONDARY BOND FORCES (9 HRS)

Types of ligands, Werner's coordination theory, Valence bond theory of bonding in octahedral and tetrahedral complexes, Drawbacks of valence bond theory.

Crystal field theory of octahedral and tetrahedral complexes, examples – high and low spin complexes, magnetic properties.

Application in qualitative and quantitative analysis.

Secondary bond forces in molecules – Ion-dipole, dipole-dipole, ion-induced dipole, dipole-induced dipole and induced dipole-induced dipole interactions.

MODULE IV – HETEROCYCLIC AND BIO INORGANIC COMPOUNDS (9HRS)

Structure of furan, pyrrole, thiophene, 1,3-diazole, 1,3-thiozole, pyridine, 1,3-diazine, indole, quinoline, isoquinoline, purine and pyramidine bases.(structure only)

Aromaticity of five and six membered heterocyclics.

Metalloporphyrins – cytochromes, chlorophyll, photosynthesis and respiration, haemoglobin and myoglobin, mechanism of O2 – CO2

transportation.

Biological fixation of nitrogen

Carbon fixation and carbon cycle.

Role of alkali and alkaline earth metals in biological systems

Biological functions and toxicity of Cr, Mn, Ni, Cu, Se, Mo, Co ,Fe & Zn.(mention only)

Text Books /References

1. Bosolo and Johns Co-ordination Chemistry
2. Rochoco, Chemistry of Organometallics
3. J.D. Lee, Concise Inorganic Chemistry
4. Puri, Sharma and Kalia "Inorganic Chemistry"
5. A.D. Madan Modern Inorganic Chemistry

UNIVERSITY OF KERALA

II Semester Bsc Degree Examination Model Question Paper

Complementary Chemistry Course for Microbiology Majors

Course Code CH1231.7 Credit 2

GENERAL CHEMISTRY II

(2020 Admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. What is chirality?
2. Draw the structure of D-glyceraldehyde and L-glyceraldehyde.
3. What are conformers?
4. What are alpha particles?

5. Define the term radioactivity.
6. Give an example for hexadendate ligand.
7. What are low spin complexes?
8. What do you mean by chelate?
9. Draw the structure of furan and pyrrole?
10. Give an example of anaerobic respiration.

SECTION-B

Short answer type (not to exceed one paragraph). Answer any 8 questions from the following. Each question carries two marks

11. What is racemisation? Comment on its optical activity.
12. What are diastereoisomers? Give examples.
14. Explain Geiger Nuttal Rule.
15. What are half life period and average life period?
16. Define mass defect and binding energy.
17. Write the postulates of Werner's Coordination Theory.
18. What are poly dentate ligands? Give an example.
19. Explain the colours of transition metal complexes.
20. Differentiate respiration and photosynthesis.
21. Mention the biological functions of Cr and Zn?
22. What is the role of chlorophyll in photosynthesis?

SECTION-C

Short essay (not exceed 120 words). Answer any 6 questions from the following. Each question carries four marks.

23. Discuss the geometrical isomerism of maleic and fumaric acid. Also assign E and Z notation.
24. Explain the conformarism of cyclohexane.
25. One microgram of phosphorus- 32 was injected into a living system for biological tracer studies. The half life period of P-32 is 14.3 days. How Long will it take for the radioactivity to fall to 10% of the initial value?
26. Explain the relation between nuclear stability and n/p ratio.

27. Write the biological effects of radiation

.

28. Suggest the structure of [NiCl4] on the basis of Valence Bond Theory.

29. Explain the magnetic properties of octahedral complexes with suitable examples.

30. Discuss the aromaticity of heterocyclic compounds.

31. Metal ions play a variety of roles in biological systems. Explain

SECTION-D

Answer any 2 questions from the following. Each question carries fifteen marks.

32.(a) What is resolution? Explain any three methods of resolution (7 marks)

(b) Apply CIP rules to find out the absolute configuration of + & - lactic acid

(5marks).

(c) Discuss asymmetric synthesis with an example. (3 marks)

33.(a) Discuss the applications of radioactivity in medicine and agriculture (5 marks)

(b) Describe any one method of detecting radioactivity (5 marks)

(c) Explain artificial radioactivity with suitable examples. (5 marks)

34. (a) Write a note on Crystal Field Theory. (5 marks)

(b) Explain the applications of complexes in qualitative analysis. (5marks)

(c)Write a brief note on secondary bond forces. (5 marks)

35. (a) Give brief outline of carbon cycle. (5 marks)

(b) Explain nitrogen Fixation. (5 marks)

(c) Write a short note on hemoglobin. (5 marks)

UNIVERSITY OF KERALA
SYLLABUS OF COMPLEMENTARYCHEMISTRY
(FOR MICROBIOLOGY MAJORS)

(2020 admission onwards)

SEMESTER	**III**
COURSE	**3**
COURSE NAME	BIOMOLECULES & BIOPHYSICAL CHEMISTRY - I
COURSE CODE-	CH1331 .7
Credit	2
HOURS	**54**
L-T-P	3-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students,*	**Cognitive Level**
1	Discuss the chemistry and structure of biologically important carbohydrates	U
2	Describe the synthesis of amino acids and polypeptides	A
3	Understand the structure of protein and nucleic acids	U
4	Explain the classification of lipids, their structure and biological importance.	U
5	Understand the role of buffers, importance of osmosis and to prepare standard solutions.	U
6	Explain the basic concepts of kinetics of chemical reactions	U

MODULE I – CARBOHYDRATES (12 HOURS)

Classification, configuration of D & L glyceraldehydes. Structure of ribose, 2-deoxy ribose, glucose, fructose, mannose and galactose.

Properties of glucose and fructose - due to functional groups - hydroxyl, aldehyde and ketone, action of acids and alkali on sugars, Reducing actions of sugars.

Pyranoside structures of glucose and fructose.

Furanoside structure of fructose (structure elucidation not expected).

Mutarotation and epimerization.

Glycosides and amino sugars.

Structure and biological importance of disaccharides - sucrose, lactose, maltose and cellobiose**.** Inversion of sucrose.

Structure and important properties of the following structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen).

Glycosaminoglycans- heparin, hyaluronic acid.

MODULE II – AMINO ACIDS AND PROTEINS (12 HRS)

Amino acids -Classification and properties, Essential and non essential amino acids, zwitter ion, isoelectric point

Synthesis of amino acids - glycine, alanine and tryptophan .

Polypeptides and proteins - peptide linkage.

Peptide synthesis - Carbobenzoxy, Sheehan and solid phase synthesis

Proteins - primary, secondary, tertiary and quarternary structure of proteins.

Denaturation and colour reactions of proteins.

RNA and DNA – Structure of purines and pyrimidines, nucleosides, nucleotides, phosphodiester linkages.

Hydrolysis of nucleoproteins, structure of nucleic acids. their biological role.

Replication of DNA.

MODULE III – LIPIDS (12 HOURS)

Lipids: Definition, basic ideas about the biochemical functions of lipids.

Classification of lipids with examples, classification of fatty acids, physical and chemical properties of fatty acids.

Structure of the following fatty acids- stearic acid, oleic acid, linoleic acid, arachidonic acid. Structure of triacylglycerol.

Saponification number, acid number and iodine number of fats.

Essential and non-essential fatty acids with examples.

Compound lipids: membrane lipids- Structure and functions of phospholipids- phosphatidic acid, lecithin, cephalin, and phosphatidyl serine, Functions of Sphingolipids.

Steroids: Strucutre and functions of cholesterol and ergosterol.

MODULE IV – ACIDS, BASES AND BUFFERS (6 HRS)

Dissociation of water, ionic product of water, concepts of pH, pOH, simple numerical problems of pH.

Determination of pH using indicators, pH meter and theoretical calculations.

Dissociation of weak acids and electrolytes, Bronsted and Lewis theory of acids and bases,

Meaning of Ka and pKa values,

Buffers: buffer action, buffers in biological system,

Henderson -Hasselbach equation with derivation, simple numerical problems involving application of this equation.

MODULE V: SOLUTIONS (6H)

Meaning of normality, molarity, molality, percentage solution, mole fractions, simple numerical problems from the above, Fundamental principles of diffusion and osmosis, biological importance of osmosis. Isotonic, hypotonic and hypertonic solutions.

MODULE VI - CHEMICAL KINETICS (6HRS)

Rate of reactions, various factors influencing rate, order, molecularity, zero, first, second, third order reactions. Rate determining step.

Derivation of first order kinetics - fractional life time, units of rate constants.

Influence of temperature on reaction rates, Arrhenius equation,

Calculation of Arrhenius parameters.

REFERENCES

1) Dr.U.Satyanarayana and Dr.U.Chakrapani,Biochemistry, Books and Allied (P) Ltd

2) J.L.Jain, Sunjay Jain, Nitin Jain, Fundamentals of Biochemistry, , S.Chand & Co. Ltd.

3) RK Murray, DK Granner, PA Mayers, VW Rodwell, Harper's Biochemistry, Prentiace-Hall International Editions.

4) Sharma,Madan and Pahania, Principles of Physical Chemistry, Vishal Publishing Co.

UNIVERSITY OF KERALA

III Semester Bsc Degree Examination Model Question Paper

Complementary Chemistry Course for Microbiology Majors

Course Code CH1331.7 Credit 2

BIOMOLECULES & BIOPHYSICAL CHEMISTRY - I

(2020 Admission onwards)

Time: 3 hours Maximum marks: 80

SECTION A

(Answer all questions. Each question carries 1 Mark)

1) Write the epimer of D-Glucose.

2) What are polysaccharides?

3) What are zwitter ions?

4) Relationship between the base sequence in DNA and the amino acid sequence in protein is known as ……..

5) Write the structure of tryptophan.

6) Name the purine bases present in DNA.

7) Explain the term rate determining step.

8) Mention about the concepts of pH& pOH.

9) Prepare 2M ,250 ml NaOH solution.(mol wt of NaOH = 40)

10) What is unit of first order reaction? (10x1=10 marks)

SECTION B

(Answer any 8 question. Each question carries 2 Marks)

11) Draw the structure of cellulose.
12) Explain inversion of cane sugar.
13) What is Tollen's reagent. Write its importance.
14) Explain denaturation of protein.
15) Differentiate essential and non-essential amino acids?
16) Name the products of hydrolysis of nucleoproteins.
17) Write the functions of cholesterol.
18) Explain saponification value.
19) Calculate the pH of 0.001M HCl.
20) What is buffer?
21) What is a first order reaction? Give an example.
22) Write Arrhenius equation and explain the terms. (8x2=16 marks)

SECTION C

*(Answer **any 6** question. Each question carries 4 Marks)*

23) Write a short note of glycosaminoglycans.
24) Give the chemical properties of glucose due to hydroxyl and carbonyl functional groups.
25) Explain mutarotation and epimerization.
26) Explain the following denaturation and colour reactions of protein.
27) Write the structure and functions of cholesterol and ergosterol.
28) Differentiate Saponification number and iodine number. Write its importance.
29) Derive first order rate equation.
30) Explain Bronsted theory of acids and bases.
31) Write any one method of synthesizing glycine and tryptophan (6x4=24marks)

SECTION D

(Answer any 2question. Each question carries 15 Marks)

32) (a) Discuss the pyranoside structure of glucose.

(b) How glucose reacts with the following (i) Br_2 water (ii) Phenylhydrazine

(iii) CH_3OH and dry Conc.HCl. (iv) Tollen's reagent.

(c) Write a short note on storage polysaccharides. (6+4+5)

33) (a) What are lipids? Discuss the biological functions of lipids.

(b) How fatty acids are classified? Discuss it with examples and structure.

(c) Write short notes on lecithin and cephalin. (4+6+5)

34) (a) Explain two methods of synthesizing peptides.

(b) Discuss primary and secondary structure of proteins.

(c) Discuss the biological role of DNA. (5+5+5)

35) (a) Derive Henderson-Hasselbach equation. Write the importance of the equation?

(b) Explicit the importance of osmosis in biological systems.

(c) Discuss the various factors influencing rate of reaction. (6+4+5)

(2x15=30 marks)

UNIVERSITY OF KERALA

SYLLABUS OF COMPLEMENTARYCHEMISTRY (FOR MICROBIOLOGY MAJORS)

(2020 admission onwards)

SEMESTER	**IV**
COURSE	**4**
COURSE NAME	**BIOMOLECULES & BIOPHYSICAL CHEMISTRY - II**
COURSE CODE-	CH1431 .7
Credit	2

HOURS	**54**
L-T-P	3-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students,*	**Cognitive Level**
1	Discuss the classification of enzymes and their biological importance.	U
2	Outline the metabolism of carbohydrates, fatty acids and proteins.	U
3	Explain the importance of UV, IR and NMR spectroscopic techniques as analytical tool.	U
4	Explain the basic concepts of thermodynamics and relevance of themodynamics in biological processes.	U
5	Discuss the classification of colloids and their synthesis and applications.	U

MODULE I – INTRODUCTION TO ENZYMES (12HRS)

Enzymes – Chemical nature and Features of active site.

Enzyme Specificity – Stereo, reaction, substrate and broad specificity.

Enzyme Commission system of classification and nomenclature of enzymes: six major classes of enzymes with one example each.

Coenzymes and their functions - NAD, NADP+, FAD, FMN, lipoic acid, pyridoxal phosphate, biotin and cyanocobalamin. Ribozymes,

Measurement and expression of enzyme activity, Definition of IU,

katals, enzyme turnover number .

Isoenzymes- Lactate dehydrogenase

Applications of enzymes – Enzymes as therapeutic agents, as analytical reagents, immobilized enzymes.

MODULE II : ENZYME KINETICS (6H)

Factors affecting enzyme catalysed reactions - effect of substrate concentration, enzyme concentration, temperature, pH and activators.

Mechanism of Enzyme action - Activation energy, Interaction between enzyme and substrate- lock and key model, induced fit model.

Enzyme kinetics - Km and its significance, Michaelis Menton equation (without derivation), Lineweaver- Burk plot.

Significance of Km and Vm values.

MODULE III: INTRODUCTION TO METABOLISM (9HRS)

Metabolism- catabolism and anabolism

Metabolism of carbohydrates – Glycolysis and citric acid cycle, Electron transport chain and Oxidative phosphorylation.

Glycogenesis and glycogenolysis, Gluconeogenesis (Mention only)

Metabolism of lipids - Metabolism of triglycerides, Outline study of β-oxidation of saturated and unsaturated fatty acids.

Metabolism of amino acids – Proteolysis, Urea cycle.

MODULE IV – ORGANIC SPECTROSCOPY (9 HRS)

Spectroscopic techniques: Principle and applications of UV and Visible spectroscopy – types of electronic transitions, concept of chromophore and auxochrome – red and blue shifts – applications.

IR spectroscopy – Molecular vibrations, vibrational frequency-bond strength relation, Functional group and finger print region – group frequencies, effect of hydrogen bonding on –OH stretching frequency.

NMR spectroscopy – nuclear spin, principle of NMR, chemical shift, spin-spin interation.

PMR of simple organic molecules $CHBr_2CH_2Br$, CH_3CH_2Br and CH_3CH_2OH. Principle of MRI.

MODULE V: BIOENERGETICS (9HRS)

Basic concepts – System – surroundings – open, closed and isolated systems – Isothermal

– isochoric and isobaric process.

Biochemical thermodynamics, first and second law of thermodynamics, Enthalpy, Entropy and Free energy.

Criteria for reversible and irreversible process - Gibbs free energy equation.

Relationship between standard free energy change and equilibrium constant.

Standard free energy changes at pH 7.0 ($\Delta G'$), additive nature of $\Delta G'$, ATP as universal currency of free energy in biological systems.

MODULE VI- COLLOIDS (9HRS)

Meaning of true solution, colloidal solution, and coarse suspension, distinction between lyophilic and lyophobic sols, Fundamental study of Donnan equilibrium- application in biological system, membrane permeability, methods of preparation of colloidal solution, separation of colloidal solutions, elementary study of charge on colloids, Tyndall effect, emulsion and emulsifying agents, application of colloidal chemistry.

References:-

5) Biochemistry, Dr,U.Satyanarayana and Dr.U.Chakrapani, Books and Allied (P) Ltd

6) Fundamentals of Biochemistry, J.L.Jain, Sunjay Jain, Nitin Jain, S.Chand & Co. Ltd.

7) Harper's Biochemistry, RK Murray, DK Granner, PA Mayers, VW Rodwell, Prentiace-Hall International Editions.

8) Principles of Physical Chemistry, Sharma,Madan and Pahania, Vishal Publishing Co.

UNIVERSITY OF KERALA

IV Semester Bsc Degree Examination Model Question Paper
Complementary Chemistry Course for Microbiology Majors

Course Code CH1431.7 Credit 2

BIOMOLECULES & BIOPHYSICAL CHEMISTRY - II

(2020 Admission onwards)

Time: 3 hours Maximum marks: 80

SECTION A

(Answer allquestions. Each question carries 1 Mark)

1. What is holoenzyme?
2. What is LB plot?
3. What is enzyme turnover number?
4. What is glycogenesis?
5. Define catabolism
6. Write the mathematical form of Beer Lamber's Law.
7. Write the useful region in IR spectroscopy.
8. Define open and closed systems.
9. What is entropy?
10. What is a colloidal solution. (10x1=10 marks)

SECTION B

(Answer any 8 question. Each question carries 2 Marks)

11. Write down any 4 industrial uses of enzymes?
12. Define IU and katal?
13. Explain the significance of km value?
14. Differentiate catabolism and anabolism.
15. What is phosphorylation?
16. What are chromophores? Give examples.
17. Write the stretching frequency of (i) carbonyl group and (ii) free

–OH group.

18. Differentiate glycogenolysis and Gluconeogenesis

19. State and explain first law of thermodynamics.

20. Distinguish isothermal and isobaric process.

21. Explain Tyndall effect.

22. What are emulsifying agents? Give examples. (8x2=16 marks)

SECTION C

*(Answer **any 6** question. Each question carries 4 Marks)*

23. What is Michaelis Menton equation? Explain?

24. Briefly explain factors affecting velocity of enzyme catalyzed reactions?

25. What are co-enzymes? Write any two co-enzymes and their functions.

26. Illustrate urea cycle.

27. (i) What is fingerprint region? (ii) Comment on the influence of hydrogen bonding on O-H stretching frequency.

28. What is chemical shift? Explain the factors influencing chemical shift.

29. Describe any two methods of preparation of colloidal solution.

30. Derive the relationship between standard free energy change and equilibrium

constant.

31) Differentiate lyophilic and lyophobic colloids. (6x4=24marks)

SECTION D

(Answer any 2question. Each question carries 15 Marks)

32. (a) Give an account of classification of enzymes?

(b) Write down any 4 industrial uses of enzymes.

(c) Explain immobilization of enzymes? (8+4+3)

33. (a) Explain the reaction sequences happening in kerb's cycle?

(d) Give an account on saturated fatty acid oxidation. (8+7)

31. (a) Explain the principle of NMR spectroscopy.

(d) What is spin-spin interaction? Explain with an example

(e) Discuss on the applications of UV-Vis spectroscopy

(6+6+3)

32. (a) Comment on the statement "ATP as universal currency of free energy in biological systems"

(d) Explain the importance of free energy to predict the feasibility of reactions.

(e) Discuss the various applicatiaons of colloids. (6+4+5) (2x15=30 marks)

UNIVERSITY OF KERALA
SYLLABUS OF LAB COURSE IN CHEMISTRY
FOR STUDENTS OF MICROBIOLOGY MAJORS

2020 Admission onwards

SEMESTER	**I,II,III &IV**
COURSE NAME	**COURSE V : LAB COURSE FOR MICROBIOLOGY**
COURSE CODE	**CH 1432.7**
CREDIT	**2**
L-T-P	**0-0-2**
TOTAL HOURS	**36**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	**Cognitive Level**
	Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, out look and scientific temper (GOOD LAB PRACTICES)	R,U,A

	Develop skill in safe handling of chemicals, take precaution against accidents and follow safety measures	U,A
	Develop skill in observation, prediction and interpretation of reactions	U,A
	Prepare organic compounds, Purify and recrystallize	U,A
	Develop skill in weight calculation for preparing standard solutions	E,A
	Perform volumetric titrations under acidimetry-alkalimetry, permanganometry, dichrometry, iodimetry-iodometry,cerimetry, argentometry and complexometry	A
	Conduct chromatographic separation of mixtures	A

SYLLABUS FOR LABORATORY COURSE

FOR COMPLEMENTARY CHEMISTRY FOR MICROBIOLOGY MAJORS

Course Code CH1432 .7 Credit 2

I.QUALITATIVE ANALYSIS

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given. A student has to analyse at least twelve organic compounds.

II.ORGANIC PREPARATIONS

1. Acetanilide from aniline
2. Metadinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

III.VOLUMETRIC ANALYSIS

A. Acidimetry and Alkalimetry

a. Preparation and standardization of 0.05N HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

c. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. HCl

d. Preparation and standardization of 0.05N NaOH using oxalic acid as primary standard

e. Estimation of a strong acids using standardized NaOH

f. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

B. Permanganometry

a. Standardization of $KMnO_4$ by oxalic acid/sodium oxalate and Mohr's salt

b. Estimation of oxalic acid/sodium oxalate

c.Estimation of Mohr's salt

d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodimetry and Iodometry

a. Standardisation of sodium thiosulphate using std potassium dichromate

b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

IV.GRAVIMETRIC ANALYSIS

1. Estimation of water of hydration in barium chloride crystals
2. Estimation of barium in barium chloride solution.

V.CHROMATOGRAPHY

TLC of simple organic compounds- phenol, napthol, nitrobenzene

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st} ,2^{nd} , 3^{rd} and 4^{th} semesters

UNIVERSITY OF KERALA

SCHEME AND SYLLABUS

(OUTCOME BASED)

FIRST DEGREE PROGRAMME IN CHEMISTRY

(BSc)

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

Core Courses, Foundation Course II, Open and Elective Courses

2020 ADMISSION ONWARDS

UNIVERSITY OF KERALA

SCHEME AND SYLLABUS

FIRST DEGREE PROGRAMME (BSc) IN CHEMISTRY

2020 ADMISSION ONWARDS

The BSc Degree programme in Chemistry covers three academic years of six semesters and aims to provide the students with an in-depth understanding and training in chemical sciences. The syllabus has been designed to stimulate the interest of the students in chemistry and prepared in order to equip the students with a potential to contribute to the academic and industrial requirements of the society. The new, updated syllabus is in accordance with the **OUTCOME BASED EDUCATION (OBE)** which aim at acquiring advanced knowledge in Chemistry as a discipline, in an interdisciplinary way. Based on the new guidelines of OBE, **Programme Outcome (PO)** ***for the First degree Programme is defined by University of Kerala***. **Programme Specific Outcome** relating to BSc Chemistry **(PSO)** and **Course Outcome (CO)** relating to each course are also specified. [CO is of the Remember level(R) understand level(U) and apply level(A) based on Blooms Taxonomy]

Chemistry being an experimental science, due importance is given to the development of laboratory and instrumentation skills. The student is acquainted with the method of science, research methodology and the use of Computational softwares and Cheminformatics thus developing basic skills and knowledge of computing and data based decision making. At the same time, emphasis is given to critically analyse the impact of Chemistry in the present scenario of emerging human friendly and ecofriendly green approach in various facets of life and to become cautious against the random usage of dangerous chemicals.

It also provides a detailed knowledge of the terms, concepts, methods, principles and experimental techniques of chemistry, in order to get a comprehensive knowledge in leading a better life in harmony with nature.

PROGRAMME SPECIFIC OUTCOME (PSO) FOR FDP IN CHEMISTRY

Sl.No.	Upon completion of BSc Degree programme in Chemistry, students	PSO No.
1	Develop scientific outlook scientific attitude and scientific temper	PSO1
2	Develop skill in experimenting , analyzing and interpreting data	PSO2
3	Develop research attitude and adopt scientific method of identifying, analyzing and solving research problems in an innovative way	PSO3
4	Apply physical and mathematical theories and principles in the context of chemical science	PSO4
5	Use chemistry related soft wares for drawing structure and plotting graphs	PSO5
6	Use instruments- potentiometer, conductometer, pH meter and colorimeter.	PSO6
7	Acquire skill in safe handling of chemicals including hazardous materials.	PSO7
8	Identify the ingredients in household chemicals, use them in a critical way	PSO8
9	Predict analytical procedures, compare experimental, theoretical and graphical methods of analysis	PSO9
10	Predict reaction mechanism in organic reactions	PSO10
11	Understand the terms, concepts, methods, principles and experimental techniques of physical, organic, inorganic and analytical chemistry	PSO11
12	Develop critical thinking and adopt healthier attitudes towards individual, community and culture through the course of Chemistry	PSO12
13	Become cautious about environmental aspects and impact of chemicals in soil, water and air and adopt ecofriendly approach in all frontiers of life	PSO13
14	Become responsible in consumption of natural resources and adopt measures for sustainable development.	PSO14
15	Visit Chemical factories and industries with scientific curiosity	PSO15
16	Develop writing skills and presentation skills using audio visual aids	PSO16
17	Compare and share knowledge in an interdisciplinary manner	PSO17
18	Inculcate spirit of originality, novelty, and necessity in scientific research	PSO18
19	Contribute to the academic and industrial requirements of the society	PSO19
20	Get motivated to higher studies - PG Degree in different branches of Chemistry, BEd Degree in Physical Science, and job opportunities in industrial and non industrial sectors	PSO20
21	Adopt safer life skills in a human friendly and ecofriendly way	PSO21

COURSE STRUCTURE

The First Degree programme in Chemistry comprises of fourteen core courses, one project course, two choice based courses (an Open course in Vth semester and an Elective course in VIth semester), one core specific foundation course (IInd semester) in addition to one area-specific foundation course, the complementary courses and language courses. The open course offered in the fifth semester is open to students from other Majors. The details of the Course Structure are given in **Table I to VI**.

A Computer Skill Development Programme is included as part of the Core Course-CH1221 (Foundation Course II in Semester II), for computational skill development with no End Semester Evaluation (ESE).

FIRST DEGREE PROGRAMME
IN CHEMISTRY
Table I : Course structure, Scheme of Instruction and Evaluation

Course Code	Study component	Instructional hrs/Week		Credit	Duration of Uty. Exam	Evaluation marks		Total Credit
		T	P			CE	ESE	18
EN1111	English I	5		4	3hrs	20	80	
1111	Additional Language I	4		3	3hrs	20	80	
EN1121	Foundation Course I	4		2	3hrs	20	80	
MM1131.2	Complementary Course I	4		3	3hrs	20	80	
PY1131.2	Complementary Course II	2		2	3hrs	20	80	
	Complementary Course Lab of PY1131.2		2	-	-	-	-	
CH1141	Core Course I	2		4	3hrs	20	80	
	Core Course Lab I of CH1141		2	-	-	-	-	
SEMESTER II								
EN1211	English II	4		3	3hrs	20	80	18
EN1212	English III	5		4	3hrs	20	80	
1211	Additional Language II	4		3	3hrs	20	80	
CH1221	Foundation Course II	2	2	3	3hrs	20	80	
MM1231.2	Complementary Course III	4		3	3hrs	20	80	
PY1231.2	Complementary Course IV	2		2	3hrs	20	80	
	Complementary Course Lab of PY1231.2		2	-	-	-	-	

SEMESTER III								
EN1311	English IV	5		4	3hrs	20	80	18
1311	Additional Language III	5		4	3hrs	20	80	
MM1331.2	Complementary Course V	5		4	3hrs	20	80	
PY1331.2	Complementary Course VI	3		3	3hrs	20	80	
	Complementary Course Lab of PY1331.2		2	-	-	-	-	
CH1341	Core Course II	3		3	3hrs	20	80	
	Core Course Lab I of CH1341		2	-	-	-	-	
SEMESTER IV								
EN1411	English V	5		4	3hrs	20	80	24
1411	Additional	5		4	3hrs	20	80	
	Language IV							
MM1431.2	Complementary	5		4	3hrs	20	80	
	Course VII							
PY1431.2	Complementary Course VIII	3	2	3	3hrs	20	80	
	Complementary Course Lab of PY1131.2 PY1231.2 PY1331.2 & PY1331.2			4	3hrs	20	80	
CH1441	Core Course III	3		3	3hrs	20	80	
CH1442	Core Course IV- Lab I of CH1141		2	2	3hrs	20	80	
SEMESTER V								
CH1541	Core Course V	3		4	3hrs	20	80	19
CH1542	Core Course VI	4		4	3hrs	20	80	
CH1543	Core Course VII	4		4	3hrs	20	80	
CH1544	Core Course VIII Lab II		5	3	6hrs	20	80	
CH 1545	Core CourseIX Lab III		4	2		20	80	
1551	Open Course	3		2	3hrs	20	80	
	Project		2	-	-	-	-	
SEMESTER VI								
CH1641	Core Course X	3		4	3hrs	20	80	23
CH1642	Core Course XI	4		4	3hrs	20	80	
CH1643	Core Course XII	4		4	3hrs	20	80	
CH1644	Core Course XIII Lab IV			3	6hrs	20	80	
CH1645	Core Course XIV Lab V			2		20	80	
CH1661.1/ CH1661.2/ CH1661.3/ CH1661.4	Elective Course	3		2	3hrs	20	80	
CH1646	Project and Factory Visit		3	4	Viva voce	-	100	

CE -Continuous Evaluation, ESE- End Semester Evaluation

Table I A. Total number of Courses offered in BSc programme

Sl No.	Courses	No. of courses	Credits semester wise
1	Language Courses	9	7+10+8+8=33
2	Foundation Courses	2	2+3=5
3	Complementary Courses	9	5+5+7+11=28
4	Core Courses	14	4+3+5+17+17=46
5	Open Course	1	2
6	Elective Course	1	2
7	Project	1	4
Total number of Courses		37	
Total number of credits in all six semesters		18+18+18+24+19+23=120.	120

Table II.Scheme of instruction of Core Courses, Foundation Course II, Open Course and Elective Course

Course No. Course code	Course Title	Sem I		Sem II		Sem III		Sem IV		SemV		Sem VI		Total	
		Hrs L/P	C	Hrs L/P	C	Hrs L/P	C	Hrs L/P	C	Hrs L/P	C	Hrs L/P	C	Hrs	**C**
C.C.I CH1141	Inorganic Chemistry I	2/2	4											2	**4**
F.C.II CH1221	Chemistry-its Origin, Methodology and Impacts			2/2	3									4	**3**
C.C.II CH1341	Inorganic Chemistry II					3/--	3								**3**
C.C.III CH1441	Organic Chemistry I														**3**
C.C.IV CH1442	Lab I of CH1141,CH1341&CH1441 (Inorganic Qualitative Analysis)					--/2		--/2	2					6	**2**
C.C.V CH1541	Physical Chemistry I									3/--	4			3	**4**
C.C.VI CH1542	Inorganic Chemistry III									4/--	4			4	**4**
C.C.VII CH1543	Organic Chemistry II									4/--	4			4	**4**
C.C.VIII CH1544	Lab II of CH1541,CH1542&CH1543 (Inorganic Volumetric Analysis)									--/5	3			5	**3**
C.C.IX CH1545	Lab III of CH1541,CH1542&CH1543 (Physical Chemistry Experiments)									--/4	2			4	**2**
O.C CH1551	Open to other majors									3/--	2			3	**2**
C.C.X CH1641	Physical Chemistry II											3/--	4	3	**4**

C.CXI CH1642	Organic Chemistry III											4/--	4	4	**4**
C.CXII CH1643	Physical Chemistry III											4/--	4	4	**4**
C.C.XIII CH1644	Lab Course IV (Organic Chemistry Experiments)											--/5	3	5	**3**
C.C.XIV CH1645	Lab Course V (Gravimetric Experiments)											--/3	2	3	**2**
E.C CH1661	Any one of the options											3/--	2	3	**2**
C.C.XV CH1646	Project									--/2		--/3	4	5	**4**
	Factory visit														
Credits/Semester		**4**		**3**		**3**		**5**		**19**		**23**			**57**

C.C-Core Course, F.C-Foundation Course, O.C-Open Course, E.C-Elective Course
L-Theory, P-Practical, C-Credit

B.Sc. Degree Programme in Chemistry

Table III. Open Course offered to students of other disciplines

Semester V

Semester	No. of Hours / Week		Credits	Course Code	Title of the Course	Instructional Hours
	L	P				
V	3	-	2	CH1551.1	Chemistry and its Application	54
				CH 1551.2	Fundamentals of Chemistry & Its Application to Everyday Life	
				CH 1551.3	Environmental Chemistry	

B.Sc. Degree Programme in Chemistry

Table IV. Elective Course offered in Semester VI

Semester	No. of Hours / Week		Credits	Course Code	Title of the Course	Instructional Hours
	L	P				
VI	3	-	2	CH1661.1	Supramolecular, Nano Particles and Green Chemistry	54
				CH 1661.2	Computational, Combinatorial and Physical Organic Chemistry	
				CH 1661.3	Polymer chemistry	
				CH 1661.4	Biochemistry	

Table V. Complementary Courses offered to BSc Chemistry (One Semester 18 weeks)

(Complementary programme - Mathematics, Total Credits – 14)

Semester	Hours/week	Number of Credits	Course code	Instructional Hours
I	4	3	MM1131.2	4×18 = 72
II	4	3	MM1231.2	4×18 = 72
III	5	4	MM1331.2	5×18 = 90
IV	5	4	MM1431.2	5×18 =90

Table VI. Complementary Courses offered to BSc Chemistry (One Semester 18 weeks)

Complementary Programme- Physics , Total Credits – 14

Semester	Hours/Week		Number of Credits	Course code	Instructional Hours
	L	P			
I	2	2	2	PY1131.2	2×18 = 36 2×18 = 36
II	2	2	2	PY1231.2	2×18 = 36 2×18 = 36
III	3	2	3	PY1331.2	3×18 = 54 2×18 = 36
IV	3	2	3 4	PY1431.2 PY1432.2	3×18 =54 2×18 = 36

GENERAL ASPECTS OF EVALUATION

MODE OF EVALUATION - COMMON TO CORE, ELECTIVE, COMPLEMENTARY AND FOUNDATION COURSES

Evaluation of each course shall involve Continuous Evaluation (CE) of 20 marks and End Semester Evaluation (ESE) of 80 marks.

1. CONTINUOUS EVALUATION FOR LECTURE COURSES

The Continuous evaluation will have 20 marks and will be done continuously during the semester.

CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) Assignment /seminar and

(ii) Test

The distribution of marks is shown below. There will be two class tests for which, the better of the two marks obtained will form part of CE. Seminar for each course to be organized by the course teacher and assessed along with a group of teachers in the Department. The topic selection by the student for assignments/seminar will be with the approval of the course teacher.

No	Component	Marks
1	Attendance	5
2	Assignment / Seminar	5
3	Tests	10
Total		**20**

1.1. EVALUATION OF THE ASSIGNMENTS AND SEMINAR

The topic selection by the student for assignments/seminar will be with the approval of the course teacher.

The assignment can be

1. A report of about 4-6 pages in A4 size paper
2. The topic can be presented either as oral or as power point for 10 minutes duration using audio-visual aids if available. The seminar is to be conducted within the contact hour allotted for the course.
3. Preparing Charts on assigned topic
4. Making static or working models.

The submitted report /chart /models should be evaluated for assignment marks.

Mode of Assignments / Seminar Evaluation		
No	**Main Component**	**Marks**
1	Adherence to overall structure & submission deadline	All four main components present & satisfactory : 5 Only three : 4 Only two : 3 Only one : 2
2	Content & grasp of the topic	
3	Lucidity / Clarity of presentation	
4	References / Interaction/Overall effort	

1.2 QUESTION PAPER PATTERN FOR CONTINUOUS EVALUATION TESTS

- The theory examination has a duration of 1.5 hours and a maximum mark of 40
- Questions should be 20% hard, 60% medium and 20% easy.

1. Each question paper has three sections: A, B & C
2. Section A has ten compulsory- one word/one sentence questions carrying 1 mark each .
3. Section B contains twelve short questions of which 7 questions have to be answered. Each question carries 2 marks.
4. Section C contains nine questions of which 4 has to be answered. Each question carries 4 marks.

   The answer must contain at least 8 points (Short Essay type).
5. 30% of the questions in physical chemistry papers should be problem based.

Question Paper Pattern for CE Test		
Question No	Type of Question	Marks
Section A: 1-10	All / one word/one sentence	1X10=10
Section B: 11-22	7out of 12; Short Answer	7 X2=14
Section C: 23-31	4 out of 9; Short Essay	4 X4= 16

TOTAL	40 marks

DETAILS OF ESE FOR LAB COURSES					
Lab Course	Course name	ESE	Time	Total Marks 100	
				CE	ESE
Lab course I	Inorganic Qualitative analysis	IV Semester	3Hrs	20	80
Lab course II	Inorganic Volumetric analysis	V Semester	3Hrs	20	80
Lab course III	Physical chemistry experiments	V Semester	3Hrs	20	80
Lab course IV	Organic Chemistry Experiments	VI Semester	3Hrs	20	80
Lab course V	Gravimetric Experiments	VI Semester	3Hrs	20	80

1.3 CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation will have 20 marks. The ESE of inorganic qualitative analysis will be done only in the IV semester and similarly the ESE of physical chemistry experiments and volumetric analysis will be done only in the V semester. The ESE of Organic and Gravimetric experiments will be done at the end of VI semester.But the corresponding CE are calculated from all the semesters in which there is attendance for laboratory sessions.

No	Component	Marks
1	Attendance	5
2	Lab test	5
3	Record	5
4	Punctuality	5
Total		**20**

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1.4 EVALUATION OF THE RECORD

On completion of each experiment, a report should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, and tables of data collected, equations, calculations, graphs, and other diagrams and the final results.

CE for Lab report &Laboratory Record *		
No	**Sub Component**	**Marks**
1	Punctual submission and Neat presentation	All four sub-components present & satisfactory : 5
2	Record of more than 90% experiments in the syllabus	Any three : 4 marks
3	Calculations and absence of errors/mistakes	Only two : 3
4	Accuracy of the result	Only one : 2

***The LAB RECORD of experiments, certified by the tutor and HOD is compulsory for the ESE**

2. GUIDELINES FOR QUESTION PAPER SETTERS FOR ESE

- The theory examination has a duration of 3 hours
- The maximum marks is 80 for each theory paper.
- Question paper should contain 20% Remember (R) ,60% Understanding (U) and 20% Application (A) Level questions.
- Questions should be as per the syllabus from the standard text books mentioned in syllabus
- Question paper setter should submit a detailed scheme of evaluation along with question paper.

QUESTION PAPER PATTERN (ESE)

1. Each question paper has four Sections: A, B , C and D
2. Section A has ten compulsory- one word/one sentence questions carrying **1** mark each .
3. Section B contains twelve short questions of which eight questions have to be answered. Each question carries **2** marks with four points (Short Answer type).
4. Section C contains nine questions of which six has to be answered. Each question carries **4** marks. The answer must contain at least 8 points (Short Essay type).
5. Section D contains four questions of which the candidate has to answer two. Each question should have **three subdivisions** with a total of **15** marks.

Question Paper Pattern for ESE		
Question No	Type of Question	Marks
Section A: 1-10	10 one word/one sentence	1x10=10
Section B: 11-22	8 out of 12; Short Answer	2x8=16
Section C: 23-31	6 out of 9; Short Essay	4x6=24
Section D: 32-35	2 out of 4	15x2=30
Total		**80 marks**

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME
2020 Admission onwards

Semester	I
Course	Core course-I
Course name	**INORGANIC CHEMISTRY I**
Course Code	CH 1141
Credit	2
Hours	36 hours
Lecture-Tutorial-Lab	2-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Discuss the course of development of structure of atom.	U	PSO1
2	Apply rules for filling electrons in classifying elements into s, p,d and f blocks	A	PSO10
3	Define various scales of electronegativities and their applications	U	PSO10
4.	Define Effective nuclear charge and Slater's rules	U,A	PSO10
5	Discuss about diagonal relationship and anomalous behaviour of hydrogen and other first element in each group.	U	PSO4
6	Correlate and predict general properties of s and p block elements based on their electronic configuration.	A	PSO4
7	Realise applications of s and p block elements in sustainable and renewable energy sources.	A	PSO14
8	Define various concepts of acids and bases.	U	PSO11
9	Understand reactions in non aqueous solvents.	U	PSO11
10	Realise various causes, effects and control measures of environmental pollution.	E	PSO13
11	Review national movements for environmental protection.	U, A	PSO21

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Atomic Structure and Periodicity**	**9**	
1.1	Introduction to structure of atom, Rutherford and Bohr model of atom,	1	1
1.2	Dual nature of electron-de Broglie equation-matterwaves and electromagnetic waves. Experimental verification by Davis and Germer method,Heisenberg's uncertainty principle- expression and significance.	1	1
1.3	Wave mechanical concept of the atom-Schrodinger	1	1

	equation and its significance (derivation not required.)		
1.4	Quantum numbers- Pauli's Exclusion principle- Aufbau Principle- Hund's rule- Electronic configuration of atoms- classification of elements into s,p,d and f blocks-	2	1
1.5	Electronegativity- Pauling's scale, Mulliken and Allred-Rochow scale(including numerical problems),	2	4
1.6	Effective nuclear charge, Slaters rule and its applications, diagonal relationship and anomalous behavior of first element with other elements.	2	4,5
2	**Representative elements**	**9**	
2.1	General properties of s and p block elements, Hydrogen – isotopes and its applications- uses as a fuel, water gas	2	6
2.2	Physical properties- atomic radii, ionization enthalpy, electron negativity, electron affinity, Flame colouration, inert pair effect	2	6
2.3	Chemical properties- solubility and thermal stability of alkali and alkaline earth metal oxides, sulphates and hydrides	2	6
2.4	p-block elements- oxides of nitrogen and phosphorus, oxyacids of halogens	1	6
2.5	Allotropism – carbon, sulphur and phosphorus	1	6
2.6	Applications- lithium battery, cesium in photovoltaic cells, selenium in xerography and barium x-ray	1	7
3	**Acids, Bases and non- aqueous solvents**	**9**	
3.1	Arrhenius concept, Lowery –Bronsted, Lewis concepts and Lux Flood concept and its limitations,	2	8
3.2	SHAB principle and its applications,	1	8
3.3	Non – aqueous solvents: General properties- classifications- self ionization and leveling effect-	2	9
3.4	Reaction in non-aqueous solvents- protic and aprotic non-aqueous solvents- examples-solutions of metal s in liquid ammonia- self ionization of liquid ammonia-liquid SO_2, liquid HF, alkali metals in liquid ammonia.	4	9
4	**Environmental chemistry- Air, water and soil pollution**	**9**	
4.1	Air pollution- Air pollution caused by fire works, harmful effects of fire works, acid rain, green house effect, smog- classic and photochemical smog	2	10

	Ozone layer depletion, ozone hole, protection of ozone umbrella. Management of air pollution.		
4.2	Water pollution: causes- heat, industrial waste, sewage water, detergents, agricultural pollutants Treatment of industrial waste water- Activated charcoal, synthetic resins, reverse osmosis and electro dialysis Quality of drinking water- Indian Standard and WHO standard- Dissolved oxygen- BOD , COD.	3	10
4.3	Soil pollution: pesticides, fertilizers, Industrial waste, Plastic. Control of Plastic threat- importance of Plastic identification codes and Plastic recycling, use of biodegradable plastics (PGA,PLA and PHBV(mention only)	2	10
4.3	Control of pollution. Pollution Control Board – Duties and responsibilities Mention environmental movements (Plachimada,Silent valley, movement against Endosulfan, Narmada Bachavo Andolan and Chipko movement)	2	11

Text Books

1. B.R.Puri, L.R,.Sharma, K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers New Delhi,2010
2. F.A.Cotton, G. Wilkinson, Advanced Inorganic Chemistry, Wiley, India(P)Ltd
3. J.D.Lee, Concise Inorganic Chemistry,5thEdn. Wiley, India(P)Ltd.
4. A.K.De,Environmental Chemistry,New Age International(P) Ltd. New Delhi
5. A.K.Ahluwalia, Environmental Chemistry, Ane Books, India, New Delhi.

For Further Reading

1. M.C.Day and J Selbin, Theoretical Inorganic Chemistry,2nd Edn.,Reinhold Book Corp.
2. S.Prakash,G.D.Tuli, S.K Basu, R.D.Madan,Advanced Inorganic Chemistry, Vol. 1.,S Chand
3. J.E.Huheey,E.A.Keiter, R.L.Keiter, O.K.Medhi. Inorganic Chemistry, 4th Edn. Pearson, 2006
4. S.S.Dara, A Textbook of Environmental Chemistry and Pollution Control, 8th Edn. S Chand& Sons, New Delhi.
5. M.N.Greenwood, A .earnshaw, Chemistry of the Elements, 2nd Edn. Butterworth, 1997.

UNIVERSITY OF KRALA
Model Question Paper of B.Sc. Chemistry First Degree Programme

2020 Admission onwards
SEMESTER -I Core Course-1 Course Code - CH1141 Credit-4

INORGANIC CHEMISTRY I

Time: 3 Hours **Maximum Marks: 80**

SECTION A

(Answer **all** questions in one word/one sentence. Each question carries **1** mark)

1. Mention about the flame colouration of II group elements.
2. Write an example of classic smog.
3. State Heisenberg's uncertainty principle.
4. What are matter waves?
5. Which is the conjugate base of HF.
6. Define covalent radius.
7. Write the reason for eutrophication.
8. In the stratosphere, fluorine from the CFC's change to which compound.
9. Name the radio isotope of hydrogen?
10. Mention any one use of alkali metals. **(1 X 10 = 10marks)**

SECTION B

(Answer any **8** questions. Each question carries **2** Marks)

11. Calculate the wavelength of electron moving with a velocity of 10^6 ms^{-1}.
12. A cricket ball weighing 100g is to be located within 0.1A^o. What is the uncertainty in its velocity?
13. What are eigen values and eigen functions?
14. How first element differs from other elements in a group?
15. What is COD?
16. What are ortho and para hydrogens.
17. Write SHAB principle?
18. Comment about the hydration of alkali metals?

19. State and illustrate Pauli's Exclusion Principle.

20. Distinguish between levelling solvents and differentiating solvents.

21. Write a note on green house effect.

22. What is acid rain? **(2 X 8 = 16marks)**

SECTION C

(Answer any **6** questions. Each question carries **4**Marks)

23. Discuss the following reactions in liquid SO_2.

(i) Solvation (ii) acid- base reaction

24. Discuss hydrogen and water gas as fuels.

25. Describe reverse osmosis for water purification.

26. Briefly explain about the Davisson and Germer's experimental verification of wave nature of electron.

27. What is smog? What are the different types of smog?

28. How ozone layer is depleted?

29. What is the trend of Ionization enthalpy and electron gain enthalpy in the periodic table?

30. What are hydrides? Explain.

31. Discuss about the redox property of alkali metals

(4 X 6 = 24marks)

SECTION D

(Answer any **2** questions. Each question carries **15** Marks)

32. (a) What is effective nuclear charge? Explain with example.

(b) Write a note on various electronegativity scales

(c) Explain about the various rules for filling up of electrons in orbitals. (5+5+5 Marks)

33. (a) Write a note on allotropes of carbon.

(b) Discuss on the topic 'hydrogen as next generation fuel'

(c) Give an account of Cesium in photo voltaic cell and Lithium battery (5+5+5 Marks)

34. (a) What are the common characteristics of solvents?

(b) Liquid ammonia is a better solvent for organic compounds. Why?

(c) Write a note on various concepts of acids and bases. (5+5+5 Marks)

35 .(a) Briefly discuss about the various air pollutants

(b) Fertilizers and pesticides pollute soil. Justify.

(c) Explain about the various water quality parameters (5+5+5 Marks)

(15 X 2 = 30marks)

SYLLABUS FOR B.Sc. CHEMISTRY PROGRAMME
2020 admission onwards

Semester	II
Course	Foundation course II
Course name	**CHEMISTRY –ITS ORIGIN, METHODOLOGY AND IMPACTS**
Course Code	CH 1221
Credit	2
Hours	36 hours
Lecture-Tutorial-Lab	2-0-2

CO no.	**COURSE OUTCOME** *Upon completion of this course, the students*	**Cognitive level**	**PSO**
1	Appreciate the development of scientific theories through years with specific examples	U	PSO1
2	Develop curiosity and scientific attitude towards the application of chemistry in daily life	C	PSO1
3	Outline a procedure for experimentation	A	PSO2
4	Appraise the current development in Chemistry	E	PSO1
5	Identify the common ingredients of house hold synthetic products	U	PSO8
6	Discriminate and classify chemicals used as drugs,explosives,	U	PSO7
7	Get motivated in visiting chemical Industries	E	PSO15

8	Adopt safety measures in handling chemicals	A	
9	Draw titration curves and explain theory of volumetric titrations	A	PSO2/PSO3
10	Select suitable indicators for acid base titration knowing the theories of acid base titration and indicators	A	PSO11
11	Develop computational skills	A	PSO5
12	Discuss separation techniques of filtration and chromatographic techniques	U	PSO3

R-Remember, U-Understand, A-Apply

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Evolution of Chemistry as a discipline of science**	**3**	
1.1	Evolution of Chemistry - ancient speculations on the nature of matter, early form of chemistry-alchemy.	1	1
1.2	Major contributions of Friedrich Wöhler, Mendeleev, Michael Faraday and Marie Skłodowska-Curie	1	2
1.3	Scope of Chemical Science, branches of Chemistry Basic idea of Chemistry as a central science connecting Physics , Biology and other branches of science	1	2
2	**Impact of Chemistry in human life**	**9**	
2.1	**Food Chemistry**: Food additives, preservatives, anti oxidants, commonly used permitted and nonpermitted food colours artificial sweeteners-taste enhancers, Health effects of fast foods, instant foods, dehydrated foods and junk foods, 'trans fat'	2	2
2.2	**Cleansing agents:** Soaps- Hard and soft soaps, alkali content-TFM, Detergents , Shampoos (Common ingredients and health aspects) **Cosmetics**: talcum powder, lip sticks, nail polish, moisturiser , hair dye, Sun screen lotions(Common ingredients and health aspects)	1	5,6,7
2.3	**Role of Chemistry in sustainable development** Role of chemical industries in polluting the environment, limitations of conventional waste management, birth of green chemistry	2	2
2.4	**Solar energy harvesting** :	1	2

	Photosynthesis, Photovoltaic cell, conventional solar cells, nano structured solar cells		
2.5	**Green solvents:**safer solvents - water, Super Critical fluids(CO2), ionic liquids, advantages of SCF	1	2
2.6	**Chemistry in the field of Medicine** (Elementary idea only) Radio active tracers in diagnosis and treatment of cancer: use of Radio isotopes(^{60}Co, ^{131}I) Use of MRI scanning, Dialysis in blood purification. advantages and disadvantages in using these techniques	2	6
3	**Methods and Tools of Science & Research methodology**	**6**	
3.1	Basis for scientific laws and factual truths– hypothesis observations- experimental proofs. Theories and laws	1	1
3.2	Experimentation - Design of an experiment, data collection – types of data -interpretation and deduction –repeatability and replication- Accuracy and precision, Revision or modification of scientific theories and laws	1	3
3.3	Research methodology, scientific method of conducting research: Selecting and defining a problem, Science Journals, Impact factor, citation, ISSN, ISBN.	1	4
3.4	*Educational softwares – INFLIBNET, NICNET, BRNET, NPTEL, VIRTUAL LABS OF MHRD academic services *Chemistry related softwares-Chem sketch and Chem Draw for structure drawing, *Chemical Databases-Pubchem, ZINC, Cambridge Structural Database (CSD), *Molecular visualization tools –Avogadro, Molden, Molekel, *File format-PDB and CIF *Graphical tools- Excel and Origin (*elementary idea only with computer assistance). .	2	11
3.5	Study of the latest/current Nobel prize winners in chemistry	1	4

4	**Analytical Principles and techniques**	**9**	
4.1	Inorganic qualitative analysis –Common ion effect and solubility product and their application in the precipitation of cations in a mixture. Introduction of Microscale analysis as a green chemistry approach	2	3
4.2	Quantitative Analysis:Theory of acid-base titration - titration curve of strong acid-strong base ,weak acid – strong base, strong acid- weak base and weak acid- weak base, theory of acid-base indicators	2	10
4.3	Theory of Redox titration: Titration of Fe^{2+} with $KMnO_4$ and $K_2Cr_2O_7$ and theory of redox indicators	1	10
4.4	Theory of complexometric titration: metal ion-EDTA titration. Theory of metallochromic indicators Precipitation titration: NaCl- AgNO3 titration and use of potassium chromate as adsorption indicator	1	10
4.5	Chromatography - classification of methods - Elementary study of adsorption chromatography Column and thin layer- partition chromatography-paper- ion exchange and gas chromatographic methods	1	12
4.6	Gravimetric Analysis - Mechanism of precipitate formation - Factors affecting solubility of precipitates – co-precipitation and post precipitation - Effect of digestion - washing, drying and ignition of precipitates.	2	3
5	**Chemistry and industry**	**3**	
5.1	Cement: Introduction, types of cement , manufacture, chemical composition of Portland cement, setting and hardening of cement and special cement	1	6,7
5.2	Ceramics: Introduction, types of clay products, properties of clay, plasticity of clay, manufacturing of white wares and stone wares and their application	1	6,7
5.3	Paints: Primary constituents, binders and solvents, requirements of a good paint-oil based paints, latex paints, luminescent paints, fire retardant paints and heat resistant paints Pigments**:** definition, White lead, lithopone, ultramarine, red lead, Guignet's green and chrome yellow	1	6,7
6	**Lab Safety measures and disaster management**	**6**	
6.1	Introduction to lab safety-regulatory requirements-labels,	1	5,8

	material safety. Knowledge of hazard warning information and symbols.		
6.2	Propellants and Explosive compounds ,Examples- TNT,TNG,Urea nitrate,Hydrazine derivatives. potentially dangerous mixtures- Flammable solvents, ignition sources used in laboratories, metal hydrides(basic idea)	2	2
6.3	Reactive inorganic substances and their toxicity (strong acids, bases, halogens, chromates). Hazards due to chemicals, toxic-solids, liquids, gases, and other harmful substances - carcinogenic substances.	2	2
6.4	Emergency procedures in chemical splashes to skin and eyes, burns and electric shock.	1	8

Textbooks

1 N.C. Datta, "The Story of Chemistry" , University Press.
2. B K Sharma, Industrial chemistry, 11th edition, Goel Publishing House, Meerut, 2000
3. B Srilakshmi, Food Science,5th edition, New Age Publishers, NewDelhi,2010
4.Kirpal Singh, Chemistry in Daily Life, PHI Learning Pvt.Ltd, 201
5. Muhammed Musa, Gaji, Abhishek Varma,(Editors)"Development of Solar power generation and energy harvesting", **ISBN 9789351249498**, Publisher Astral
6. Medicinal Chemistry , An introduction, II nd edition Gareth Thomas, Wiley
7. Hazards in chemical laboratories and guide to safe practices in chemical laboratories published by Royal Society of Chemistry
8. A. I. Vogel, "Text book of Quantitative Inorganic Analysis
9. Day& Underwood "Quantitative analysis: laboratory manual

Further reading

1. H.Collins and T.Pinch ,The Golem : What everyone should know about science, Cambridge Univ Press 1993
2.R T Mishra, Teaching of information Technology.
3.M Ravikumar, Information Technology for Higher Education
4.Fletcher,Gilbert , Radiation therapy in the management of cancers;
5.http://www.vlab.co.in
6.http://nptel.iitm.ac.in/
7. V. Rajaram, Introduction to Information Technology , Prentice Hall

8. Barbara Wilson, Information Technology, The Basics, Thomas Learning
9.Calvin W Tayler and Frank Barron Scientific Creativity : Its Recognition and Development

10. A.H Ahluwalia,Renu Aggarwal, Comprehensive Practical organic chemistry Renu Aggarwal, 2000, Universities press.
11.T.F.Gieryn, Cultural boundaries of science Univ. Chicago Press 1999
12.MSR Winter, A Consumer's dictionary of cosmetic ingredients, 7th edition, Three Rivers Press, NewYork,2009

UNIVERSITY OF KERALA

Model Question Paper of B.Sc. Chemistry Programme
2020 Admission onwards
SEMESTER –II Course Code - CH 1221
Foundation course II
CHEMISTRY-ITS ORIGIN, METHODOLOGY AND IMPACTS

Time: 3 Hours **Maximum Marks: 80**

SECTION A

Answer all Questions in one word to maximum of two sentences

Each question carries one mark

1. Name two interdisciplinary branches of chemistry.
2. State and explain the term alchemy.
3. Define the term repeatability.
4. Define hypothesis.
5. Name a redox indicator?
6. Define Rf value
7. Name an artificial sweetener.
8. Write one example ionic liquid.
9. Draw two symbols for hazardous chemicals.
10. What are propellants?

10x1 = 10 marks

SECTION B

Short answer type (Not to exceed one paragraph)
Answer any 8 questions from the following.
Each question carries two marks

11. Write any two contributions by the scientist Marie Curie?
12. Name any two databases and molecular visualization tools in chemistry?
13. State the difference between accuracy and precision.
14. Write the importance of ISSN and ISBN.
15. How micro scale analysis support green chemistry?
16. What are metallochromic indicators?
17. What are the errors occurring in gravimetric analysis?
18. Explain two educational softwares.
19. What are food additives?
20. How solar energy is trapped naturally?
21. What do you mean by' trans fat'?
22. Write short note on ceramics.

8×2 = 16 marks

SECTION C

Short essay (Not to exceed 120 words)
Answer any 6 questions from the following.
Each question carries four marks

23. What are soaps. How are they classified? Discuss the parameters to check the quality of soap.
24. Write a note on research methodology.
25. How will you plot a standard curve using excel sheet?
26. Describe the theory behind redox titration with one example?
27. Explain the different steps in gravimetric analysis?
28. Write a short note on the contributions of latest Nobel laureates in chemistry.
29. Briefly explain 1) MRI, 2) dialysis
30. Discuss the importance of plastic recycling in the present scenario.
31. Discuss the principle of paper chromatography.

6× 4 = 24 marks

SECTION D

Answer any two questions from the following
Each question carries fifteen marks

32. a. Discuss on green solvents.
    b. Write the importance of research journals?
    c). What are the major contributions of Faraday, Medeleeve and Wohler in chemistry? (5+5+5)
33. a)Discuss the application common ion effect in the inter group separation of cations.
    b)Describe the manufacture of cement and the chemistry of setting.
    c)Differentiate between propellants and explosives. Give examples (5+5+5)

34. a) Discuss on paints, classification and constitution.
b)Write note on white lead, lithopone and ultramarine
c)Explain the different methods of harvesting solar energy (5+5+5)

35.Explain the safety measures to be adopted in the laboratory?

b)Briefly discuss on microscale analysis as a green chemistry approach.
c)Discuss on metal ion EDTA complexation and its application (5+5+5)

2×15 = 30 marks

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards

Semester	III
Course	Core course-II
Course name	**INORGANIC CHEMISTRY II**
Course Code	CH 1341
Credit	3
Hours	54 hours
Lecture-Tutorial-Lab	3-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students.*	Cognitive Level	PSO No.
1	Understand various theories of chemical bonding and their limitations.	U	PSO4
2	Predict stability of atoms and the nature of bonding between atoms.	U,A	PSO4
3	Discuss various applications of intermolecular interactions	U	PSO4
4.	Understand chemistry of glass, silicates and silicones	U	PSO7 PSO8
5	Discuss chemistry of Boron compounds, oxyacids and oxides of Phosphorous	U	PSO11
6	Understand refractory carbides, nitrides, borides and silicides.	U	PSO11
7	Describe various types of halogen compounds.	U	PSO3
8	Understand chemistry of noble gas	U	PSO3
9	Understand inorganic polymers and their applications.	U	PSO8
10	Distinguish between types of nuclear reactions.	U	PSO11
11	Describe measurement of radioactivity.	U	PSO2 PSO3
12	Discuss applications of radioactivity in various fields.	U	PSO3
13	Understand introductory concepts of nanochemistry	U,A	PSO18
14	Suggest methods of synthesizing nano materials.	U	PSO18
15	Appreciate the variety of applications of nanomaterials.	U ,A	PSO18

R-Remember, U-Understand, A-Apply

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Chemical Bonding I**	**9**	
1.1	VSEPR theory and its applications- structure of molecules with bond pairs only, molecules with both bond pairs and lone pairs-	3	1
1.2	valence bond theory- conditions of overlapping- types of overlapping(positive , negative and zero overlapping), hybridization-methane, ethylene, benzene,acetylene, allenes, sp^3d and sp^3d^2- limitations of VBT.	3	1
1.3	MO theory, LCAO, homonuclear diatomic molecules- C_2, B_2, N_2, O_2 and ions like O_2^+ - heteronuclear diatomic molecules(HF, NO and CO)-calculations of bond order and its applications.	3	1
2	**Chemical Bonding II**	**9**	
2.1	Types of bonding- ionic bond- ionic lattice energy of ionic compounds- Bond –Lande equation, Born – Haber cycle, salvation energy and solubility of ionic solids, covalent character of ionic bond, Fajan's rules	2	2
2.2	Polarity of covalent bond- dipole moment- percentage of ionic character- dipole moment and molecular structure.	2	2
2.3	Metallic bonding- free energy theory, VB theory and band theory (Qualitative treatment only) –	1	2
2.4	Secondary forces- hydrogen bond, inter and intramolecular hydrogen bond, Applications-intermolecular interactions- ion-dipole-van der Waal's forces such as dispersion forces, dipole-dipole, ion – induced dipole, dipole induced dipole.	4	2, 3
3	**Compounds of non- transition elements I**	**9**	
3.1	Manufacture and uses of the following Glass- different types of glasses, silicates, zeolites and silicones.	4	4
3.2	Borax- boron hydrides, boron nitrides, borazole and carboranes,	2	5
3.3	Oxides and oxyacids of phosphorus.	1	6
3.4	Refractory carbides, nitrides, salt like carbides, borides and silicides.	2	7
4	**Compounds of non- transition elements II**	**9**	
4.1	Oxides and oxyacids of halogens (structure only) – inter halogen compounds and pseudo halogens-	3	8
4.2	Noble gases-uses, Xenon compounds–structure and hybridization in Xenon fluorides.	2	9
4.3	Inorganic polymers, phosphorus, boron and silicon based polymers- structure and industrial applications.	4	10
5	**Nuclear chemistry** (numerical problems expected)	**9**	
5.1	Natural radioactivity, decay constant (Derivation not expected), half life, average life	1	11
5.2	Disintegration series, modes of decay-α,β, positron emission and electron capture, artificial transmutation and artificial radioactivity	1	11
5.3	Nuclear stability, n/p ratio,modes of decay- α, β and positron emission, packing fraction, mass defect and binding energy	1	11

5.4	Units of radio activity, Measurement of radioactivity by GM counter, Wilson cloud Chamber, scintillation counter,	1	12
5.5	Nuclear fission-atom bomb and nuclear fusion- hydrogen bomb-	1	13
5.6	Applications of radioactivity- ^{14}C dating, rock dating, neutron activation analysis Isotope as tracers, dosimetry, units Study of reaction mechanism (ester hydrolysis)	2	13
5.7	Application of radioactive isotope in medicine- radio diagnosis and radiotherapy, industrial applications	1	13
5.8	Merits and demerits of nuclear technology.	1	13
6	**Chemistry of Nano materials**	**9**	
6.1	Evolution of nanoscience- Historical aspects, preparations containing nano gold in traditional medicine. Lycurgus cup-Faraday's divided metal etc. Nanosystems in nature.	2	14
6.2	Preparations of nanoparticles: Top-down approaches and Bottom to top approaches. Sol- gel synthesis, colloidal precipitation, co-precipitation, combustion techniques, sonochemistry, hydrothermal technique, high energy ball milling etc.	3	13
6.3	Carbon nanotubes , fullerens.	1	14
6.4	Properties of nanoparticles: optical, magnetic, mechanical, thermal and catalytic property with examples.	2	15
6.5	Application nano materials- Nano sensors and Quantum dots(basic idea)	1	13

Text books

1. M C Day and Selbin, "Theoretical Inorganic Chemistry",
2. F A Cotton, G Wilkinson ,"Basic Inorganic Chemistry", Wiley
3. J D Lee, "Concise Inorganic Chemistry ,.ELBS
4. Puri ,Sharma and Kalia, Inorganic Chemistry, Vishal Pub.lishing House
5. T Pradeep, Nano, The Essentials, Mc Graw Hill Education

For Further Reading

1. S Glasston,"Source Book on Atomoc Energy", East West Press Pvt. Ltd, New Delhi
2. J E Huheey Inorganic Chemistry, Principles, structure and Reactivity, by
3. H S Arnicker,"Essentials Nuclear Chemistry", New Age international (P)Ltd, New Delhi
4.Manas Chanda, " Atomic Structure and Chemical bonding in Molecular Spectroscopy",Tata Mc Graw Hill

UNIVERSITY OF KRALA
Model Question Paper of B.Sc. Chemistry Programme
2020 admissions onwards
SEMESTER -III Core Course-II Course Code – CH1341 Credit-3

INORGANIC CHEMISTRY II

Time: 3 Hours **Maximum Marks: 80**

SECTION A

(Answer **all** questions. Each question carries **1** mark)

1. Calculate the bond order of O_2^+
2. C_{60} is called ----------
3. What are nano sensors?
4. Name the type of hydrogen bonding in salicylaldehyde.
5. Draw the structure of inorganic benzene.
6. Write an example for inter halogen compound.
7. Give an example for phosphorus based polymer.
8. Name a naturally occurring radioactive isotope.
9. Write an example of carboranes?
10. What is zeolite?

SECTION B

(Answer any **8** questions. Each question carries **2** Marks)

11. Compare the properties of borazole with benzene.
12. Explain one method of preparation of gold nano particles.
13. Enumerate the applications of nano particles in medicine and electronics
14. Write a note on Fajan's rule.
15. Calculate the bond order of N_2 and C_2.
16. What are the limitations of VBT?
17. Explain the 'banana bond' in diborane.
18. Define lattice energy?
19. Differentiate between Rad and Roentgen units.
20. What is the criterion of a stable nucleus?
21. Write a note pseudo halogens.
22. Give a suitable example of dipole-dipole interaction

SECTION C

(Answer any **6** questions. Each question carries **4** Marks)

23. Draw the MO diagram for NO and CO molecule
24. Give a comparative account of VB and MO theories using relevant examples.
25. What is meant by dipole moment? How is it helpful in explaining the structure of molecules?
26. Write a note on the preparation of nano particles using sol-gel method.
27. Explain the optical, magnetic properties of nanoparticles with examples.

28. Write the hybridisation and structures of Xenon fluorides.
29. Explain artificial transmutation with an example.
30. How is mass defect related to Nuclear binding energy?
31. Write a note on the manufacture of glasses.

SECTION D

(Answer any **2** questions. Each question carries **15** Marks)

32. (a) Explain VSEPR theory with example (5 marks)

(b) Write a note on

i) solvation energy and solubility of ionic solids (5 marks)

ii) secondary bond forces (5 marks)

33.(a) Explain the measurement of radio activity by

i) GM counter (5 marks)

ii) Scintillation counter (5 marks)

(b) Write a note on radio carbon dating. (5 marks)

34. (a) Write a note on disintegration series. (6 marks)

(b) Explain the structure of silicates. (5 marks)

c) Give an account of oxy acids of phosphorus (4 marks)

35. (a) Write a note on carbon nanotubes and fullerenes (6 marks)

(b) Radio active carbon in wood decay with a half life of 5770 years.

What is the rate constant (in year^{-1}) for the decay?

What fraction would remain after 11540 years? (4 marks)

(c) Give an account of band theory (6 marks)

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards

Semester	IV
Course	Core course-III
Course name	**ORGANIC CHEMISTRY – I**
Course Code	CH 1441
Credit	3
Hours	54 hours
Lecture-Tutorial-Lab	**3-0-2**

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Recall the fundamentals of organic chemistry.	R	PSO1
2	Apply the electron displacement effects to compare acidity, basicity and stability of organic compounds/intermediates.	A	PSO4
3	Judge the reaction mechanism of substitution and elimination on the basis of the structure of alkyl halides.	U	PSO10
4	Summarise the chemistry of reaction intermediates.	U	PSO10
5	Discuss optical, geometrical and conformational isomerism of organic compounds.	U	PSO11
6	Use CIP rules to predict the configuration of organic compounds	A	PSO10
7	Differentiate photochemical and thermal reactions.	U	PSO11
8	Discuss theory of colour and constitution and the method of synthesis of dyes	U	PSO8
9	Explain aromaticity, orientation effect and mechanism of aromatic electrophilic substitution.	U	PSO10
10	Demonstrate the method of determination of reaction mechanism.	A	PSO10

R-Remember, U-Understand, A-Apply

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Introduction to organic chemistry**	**3**	
1.1	Uniqueness of carbon: classification of organic compounds, Functional groups (mention only), Review of basic rules of IUPAC nomenclature and IUPAC naming of organic compounds.	1	1
1.2	Types of reagents: Electrophiles and Nucleophiles. Definition of reaction mechanism. Drawing of electron movements with arrows: curved arrow notation, Half headed and double headed arrows.	2	1

	Nature of bond fissions: Homolysis and heterolysis.		
2	**Reaction mechanism I**	**9**	
2.1	Electron displacement effects: Inductive effect, electromeric effect, mesomeric effect, resonance, hyperconjugative and steric effects.	2	2
2.2	Acidity and basicity of organic compounds based on electron displacement effects: Acid characters of alcohols, phenols (phenol, o/m/p-cresols and o/m/p-nitro phenols) and carboxylic acids (aliphatic acids, mono, di, tri chloro acetic acids, Benzoic acid, o/m/p-nitro benzoic acids) and basic character of amines (aliphatic amines, aniline, N- & N,N-dimethyl aniline, o/m/p-nitro anilines ando/m/p- toluedienes)	2	2
2.3	Effects of hyperconjugative effect: stability of alkenes, alkylbenzenes, free radicals and carbocations. Dipole moment of propene and toluene.	1	2
2.4	Reaction intermediates: Carbocations, carbanions, free radicals and carbenes (definition, hybridization, structure, classification, formation, stability and important reactions), rearrangement of carbocations nitrenes(mention only).	2	2/4
2.5	Methods of determination of reaction mechanism: product analysis, intermediates, isotopic labeling (only benzyne mechanism), kinetic and stereo chemical evidences (Walden inversion).	2	10
3	**Reaction Mechanism II**	**9**	
3.1	Aliphatic nucleophilic substitutions: mechanism of SN1 and SN2 reactions, Effect of nature of substrate and solvent in substitution reactions , Stereochemistry of SN reactions ,Stereospecificity and Stereoselecticity in SN reactions , Walden Inversion. Neighbouring group participation (anchimeric assistance): Participation of lone pair of electrons in substitution reaction, mechanism of base catalysed hydrolysis of mustard gas only.	3	3
3.2	Elimination reaction: 1,1 and 1,2 eliminations, mechanisms of E1 and E2 reactions, Regioselectivity in elimination reactions (Hoffmann and Saytzeff rule and Bredt's rule). Stereo chemical pathways of elimination: Syn and Anti eliminations. Substitution vs Elimination.	3	3
3.3	Addition reactions: mechanism of addition of bromine and hydrogen halides to double bonds6y, Regioselectivity in addition reaction (Markownikoff's rule and peroxide effect). Cis-hydroxylation, Diels Alder addition, 1,2- and 1,4- additions in 1,3-butadiene.	3	3
4	**Stereochemistry I**	**6**	
4.1	Representation of organic molecules: Fischer, Flying wedge, Sawhorse and Newman projection formulae.	1	5
4.2	Conformational isomerism : conformation , Dihedral angle , Torsional strain , conformational analysis of ethane and n-butane including energy diagrams	2	5
4.3	Baeyer's strain theory , Sache-Mohr theory of strainless rings, Pitzer strain	1	5
4.4	Conformation of cyclohexane (chair, boat and skew boat	2	5

	forms),axial and equatorial bonds ,ring flipping,conformers of mono and dialkyl substituted cyclohexanes.		
5	**Stereochemistry II**	**9**	
5.1	Optical Isomerism: Chirality and elements of symmetry, DL notation, Enantiomers Optical isomerism in glyceraldehydes, lactic acid and tartaric acid Diastereoisomers, meso compounds	2	6
5.2	Cahn-Ingold-Prelog rules, R-S notations for optical isomers with one and two asymmetric carbon atoms, erythro and threo representations. Racemic mixture, resolution, methods of resolution.	2	5/6
5.3	Enantiomeric excess , Introduction to asymmetric synthesis Optical activity in compounds not containing symmetric carbon atoms: biphenyls and allenes.	2	6
5.4	Geometrical isomerism: cis-trans, syn-anti and E-Z notations , geometrical isomerism in maleic and fumaric acids and unsymmetrical ketoximes , methods of distinguishing geometrical isomers using melting point, dipole moment, dehydration and cyclisation	3	6
6	**Organic Photochemical Reactions and Dyes**	**9**	
6.1	Introduction – photochemical Vs thermal reactions. Single and Triplet states b , Allowed and forbidden transition. Photosensitization	1	7
6.2	Photochemical reactions of olefins: Photodimerisation Photochemistry of carbonyl compounds: Norrish I (Acetone), Norrish II cleavages.	2	7
6.3	Introduction to pericyclic reaction: Electrocyclic, cycloaddition and sigmatropic reactions.(Elementary idea only)	2	7
6.4	Dyes: Theory of colour and constitution , classification according to structure and method of application. Preparation and uses of 1) Azo dye - methyl orange, congored, 2) Triphenyl methane dye - malachite green, 3) Phthalein dye - phenolphthalein, 4) Xanthen dye - fluorescein, 5) Anthraquinone dye - alizarin 6) Vat dye - indigo. Optical brightners – Introduction and important characteristics.	4	8
7	**Arenes and Aromaticity**	**9**	
7.1	Heat of hydrogenation and heat of combustion of benzene, structure of benzene , Concept of aromaticity – Application of Huckel's rule to benzenoid and nonbenzenoid compounds (naphathalene, anthracene, annulenes, cyclic carbocations and anions, five membered heterocylics, azulene, fulvene)	3	9
7.2	Electrophilic substitution reactions in benzene: Mechanism of halogenation, nitration, sulphonation and Friedel Craft's alkylation and acylation, energy profile diagram.	2	9
7.3	Ring activating and deactivating groups with examples. Orientation effect in mono substituted benzene - –OH, -NH2, NO2, -CH3, -CHO, COOH and halogens.	2	9
7.4	Aromatic nucleophilic substitution – Uni and bimolecular displacement mechanism , Elimination and Addition mechanisms	1	9
7.5	Reactivity of naphthalene towards alkylation, nitration and sulphonation. Basic idea of carcinogenic polynuclear arenes.	1	9

Text books:

1. A.Bahl and B.S.Bahl, Advanced Organic Chemistry, S.Chand & Company, New Delhi.
2. L.G.Wade Jr, Organic Chemistry, Pearson Education, New Delhi.
3. K.S.Tewari, N.K.Vishnoi and S.N.Mehrotra, A textbook of Organic Chemisty, Vikas Publishing House (Pvt) Ltd., New Delhi..
4. S.C.Sharma and M.K.Jain, Modern Organic Chemistry, Vishal Publishing Company, New Delhi.
5. D.Nasipuri, Stereochemistry of Organic Compounds: Principles and Applications, New Age International Publizhers, New Delhi.
6. J.Clayden, N.Greeves and S.Warren, Organic Chemistry, Oxford University Press, New York.
7. I L Finar, "Organic Chemistry" Vol – 1, 5th Edition, Pearson Education, NewDelhi
8. Jagadamba Singh and Jaya Singh, Photochemistry and Pericyclic rections, New Age International, New Delhi.

For Further Reading

1. P.S.Kalsi, Organic Reactions, Stereochemistry, and Mechanism, New Age International Publishers, New Delhi
2. R.T.Morrison, R.N.Boyd. Organic Chemistry, Pearson Education, New Delhi.
3. P.Y.Bruice, Essential Organic Chemisty, Pearson Education, New Delhi.
4. Peter Sykes, A Guide Book to Mechanism in Organic Chemistry, Pearson Education, New Delhi.
5. G.M. Louden, Organic Chemistry, Oxford University Press, New York.
6. E.L.Eliel, Stereochemistry of Carbon compounds, Tata McGraw Hill Publishing House, New Delhi.
7. J.March, Advanced Organic Chemistry, John Wiley & Sons., NY.
8. S.M.Mukerji and S.P.Singh, Reaction Mechanism in Organic Chemistry, McMillan Publishers.
9. R.O.C. Norman and J.M.Coxon, Principles of Organic Synthesis, CRC Press.

UNIVERSITY OF KERALA

Model Question Paper of BSc Chemistry Programme

2020 Admission onwards

SEMESTER IV Core Course III Course Code CH1441 Credit-3

ORGANIC CHEMISTRY I

Time:3 hours Max.Marks : 80

SECTION – A

*(Answer **all** questions. Answer in **one** word to maximum **two** sentences. **Each** question carries **one** mark)*

1. What is the product formed when a bond undergoes homolytic fission?
2. Give one example for each (i) substitution reaction and (ii) elimination reaction.
3. Write an example for electrocyclic reaction.
4. Name two reagents used for cis-hydroxylation.
5. What are the products obtained when naphthalene undergoes sulphonation at different temperatures?
6. Identify the orienting effect of the following functional groups $–CH_3$, $-NO_2$, -CHO and –OH.
7. What are chromophores?
8. What is stereo selectivity?
9. What is geometrical isomerism?
10. What are optical brightners?

(1 X 10 =10 Marks)

SECTION - B

(*Short answer type. Answer **any 8** questions from the following. **Each** question carries **two** marks.)*

11. What are electrophiles and nucleophiles? Give examples
12. Write the structure of the following compounds (i) 3,3,4-trimethyl-4-heptene (ii) 2-ethyl-3-methyl hexanal.
13. Phenol is acidic while ethanol is not. Why?
14. Arrange the following in the decreasing order of stability. Justify your answer.
$(CH_3)_2CH^+$, CH_3^+, $(C_6H_5)_2CH^+$, $C_6H_5CH_2^+$
15. Give an example and state Hofmann rule.
16. What is Walden Inversion?
17. What is Kharasch effect? Illustrate with an example.
18. When toluene is nitrated the major products are ortho and para substituted products. Why?
19. State Huckel's rule.
20. Explain photosensitization with an example.
21. What is enantiomeric excess?
22. Explain with examples the importance of dipole moment measurements in distinguishing geometrical isomerism.

(2 X 8 = 16 Marks)

SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. What is inductive effect? How is it affect the acidity and basicity of organic acids and bases?
24. Explain the mechanism of E1 and E2 eliminations.
25. *o*-chloro toluene when treated with sodamide in liquid ammonia gives *o*-toluidine and *m*-toluidine. Explain this observation with relevant mechanism.
26. Explain Norrish I and Norrish II reactions.
27. Determine the R & S notations of the asymmetric carbon atoms in (+) tartaric and (-) tartaric acid
28. Explain the conformational analysis of *n*-butane.
29. Give a brief account on optical activity due to restricted rotation.
30. Explain any two methods of determination of reaction mechanism.

31. What are non-benzenoid aromatics compounds? Explain their aromaticity with examples

(4 X 6 =24marks)

SECTION – D

(*Answer **any2** question. Each question carries 15 marks*)

32. (a) Explain S_N1 and S_N2 mechanisms.
    (b)Write the influence of structure of the substrate and polarity of the solvent on nucleophilic substitution reactions.
    (c) Explain Baeyer's strain theory. (5+5+5)

33. (a) Explain the mechanism of (i) nitration (ii) halogenation of benzene.
    (b) Discuss the orientation of influence of $–NO_2$ and –OH group in aromatic electrophilic substitution.
    (c) Discuss the classification of dyes on the basis of structure.
    (5+5+5)

34. (a) What is resolution? Explain any two methods of resolution.
    (b) What are carbenes? How are they generated? Comment on the structure of carbene.
    (c) Draw conformers of dimethyl cyclohexane and discuss their comparative stability.
    (5+6+4)

35. (a) Write the synthesis and uses of the following dyes (i) Malachite green (ii) Methyl Orange.
    (b) Explain the geometrical isomerism of maleic and fumaric acid.
    (c) What is hyperconjugative effect? How is it useful to explain the stability of carbonium ions?

    (6+4+5)

(15 X 2 = 30marks)

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards

Semester	V
Course	Core Course V
Course name	**PHYSICAL CHEMISTRY I**
Course Code	CH 1541
Credit	4
Hours	54 hours
Lecture	3-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive level	PSO
1	Identify, compare and explain the properties and behaviourof ideal and real gases, knowing kinetic theory of gases and different types of molecular velocities and collision properties.	U	PSO11
2	Perform numerical problems of gases under a set of conditions	A	PSO2
3	Differentiate between amorphous and crystalline solids, Understandanisotropy, symmetry and types of crystals, X-ray diffraction methods of study of crystal structure, identify the imperfections in crystals understand the physical aspects of surface tension and viscosity of liquids and the basics of liquid crystals and their applications	U	PSO11
4	representation of lattice planes and calculation of interplanar spacing, draw the crystal structures of NaCl and CsCl	A	PSO9
5	Recalling the basic concepts of solutions, concentration terms, Raoult's law and colligative properties	U	PSO9
6	Determination of colligative properties and molecular mass of solute	E	PSO9
7	Understand the working principle Electro-Chemical cells	U	PSO9
8	Design and Determine the potentials ofelectrochemical systems	E	PSO2
9	Assess the nature of electrolytes in terms of dissociation and ionic conductance of electrolytes in terms of mobility of ions	E	PSO2
10	Integrate the theory into practical applications of conductometric titrations	A	PSO3

MODULE	**COURSE DESCRIPTION**	**Hrs**	CO No.
1	**Gaseous state**	**9**	
1.1	Ideal gas, Ideal gas equation, gas constant: values in different units ($JK^{-1}mol^{-1}$, L atm $K^{-1}mol^{-1}$, cal $K^{-1}mol^{-1}$.), Dalton' Law of Partial pressure- Definition and mathematical expression.	1	1
1.2	Kinetic Theory of gases: postulates,Types of molecular velocities (average, most probable and RMS), formulas and their inter relations. Maxwell Boltzmann distribution of molecular velocities (with plots), Effect of temperature on distribution of molecular velocities	2	1/ 2
1.3	Collision properties. Collision diameter, Collision number, Collision frequency and mean free path. Relation between collision parameters and viscosity and thermal conductivity of gases (no derivation).	1	1/ 2

1.4	Behaviour of real gases, Deviation from ideal behaviour, Explanation for deviation, Compressibility factor, Z-P plots of ideal gas and the real gases H_2, He, NH_3, CO and methane at 0°C, Z-P plots of N_2 at several temperatures. van der Waal's equation of state – Correction factors. van der Waal's equation at low and high pressures and at high temperature.	2	1/ 2
1.5	Boyle temperature, Boyle temperature in terms of van der waal's constant. Virial equation of state and virial coefficients. (no derivations)	1	2
1.6	Critical phenomena: PV-Isotherms of CO_2, continuity of states, critical point, Critical constants, relation between critical constants and van der Waals constants, Experimental determination critical constants.	2	2
2	**Solids, Liquids and Liquid Crystals**	**12**	
2.1	Amorphous and Crystalline solids. Isotropy and anisotropy, size and shape of crystal, Interfacial angle, types of crystals: molecular crystals, ionic crystals, covalent crystals and metallic crystals- examples and properties.	1	3
2.2	Symmetry of crystals- plane of symmetry, axis of symmetry, centre of symmetry (definitions and basic idea only), Seven basic crystal systems, Space lattice and unit cell, Bravais lattices, (unit cell parameters and examples of 14 Bravis lattices), close packing structures of cubic and orthorhombic space lattices.	2	3
2.3	Laws of rational indices, Miller indices, Representation of lattice planes of cubic crystals, interplanar spacing in crystals Determination of Avogadro number from crystallographic data	2	4
2.4	X-ray diffraction studies of crystals, Bragg's equation – derivation and applications, Rotating crystal and powder method. Structure of NaCl and CsCl	2	4
2.5	Imperfections in crystals. Stoichiometric and Non-stoichiometric defects, point defects – Schottky and Frenkel defects, F-centre	1	3
2.6	**liquid state** : Properties of liquids: Vapour pressure-definition and concept, Surface tension-factors affecting Surface tension and measurement by capillary rise and stalagmometer method	1	3/ 4
2.7	Viscosity- Poisuelle's equation, Determination of viscosity by Ostwald's viscometer, Refractive index-determination by Abbe refractometer	1	4
2.8	**Liquid Crystals :** Liquid crystals- introduction, characterization of liquid crystals, Types –smectic, nematic and cholesteric liquid crystals,- examples; Disc shaped liquid crystals, Polymer	2	3

	liquid crystals. uses of liquid crystals		
3	**Dilute solutions and colligative properties**	**9**	
3.1	Dilute solutions: Binary solutions, Concentration- Molarity, Molality, Normality and Mole fraction. (numerical problems)	2	5
3.2	Raoult's Law for solutions of non-volatile solutes, vapour pressure of ideal solutions and relative lowering of vapour pressure.	1	5
3.3	Colligative properties- lowering of vapour pressure; elevation of boiling point and depression in freezing point; molal elevation constant, molal depression constant, Thermodynamic derivation of ΔT; Osmosis and Osmotic pressure, van't Hoff equation; Isotonic, hypertonic and hypotonic solutions, Abnormal molecular mass and van't Hoff factor, Determination of degree of dissociation and association, Reverse osmosis (numerical problems).	4	5/ 6
3.4	Experimental determination of molecular mass of solutes by cooling curve method,Rast's and Beckmann methods	2	6
4	**Electrolytic conductance**	**12**	
4.1	Electrolytic conductance, specific and equivalent conductance and the relation between them. Molar conductance and its variation with dilution, Kohlraush's law and its applications , cell constant	2	7
4.2	Ionic mobility, transport number- determination by Hittorf's and moving boundary method	2	7
4.3	Applications of conductivity measurements:- Determination of degree of dissociation of weak electrolytes, degree of hydrolysis, solubility of sparingly soluble salts, conductometric titrations involving strong acid strong base, strong acid-weak base, weak acid- strong base, weak acid-weak base and precipitation.	2	7, 10
4.4	Debye-Huckel theory of strong electrolytes, Debye-Huckel-Onsager equation, Debye-Falkenhagen effect, Wien effect	2	7
4.5	Activity and activity coefficient of electrolytes, Ionic strength	2	7
5	**Electromotive force**	2	8
5.1	Electrochemical cells- definition, types- electrolytic and galvanic with examples (Daniel cell and electrolysis of Cu), Origin of electrode potential, half cell reaction and	**12**	9

	cell reactions.		
5.2	Types of electrodes-Metallic electrodes, anion reversible electrodes and redox electrodes, Reference electrodes-standard hydrogen electrode, calomel electrode and	2	9
5.3	Effect of concentration of electrolytes on electrode potential: Nernst equation for electrode and cell (Derivation), Numerical problems	2	10
5.4	Relation between electrical energy, free energy, enthalpy and entropy- Gibb's Helmholtz equation and EMF of a cell -calculation of ΔG, ΔH and ΔS from EMF data.	3	9
5.5	Concentration cells - electrode and electrolyte concentration cells,examples, with and without transference (no derivation),fuel cells –H2-O2 and hydrocarbon-O2	3	9
5.6	Applications of EMF measurements- Determination of pH using hydrogen electrode and potentiometric titrations of redox systems with Fe/Cr system	2	8,10

(At least 100 problems are to be worked out from all units together. 30% of the questions for Examination shall contain problems.)

Textbooks

1. Gurdeep Raj, "Advanced Physical Chemistry", Goel Publishing House

2.P W Atkins, "Physical Chemistry", Oxford University Press

3. Anthony R West, " Solid State Chemistry and its Applications", Wiley Eastern

4. V Ramakrishnan and M S Gopinathan, "Group Theory in Chemistry",Vishal Publishing Co.

5.Puri, Sharma and Pathania, "Principles of Physical Chemistry", Millennium Edition, Vishal Publishing Co

For Further Reading

1 A. Salahuddin Kunju and G. Krishnan "Group Theory and its Applications in Chemistry

2. R J Silby and R A Alberty, "Physical Chemistry", John Wiley & Sons

3. G W Castellan, "Physical Chemistry", Narosa Publishing House

4. F Daniels and R A Alberty, "Physical Chemistry", Wiley Eastern

5. E A Moelwyn Hughes, " Physical Chemistry", Pergamon Press

6.R.Stephen Berry,Stuart A.Rice,John Ross,"Physical Chemistry,2nd edition,Oxford".

7. S Glasstone, "Thermodynamics for Chemists", Affiliated East West Publishers

8.L V Azaroff, " Introduction to Solids", McGraw Hill

9. N B Hannay, " Solid State Chemistry", Prentice Hall

10. A.S.Negi and S.C.Anand, A text book of Physical Chemistry, New Age International publishers.

UNIVERSITY OF KERALA

Model Question Paper of B.Sc. Chemistry Programme

2020 Admissions onwards

SEMESTER- V Core Course- V Course Code 1541 Credit-4

PHYSICAL CHEMISTRY –I

Time: 3 Hrs Total marks: 80

SECTION A

Answer all the questions. Each question carries 1 mark

1. Write down the van der Waal's equation for n moles of a gas.
2. Write down the conditions at which real gases tend to approach ideal behaviour
3. Explain the Braggs equation
4. Depict the structure of CsCl.
5. Identify the use of Stalagmomter.
6 Represent the cell diagram of Daniel cell
7. Name a primary reference electrode.
8. In which type of liquid crystals, the colour of the material is sensitive to temperature changes
9. How will you express the degree of dissociation in a weak electrolyte?
10. Explain the Gibb's Helmholtz equation for the emf of a cell.

(1 x 10 = 10 marks)

SECTION B

Each question carries 2 marks (Short answer). Answer any **8** questions

11. Distinguish between RMS and most probable velocity.
12. Distinguish between isotropy and anisotropy.
13. Calculate the Miller index of of a plane with x=1,y=1/2 and z=1.
14. Explain elements of symmetry of crystals
15. Comment on the statement that Depression in freezing point is a colligative property.
16. Calculate the normality of a solution containing 10 gram NaOH in 250 mL of NaOH solution.
17. How is the EMF generated in a concentration cell? Explain..
18. How will you carry out potentiometric titration of HCl and NaOH?
19. Derive the Nernst equation for the reduction of Cu^{2+} to Cu.
20. Define Kohlraush's law
21. Name a common anion reversible electrode and give its reduction half cell representation
22. Define transport number. Suggest one method for its determination.

(2×8 = 16)

SECTION C

Each question carry 4 marks (Short essay) **Answer any 6 questions**

23.What is the law of corresponding states? How is it derived from van der Waals equation

24. Derive the Bragg equation. What is its application?

25.The average speed of a certain gas at $27^{o}C$ is $400ms^{-1}$. Calculate the temperature at which the speed will be $800ms^{-1}$.

26. How will you determine Avogadro number from crystallographic data?.

27. Write a note on the different types of Liquid crystals

28. Discuss on cubic and hexagonal close packing in crystals. Give example for each.

29. Differentiate between molecular and covalent crystals.

30. Calculate the wave length of X rays used for a first order reflection in NaCl crystal. The inter planar spacing is 0.281nm for this reflection.

31. Derive an expression for pH measurement using Hydrogen electrode.

(4 x 6 = 24 marks)

SECTION D

Answer any two questions. Each question carries 15 marks

32. a)Do all gases obey gas laws? Discuss some experimental results to explain deviation and point out the causes which accounts for this behaviour
(5 marks)

b) Explain with diagrams the influence of temperature on molecular velocities in gases.
(5marks)

c) Write a note on continuity of states and critical points.
(5marks)

33. a) Derive Bragg's equation. (5 marks)

b) The edge length of the unit cell of NaCl crystal lattice is 564 pm by X-ray diffraction. Compute the interionic distance between sodium and chloride ions. (5 marks)

c) Give an account of point defects in a crystal. (5 marks)

34. a) An aqueous solution containing 0.50 g of a solute, dissolved in20 g of water froze at 272.58K. Calculate the molar mass of the solute. Enthalpy of fusion of ice, at 273K is 6024.6 J/mol. (5 marks)

b) b)Briefly discuss on the determination of viscosity of liquids. (5 marks)

c) (Explain with necessary diagrams the conductometric titrations of acids and bases. (5 marks)

35. a). Calculate the following

i) the free energy change for the cell , $Zn/Zn^{2+}// Cu^{2+}/Cu$ with an EMF of 1.1 volt at 25^0C.

ii) the electrode potential of Cu^{2+}/Cu in the above cell if the electrode potential of Zn/Zn^{2+} is 0.76 volt.

(5marks)

b) How will you construct a concentration cell using Zn metal electrode and zinc sulphate solution? (5 marks)

c) Give an account of Standard hydrogen electrode and Calomel electrode. (5 marks)

(15x2=30)

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards

Semester	V
Course	Core course-VI
Course name	**INORGANIC CHEMISTRY III**
Course Code	CH 1542
Credit	4
Hours	72 hours
Lecture-Tutorial-Lab	4-0-3

CO No.	COURSE OUTCOME *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Discuss the electronic configuration and related properties of transition elements and inner transition elements	U	PSO11
2	Understand preparation of selected transition metal compounds,lanthanides and actinides	U,A	PSO11

3	Compare lanthanide and actinide contraction and their consequences.	U	PSO11
4.	Name coordination complexes,organometallics, discuss their properties and bonding	U	PSO11
5	Understand stability of complexes and factors affecting stability	U	PSO3
6	Discribe isomerism in coordination compounds	U, A	PSO3
7	Discuss spectrochemical series, CFSE and their consequences	U	PSO3
8	Correlate geometry , stability and Jahn Teller effect and its causes	A	PSO11
9	Discuss reaction mechanisms and applications of coordination compounds	U	PSO11
10	Name and Classify organometallic compounds	U	PSO3
11	Discuss preparation and properties and bonding of carbonyls	U	PSO3
12	Identify the role of organometallic compounds in organic synthesis	U	PSO10
13	Discuss the role of inorganic ions in biological systems and biochemistry of haemoglobin, myoglobin, cytochromes, iron sulphur proteins	U	PSO10
14	Discuss various bioinorganic processes like photosynthesis, working of sodium potassium pump, etc	U	PSO17
15	Discribe various aspects of metallurgy,and instrumental methods of analyses viz., spectrophotometric methods, thermal methods and tools available to measure nanomaterials	U	PSO6

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Transition elements and Inner transition elements-I**	**9**	
1.1	Electronic configuration and general characterisitics- Oxidation state, Ionization enthalpy (variation of I,II and III ionization enthalpy across 3d series) and Enthalpy of atomisation	2	1
1.2	Melting and boiling point, density and Variation of std. electrode potentials (E^o M^{2+}/M & E^o M^{3+}/M^{2+})	2	2
1.3	Stability of higher oxidation states and formation of complexes	1	2
1.4	Colour, magnetic property and catalytic property	1	2
1.5	Comparison of 3d, 4d and 5d transition series	1	3
1.6	Preparation, properties and uses of $K_2Cr_2O_7$, $KMnO_4$ and $TiCl_4$. Important application of transition metals	2	4,5

2	**Transition elements and Inner transition elements-II**	**9**	
2.1	Electronic configuration, general properties (including oxidation state, I.E., melting and boiling points, density, ionic radii, colour, etc) and reactions of Lanthanides and actinides	3	6
2.2	Occurrence and isolation of lanthanides from monazite(Special reference to mineral sands of Kerala)	2	7
2.3	Lanthanide contraction, actinide contraction and their consequences	2	8
2.4	Magnetic properties and complexation behaviour of lanthanides and actinides (with comparison)	2	8
3	**Coordination chemistry-I**	**9**	
3.1	Ligands and their classifications and nomenclature of complexes (latest version)	2	9
3.2	EAN rule – Chelates – Stability of complexes and Factors affecting stability of complexes	1	10
3.3	Isomerism – Structural and stereoisomerism – Geometrical and optical isomerism	2	11
3.4	Bonding in complexes – V.B. Theory, CFT applied to Octahedral, Tetradral and square pyramidal complexes. factors affecting crystal field	4	12
4	**Coordination chemistry –II**	**9**	
4.1	Spectrochemical series – CFSE, Magnetic properties and colour of metal complexes .	3	13
4.2	Effects of crystal field splitting –Jahn -Teller effect- Tetragonal distortion of an octahedral complex	3	14
4.3	Application of coordination compounds in metallurgy, volumetric - quantitative and qualitative analysis. EDTA as a titrant.	2	15
4.4	Reactions of metal complexes-labile &inert complexes, ligand substitution reactions- SN1 & SN2 reactions	1	16
5	**Organometallic and Bioinorganic chemistry-I**	**9**	
5.1	Definition and nomenclature of organometallic compounds.	1	17
5.2	Classification as Sigma, Pi and mixed (containing both Sigma and pi) complexes, 18 electron rule	2	18
5.3	Metal carbonyls- mononuclear and polynuclear (give examples with Fe, Co and Ni)	2	19
5.4	Preparation and properties of carbonyls (Fe, Ni, Mn, Cr), Vibrational frequency of CO bond in metal carbonyls.	2	19

5.5	Bonding in organometallic compounds like ferrocene, dibenzene chromium, Ziese's salt (without MOT) and dinitrogen complexes.	2	20
6	**Organometallic and Bioinorganic chemistry-II**	**9**	
6.1	Application of organometallic compounds	2	21
6.2	Bioinorganic chemistry- Role of metal ions in biological systems- Biochemistry of iron-haemoglobin and myoglobin (elementary idea of the structure and mechanism of their actions)	3	22, 23
6.3	Electron transport proteins: Cytochromes, Iron-Sulphur proteins- storage and transport of iron.	2	23
6.4	Photosynthesis, Sodium -Potassium pump, Biochemistry of magnesium and calcium (brief study only)	2	24
7	**General Principles of Isolation of elements**	**9**	
7.1	Methods of concentration of an ore- Gravity separation, Froth floatation, Magnetic separation, Leaching, electrostatic separation, automated ore sorting and dewatering.	2	25
7.2	Preliminary processes- calcination and roasting.	1	25
7.3	Methods of extracting metal from concentrated ore- Electrometallurgy- Metallurgy of Aluminium, Sodium- Pyrometallugy-	2	25
7.4	Metallurgy of iron and zinc	1	25
7.5	Aluminothermy, auto-reduction and hydrometallurgy- metallurgy of silver and gold	1	25
7.6	Purification of crude metal- Distillation, Liquation, Zone refining, Electro refining , Chromatographic techniques and Vapour phase refining (Mond's process and Van Arkel process)	2	25
8	**Instrumental methods of Analysis**	**9**	
8.1	Spectrophotometry- Laws of spectrophotometry- Beer Lambert's Law	1	26
8.2	Applications of spectrophotometry- colorimetry, atomic absorption spectroscopy and flame emission spectroscopy.	3	26
8.3	Thermal methods- introductory aspects of TG, DTA and DSC- Instrumentation and applications.	2	27
8.4	Tools for measuring nanostructures: XRD, AFM, STM, SEM and TEM	3	28

Text Books

1. B.R.Puri, L.R,.Sharma, K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers
   New Delhi,2010
2. S.Prakash,G.D.Tuli, S.K Basu, R.D.Madan,Advanced Inorganic Chemistry, Vol. 1.,S Chand
3. R. Gopalan, V. Ramalingam, Concise coordination chemistry, 1st Edn., Vikas Publishing house
4. J.E.Huheey,E.A.Keiter, R.L.Keiter, O.K.Medhi. Inorganic Chemistry, 4th Edn. Pearson, 2006
5. D.A.Skoog, F.James Holler. S.R. Crouch. Principles of Instrumental analysis, 6th Edn., Cengage Learning, Noida,2004.

For Further Reading

1. D.A.Skoog, F.James Holler, T.A.Nieman. Principles of Instrumental analysis, 6th Edn., Cengage Learning, India Ltd.
2. A.Cottrel, An Introduction to Metallurgy, 2nd Edn. University Press, 1990.
3. D.C.Harris, Qualitatve Chemical Analysis,5th Edn., W.H. freeman & Co. New York.
4. F.A.Cotton, G. Wilkinson, Advanced Inorganic Chemistry, Wiley, India(P)Ltd

UNIVERSITY OF KERALA

Model Question Paper of B.Sc. Chemistry Programme

2020 admissions onwards

SEMESTER- V Core Course- VI Course Code CH1542 Credit-4

INORGANIC CHEMISTRY III

Time: 3 Hours **Maximum Marks : 80**

SECTION A

Answer all questions, each question carries 1 mark (answer in a word\sentence)

1. Give the general outer electronic configuration of a transition element
2. Which is more basic; $La(OH)_3$or $Lu(OH)_3$?
3. Which is the catalyst used in the oxidation of SO_2 to SO_3 in contact process?
4. Give an example for a mono nuclear and a binuclear carbonyl.
5. What is the coordination number of Ag in [Ag(CN)2] ?
6. Give the IUPAC name of Na3[Co(CO3)3]
7. What is the unit of magnetic moment?
8. Give the example for a tridentate ligand.
9. Write the structure of ferrocene.
10. Give the formula of a metal carbonyl which does not obey 18-electron rule. (1 x 10 = 10)

SECTION B

Answer any 8 questions, each question carries 2 marks (short

answer questions)

11.Explain zone refining.
12.Name the metal ion, other than magnesium, involved in photosynthesis.
13. Explain the stability of EDTA metal complexes.
14. How is the ore galena purified?
15. What is the oxidation number of P in H_3PO_4?
16. Give the importance of a cytochromes.
17. Transition metals are less reactive than the alkali and alkaline earth metals - Justify.
18. Which is more stable: Cu^{2+} or Cu^{+}in aqueous solution. ? Substantiate your answer.
19. Which has got greater tendency to form complexes; lanthanides or actinides ? Give reasons.
20. Write the difference between calcinations and roasting
21. What is an ambidentate ligand ? Give example.
22. Explain geometrical isomerism in metal complexes with suitable example (**2x8=16)**.

SECTION C

Answer any 6 questions, each question carries 4 marks **(short essay type)**

23.What is Ziese's salt ? Give its structure.
24. State and explain 18-electron rule with examples .
25. How haemoglobin differ from myoglobin.
26. Write notes on AAS and Flame Emission Spectroscopy.
27. Purification of crude metals by Monds proess and van Arkel processes
28. How does TGA differ from DTA?
29. What is lanthanide contraction ? Explain its consequences .
30. What are the factors that affect stability of metal complexes ?
31. Give an account of the applications of coordination compounds in quantitative and qualitative analysis.

SECTION D

(Answer any 2 questions, Each question carries 15 marks)

32.a) Describe the ion exchange method for the separation of lanthanides from monazite. (5 marks)

b) Describe the splitting of d-orbitals in tetrahedral and octahedral fields according to crystal field theory (5 marks)

c) Comment on the magnetic properties of lanthanides (5 marks)

33.a)Give an account of Electrometallurgy and pyrometallurgy (5 marks)

b.Discuss the nature of bonding in metal carbonyls. (5marks)

c) Narrate the use of EDTA as a titrant . (5 marks)

34.a).How silicones are prepared ? Discuss their structure and uses.

b).Give an account of sodium-potassium pump in biological systems.

c)Explain the principle of zone refining with an example.

35.a)Comment on the importance of mineral sands of Kerala ?

(5marks)

b) Explain the principle and working of AFM.

(5marks)

c)Explain the crystal field splitting in octahedral field.

(5marks)

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards

Semester	V
Course	Core course-VII
Course name	**ORGANIC CHEMISTRY II**
Course Code	CH 1543
Credit	4
Hours	72 hours
Lecture-Tutorial-Lab	4-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Describe the preparation of hydroxy, carbonyl & amino compounds, carboxylic acids and organo Mg, Li & Zn compounds.	R	PSO10
2	Distinguish primary, secondary & tertiary alocohols and amines.	U	PSO10

3	Write reaction steps in ascending & descending of alcohol and aliphatic acid series, interconversion of aldose and ketose, chain lengthening and shortening of aldoses.	U	PSO11
4.	Explain the structure of glucose, fructose, sucrose, starch and cellulose.	U	PSO11
5	Predict the outcome and mechanism of simple organic reactions, using a basic understanding of the reactivity of functional groups	A	PSO10
6	Illustrate the use of organic reagents in synthesis.	**A**	PSO3 PSO10
7	Discuss fundamental principles of supramolecular and green chemistry	U	PSO13

R-Remember, U-Understand, A-Apply

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Alcohols, Phenols and Ethers**	**12**	
1.1	Alcohols: Preparation- From alkenes (hydration. Hydroboration-oxidation, oxy-mercuration demercuaration) and carbonyl compounds (reduction and with Grignard reagent)	2	1
1.2	Chemical properties: Reactions involving cleavage of O-H bonds (acidity and esterification), oxidation (with PCC, Collins reagent, Jones reagent and $K_2Cr_2O_7$) and catalytic dehydrogenation	2	5
1.3	Distinction between primary, secondary and tertiary alcohols – Ascent and descent in alcohol series. Biofuel – ethanol and biodiesel.	1	2
1.4	Dihydric alcohols: Oxidative cleavage – Lead tetra acetate, periodic acid – Pinacol-pinacolone rearrangement.	1	5
1.5	Phenols: Preparation from halobenzens, cumene and sulphonic acid. Chemical properties: – Bromination, nitration, sulphonation.	2	1/5
1.6	Reimer-Tiemann reaction (mechanism expected), Kolbe reaction, Liebermann's nitroso reaction and Lederer-Mannasse reaction. Distinction between alcohols and phenols.	2	5
1.7	Ethers: Preparation by Williamson's synthesis. Reactions of ethers: Cleavage by HI and Claisen rearrangement (Mechanism expected) – Ziesel's method of estimation of methoxy group. Crown ethers: Nomenclature and importance of crown ethers.	2	5
2	**Aldehydes and Ketones**	**12**	
2.1	Preparation: Oxidation of primary and secondary alcohols using PCC, reduction of esters using DIBAL-H, Rosenmund	2	1

	reduction, Gattermann-Koch formylation and Friedel-Craft's acylation.		
2.2	Chemical properties: Nucleophilic addition (HCN, NaHSO3, RMgX and ROH)	1	5
2.3	Addition-elimination reaction (with ammonia and ammonia derivatives). Addition reactions of unsaturated carbonyl compounds: Michael addition.	1	5
2.4	Reduction using Metal hydrides (mechanism expected), MPV reduction, Clemmenson and Wolff-Kishner reduction.	2	5
2.5	Oxidation: with KMnO4, Tollen's reagent, Fehling solution, Br2 water, Oppenaur oxidation, Baeyer-Villiger oxidation.	2	5
2.6	Acidity of α-hydrogen: Aldol, Claisen-Schmidt, Benzoin, Perkin and Knovenagel condensations (all mechanisms expected).	2	5
2.7	Haloform reaction – Iodoform test – Cannizaro reaction (mechanism expected) and Beckmann rearrangement (mechanism expected)	2	5
3	**Carboxylic acids, Sulphonic acid and their Derivatives**	**9**	
3.1	Preparation: Hydrolysis of nitrile, carboxylation of Grignard reagent and oxidation of alkyl benzenes.	1	1
3.2	Chemical properties: HVZ reaction, Decarboxylation – Kolbe electrolysis (Mechanism expected), Curtis reaction. Ascent and descent series in aliphatic carboxylic acids	2	3,5
3.3	Preparation, properties and uses of anthranilic acid, cinnamic acid, citric acid, lactic acid, oxalic acid, adipic acid and phthalic acid.	3	1
3.4	Formation of acid derivatives – acid chlorides, amides, acid anhydrides and esters – comparison of reactivity of acid derivatives. Preparation of coumarin – Fries rearrangement (Mechanism expected)	3	5
3.5	Preparation and reactions of benzene sulphonic acid, toluene sulphonic acid and benzene sulphonyl chloride – Importance of tosyl group – synthesis and application of saccharin.	3	1,5
4	**Organic Nitrogen Compounds**	**12**	
4.1	Nitrocompounds: Nitro-acitautomerism, Nef's reaction. Reduction of nitrobenzene in various media. Preparation of nitro toluenes, nitro compounds as explosives.	3	5
4.2	Amines: Classification – Preparation: From alkyl halides, nitro compounds, nitriles, isonitriles and amides – Hoffmann's bromamide reaction, Schmidt reaction, Gabriel phthalimide synthesis.	2	1
4.3	Chemical properties: Carbyl amine reaction, conversion of amines to alkene (Hoffmann elimination with mechanism), acylation, reaction with nitrous acid and Mannich reaction.	2	5
4.4	Electrophilic substitution reactions of aniline: halogenation, sulphonation and nitration by amino protection (acetylation). Benzidine rearrangement (mechanism expected).	2	5
4.5	Separation of mixture of amines – methods to distinguish	1	2,5

	primary, secondary and tertiary amines. Distinction between aliphatic and aromatic amines.		
4.6	Preparation and synthetic applications of diazonium chloride and diazomethane.	2	5
5	**Carbohydrates**	**9**	
5.1	Classification and nomenclature of monosaccharides, configuration of monosaccharides.	1	
5.2	Reactions of glucose and fructose – Determination of openchain structure of D-glucose and D-fructose.	3	4,5
5.2	Anomers and mutarotation in glucose (mechanism expected) - cyclic structure – pyranose and furanose forms – Haworth projection formula – chair conformations.	2	4
5.3	Epimers and epimerization – Interconversion of aldoses and ketoses – chain lengthening and shortening of aldoses.	1	3
5.4	Disaccharides – reactions and structure of sucrose (structural elucidation not required) Polysaccharides – Structure of starch and cellulose (structural elucidation not required) – Industrial applications of cellulose.	2	4
6	**Organometallics, Active methylene compounds and Reagents in Organic synthesis**	**9**	
6.1	Organomagnesium compounds: Grignard reagent: Preparation – Reaction with compounds containing acidic hydrogen, carbonyl compounds, cyanides and CO2.	2	1,6
6.2	Organo lithium compounds: Preparation – Reaction with compounds containing acidic hydrogen, alkyl halides, carbonyl compounds, cyanides and CO2.	1	1,6
6.3	Organo zinc compounds: Preparation of dialkyl zinc – Reaction with active hydrogen compounds, acid halides and alkyl halides, Reformatsky reaction (mechanism expected) Li dialkylcuprates – Preparation and reaction with aliphatic/aromatic/vinyl halides.	2	1,6
6.4	Active methylene compounds – examples. Preparation of ethyl acetoacetate by Claisen condensation (mechanism expected), tautomerism, Synthetic applications of acetoacetic ester.	2	1,6
6.5	Reagents in organic synthesis: Study of the following reagents with respect to functional group transformations – 1. LiAlH4 – reduction of =CO, -COOR and –CONH2. 2. NaBH4 and Diborane – reduction of =CO 3. SeO2 - hydroxylation of allylic and benzylic positions, oxidation of CH2 alpha to =CO to =CO 4. NBS : Allylic and benzylic bromination.	2	6
7	**Introducing supramolecular and green chemistry**	**6**	
7.1	Supramolecular chemistry: Introduction – molecular recognition – host-guest interactions – types of non-covalent interactions.	2	7

7.2	Green Chemistry: Introduction – atom economy – principles of greenchemistry.	2	7
7.3	Newer methods of synthesis : Ultrasound, microwaves and phase transfer catalysis.	2	7

Text books

1. A.Bahl and B.S.Bahl, Advanced Organic Chemistry, S.Chand& Company, New Delhi.
2. L.G.Wade Jr, Organic Chemistry, Pearson Education, New Delhi.
3. K.S.Tewari, N.K.Vishnoi and S.N.Mehrotra, A textbook of Organic Chemisty, Vikas Publishing House (Pvt) Ltd., New Delhi..
4. S.C.Sharma and M.K.Jain, Modern Organic Chemistry, Vishal Publishing Company, New Delhi.
5. I L Finar, "Organic Chemistry" Vol – 1, 5th Edition, Pearson Education, New Delhi.
6. J. Clayden, N.Greeves and S.Warren, Organic Chemistry, Oxford University Press, New York.
7. Helena Dodzuik, Introduction to supramolecular chemistry, Springer.
8. V.K.Ahluwalia, Green Chemistry, Enviornmentally Benign reaction, Ane Book.

For further reading:

1. L.M. Lehn, Supramolecular Chemistry, VCH.
2. M.M.Sreevastava and Rashmi Sanghi, Green Chemistry for environment, Narosa Publishing House.
3. R.T.Morrison, R.N.Boyd. Organic Chemistry, Pearson Education, New Delhi.
4. P.Y.Bruice, Essential Organic Chemisty, Pearson Education, New Delhi.
5. G.M. Louden, Organic Chemistry, Oxford University Press, New York.
6. V.K.Ahluwaliya, Organic Reaction Mechanisms, Narosa Publishing House, New Delhi.

UNIVERSITY OF KERALA
Model Question Paper of BSc Chemistry Programme
2020 Admission onwards
SEMESTER- V Core Course VII Course Code CH1543 Credit 4
ORGANIC CHEMISTRY II

Time:3 hours **Max.Marks : 80**

SECTION – A

*(Answer **all** questions. Answer in **one** word to maximum **two** sentences. **Each** question carries **one** mark)*

1. What is Williamson's synthesis?
2. Which reagent is used for the oxidative cleavage of 1,2-diols?
3. Give a test to distinguish aliphatic aldehydes from aromatic aldehydes.
4. What is atom economy?
5. What is HVZ reaction?
6. What happens when aniline is treated benzoyl chloride in alkaline medium?
7. Draw the structure of D-Arabinose and D-Ribose?
8. What are epimers?
9. What is Frankland reagent?
10. Name a nitro compound used as explosive.

(10 X 1 =10 Marks)

SECTION - B

(*Short answer type. Answer **any 8** questions from the following. **Each** question carries **two** marks.)*

11. What is Mannich reaction?
12. How can you convert isopropanol to *tert*-butyl alcohol?
13. How can you distinguish 2-pentanone from 3-pentanone?
14. What is MPV reduction?
15. How coumarin is prepared?
16. How will you convert acetic acid to propionic acid?
17. Explain Nef's reaction.
18. Write the mechanism of Benzidine rearrangement.
19. Explain inversion of cane sugar.
20. Write any two industrial applications of cellulose.
21. What is NBS? What is its use?
22. What is DIBAL? What is its use?

(8 X 2 = 16 Marks)

SECTION - C

(*Short essay type. Answer **any 6** questions from the following. **Each** question carries **four** marks.)*

23. Explain Zeisel's method of estimating methoxy group?
24. How can you distinguish primary, secondary and tertiary alcohol?
25. Write the importance of $LiAlH_4$ and $NaBH_4$ in carbonyl chemistry.
26. Comment on Clemmensen and Wolff-Kishner reduction.
27. How cinnamic acid is prepared? Explain its important properties.
28. Discuss Hoffmann elimination?
29. Explain microwave synthesis with examples.
30. Discuss the mechanism of Reformatsky reaction.
31. What is mutarotation? Explain its mechanism.

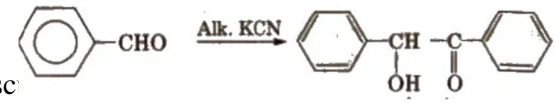
6 X 4 = 24marks)

SECTION – D

(*Answer **any 2** questions. Each question carries 15marks*)

32. (a) Write the mechanism of the following reactions:

a. (a)



(b) Disc action and (ii) Claisen Condensation.

(c) Comment on the following (i) Biodiesel and (ii) Crown ethers.
(5+5+5)

33. (a) Explain the synthesis and applications of saccharin.

(b) How diazonium chloride is prepared? How is it useful to synthesis the following compounds: phenol, iodobenzene, azocompounds,

(c) How can you effect the following conversions (i) aniline to para-bromo aniline(ii) benzamide to aniline.
(5+5+5)

34.(a) Discuss the cyclic structure of glucose
(
(b) (i) Why glucose and fructose form same osazone?

(ii) How fructose reacts with the following reagents?

(1) Na/Hg and H_2O (2) CH_3OH and dry HCl (3) Fehling's solution.

(c) Discuss the application of the following reagents in organic synthesis (i) SeO2 (ii) Lithium alkyl cuprate.

(5+5+5)

35. (a) How primary, secondary and tertiary amines are separated?

(b) Discuss the preparation and important reactions of benzene sulphonic acid.

(c) Discuss the different types of non covalent interactions in molecules. (5+5+5)

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards

Semester	VI
Course	Core course-X
Course name	**PHYSICAL CHEMISTRY II**
Course Code	CH 1641
Credit	4
Hours	72 hours
Lecture-Tutorial-Lab	4-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	**Cognitive level**	**PSO**
1	Understand basic concepts of thermodynamics , spectroscopy and group theory	U	PSO11
2	Apply laws of thermodynamics in physical and chemical processes and real system	A	PSO1
3	Classify processes, properties and systems on a thermodynamic basis		PSO3
4	Discuss the second law of thermodynamics and Assess thermodynamic applications using second law of thermodynamics.	E, A	PSO3
5	Discuss basic concepts of statistical thermodynamics	U	PSO11

6	Solve numerical problems based on thermodynamics and thermochemistry		PSO2
7	Understand the basics of spectroscopic techniques-Rotational, Vibrational and Raman Spectroscopy	U	PSO2
8	Compare NMR and ESR spectroscopy and their applications	U	PSO3
9	Evaluate physical and chemical quantities using non-spectroscopic techniques.	U, E	PSO4
10	Identify the elements of symmetry and Determine the point groups of simple molecules	E	PSO11
11	Differentiate diamagnetism and paramagnetism, measurement of magnetic susceptibility	U	PSO11
12	Correlate dipole moment with geometry of molecules	R, U	PSO11

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Thermodynamics I**	**9**	
1.1	Types of processes, zeroth law of thermodynamics.	1	1
1.2	Definition of internal energy and enthalpy Heat capacities at constant volume (Cv) and at constant pressure (Cp), relationship between Cp and Cv.	1	2
1.3	First law of thermodynamics, mathematical form, (numerical problems)	1	2
1.4	Reversible process and maximum work. Calculation of work, heat, internal energy change and enthalpy change for the expansion of an ideal gas under reversible isothermal and adiabatic condition. (numerical problems)	2	2
1.5	The Joule-Thomson effect – isoenthalpic process, Joule-Thomson coefficient, derivation of the expression for Joule-Thomson coefficient. Sign and magnitude, inversion temperature-in terms of van der waal's constant.	1	2
1.6	Thermochemistry – Standard state. Standard enthalpies of reactions: Enthalpies of formation, combustion and neutralization. Enthalpies of solution -Integral and differential enthalpies of solution. Hess's law and its applications. Kirchoff's equations.	3	2
2	**Thermodynamics II**	**9**	
2.1	Limitations of Ist Law, Need for IInd law of thermodynamics. Spontaneous process.	1	3

2.2	Carnot cycle:-net work done and efficiency of Carnot engine, Carnot theorem. Different statements of II^{nd} law	2	3
2.3	Thermodynamic scale of temperature Concept of entropy- Definition and physical significance. Entropy as a function of volume and temperature, pressure and temperature, as a criterion of spontaneity and equilibrium. Entropy changes in reversible and irreversible processes. Entropy change accompanying change of phase, solid to liquid, liquid to vapour, one crystalline form to another	2	3
2.4	Free energy: Gibbs and Helmholtz free energies and their significances - criteria of thermodynamic equilibrium and spontaneity. Gibbs-Helmholtz equation, dependence of Gibbs free energy changes on temperature, volume and pressure. Significance of Gibbs-Helmholtz equation.	2	3
2.5	Partial molar quantities. Chemical potential-Gibbs-Duhem equation, Clapeyron – Clausius equation. Concept of fugacity, determination of fugacity by graphical method.	2	3
3	**Thermodynamics III & Statistical thermodynamics**	**12**	
3.1	Nernst heat theorem, proof and its consequences. Statement of III^{rd} law-Plank's statement, Lewis Randall statement. Concept of perfect crystal, evaluation of absolute entropies of solid, liquid and gas. Exception to III^{rd} law with reference to examples- CO, NO, N_2O and H_2O	5	4
3.2	Statistical thermodynamics: introduction, types of statistics- MB, BE and FD. Ferminons and bosons, Phase space, system, assembly and ensemble-types of ensembles and uses. Thermodynamic probability, Boltzmann distribution law (no derivation). Partition function, molecular partition function for ideal gas	4	4
3.3	Thermodynamic functions in terms of partition functions - internal energy, enthalpy, pressure, work function and free energy function	3	4
4	**Spectroscopy I**	**12**	
4.1	Regions of electromagnetic spectrum. Different units of energy (erg, Joule, calorie, an cm^{-1}, Hz, A^0 and eV) and their interconvertions. Interaction with mater- Quantization of energy- photon,various types of molecular excitation and types of molecular spectra. Born-Oppenheimer approximation.	2	5

4.2	Rotational spectroscopy: Interaction between molecules and microwaves and criteria for microwave activity, rotation of molecules: Types of molecules according to moments of inertia- linear, symmetric top, asymmetric top and spherical top with two examples each. Microwave spectroscopy of rigid diatomic molecules, derivation for $I= \mu r^2$. energy expression, rotational constant,rotational energy levels, selection rule, pure rotational spectra. Separation between spectral lines, equation of J for maximum intensity (no derivation), determination of bond length.	2	5
4.3	Vibrational spectroscopy: Criteria for IR activity, Simple Harmonic oscillator model; Hooks law, energy and frequency equations. IR spectra of diatomic molecules. Energy expression, Selection rules, Zero-point Energy, frequency of separation, calculation of force constant, anharmonic oscillators, Morse equation. Energy expression and Selection rules, Fundamental and overtone transitions. Combination bands. Degree of freedom of polyatomic molecules.	2	5
4.4	Raman spectroscopy: Rayleigh and Raman Scattering, Stoke's and antistoke's lines and their intensity difference. Interaction between molecules and IR radiations and criteria for Raman activity, Induced dipole moment and polarizability, Pure Rotational Raman spectra. Selectionrule. Frequency of separation, vibrational Raman spectra, Selection rule, Rule of Mutual exclusion, (example;CO_2)		5
5	**Spectroscopy II**	**12**	
5.1	Electronic spectroscopy of molecules: Selection rule, Vibrational Coase Structure, Frank-Condon principle-Diagram, spectrum and continuum.	2	6
5.2	Dissociation and dissociation energy, Determination of Dissociation energy (equation only), Predissociation. Electronic spectra of polyatomic molecules (qualitative idea only), Different types of electronic excitations.	2	6
5.3	NMR spectroscopy: Principle of NMR, nuclear spin. H-NMR, Interaction of nuclear spin with external magnet. Energy level splitting, Precession.	2	6
5.4	Chemical shift. Delta and tau scales. Presentation of NMR spectra, Low resolution spectra and high resolution spectra,-Spin-spin coupling	2	6

5.5	Electron spin resonance spectroscopy: Principle, Types of substances with unpaired electrons, interaction of electron magnet with external magnet. Energy level spliting. Lande splitting factor,	2	6
5.6	presentation of ESR spectrum, the normal and derivative spectra. Hyperfine splitting. Simple examples of methyl and benzene radicals.	2	6
6	**Non-spectroscopic methods**	**9**	
6.1	Dipole moment, Debye equation and Clausius-Mosotti equation, measurement of dipole moment by temperature method, Dipole moment and molecular structure.	3	7
6.2	Diamagnetism and paramagnetism, Magnetic susceptibility and unpaired electrons, measurement of magnetic susceptibility,	3	7
6.3	Molar refraction and molecular structure, Atomic refraction, Optical exaltation, Parachor and atomic equivalent of parachor.	3	7
7	**Group theory**	**9**	
7.1	Group theory: Elements of symmetry – Proper and improper axis of symmetry, plane of symmetry, centre of symmetry and identity element. Combination of symmetry elements,	2	8
7.2	Determination of point groups of simple molecules- Acetylene,H2O, NH3, BF3, [Ni(CN)4]2- and C6H6.	2	8
7.3	Symmetry operations. Order of a group. Combination of symmetry operations. Group theoretical rules.	3	8
7.4	Construction of Group multiplication table of C2V.	2	8

Text books

1. B. R Puri,L. R Sharma,M. S.Pathania, Principles of Physical Chemistry,Vishal Publishing Company,
2. C.N. Banwell, Fundamentals of Molecular Spectroscopy, Tata McGraw-Hill Education
3. A. SalahuddinKunju and G. Krishnan, Group Theory and its Applications in Chemistry, PHI Learning Pvt. Ltd
4. Ramakrishnan and M S Gopinathan, Group Theory in Chemistry, Vishal Publishing Co

For Further Reading

1. Gurdeep Raj, “Advanced Physical Chemistry”, Goel Publishing House
2. P W Atkins, “Physical Chemistry”, Oxford University Press
3. Physical Chemistry. Ira N Levine, McGraw Hill
4. R J Silby and R AAlberty, “Physical Chemistry”, John Wiley & Sons
5. S Glasstone, “Thermodynamics for Chemists”, Affiliated East West Publishers
6. G W Castellan, “Physical Chemistry”, Narosa Publishing House

7. M C Guptha, “Elements of Statistical Thermodynamics”, New Age International (P) Ltd.
8. L K Nash, “Elements of Statistical Thermodynamics”, Addison Wesley
9. ManasChanda, “ Atomic structure and Chemical bonding in Molecular Spectroscopy”, Tata McGraw Hill

UNIVERSITY OF KERALA

Model Question Paper of B.Sc. Chemistry Programme

2020 Admission onwards

SEMESTER VI Core Course-X Course Code CH1641 Credit-4

PHYSICAL CHEMISTRY II

Time: 3 Hrs **Total marks: 80**

SECTION A

Answer all the questions. Each question carries 1 mark

1. Which of the following will give pure rotational spectrum, H_2, N_2, CO2 or HCl.
2. Write the mathematical expression of first law of thermodynamics.
3. Which branch of spectroscopy is used for the identification of free radicals?
4. What is the significance of polarizability of a molecule?
5. Give the selection rule in vibrational spectroscopy.
6. State different symmetry elements in molecules.
7. Write the Clausius- Mosotti equation .
8. Differentiate delta and Tau scale.
9. Give the selection rule for rotational spectroscopy.
10. What is the unit of dipole moment?

SECTION B

Answer any 8 questions (Short answer type, 2 marks each),

11.Explain Hess’s law with an example.
12. Derive an expression for Joule Thomson coefficient
13. How will you account for the origin of second law of thermodynamics?
14. How will you correlate dipolemoment with geometry of molecules. Explain with two examples.
15. Discuss on symmetric top and asymmetric top molecules.
16. State mutual exclusion principle with an example.

17 What is meant by normal modes of vibrations?
18. Explain predissociation with diagram.
19. Calculate the number of fundamental modes of vibrations of CO2 and SO2 molecules.
20. How does stokes and anti stokes lines originate in Raman spectrum.
21. What do you mean by the term 'parachor'
22. Explain Chemical shift.

SECTION C

Each question carries 4 marks (Short essay), Answer any 6 questions

23. What is an ensemble, explain the different types of ensembles.
24. Discuss the calcualation of workdone in irreversible expansion of an ideal gas under isothermal and adiabatic condition.
25. State and prove Nernst heat theorem. What are its consequences?
26. What is meant by Optical Exaltation? Calculate the optical exaltation of 2,6-dimethylhepta-2,5-dien-4-one.
27. Compare principle of NMR and ESR.
28. Explain the following terms Entropy and free energy. Explain why $T\Delta S$ determine randomness of a system?
29. Give an account of intensive and extensive properties.
30. Explain mutual exclusion rule with examples.
31. The fundamental vibrational frequency of carbon monoxide molecule is 2170. cm^{-1} Calculate the force constant of the molecule.

SECTION D

Answer any two question , 15 marks each

32. a) What is meant by reversible process? Derive an expression for work done in the reversible isothermal expansion of an ideal gas. (5 marks)

b) Calculate the work done in expanding one mole of an ideal gas from a volume of 2 to 20 dm^3 at 27 ^0C (5 marks)

c) Derive the relation between Cp and Cv. (5 marks)

33. a) Give an account of different statistical approaches (6 marks)

b) Show that for a rigid diatomic rotor, the moment of inertia is given by $I = \mu r^2$

c) The pure rotational spectrum of a gaseous molecule CN consists of a series of equally spaced lines separated by 3.7978cm^{-1}. Calculate the internuclear distance of the molecule. The molar masses are; ^{12}C=12.011 and ^{14}N=14.007 g mol^{-1}.

34. a) How can NMR spectrum distinguish between the isomers: p-xylene and ethyl benzene?

b) Explain the shielding and deshielding mechanism in NMR.

c) Give the hyperfine structure of ESR spectrum of hydrogen atom. Calculate the ESR frequency of an unpaired electron in a magnetic field of 0.33T. Given ge = 2 and μB = 9.273x10-24 JT^{-1}.

35. a) Discusson order of a group (5 marks)

b) Explain Frank Condon principle with diagram. (5 marks)

c) Draw the group multiplication table of C2vpoint group (5 marks)

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards

Semester	VI
Course	Core course-XI
Course name	**ORGANIC CHEMISTRY III**
Course Code	CH 1642
Credit	4
Hours	72 hours
Lecture-Tutorial-Lab	3-0-2

CO No.	**COURSE OUTCOMES** *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Outline the chemistry of simple heterocyclic compounds	U	PSO10
2	Classify amino acids, proteins, nucleic acids, drugs, terpenes, vitamins, lipids and polymers.	U	PSO10
3	Discuss the synthesis of amino acids, peptides, drugs and polymers.	U	PSO9
4	Describe the isolation and structure of terpenes and alkaloids.	R	PSO10
5	Explain the mechanism and techniques of polymerisation.	U	PSO11

6	Discuss the principle of UV, IR, NMR and Mass spectroscopy.	U	PSO2
7	Interpret spectroscopic data to elucidate the structure of simple organic compounds.	A	PSO18
8	Use the simple organic reactions to elucidate the structure of quinoline, piperine and conine.	A	PSO18

R-Remember, U-Understand, A-Apply.

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Heterocyclic compounds and Drugs**	**9**	
1.1	Heterocyclic compounds- classification,nomenclature, aromaticity. Basicity of pyridine and pyrrole.	1	1
1.2	Preparation - Paal-Knor synthesis and Hantzsch synthesis. Properties of furan, pyrrole, thiophene and pyridine.	2	1
1.3	Synthesis and reactions of quinoline, isoquinoline and indole with special reference to Skraup, Bischler-Napieralski and Fischer-Indole synthesis.	2	1
1.4	Structural elucidation of quinoline. Structure of purine and pyrimidine bases.	1	1,8
1.5	Drugs – introduction – classification on the basis of application	1	2
1.6	Synthesis and use of sulphanilamide, sulphathiazole,sulphapyridine, paracetamol and aspirin. Mode of action of sulphadrugs and amphicillin. Elementary idea of the structure and application of chloroquine, ibrufen and phenobarbitol.	2	3
2	**Amino acids, proteins and nucleic acids**	**9**	
2.1	Amino acids – classification, structure and stereochemistry of amino acids,	2	2
2.2	Essential and non essential amino acids – zwitter ion, isoelectric point.	1	2
2.3	Synthesis of amino acids – Strecker synthesis, Gabriel phthalimide synthesis, Erlenmeyer azlactone synthesis. Peptides: Structure and synthesis (Carbobenzoxy, Sheehan and solid phase synthesis)	2	3
2.4	Proteins – classification of proteins – structure of proteins – denaturation and colour reactions.	2	2
2.5	Nucleic acids: Classification, structure of DNA and RNA. Replication of DNA. Transcription and Translation - Genetic code.	2	2
3	**Natural products**	**9**	
3.1	Terpenes – Classification - Isoprene rule - Essential oil – Source	1	2,4
3.2	Structure (no structural elucidation) and uses of citral, geraniol, limonene and menthol. Structure of natural rubber – vulcanization and its advantages.	1	4

3.3	Alkaloids – Extraction. Structure and importance of nicotine, quinine, morphine and codeine.	2	4
3.4	Structural elucidation of piperine and conine.	2	8
3.5	Vitamins : Classification, structure, functions and deficiency diseases (structure of vitamin A, B1 and C only - no structural elucidation).	1	2
3.6	Lipids – biological functions – oils and fats - Common fatty acids	1	2
3.7	Hydrogenation, rancidity, saponification value, iodine value and acid value.	1	2
4	**Soaps, Detergents and Polymers**	**9**	
4.1	Soaps and detergents: Soap – synthetic detergents – cleaning action of soap and detergents.	1	2
4.2	Polymers: General idea of monomers, polymers and polymerisation	1	2
4.3	Degree of polymerisation – polydispersity - number and weight average molecular mass.	1	2
4.4	Classification of polymers, Homopolymers and copolymers, Addition and condensation polymers, thermoplatstics and thermosets	1	2
4.5	Mechanism of addition polymerization (Cationic, anionic and free radical)	1	5
4.6	Coordination polymerization - Ziegler Natta catalyst - Tacticity in polypropylene.	1	2
4.7	Polymerisation techniques – Bulk, solution and emulsion polymerization (Elementary idea)	1	5
4.8	Addition polymerization- Preparation and uses of (i) polyethylene (ii) PVC (iii) Teflon Condensation polymerization - (i) phenol-formaldehyde resin (ii) epoxy resin (iii) nylon-66 (iv) polyethylene terephthalate.	1	2
4.9	Synthetic rubbers – SBR and nitrile rubbers. Additives to polymers – Plasticisers, stabilizers and fillers. Biodegradable polymers (Basic idea only).	1	2
5	**Organic Spectroscopy I**	**9**	
5.1	UV–Visible spectroscopy – Beer-Lambert's law, types of electronic transitions, bathochromic, hypsochromic shifts, hyperchromic and hypochromic effects.	2	6
5.2	UV-Visible spectra of enes, effect of conjugation – solvent effect - Calculation of λmax of dienes and α,β-unsaturated ketones.	2	6
5.3	IR spectroscopy – Molecular vibrations, Functional group and finger print region – group frequencies, effect of hydrogen bonding on –OH stretching frequency.	3	6
5.4	Factors influencing carbonyl stretching frequency. Comparison of carbonyl stretching frequency in compounds containing carbonyl group.	1	6
5.5	Interpretation of IR spectra of simple organic molecules such as	1	7

	salicylaldehyde, benzamide, acetophenone, nitro benzoic acid and phenyl acetate.		
6	**Organic Spectroscopy II**	**9**	
6.1	NMR spectroscopy – principle of proton NMR, shielding and deshielding effect.	2	6
6.2	chemical shift, factors influencing chemical shift	1	6
6.3	spin-spin splitting, coupling constant, interpretation of PMR spectrum of simple molecules like $CHBr_2CH_2Br$, ethylbromide, pure ethanol and impure ethanol (acidic impurities) acetaldehyde and toluene. Introduction to ^{13}C NMR	3	6
6.4	Structural elucidation of simple organic molecules using IR and NMR spectroscopic techniques.	1	7
6.5	Theory of Mass spectrometry – mass spectrum, base peak and molecular ion peak, types of fragmentation, McLafferty rearrangement, isotopic effect.	2	6

Textbooks:

1. A.Bahl and B.S.Bahl, Advanced Organic Chemistry, S.Chand& Company, New Delhi.
2. K.S.Tewari, N.K.Vishnoi and S.N.Mehrotra, A textbook of Organic Chemisty, Vikas Publishing House (Pvt) Ltd., New Delhi..
3. S.C.Sharma and M.K.Jain, Modern Organic Chemistry, Vishal Publishing Company, New Delhi..
4. I L Finar, "Organic Chemistry" Vol – 1&2, 5th Edition, Pearson Education, New Delhi.
5. Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd, New Delhi.
6. O.P.Agarwal, Chemistry of Natural Products, Goel Publications.
7. T.L.Gilchrist, Heterocyclic Chemistry, Pearson Education, New Delhi.
8. Y.R.Sharma, Elementary Organic Spectroscopy, Pearson Education, New Delhi.
9. William Kemp, Organic Spectroscopy, Macmillan, New York.
10. AshuthoshKar, Medicinal Chemistry, New Age International Publishers.

For Further Reading:

1. R.T.Morrison, R.N.Boyd. Organic Chemistry, Pearson Education, New Delhi.
2. P.Y.Bruice, Essential Organic Chemisty, Pearson Education, New Delhi.
3. J.Clayden, N.Greeves and S.Warren, Organic Chemistry, Oxford University Press, New York.
4. Billmeyer F.W., Text book of Polymer Science, John Wiley and Sons.
5. S.P.Bhutani, Chemistry of Biomolecules, Ane Book Pvt Ltd.
6. R.M.Silverstein and F.X.Webster, Spectrometric Identification of Organic Compounds, John Wiely and Sons, New York.
7. P.S.Kalsi, Application of Spectroscopic Techniques in OrganicChemistry, NewAge International, New Delhi.

UNIVERSITY OF KERALA

Model Question Paper of B.Sc. Chemistry Programme

2020 Admission onwards

SEMESTER- VI Core Course XI Course Code CH1642 Credit 4

ORGANIC CHEMISTRY III

Time:3hours Max.Marks: 80

SECTION – A

*(Answer **all** questions. Answer in **one** word to maximum **two** sentences. **Each** question carries **one** mark)*

1. Write the IUPAC name of (i) Furan and (ii) quinoline.
2. Draw the structure of chloroquine.
3. What is isoelectric point?
4. What is natural rubber chemically?
5. Write any two biological functions of lipids.
6. What is soap?
7. Identify the types of electronic transitions in CH_3CHO.
8. What is base peak?
9. Write the monomers of the following polymers (i) PTFE (ii) PP.
10. What is SBR?

(10 X 1 =10 Marks)

SECTION - B

(*Short answer type. Answer **any 8** questions from the following.**Each** question carries **two** marks.)*

11. Compare the aromaticity of furan and thiophene.
12. Write the structure of pyramidine bases present in nucleic acids.
13. Define the terms (i) saponification value and (ii) iodine value.
14. What is isoprene rule?
15. What are essential and non-essential amino acids?
16. What is denaturation of protein?
17. Differentiate oils and fats.
18. Define the terms M_n and M_w
19. What is vulcanisation?
20. What are plastisizers?
21. Differentiate bathochromic and hypochromic shifts.
22. What is TMS? Why it is selected as a reference compound in ^{1}H-nmr spectroscopy?

(8 X 2 = 16 Marks)

SECTION - C

(*Short essay type. Answer**any 6**questions from the following.**Each**question carries**four**marks.)*

23. Explain the synthesis of amino acid by (i) Strecker and Erlenmeyer azlactone synthesis.
24. What are vitamins? How are they classified? Write the structure of Vitamin A and C.
25. What is tacticity? Explain it by taking poly propylene as an example.
26. What is Bakelite? How is it prepared? Give its important applications.
27. Write a short note on the structure of DNA.
28. Discuss the classification of drugs on the basis of application.
29. Elucidate the structure of conine.
30. (i) How can you distinguish inter and intra molecular hydrogen bonding using IRspectroscopy?
    (ii) Predict the regions where salicylaldehyde give IR absoptions.
31. Explain spin-spin coupling in 1,1,2-tribromo ethane and draw the ^{1}HNMR spectrum of it.

(6 X 4 =24marks)

SECTION – D

(*Answer**any2**question. Each question carries 15 marks*)

32. (a) Discuss the Woodward-Fieser rule for calculating λ_{max} of dienes.
    (b) Explain the principle of nmr spectroscopy.
    (c) A compound with molecular formula C_8H_8O shows the following absorptions:
        (i) IR Spectrum: 3050, 2950, 1700, 1620, 1550, 690 cm^{-1}.
        (ii) pmr spectrum: δ 7-8ppm (multiplet, 5H), 2.5ppm (singlet, 3H).
    Identify the structure of the compound. (5+5+5)
33. (a) Explain the Fischer-Indole synthesis.
    (b) What are sulphadrugs? Give examples. Explain the mode of action of sulphadrugs.
    (c) What are terpenes? How are they classified? Write the structure and uses of limonene
    and menthol. (5+5+5)
34. Write brief note on the following :
    (a) Replication of DNA
    (b) Merrifield synthesis
    (c) Structure of protein (5+5+5)
35. (a) Discuss on the factors influencing chemical shift in NMR spectroscopy.
    (b) Write brief note on the isotopic effect in mass spectroscopy.
    (c) Explain the mechanism of cationic and anionic polymerization. (7+4+4)

(15 X 2 = 30marks)

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards

Semester	V
Course	Core course-XII
Course name	**PHYSICAL CHEMISTRY III**
Course Code	CH 1643
Credit	4
Hours	72 hours
Lecture-Tutorial-Lab	4-0-2

CO No.	**COURSE OUTCOMES** *Upon completion of this course, the students*	**Cognitive Level**	**PSO**
1	Recall the basic physical concepts in quantum mechanics, colloids, adsorption, Chemical Kinetics, catalysis, chemical and ionic equilibria, phase equilibria, binary liquid systems and photochemistry	R	PSO4
2	Understand the basic concepts involved in quantum mechanics, colloids, adsorption, Chemical Kinetics, catalysis, chemical and ionic equilibria, phase equilibria, binary liquid systems and photochemistry	U	PSO4
3	Derive and Interpret important theories and equations involved in physical chemistry	A	PSO10
4	Demonstrate the origin of quantum numbers by correlating the Cartesian and spherical polar coordinates of hydrogen atom.	A	PSO10
5	Identify and recognize the applications of various principles, equations andphysical processes	U	PSO10
6	Perform calculations involving physical concepts and equations	A	PSO4
7	Analyze` graphical representations (phase diagrams, two and three components, vapour pressure – composition and boiling point –composition, temperature-composition) present in physical chemistry.	A	PSO9
8	Understand terminology	U	PSO11

9	Understand the effects of external influence on various chemical processes	U	PSO1
10	Understand different laws and principles of physical chemistry	U	PSO3

MODULE	COURSE DESCRIPTION	Hrs	CO number
1	**Quantum mechanics**	**12**	
1.1	Radiation phenomena- blackbody radiation, photoelectric effect, Compton effect and atomic spectra. Plank's quantum theory and explanation of the radiation phenomena.	2	1,2,6
1.2	Schrodinger wave equation – significance of Ψ, well behaved functions, Concept of operators and some operators of interest , Laplacian and Hermitian (properties of operators not required), Postulates of quantum mechanics	3.5	1,2,5
1.3	Application of quantum mechanics to simple systems - particle in 1 D box, normalization of wave function, Particle in 3 D box. Concept of degeneracy	3.5	1,2,3,5,6
1.4	Application to hydrogen atom (no derivation) Schrodinger wave equation in Cartesian and spherical polar co-ordinates, Quantum numbers.	3	4
2	**Colloids and Adsorption**	**12**	
2.1	Colloidal state: Classification of colloids- Kinetic, optical and electrical properties of colloids.	1	1,2
2.2	Purification of colloids – ultra filtration and electrodialysis,	1	1,2
2.3	Ultra microscope, Electrical double layer and zeta potential.Coagulation of colloids, Hardy-Schulz rule, Gold number.sedimentation and streaming potential	2	1,2
2.4	Gels: Elastic and non-elastic gels, Imbibition and syneresis, Micelles and critical micelle concentration	2	1,2
2.5	Application of colloids – Cottrell precipitator, purification of water and delta formation.	1	1,2
2.6	Adsorption: Physical and chemical adsorption, Freundlich adsorption isotherm, ,	2	1,2
2.7	Derivation of Langmuir adsorption isotherm, Statement and explanation of BET and Gibbs isotherms	2	1,2,3
2.8	Determination of surface area of adsorbents by BET equation. Applications of adsorption	1	1,2,5,6

3	**Chemical Kinetics &Catalysis**	**12**	
3.1	Order of reaction, Derivation of integrated rate equation of zero, first, second and nth order reaction	2	1,2,3,6
3.2	Determination of order of reactions:- Graphical and analytical methods using integrated rate equations, Fractional life- method, Differential rate equation method, Isolation method.	2	1,2,6,7
3.3	Qualitative idea of Complex reactions:- (a) opposing reactions (b) first order consecutive reactions (c) parallel reactions. Qualitative idea of chain reactions.	1.5	1,2
3.4	Influence of temperature on rate of reaction: Arrhenius equation, Determination of Arrhenius parameter, Energy of activation and its significance.	2.5	1,2,3,6,9
3.5	Collision theory, Derivation of the rate equation for a second order reaction based on collision theory, unimolecular reactions- Lindemann mechanism, steady state approximation.	2	1,2,3,10
3.6	Catalysis:- Theories of catalysis, Intermediate compound formation theory, steady state method	1	1,2,10
3.7	Enzyme catalysis, Michaelis-Menten law.	1	1,2,3,10
4	**Chemical and Ionic Equilibria**	**12**	
4.1	Equilibrium constant and free energy	1	1,2,6
4.2	Thermodynamic derivation of law of mass action, relation between Kp,Kc and Kx	1	1,2,3
4.3	Le-Chatelier'sPrinciple – Application in Haber process and dissociation of PCl_5	1	1,2,3,5,9,10
4.4	Reaction isotherm, Temperature dependence of equilibrium constant, Pressure dependence of equilibrium constant	2	1,2,9
4.5	Application of Clausius-clapeyron equation in physical equilibria.	2	1,2,3,5,6
4.6	Ionic equilibrium : Ionic product of water, Effects of solvents on ionic strength, levelling effect,	1	1,2,5,6,8
4.7	pKa and pKb values, solubility product and common ion effect and their applications	1	1,2,3,5,6,8
4.8	pH and its determination by indicator methods, buffer solution, buffer action, Henderson's equation, buffer capacity	1	1,2,3,5,6,8
4.9	hydrolysis of salts of all types, degree of hydrolysis and hydrolytic constant, determination of degree of hydrolysis, relation between hydrolytic constant and ionic product of water	2	1,2,3,6,8

5	**Phase Equilibria**	**12**	
5.1	Phase Equilibria:-Terminology, the phase rule, thermodynamic derivation of phase rule	1	1,2,3,6,8
5.2	application to (a) water system (b) sulphur system (c) solid-liquid equilibria involving simple eutectic system such as Pb-Ag system, KI-water system	3	1,2,6,7
5.3	application to solid-liquid equilibria involving simple eutectic system such as Pb-Ag system, KI-water system	2	1,2,6,7
5.4	freezing mixtures, thermal analysis and desilverisation of lead	1	1,2,7,8
5.5	solid-liquid equilibria involving compound formation with congruent and incongruent melting points:- $FeCl_3$-H_2O system and Na_2SO_4-H_2O system	3	1,2,6,7,8
	solid–gas system- decomposition of $CaCO_3$, dehydration of $CuSO_4.5H_2O$, deliquescence and efflorescence.	2	1,2,6,7,8
6	**Binary Liquid Systems**	**9**	
6.1	Liquid-Liquid system:- Completely miscible, ideal and non-ideal mixtures,	1	1,2
	Raoult's law, vapour pressure- composition, temperature-composition curves	2	1,2,5,7,10
6.2	fractional distillation, deviation from Raoult's law	1	1,2,5,8
6.3	Azeotropic mixtures, partially miscible liquid system, critical solution temperature, Conjugate layers, example for upper, lower and upper cum lower CST	2	1,2,5,8
6.4	Introduction to three component system, distribution law, its thermodynamic derivation, limitations of distribution law.	2	1,2,3,5,10
6.5	Application of distribution law to the study of association and dissociation of molecules	1	1,2,5,6
7	**Photochemistry**	**3**	
7.1	Grothus-Draper, Beer- Lambert and Stark- Einstein laws.	1	1,2,6,10
7.2	Quantum yield, Reason for very low and very high quantum yields, Rate equation for decomposition of hydrogen iodide, Qualitative treatment of H_2-Cl_2 reaction and H_2-Br_2 reaction	1	1,2,9
7.3	Fluorescence and phosphorescence, chemiluminescence and photosensitization, Explanation and examples	1	1,2,5,8

Textbooks

1. Puri, Sharma & Pathania, Priniciples of Physical Chemistry, Vishal Publishing Co
2. Elements of Physical Chemistry , Glasstone and Lewis,Macmillan
3. ,P.C.Rakhit, Physical Chemistry,Sarat Book House,Calcutta
4. I N Levine, Quantum Chemistry, Prentice Hall

5.RL Madan ,Physical Chemistry, Mc Graw Hill

For Further Reading

1.R J Selby and RA Alberty, Physical Chemistry,John Wiley &sons
2. Levin, Physical Chemistry , 5th edn ,TMH
3 Bahl, Arun Bahlan dG D Tuli,Essentials of Physical Chemistry , S Chand Ltd
4. S.C.Anand, A text book of Physical Chemistry, New Age International publishers.
5.Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house

UNIVERSITY OF KERALA
Model Question Paper of B.Sc. Chemistry Programme
2020 admissions onwards
SEMESTER VI Core Course XII: Course Code CH1643 Credit 4
PHYSICAL CHEMISTRY – III

Time: 3 Hrs **Total marks: 80**

SECTION A

Answer all the questions Each question carries 1 mark

1. Name two quantum mechanical operators
2. Give the Arrhenius equation.
3. Write the integrated rate equation for a first order reaction.
4. Give the relation between hydrolytic constant, dissociation constant and ionic product of water of a salt of strong acid and weak base.
5. The solubility of AgCl in water at 250C is 0.00179 g/L. calculate its solubility product at 25 ^{0}C.
6. Write Debye- Huckel- Onsagar equation.
7. Write the reduced phase rule equation.
8. Give an example for a system having upper cum lower CST.
9. Give the Nernst equation for the potential of a copper electrode.
10. What is meant by quantum yield of a photochemical reaction?

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SECTION B

Each question carries 2 marks (Short answer) **.** Answer any **8** questions

11. Explain an eigen function with an example.
12. Give the normalization condition of a wave function.
13. Give one example each for an acidic and a basic buffer.
14. Define buffer solution and buffer index
15. Define the term activation energy. Why different reactions proceed at different rates?
16. What is meant by common ion effect? Explain with an example.
17. Describe with example (i) Triple point (ii) Eutectic point
18. Explain the term congruent melting point with an example
19. Write a note on ionic product of water
20. Differentiate between pKa and pKb values.
21. How will you characterise the triple point of water?
22. What is meant by phosphorescence?

SECTION C

Answer any 6 questions. Each question carries 4 marks (Short essay).

23. Discuss postulates of quantum mechanics
24. The rate constant of a second order reaction is 5.70 x 10^{-5} dm^3mol^{-1} S^{-1} at 25^0C and 1.64 x 10^{-4} dm^3mol^{-1} S^1 at 40^0C. Calculate the activation energy and the Arrhenius preexponential factor
25. What would be the pH of a solution obtained by mixing 5 g of acetic acid and 7.5 g of sodium acetate and making the volume equal to 500 ml? Dissociation constant of acetic acid at 250C is 1.75 x 10^{-5}.
26. Explain the principle of freezing mixture by taking KI – H2O system as an example
27. State and explain Nernst distribution law. What are the limitations of the law?
28. Write notes on ultra filtration and electrodialysis.
29. Discuss on a consecutive and a parallel reactions with examples
30. What are the laws of photochemistry , explain ?
31. Explain the phase diagram of Pb-Ag system

.

SECTION D

Each question carries 15 marks ,Answer any two questions

32. a) using Le Chatliers Principle, describe the effect of temperature, pressure and concentration for the following systems in equilibria:
    1) Formation of $NH_{3(g)}$ from $N_{2\,(g)}$ and $H_{2(g)}$
    2) Dissociation of $PCl_{5(g)}$ in to $PCl_{3(g)}$ and $Cl_{2(g)}$ (6 marks)

    b)Derive the rate equation for a second order reaction based on collision theory. (4 marks)
33. a)What is critical solution temperature? How does it vary by the addition of an

electrolyte?

((5 marks)

b) What is meant by CST. Explain different types of CST with examples (6 marks)

c) Elaborate on azeotropic mixtures with examples (4 marks)

34. a)Derive van't Hoff equation for temperature dependence of equilibrium constant

b)The equilibrium constant for a reaction is 1× 105. Calculate the standard free energy change

for the reaction in kilojoules at 25? C.

c) The half life of a first order reaction is 50 min. Calcualate the time required to reduce the initial concentration to 12.5%. (5x3=15 marks)

35. a) Write note on (i) Fluorescence (ii) Chemiluminescence (5 marks)

b) Derive Langmuir adsorption isotherm (5 marks)

c) Explain the phase diagram of water (5 marks)

UNIVERSITY OF KRALA

SYLLABUS FOR B.Sc. CHEMISTRY

FIRST DEGREE PROGRAMME

2020 Admission onwards

LAB COURSES

(For all Lab courses scheme of ESE is decided by the board of examiners in each year)

Computer Lab for

Foundation Course II (CH 1221) SEMESTER II

(No ESE)

Semester	II
Hours	2 hours/week
Lecture-Tutorial-Lab	0-0-2

CO No.	COURSE OUTCOME *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Get acquainted with Computer Lab based instruction on the use of computer and internet in learning.	U	PSO5
2	Use of educational softwares, information mining from internet and using INFLIBNET/NICNET, NPTEL and VIRTUAL LABS OF MHRD.	A	PSO5
3	Learn Word processing and document preparation. Use of Spread sheets in Data handling and presentation	U	PSO5
4	Develop skill in chemical structure drawing and visualization of molecules using chemistry softwares	U	PSO5

Students should submit the following documents, certified by Teacher in charge, along with LAB COURSE I records for ESE

1. Structure of any five simple organic molecules using Chem Sketch or Chemdraw

2. Any five chemistry related graphical plots using Excel

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UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards
Core Course-II
LAB COURSE I
INORGANIC QUALITATVE ANALYSIS
(ESE at IV Semester)

Time 3Hrs **Marks 80**

Semester	I,III &IV
Course	**Core Course-IV, Lab Course I**
Course name	**Inorganic Qualitative Analysis**
Course Code	**CH1442**
Credit	2
Hours	2 hours/week
Lecture-Tutorial-Lab	0-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, out look and scientific temper (GOOD LAB PRACTICES)	U	PSO1
2	Develop skill in safe handling of chemicals, take precaution against accidents and follow safety measures	A	PSO2/ PSO8
3	Use glass wares ,electric oven, burners and weighing balance	A	PSO1
4	Develop skill in observation , prediction and interpretation of reactions	A	PSO1
5	Detect solubility, and classify compounds according to their solubility	U	PSO3
6	Apply the principle of common ion effect and solubility	A	PSO1&

	product in the identification and separation of ions		PSO2
7	Develop skill in preparing and purifying inorganic complex compounds	A	
8	Use filtration and chomatographic techniques, vacuum pump and centrifugal pumps	U	PSO4

MODULE	COURSE DESCRIPTION	Hrs	CO No.
I	**Lab Safety Measures**	**36**	1
A	***General Instructions***	**10**	
1	Readiness to follow Laboratory rules and regulations and cooperating with Lab instructors and staff for avoiding accidents	2	
2	Laboratory safety measures, develop safety skills by wearing lab coats, gloves and safety eye glasses wherever necessary (Necessity of **FIRST AID** and of keeping first Aid box in Lab)	2	
3	Procedures adopted in chemical splashes to skin, eyes, burns and electric shock, Instruction for emergency use of **Fire extinguishers in Lab**	2	
4	Labels and warning symbols for Safe handling of Toxic and corrosive chemicals	4	
B	***Experimental and scientific Skills***	**26**	3,4
1	Preparation of solution, Precipitation, Dissolution, Crystallisation techniques	4	
2	Use of Bunsen Burner, Electric Burners , advantages and disadvantages -Ignition tests,Flame tests and ash tests for detection of cations and anions	4	
3	Filtration techniques-Filter paper, Electric Centrifuge, Vacuum pump	2	
4	Purification technique-Washing of precipitates,Re-crystallsation and drying of precipitate	4	
5	Writing experimental procedures	2	
6	Reporting, Tabulation of data,Use of Lab records	2	
7	Semimicro analysis and Microanalysis, advantages and disadvantages		
8	Application of common ion effect in precipitation and separation of ions	4	
9	Inter group separation techniques	4	

II	**Qualitative Inorganic Analysis (Micro Analysis)**	**48**	4,5, 6
1	Studies of the reactions of the following basic radicals with a view to their identification and confirmation: Lead, Copper, Bismuth, Cadmium, Tin, Antimony, Ferrous, Ferric ions, Aluminium, Chromium, Zinc,Manganese,Cobalt,Nickel,Calcium,Strontium,Barium,Magnesium , Potassium and Ammonium ions/radicals	12	
2	Studies of the reactions of the following acid radicals with a view to their identification and confirmation: Carbonate, Sulphide, Nitrite, Nitrate, Fluoride, Chloride, Bromide, Iodide , Borate, Acetate, Oxalate, Chromate, Phosphate and Sulphate anions.	12	
3	Systematic qualitative analysis by **microscale methods** of salt mixtures containing two acidic and two basic radicals from the above list (more than one interfering radical should be avoided).	30	
III	**Inorganic Preparations** Preparations of i)Potash alum ii) Hexamine cobalt Chloride iii) Tetramine copper Sulphate iv) Mohr's salt v) Microcosmic salt vi) Sodium cobalti nitrate vii) Sodium nitro prusside vii) Manganese phthalocyanin ix) Potassium trioxalatochromate x) Potassium trioxalatoferrate	**20**	4,5, 6
IV	**Introduction to Chromatographic Separation techniques (No ESE)**	**4**	8
1	Demonstration of Paper chromatography	2	
2	Demonstration of Thin layer chromatography	2	

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME
2020 Admission onwards
SEMESTER V
Core Course-VIII
LAB COURSE II
INORGANIC VOLUMETRIC ANALYSIS
(ESE at V Semester)

Time 3Hrs **Marks 80**

Semester	V
Course	Core Course-VIII, Lab Course II
Course name	**INORGANIC VOLUMETRIC ANALYSIS**
Course Code	**CH1544**
Credit	3
Hours	5 hours/week (90Hrs)
Lecture-Tutorial-Lab	0-0-5

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Develop skill in selecting, primary and secondary standards	U	PSO1
2	Develop skill in weight calculation of primary standards weighing by electronic balance, making of solutions of definite strength (standard solutions)	A	PSO2 PSO8
3	Use sophisticated glass wares, calibrate apparatus and develop skill in keen observation , prediction and interpretation of results	A	PSO1
4	Perform volumetric titrations under acidimetry-alkalimetry, permanganometry, dichrometry, iodimetry-iodometry,cerimetry, argentometry and complexometry	A	
5	Compare the advantages and disadvantages of different volumetric techniques	U	
6	Practice Punctuality and regularity in doing experiments and submitting Lab records	A	

MODULE	COURSE DESCRIPTION	Hrs	CO No.
I	**Preparation of standard solutions**	**6**	
1	Calculation of mass of a primary standard substance and preparing its standard solution (use of constant boiling hydrochloric acid and Analytical Grade Reagents is recommended)	**2**	
2	Preparation of a solution of definite strength by Dilution techniques	**2**	
3	Preparation of carbonate free sodium hydroxide.	**2**	
II	**Inorganic Volumetric analysis-(one burette titration)**		
(a)	***Acidimetry and alkalimetry***	**25**	
1	Standardisation of HCl using Analytical Grade Na_2CO_3	**3**	
2	Titrations of Strong acid (HCl, HNO_3 and H_2SO_4) by strong bases (NaOH, KOH)	**8**	
3	Strong base (NaOH, KOH)– weak acid (Oxalic acid)	**5**	
4	Strong acid –(HCl, HNO_3 or H_2SO_4) by weak base (Na_2CO_3 solution)	**5**	
5	Determination of Na_2CO_3 and $NaHCO_3$ in a mixture by indicator method	**2**	
6	Estimation of NH_3 in an ammonium salt by direct and indirect methods	**2**	
(b)	***Permanganometry***	24	
1	*Standardisation of Potassium permanganate using A.R Oxalic acid/Mohr's salt*	3	
2	Estimation of Ferrous iron	3	
3	Estimation of Oxalic acid	3	
4	Estimation of Hydrogen peroxide	3	
5	Estimation of Calcium	4	
6	Estimation of Nitrite	3	
7	Estimation of MnO_2 in pyrolusite	5	
(c)	***Dichrometry***	*9*	
1	Determination of Ferrous iron using internal & external indicator	4	
2	Determination of Ferric iron after reduction with $SnCl_2$.	5	
(*d*)	***Cerimetry***	4	
1	Standardisation of ceric ammonium sulphate with Mohr's salt.	2	
2	Determination of oxalic acid using ceric ammonium sulphate.	2	
(e)	***Iodimetry &Iodometry***	**9**	
1	Standardisation of thiosulphate using KIO_3	3	
2	Standardisation of iodine using thiosulphate	3	
3	Determination of copper in copper sulphate	3	
(f)	*Precipitation titration*	*3*	
	Determination of chloride in neutral medium	3	

(g)	***Complexometry***	*10*	
1	Standardisation of EDTA solution with ZnSO4	3	
2	Determination of Zinc, using EDTA	2	
3	Determination of Magnesium	2	
4	Determination of permanent and temporary hardness of water using standardized EDTA	3	

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards
LAB COURSE III

PHYSICAL CHEMISTRY EXPERIMENTS

(ESE at V Semester)

Time 3Hrs

Marks 80

Instructions for use of computer softwares and programmes in the physical chemistry experiments

1.Computer software (Excel) is to be used for plotting graph or calculations.
2. Spread sheet program can be used for determining Equivalence point in potentiometric and conductometric titrations .
3. Data analysis of kinetic experiments using spreadsheet program (determination of rate constant)
4.Plot scatter diagram (wherever applicable in physical experiments)

Semester	V
Course	Core Course-IX, Lab Course III
Course name	**PHYSICAL CHEMISTRY EXPERIMENTS**
Course Code	**CH1545**
Credit	2
Hours	4 hours/week (72Hrs)
Lecture-Tutorial-Lab	0-0-4

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Develop Scientific outlook and approach in applying principles of physical chemistry in chemical systems/reactions	U	PSO1
2	Use computational methods for plotting graph	A	PSO2/PSO8

3	Desribe systematic procedures for physical experiments	U	PSO1
4	Acquire Instrumentation skill in using conductometer, potentiometer, refractometer, stalagmometer and Ostwald's viscometer.	U	PSO3
5	Compare theory with experimental findings	A	PSO1& PSO2
6	Practice Punctuality and regularity in doing experiments and submitting Lab records	A	

MODULE	COURSE DESCRIPTION	Hrs	CO No.
I	**Conductometry**	**12**	1-7
1	Determination of cell constant		
2	Conductometric titration of NaOH using HCl		
II	**Potentiometry**	**8**	1-7
1	Potentiometric titration of Fe^{2+} *versus* $Cr_2O_7^{2-}$		
2	Potentiometric titration of $KMnO_4$ *versus* KI		
3	Potentiometric titration of HCl *versus* NaOH using quinhydrone electrode		
III	**Phenol-water (Binary liquid systems)**	**12**	1-7
1	Critical solution temperature of phenol –water system		
2	Influence of KCl(impurity) on the miscibility temperature of phenol-water system .Determination of concentration of given KCl solution		
IV	**Transition temperature depression methods**	**12**	1-7
1	Determination of transition temperature of a salt hydrate.		
	Determination of Kt of salt hydrate		
2	Determination molar mass of a solute using transition point depression method		
V	**Kinetics**	**4**	1-7
	Kinetics of hydrolysis of an ester (methyl acetate/ ethyl acetate)		
VI	**Surface tension**	**4**	1-7
1	Determination of Surface tension of any three liquids		
2	Surface tension of binary mixtures and determination of concentration of an unknown mixture		
VII	**Viscosity**	**4**	1-7
1	Determination of viscosity of any three liquids		
2	Viscosity of binary mixtures and determination of concentration of an unknown mixture		
VIII	**Refractice index experiments**	**4**	1-7
1	Determination of refractive indices of any three liquids		
2	Refractive indices of KCl solutions of different concentrations and determination of concentration of unknown KCl solution		
IX	**Heat of neutralization**	**4**	1-7

	Determination of water equivalent of Calorimeter and heat of neutralization of strong acid and strong base		
X	**Partition experiments**	**8**	1-7
	Partition coefficient of iodine between CCl_4 and H_2O or Partition coefficient of ammonia between $CHCl_3$ and H_2O		

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards

LAB COURSE IV ORGANIC CHEMISTRY EXPERIMENTS

(ESE at VI Semester)

Time 3Hrs **Marks 80**

Semester	VI
Course	Core Course-XIII, Lab Course IV
Course name	**ORGANIC CHEMISTRY EXPERIMENTS**
Course Code	CH1644
Credit	3
Hours	5 hours/week (90 Hrs)
Lecture-Tutorial-Lab	0-0-5

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Develop curiosity in systematically analyzing organic compounds	A	PSO1
2	Differentiate and identify organic compounds by their characteristic reactions towards standard reagents	U	PSO10
3	Confirm their findings by preparing solid derivatives, and thus understand reliability of experimental results	A	PSO2
4	Determine physical constants of organic compounds	A	PSO3

5	Separate organic compounds by TLC/paper/column chromatographic techniques	A	PSO3
6	Prepare soaps	A	PSO18
7	Apply the principles and techniques in organic chemistry, thereby developing skill in designing an experiment to synthesize and purify organic compounds	A	PSO18
8	Practice systematic scientific procedure and prepare adequate report of them	A	PSO16
9	Understand the chemistry behind organic reactions	A	PSO10

MODULE	COURSE DESCRIPTION	Hrs	CO No.
I	**Detection of Elements**	**3**	
	Lassaign's test for Nitrogen, Sulphur and Halogen		
II	**Solubility Tests**	**5**	2
1	Classification of compounds into water soluble/insoluble		
2	Classification of compounds into ether soluble/insoluble		
3	Solubility in Na_2CO_3		
4	Solubility in NaOH		
5	Solubility in HCl		
III	**Tests for Aliphatic and Aromatic compounds**	**2**	2
	(i)Ignition test (ii)Nitration test		
IV	**Tests for saturated and unsaturated compounds**	**2**	2
	(i)Oxidation (ii) Bromination		
V	**Tests to distinguish between following compounds**	**6**	2
1	monocarboxylic acid and dicarboxylic acid		
2	primary,secondary and tertiary amines		
3	monoamide and diamide		
4	aldehyde and ketone		
5	reducing and non reducing sugars		
6	monohydric phenols and dihydric phenols		
VI	**Reactions of common functional groups using known organic compounds**.	**6**	6
VII	**Systematic qualitative analysis with a view to characterization of the following functional groups**	**30**	6

1	Halo compounds :chlorobenzene, benzyl chloride,		
2	Phenols: phenol, *o* ,*m* ,*p* -cresols, naphthols, resorcinol		
3	Aldehydes and ketones: benzaldehyde, acetophenone, benzophenone		
4	Carboxylic acids: benzoic, phthalic, cinnamic and salicylic acids		
5	Esters: ethyl benzoate, methyl salicylate		
6	Amides: benzamide, urea		
7	Anilines: aniline, *o,m, p* - toluidines, dimethylaniline		
8	Nitro compounds: nitrobenzene, *o*- & *p*- nitro toluene		
9	Poly nuclear hydrocarbons: naphthalene, anthracene		
10	Reducing and non reducing sugars: glucose and sucrose		
VIII	**Preparation of Organic Compounds.**	**16**	5&6
1	Halogenation :Bromination of acetanilide		
2	Nitration of Acetanilide or nitrobenzene		
3	Oxidation of benzaldehyde/Toluene/Benzyl chloride		
4	Acetylation of salicylic acid or aniline Benzoylation of phenol or aniline		
5	Hydrolysis of ethyl acetate and benzamide		
IX	***Preparation of Soap**		
X	**Chromatography**	**10**	4
1.	**TLC of simple organic compounds (using TLC sheets)		
2	*Paper chromatographic separation of mixture of inks and sugars		
3	*Column chromatographic separation of a mixture of dyes		
XI	***Organic estimations**	**4**	8
1	Estimation of phenol		
2	Estimation of Aniline		
XII	**Determination of physical constants	**3**	3
XIII	Steam distillation –Extraction of essential oil from citrus fruits/eucalyptus leaves (NOT FOR ESE)	**3**	4

** **Experiments under X or XII are compulsory but only one is expected for a batch.**

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME
2020 Admission onwards
SEMSTER VI Core Course-XIV

LAB COURSE V GRAVIMETRIC EXPERIMENTS

(ESE at VI Semester)

Semester	VI
Course	Core Course-XIV, Lab Course V
Course name	GRAVIMETRIC EXPERIMENTS
Course Code	CH1645
Credit	2
Hours	4 hours/week (72Hrs)
Lecture-Tutorial-Lab	0-0-4

CO No.	COURSE OUTCOME *Upon completion of this course, the students*	Cognitive Level	PSO No.
1	Understand precipitation techniques in quantitative context	U	PSO1
2	Appreciate the application of silica crucible and sintered crucible in gravimetry	A	PSO2 PSO8
3	Practice technique of making, diluting solutions on quantitative basis	A	PSO1
4	Realise the factors affecting precipitation/crystallisation	A	PSO1
5	Take precautionary measures in filtration , drying and incineration of precipitates	U	PSO3
6	Understand the principle of colorimetry to estimate Fe^{3+} and ammonia	A	PSO1& PSO2
7	Practice Punctuality and regularity in doing experiments and submitting Lab records	A	PSO18

MODULE	COURSE DESCRIPTION	Hrs	CO No.
I	**Precipitation and Filtration Techniques**	**10**	1,2
1	True solution , Colloids, Precipitates		
2	Saturated and super saturated solutions		
3	Solubility product and common ion effect		
4	Precipitating agents		

5	Co-precipitation and post precipitation		
6	Washing of precipitate based on principle of solvent extraction		
7	Filtration using Whatmann Filter paper		
8	Desiccating agents and use of desiccators and vacuum desiccators		
9	Incineration in silica crucible		
10	Use of sintered crucible and its advantages and limitations		
II	**Gravimetric Estimations**		
A	**Estimations using silica crucible**	**30**	1,2
1	Estimation of water of crystallization in hydrated Barium chloride		
2	Estimation of Barium as Barium sulphate		
3	Estimation of sulphate as Barium sulphate		
4	Estimation Iron as Fe_2O_3		
5	Estimation Calcium as $CaCO_3$		
6	Estimation Aluminium as Al_2O_3		
7	Estimation Magnesium as $Mg_2P_2O_7$		
B	**Estimations using sintered crucible**	**20**	1,2
1	Magnesium as oxinate		
2	Nickel as nickel dimethyl glyoximate		
3	Copper as copper thiocyanate		
4	Silver as silver chloride		
II	**Colorimetry**	**12**	3
1	Determination of Fe^{3+} using thiocyanate		
2	Determination of ammonia using Nessler's reagent.		

Textbooks

1. A.I.Vogel, "A text book of Qualitative Analysis including semi micro methods" Longmans.
2. V.V.Ramanujam, "Semi micro Qualitative Analysis"
3. E.S.Gilreath "Qualitative Analysis using semi micro method" Mc Graw Hill
4. A.I.Vogel, "A text book of Qualitative Inorganic Analysis" Longmans
5. A.I.Vogel, "Elementary Practical Organic Chemistry" Longmans
6. J B Yadav,Advanced Practical Physical Chemistry, Goel ,Publishing House

For Further Reading

1. Day and Raman, "Laboratory Manual of Organic Chemistry".
2. B.Viswanathan and P.S Raghavan , "Practical Physical Chemistry" 2005 Edn. Viva Books (Pvt.Ltd)
3. F.G Mann and B.C Saunders, "Practical Organic Chemistry" 4th Edn, Orient Longmann
4. A.Findlay, "Practical Physical Chemistry" Creative Media
5. R.C.Das and E.Behara, "Experimental Physical Chemistry", Tata Mc Graw Hill
6. N.K.,Vishnu, "Advanced practical organic chemistry" Vikas publishing house, New Delhi

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards

Semester	V-VI
Course	**PROJECT COURSE**
Course name	**PROJECT**
Course Code	**CH1646**
Credit	4
Marks	100 (No CE marks)
Lecture-Tutorial-Lab	0-0-2

CO No.	**COURSE OUTCOME** *Upon completion of this course, the students*	**Cognitive Level**	**PSO No.**
1	Develop an aptitude for research in chemistry	U,A	PSO1
2	Practice research methodology and literature search	A	
3	Critically choose appropriate research topic and presentation	A	PSO2 PSO8

GUIDELINES FOR PROJECT COURSE (Course Code CH1646)

- The board of examiners can decide the scheme of evaluation of project , study tour report and viva voce
- Topics of chemical interest can be selected for the project. Project is to be done by a group not exceeding 5 students on approval by the teacher in charge.
- Every student should submit typed (A4 paper, 12 Font, 1.5 Space, 20- 30 pages), spirally bind
  project report duly attested by the supervising teacher and the Head of the Department on the day of practical examination before a board of two Examiners for ESE.
- The viva-voce based on the project is conducted individually.
- Project topic once chosen shall not be repeated by any later batches of students.
- List of projects submitted year wise is to be maintained in a register and submitted before the examiners if necessary.

. .**The project report may contain the following sections**

1. Preliminary (Title page, declaration, certificate of the supervising teacher, content etc.)
2. Introduction with relevant literature review and objective
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion / Summary
7. References

STUDY TOUR AND FACTORY VISIT

Students are directed to

- Visit at least one chemical factory preferably with in the state of Kerala.
- Submit scientifically prepared hand written study tour report along with photographs of candidate at the places of visit for ESE on the day of the examination of project evaluation.

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

2020 Admission onwards
OPEN COURSE FOR OTHER MAJORS

Semester	V
Course	Open Course
Course name	**CHEMISTRY AND ITS APPLICATIONS**
Course Code	CH 1551.1
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	2-0-0

CO No.	COURSE OUTCOME *Upon completion of this course, students*	Cognitive level	PSO
1	Appreciate the history of evolution of science	U	PSO1
2	Develop curiosity and scientific attitude towards the application of chemistry in daily life	C	PSO1
3	Appraise the current development in Chemistry and contribution of chemistry for sustainable development	E	PSO1
4	Identify the common ingredients of house hold synthetic products	U	PSO 8
5	Classify chemicals according to their uses	U	PSO3
6	Critically choose cosmetics and cleansing agents for daily use	E	PSO15
7	Adopt safer and healthier life skills in harmony with nature	A	PSO21

MODULE	**COURSE DESCRIPTION (No Chemical structure required)**	**Hrs**	CO No.
1	**Evolution of Chemistry as a discipline of science**	**9**	1,2
1.1	Evolution of Chemistry - ancient speculations on the nature of matter, early form of chemistry-alchemy.	1	
1.2	Chemical revolution, Atomic and Molecular Theory	1	
1.3	Comparison of Rutherford's atom model with solar system	2	
1.4	Major contributions of Mendeleev, Michael Faraday and Marie Curie.	1	
1.5	Scope of Chemical Science, branches of Chemistry, Basic idea of interdisciplinary areas involving Chemistry	1	

2	**Chemistry for energy production**	**9**	3
2.1	Electrochemical cell-cathode and anode, Daniel cell, Dry cell	**2**	
2.2	Fuels: Definition and classification of fuels, characteristics of a good fuel, Combustion, calorific value, Wood, coal, Classification based on carbon content	2	
2.3	Petroleum, Origin, Petrol- Diesel, Flash point. Aviation fuels	2	
2.4	Natural gas, biogas, and LPG- composition Pollution due to burning of fossil fuels	2	
2.5	Solar energy and solar cells (applications only)	1	
3	**Vitamins , hormones, enzymes and nucleic acids**	**9**	2
3.1	Vitamins: Vitamin A, B_2, C, D, E and K source, function and deficiency diseases	3	
3.2	Hormones: Insulin and its function, Thyroid hormones, Iodine deficiency condition	2	
3.3	Enzymes: as Biological catalysts,– Role of enzymes in digestion of food	2	
3.4	Nucleic acids: RNA and DNA, Role of nucleic acids in life process (No structure or chemical reactions)	2	
4	**Chemistry in day today life**	**9**	3,7
4.1	**Food Chemistry**: Food additives, preservatives, anti oxidants, commonly used permitted and nonpermitted food colours -artificial sweeteners-taste enhancers Health effects of fast foods, instant foods, dehydrated foods and junk foods	2	
4.2	**Cosmetics**: talcum powder, lip sticks, nail polish, moisturiser Sun screen lotions and hair dye	2	
4.3	**Cleansing agents**: Soaps- Hard and soft soaps, alkali content-TFM, Detergents and Shampoos.	1	
4.5	**Plastics** : Thermo plastics and thermosetting plastics, Plastic identification codes, biodegradable plastics (PGA,PLA and PHBV) and their applications, Importance of Plastic recycling	2	
4.6	**Pharmaceuticals**: Drugs, classification into analgesics, antacids, antibiotics, antiseptics, disinfectants, anaesthetics, tranquilisers, narcotics and antidepressants-one example	2	
5	**Environmental Chemistry I**	**9**	**2,7**
5.1	Air pollution: Composition of air, major causes of air pollution, Pollutants in air-carbon monoxide, carbon dioxide, oxides of Nitrogen and sulphur , chlorofluro	2	

	carbons- effect of using refirigerators and air conditioners, Particulate matter- Acid rain, Green house effect, ozone layer and its depletion		
6	**Environmental Chemistry II**	**9**	2,7
6.1	Water pollution: causes- heat, industrial waste, sewage water, detergents, agricultural pollutants Treatment of industrial waste water- Activated charcoal, Reverse osmosis Quality of drinking water- Indian Standard and WHO standard- Dissolved oxygen- BOD , COD	6	
6.2	Soil pollution: pesticides, fertilizers, Industrial waste, Plastic.	3	

Reference

1.T F Giereyn, Cultural boundaries of science) University, Chikago Press, 1999
2 N C Dutta, The Story of Chemistry, University Press

3.MSR Winter, A Consumer's dictionary of cosmetic ingredients, 7th edition, Three Rivers Press, NewYork,2009
4.B K Sharma, Polymer chemistry, Goel Publishing House, Meerut, 1989
5. B K Sharma, Industrial chemistry, 11th edition, Goel Publishing House, Meerut, 2000
6.A K Day,"Environmental chemistry-An Introduction", New Age Publisher, 8th edition
7. B Srilakshmi, Food Science,5th edition, New Age Publishers, NewDelhi,2010
8. Organic Chemistry of Drug action and drug design-L B Silverman, Elsvier,
9. Medicinal Chemistry , An introduction, II nd edition Gareth Thomas, Wiley, India,2011

UNIVERSITY OF KERALA
Model Question Paper First Degree Programme
2020 Admission onwards
SEMESTER V Course Code CH1551.1
OPEN COURSE FOR OTHER MAJORS
CHEMISTRY AND ITS APPLICATION

SECTION A
Answer all questions in one word , each question carry one mark

1.Name any one interdisciplinary area of chemistry
2.Early form of chemistry is called--------
3.Enzymes are called biological ---------
4. Name the hormone produced byPancrease
5.Alkali content of soap is expressed as ------

6.PGA is a biodegradable plastic. State true or false
7 .Name the main constituent of LPG
8.White lead is a --------
9.Which among DNA and RNA determine heredity ?
10.Night blindness is caused by deficiency of
a)Vitamin A,b)Vitamin C,c)Vitamin.D,d)Vitamin K

SECTION B

Each Question carries 2 marks. Answer any 8 questions.

11.Give two examples each for enzymes and hormones.
12. How will you distinguish between hard and soft soaps?
13.What are nucleic acids? Give examples.
14.How does acid rain occurs?
15.Define calorific value of a fuel.
16.Suggest a natural way of harvesting solar energy. Explain.
17.How will you classify fuels?
18.Name two petroleum based fuels.
19.How do iodine deficiency affect human beings?
20.What is an electrochemical cell?
21.Name the electrodes in Daniel cell.
22. What is the cause of green house effect?

SECTION C

Each Question carries 4 marks. Answer any 6 questions.

23. Explain the source and hazards of fly ash and asbestos.
24. Explain briefly soil pollution.
25. Write a note on enzymes.
26. List four different types of drugs
27. Distinguish between antiseptics and disinfectants
28. What are the characteristic of a good fuel?
29. What are the functions and deficiency diseases of Vitamin C, Vitamin D ?.
30. Write a note on Enzymes.
31. Discuss on the health effects of fast food and junk food.

(4×6 = 24 marks)

SECTION D

Answer any two questions (15 marks each)

32. a) Discuss on the major contributions of Rutherford .
    b) Differentiate between cathode and anode. Identify the anode and cathode in Dry cell
    c) Chemistry is the central science of many other disciplines.Justify (5x3 = 15 marks)

33. a) Write a note on Dalton's atomic theory.
    b) How do Refrigerators cause air pollution? Explain.

c) Write a note on vitamin deficiency disease. (5x3 = 15 marks)

34. a) What are the 'Three R's of plastic control?
b) What is meant by DNA? Name the sugar unit present in DNA.
c) Write a note on Drugs. (5x3 = 15 marks)

35. a) Explain the cleansing action of soap.
b) What is antibiotic? Give the names of the first antibiotic and the scientist who discovered it.
c) Give an account of the green house effect. (5 x 3 =15 marks)

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UNIVERSITY OF KERALA

OPEN COURSE FOR OTHER MAJORS

SEMESTER-V CREDIT-2 COURSE CODE-CH1551.2

Semester	V
Course	Open Course
Course name	**FUNDAMENTALS OF CHEMISTRY AND ITS APPLICATION TO EVERYDAY LIFE**
Course Code	CH 1551.2
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	2-0-0

CO No.	**COURSE OUTCOME** *Upon completion of this course, students*	**Cognitive Level**	**PSO No.**
1	Appreciate the evolution of Science and Chemistry and the early form of chemistry	U	PSO1
2	Understand the dvelopement of Chemistry as a discipline and the role of chemistry as a central science	U	PSO1
3	Discuss the fundamental properties of atom, structure of atom, classification of elements in to a periodic table	U	PSO3
4	Differentiate between simple molecules and giant molecules and the bonding nature	U	PSO11
5	Explain different types of bonding and predict stability	U	PSO4

6	Compare properties of graphite and diamond and their structural differences	U	PSO4
7	Identify house hold chemicals, their advantages and disadvantages	U	PSO12
8	Become aware of chemical hazards and the precautions in handling chemicals	A	PSO12
9	Beware of food adulterants	A	PSO12 PSO21
10	Critically select chemical fertilizers,artificial sweeteners, beverages, and food preservatives	A	PSO21

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Evolution of Chemistry**	**9**	**2**
1.1	Evolution of Chemistry - ancient speculations on the nature of matter, early form of chemistry -alchemy	3	
1.2	Robert Boyle and the origins of modern chemistry in the latter 1600s - origin of modern chemistry - Antoine Lavoisier and the revolution in chemistry	3	
1.3	Role of Chemistry as a central science connecting Physics, Biology and other branches of science. Basic ideas of interdisciplinary areas involving Chemistry	3	
2	**Atomic structure**	**9**	**2**
2.1	Atom- model of Dalton- Thomson – Rutherford and Bohr	3	
2.2	Nature of electron proton and neutron – atomic number – mass number- isotopes -state the relative charges and approximate relative masses of a proton, a neutron and an electron	3	
2.3	Description with the aid of diagrams, the structure of simple atoms as containing protons and neutrons (nucleons) in the nucleus and electrons arranged in shells (energy levels-K,L,M etc) (mention only of s, p, d and f orbitals)	3	
3	**Periodic table**	**9**	**2**
3.1	The Periodic Table - Periodic trends, Group properties - describe the relationship between group number and the ionic charge of an element-	3	
3.2	similarities among the elements in the same group - metallic to non-metallic character from left to right across a period of the Period Table	2	
3.3	Classification into s,p,d, and f block- General Properties of elements in Group I and XVIII using the Periodic	4	

	Table, metals, nonmetals, metalloids and inert gases		
4	**Structure and properties of materials**	**9**	**5**
4.1	Elements, compounds and mixtures – elementary idea of ionic bond and covalent bond	2	
4.2	Compare the structure of simple molecular substances, e.g. methane; water, carbon dioxide, iodine, with those of giant molecular substances, e.g. poly(ethene); sand (silicon dioxide);	4	
4.3	Diamond and graphite in order to deduce their properties compa the bonding structures of diamond – graphite, electrical conductivity	3	
5	**Chemicals used in everyday life.**	**9**	**8**
5.1	Household materials – Major chemical ingredients (No structural formula and preparation needed), : Match Box- Soap- detergent— cooking gas – tooth paste – shampoo- hair dye- nail polish- whitener-moth balls, house hold bleach	4	
5.2	method of action and possible hazards/toxicity of	3	
5.3	Explosive chemicals, propellants –fire crackers.	2	
6	**Chemicals in food and beverages**	**9**	**9**
6.1	Important chemical ingredients/ taste makers used in packed food - soft drinks - and its health hazards ,Chemicals in food production	3	
6.2	fertilizers used in natural sources - Fertilizers urea, NPK and Super phosphates - uses and hazards.	2	
6.3	Adulterants in milk, ghee, oil, coffee powder, tea, asafoetida, chilli powder, pulses and turmeric powder - identification	2	
6.4	artificial sweeteners - food preservatives	2	

UNIVERSITY OF KERALA

Model Question Paper First Degree Programme

2020 Admission onwards

SEMESTER V Course Code CH1551.2 Credit 2

OPEN COURSE FOR OTHER MAJORS

FUNDAMENTALS OF CHEMISTRY & ITS APPLICATION TO EVERYDAY LIFE

Time: Three Hours **Maximum Marks : 80**

SECTION A

(Answer in a word / sentence) Answer all questions

1. Name the early form of chemistry
2. Who is the father of modern chemistry?

3. What is superphosphate?
4. ^{1}H , ^{2}H and ^{3}H are called --------of hydrogen
5. Diamond is chemically ----(carbon, gold, Silicon, glass)
6. What is main constituent of LPG ?
7. Mercury is a liquid ----(metal, nonmetal, metalloid, none of the above)
8. Silica is the chemical name of (sand, soap,silver, carbon)
9. Artificial sweeteners and ------- ---- are common in junk food.
10. What is periodicity?

SECTION B

Each question carries 2 marks (Short answer type).
Answer any eight questions .

11. Name any two Toxic Chemicals in Cosmetics
12. Obtain the electron configuration for (a) N; (b) F.
13. Explain Hund's rule of maximum multiplicity with an example.
14. Define electron affinity, explain with an example.
15. Which of the following elements Li, Be, B, C, N, O, F and Ne are metals?
16. Explain Bohr model of atom.
17. Why is the electronegativity value of most noble gases equal to zero?
18. What are the Health Effects of Drinking Soda?
19. Which do you expect to have more metallic character, Lead (Pb) or Tin (Sn)
20. What is a Match Head of match stick made of?
21. Explain why graphite conducts electricity whereas diamond doesn't.
22. Is the reactivity of group I metals increasing or decreasing down the group? Explain why?

(2×8 = 1

SECTION C

Each question carries **4 marks** (Short essay type)
Answer any six **questions**

23. Explain the colour of firecrackers.
24. What is the difference between covalent and ionic bonding?
25. What are periods and groups in the periodic table? What is periodicity?
26. What are adulterants.
27. How is Thomson's model of the atom different from Dalton's model of atom?
28. What's the difference between an oxidation number and an ionic charge?
29. Explain the health hazards associated with drinking soft drinks?

30. How can metallic character change across a period?

31. Describe clearly the link between increasing effective nuclear charge across a period and the changes in van der Waals radius.

SECTION D

Each question carries 15 marks (essay type) Answer any two questions.

32. a.Explain about the pH changes of aqueous solutions of elements in the third period as the period is crossed.
b. Explain how these changes are directly related to the changes in effective nuclear charge across the period.
c. Describe the metallic character of elements in a period. (5x3 marks)

33. a.Explain the role of some chemicals in household items. (8 marks)
b.Write a short note on food adultration. (7 marks)

34. a.Write a short note on the uses and hazards of fertilisers. (8 marks)
b.Draw the structure of carbon and sodium (shell model) (7 marks)

35. a. Draw the structures showing shapes of methane, water and carbon dioxide (8 marks)
b.compare the bonding structures of diamond – graphite. (7marks)

UNIVERSITY OF KERALA

OPEN COURSE FOR OTHER MAJORS

2020 Adimission onwards

Semester	V
Course	Open Course
Course name	**ENVIRONMENTAL CHEMISTRY**
Course Code	CH 1551.3
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	2-0-0

CO No.	**COURSE OUTCOME** *Upon completion of this course, students*	**Cognitive Level**	**PSO No.**
1	Discuss the structure and composition of the atmosphere	U	PSO14
2	Identify,Realise and enlist the causes of pollution to water, soil and air	U	PSO14
3	Become aware of environmental issues and its effect to man and other living beings	U	PSO12
4	Review major environmental disasters and suggest controlling and preventive measures	U	PSO12
5	Discuss the laws of environmental protection	U	PSO21

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Environmental Components** Structure and composition of the, Atmosphere, hydrosphere, biosphere and Lithosphere – composition of atmosphere	9	1,2,3
2	**Water pollution** Sources, its effect and control; Sampling and measurement of water quality and their analysis, water quality standards, BOD and COD Hard water – soft water Eutrophication and restoration of lakes.	9	1,2,3
3	**Air Pollution** Types and sources of air pollution, Common Air Pollutants - Effects of air pollution; Smog – ozone layer depletion green house effect – acid rain	9	1,2,3
4	**Soil Pollution** Sources, types, effects and control of: Land pollution, Marine pollution, Thermal Pollution and Radioactive pollution. Waste separation, storage and disposal ; Waste Reduction, Recycling and Recovery of materials.Plastics and their misuses.	9	1,2,3
5	**Major environmental disasters** Major environmental disasters - mercury poisoning in Minamata, Japan, Itaiitai disease due to cadmium poisoning in Japan - Love Canal toxic waste site, Seveso disaster chemical plant explosion - Bhopal disaster - Chernobyl incident	9	4
6	**Major environmental laws:** Environment (Protection Act) – The Air (Prevention and control of pollution) Act – The water (Prevention and control of pollution) Act – The wild life protection Act – Forest conservation Act – The Ozone Depleting Substances (Regulation and Control) Rules – The Plastic Waste (Management and Handling) Rules - Rio declaration- Montreal protocol, Kyoto protocol Introduction to Green chemistry (elementary ideas only)	9	5

Reference

1. Banerji, K Sameer"Environmental Chemistry", ISBN - 9788120315761.
2. K. De "Environmental Chemistry - An introduction" New Age International (P)Ltd.,2017
3. B. K. Sharma "Air Pollution", Goel Publishing House
4. V. K. Ahluwalia "Environmental Chemistry", books.google.co.in, 2017
5. G.W. vanLoon and S. J. Duffy "Environmental Chemistry: A Global Perspective"
6. S.K.Mohanty, Environment and Pollution Laws, Universal Law Publishing Co. (P)Ltd

UNIVERSITY OF KERALA
Model Question Paper for
B.Sc Chemistry Programme
OPEN COURSE FOR OTHER MAJORS
Semester V Course Code CH1551.3 Credit -2
ENVIRONMENTAL CHEMISTRY

Time: 3 hours
Marks: 80

SECTION A

Answer all questions (Each question carries 1 mark)

1. What you meant by Triple R in waste management ?.
2. What type of pollution causes acid rain?
3. What are the misuses of plastics?
4. What are the three major man made sources of air pollution?
5. What kind of materials are discharged into the seas?
6. What increases the amount of carbon dioxide in the atmosphere?
7. Explain the action of zeolites on hard water.
8. What are freons?
9. Define pollution
10. What is fly ash?

SECTION B

(short answer type) (Answer any 8 questions, Each answer carries 2 mark)

11. How is pollution related to acid rain?
12. How does ocean pollution affect sea animals?
13. What are the main concepts of Green Chemistry
14. Write short note on Radioactive pollution
15. Discuss the major composition of earth's atmosphere 16. Write about the cause and consequence of Chernobyl incident
17. What is BOD and COD?
18. What causes radioactive pollution?
19. Distinguish between Hard water and soft water.
20. What is the goal of Forest Conservation Act?
21. What is the Greenhouse effect and what is its cause? 22. What are the types of air pollutants ? **(2×8 = 16)**

SECTION C

(Short essay type) each question carries **4**marks. Answer **any**

23. Write short note on volatile organic compounds.
24. How can thermal pollution be prevented?
25. How do you control Radioactive pollution?
26. What is smog? How does smog arise?
27. What is Eutrophication
28. Write a note on Rio-Declaration.
29. Explain the various layers of the Atmosphere
30. What is Air Pollution? How can air pollution be minimized?
31. Briefly explain about the components of atmosphere.

SECTION D

Answer **any 2** from the following. Each question carries **15** marks

32. (a) Explain Hardness of water and the different types. (5 marks)
    (b) Discuss about the various sources of water pollution. (5 marks)
    (c) What are the control measures for water pollution ? . (5 marks)
33. (a) Write short note on causes and problems of ozone layer depletion?
    (b) Explain the various types of smog.
    (c) Discuss the Ozone Depleting Substances (Regulation and Control) Rules
34. (a) Explain thermal pollution
    (b) Discuss about plastics and their misuses
    (c) Discuss about Chernobyl disasters
35. (a) Discuss about green chemistry
    (b) Explain Montreal protocol and Kyoto protocol
    (c) The water (Prevention and control of pollution) Act (15 × **2= 30)**

UNIVERSITY OF KRALA

SYLLABUS FOR B.Sc. CHEMISTRY

FIRST DEGREE PROGRAMME

2020 Admission Onwards

ELECTIVE COURSES

Semester	V1
Course	Elective Course
Course name	**SUPRAMOLECULAR, NANO PARTICLES AND GREEN CHEMISTRY**
Course Code	**CH1651.1**
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	2-0-0

CO No.	**COURSE OUTCOME** *Upon completion of this course, students*	**Cognitive Level**	**PSO No.**
1	Become aware of pollution caused by industries	U	PSO13
2	Recognise the necessity of green approaches to protect nature	R	PSO14
3	Discuss about sustainable development and logical use of natural resourses	U	PSO14
4	Motivated to more ecofriendly life style	A	PSO21
5	Realises the importance of microscsale approaches and nano material research	U	PSO13 PSO21

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Green Chemistry-I**	**9**	**1-5**
1.1	Role of Chemical Industries in polluting the environment	1	
1.2	Limitations of conventional waste management and pollution prevention-birth of green chemistry	2	
1.3	introduction to the principles of green chemistry-atom economy calculation(simple reactions)	2	
1.4	-production of Ibuprofen-less hazardous chemical syntheses, designing safer chemicals	2	
1.5	Bhopal gas tragedy- new greener syntheses, safer solvents and auxiliaries ionic liquids-super critical fluids CO2 and H2O, advantages of SCFs	2	
2	**Green Chemistry-II**	**9**	**1-5**
2.1	Design for energy efficiency-principle of microwave oven, microwave assisted organic syntheses, simple examples-	2	
2.2	renewable feedstock- biodiesel, preparation, advantages	2	
2.3	catalysis, green catalysts- inherently safer chemistry for accident prevention	2	
2.4	Green chemistry practices in research, educational and commercial laboratories- lab safety signs-introduction to micro scale experiments.	1	
3	**Chemistry of Nano Materials - I**	**9**	**2**
3.1	Classifications of nanostructured materials, nano particles; quantum dots, nanowires, ultra – thinfilms multilayered materials.	2	
3.2	Synthesis of nanometre scale particles of colloidal semiconductors such as TiO2, CdS, ZnO, BaTiO3, by wet chemical methods, hydrothermal methods, and pyrolytic or high temperature methods.	2	
3.3	Carbon nanotubes fullerenes and graphene.	2	
	Synthesis and purification of carbon nanotubes, Singlewalled carbon nanotubes and multiwalled carbon nanotubes, Structure-property relationships.	3	
4	**Chemistry of Nano materials - II**	**9**	**2**
4.1	Preparation of self-assembled monolayers, core shell nanoparticles and quantum dots.	2	
4.2	Properties of nanoparticles: optical, magnetic, mechanical, thermal and catalytic properties,	2	
4.3	characterisation of nano particles by AFM, STM and	2	

	SEM. Applications of nanomaterials:		

4.3	Characterisation of nano particles by AFM, STM and SEM. Applications of nanomaterials:	2	
4.4	Potential uses of nanomaterials in electronics, robotics, computers, sensors, mobile electronic devices, vehicles and transportation. Medical applications of nanomaterials	3	
5	**Molecular recognition**	**9**	**5**
5.1	The concepts of molecular recognition, host, guest and receptor systems.	**3**	
5.2	Forces involved in molecular recognition.	**3**	
5.3	Hydrogen bonding, ionic bonding, p-stacking, vander Waal's and hydrophobic interactions.	**3**	
6	**Supramolecularchemistry**	**9**	5
6.1	Introduction to molecular receptors-design principles	**2**	
6.2	Tweezers, Cryptands and Carcerands, Cyclophanes, Cyclodextrins and Calixarenes	**2**	
6.3	Typical examples Molecular recognition and catalysis-catalysis by cation receptors, anion receptors and cyclophanes	**3**	
6.4	Molecular recognition in DNA and protein structure	**2**	

References

1. Anastas. P.T.; Warner, J.C.,"Green Chemistry; Theory and Practice", Oxford University Press; Oxford , U.K.,1998.

2. Lancaster,M,"Green Chemistry; An Introductory Text",Royal Society of Chemistry; Cambridge,U K, 2003

3. Rashmi Sanghi and M.M Srivasthava, "Green Chemistry Environment Friendly Alternatives", Narosa Publishing House,2006

4. T.Pradeep, "NANO: The Essentials", 'McGraw-Hill Education'.
5. D. Nasipuri "Stereochemistry of Organic Compounds", Wiley
6. J M Lehn, "Supramolecular Chemistry", V C H.
7. H Vogtle, "Supramolecular Chemistry", W iley.
8. P S Kalsi, J P Kalsi,"Bioorganic, Bioinorganic and supramolecular Chemistry", New Age International

UNIVERSITY OF KERALA
Model Question Paper B.Sc Chemistry Programme
2020 Admission Onwards
SEMESTER VI Course Code CH1651.1 Credit 2
ELECTIVE COURSE
SUPRAMOLECULAR, NANO
PARTICLES AND GREEN CHEMISTRY

Time: 3 Hours **Maximum marks : 80**

SECTION A

Answer all questions. Each question carries 1 mark.

1. Define atom economy.
2. Write an example of green catalyst.
3. Between an addition and elimination reaction which is having a better atom economy?
4. Name a colloidal semiconductor.
5. Expand SAMS.
6. What is graphene?
7. Name the different allotropes of carbon.
8 . Name any two molecular receptors.
9. What are cryptands?
10. Define π stacking.

SECTION B

Answer any eight questions. Each question carries 2 marks.

11. Write a note on Bhopal Tragedy.
12. Define Carbon efficiency.
13. Explain the limitations of conventional waste management.
14. Give any four lab safety signs with its meaning.
15.Write about the wet method of preparing colloidal semiconductors.
16.What are the magnetic properties of nanoparticles.
17. Briefly describe the catalytic properties of nano materials.
18. Explain the different types of SWCNTs.
19. What are the non-covalent bonds involved in molecular recognition?
20. Define host and guest in supramolecular chemistry.
21. Write a note on Cyclodextrins.
22. What are molecular tweezers?

SECTION C

Answer any six questions. Each question carries 4 marks.

23. What are secondary electrons?
24. Write a note on safer solvents and auxiliaries.
25. Explain ionic liquids.
26. Write a note on biodiesel.
27. Describe the synthesis of quantum dots and mention its optical properties.
28. Explain the preperation of SAMs.
29 Discuss the potential applications of nanomaterials in computers, sensors, and Medical

applications.
30. Discuss the various aspects of molecular recognition involved in the structure of DNA.
31 Write notes on cation and anion receptors.

SECTION D

Answer any two questions. Each question carries 15 marks.

32. (a)Explain the twelve principles of green chemistry. (10marks)
(b) Explain microwave assisted organic syntheses with an example. (5marks)
33. (a) Explain the principle and working of SEM
(b) Write a note on synthesis and purification of carbon nanotubes.
34. Write short notes on (a) calixarenes (b) Cyclodextrins (c) cyclophanes.
35. Write short notes on(a) molecular recognition(b) preparation biodiesel(c)non bonded interactions.

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME

SEMESTER V1 **COURSE CODE CH1651.2**
ELECTIVE COURSE
COMPUTATIONAL, COMBINATORIAL AND PHYSICAL ORGANIC CHEMISTRY

Semester	V1
Course	Elective Course
Course name	**COMPUTATIONAL, COMBINATORIAL AND PHYSICAL ORGANIC CHEMISTRY**
Course Code	**CH1651.2**
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	2-0-0

CO No.	COURSE OUTCOME *Upon completion of this course, students*	Cognitive Level	PSO No.
1	Understand the use of Chemistry related softwares	U	PSO5
2	Discuss computational methods and combinatorial synthesis	U	PSO5
3	Classify reaction mechanism with suitable examples	U	PSO10
4	Understand the role of Thermodynamic functions in the study of Kinetics	U	PSO11
5	Correlate structure with reactivity	A	PSO11

MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Introduction to Computational Chemistry**	**9**	**1**
1.1	Web resources in chemistry learning,	1	
1.2	Introduction to structure drawing, spread sheet and chemistry related softwares.	2	
1.3	Approximate methods in Quantum mechanics- Many electron atoms: Self consistent field method. Chemical bonding:	3	
1.4	Perturbation theory and variational principle. MO theory of hydrogen molecule ion. VB theory of hydrogen. Concept of resonance.	3	
2	**Computational Methods**	**9**	**1,2**
2.1	Brief description of computational methods: ab initio, semi empirical, DFT and molecular mechanics.	2	
2.2	RHF, ROHF &UHF methods Basis sets, STO &GTO	2	
2.3	Z-matrix of simple molecules H2O, CO2 & NH3	3	
2.4	Common computational and visualization softwares	2	
3	**Combinatorial Chemistry Introduction**	**9**	**2**
3.1	Early development, what is combinatorial synthesis, library synthesis on resin beads,	3	
3.2	solid phase chemistry, Merrifield peptide synthesis, support for solid phase synthesis,	3	
3.3	parallel synthesis and mix and split library synthesis.	3	
4	**Combinatorial Synthesis**	**9**	**2**
4.1	Libraries on multipins, libraries on wicks, libraries on		

	laminar solid phases (no detail study).		
4.2	Solution phase library synthesis- eg.-, Hantzsch synthesis of aminothiazole, peptide and nonpeptide libraries(eg. only),.		
4.3	Applications of combinatorial chemistry in drug discovery		
5	**Introduction to Physical organic chemistry**	**9**	**3-5**
5.1	Classification of mechanism with suitable examples. Bond breaking mode – Heterolytic, Homolytic and Pericyclic Nature of reaction –	2	
5.2	Substitution, Elimination, Addition, Pericyclic and Rearrangement reactions. Nature of reagent – Nucleophilic, Electrophilic and Free radical.	2	
5.3	Thermodynamic and Kinetic control of reaction. The Hammond postulate (qualitative treatment). The thermodynamic functions – ΔH, ΔS and ΔG and their determination from Arrhenius equation. Role of above thermodynamic functions in mechanistic probe of reactions.	3	
5.4	Methods of determining mechanism, Identification of products, Detection of intermediates, Catalytic study, Isotopic labeling, Stereochemical evidence, Kinetic evidence	2	
6	**Correlation of structure with reactivity**	**9**	**3-5**
6.1	The effect of substrate structure – Differences in mechanism for primary, secondary and tertiary systems.	2	
6.2	The effect of a and ß substitution – the +I and –I effects (Inductive effects of electron releasing and electron withdrawing groups at a and ß positions).	1	
6.3	Substitution of mono and bicyclic (at a and ß positions) aromatic rings (Resonance effects). Hyperconjugate effects.	2	
6.4	Neighbouring group effect nonclassical bridge head	2	
6.5	Steric effects – B-strain, Strain in aliphatic cyclic systems. Steric inhibition of resonance – ortho effect and a-effect, The Hammett equations	2	

References :

1. Guy H. Grant and W.Graham Richards, “Computational Chemistry”, OCP(29) 2. Christopher J. Cramer, John Wiley,“Essentials of Computational Chemistry”,
3. Frank Jenson, “Computational Chemistry”.
4. Ira N. Levine,“ Quantum Chemistry”.
5. David Young, “Computational Chemistry A Practical Guide for Applying

Techniques to Real World Problems", Wiley Interscience.

6. N K Turret, "Combinatorial Chemistry", (Oxford Publication)
7. Jerry March "Advanced Organic chemistry", 3rd edition, Wiely International (Indian edn New Delhi) Chapter 6 and 10
8. P S Kalsi," Text of organic Chemistry", Mac million India ltd 1999 Ch 2
9. M K Jain and S C Sharma," Modern Organic Chemistry" , Vishal Publishing Co, 2004, Chapter 3,4, 15

UNIVERSITY OF KERALA
Model Question Paper of BSc Chemistry Programme
2020 Admission onwards
SEMESTER VI - Course Code CH1651 .2 Credit 2
ELECTIVE COURSE

COMPUTATIONAL, COMBINATORIAL AND PHYSICAL ORGANIC CHEMISTRY

Time: 3 Hours **Marks : 80**

SECTION A

Answer all questions.
Each question carries 1 mark.

1. Write Arrhenius expression and explain the terms.
2. What is RHF?
3. What are nucleophilic reagents? Give examples.
4. Name any two structure drawing softwares.
5. Write Hammett equation.
6. Give one example solution phase library synthesis.
7. Write any two examples for polyamide resin.
8. Propene is more stable than ethane. Why?
9. What is combinatorial synthesis?
10. Write any two examples for heterolytic bond breaking reaction.

1 X 10 = 10 Mark

SECTION B

Answer any eight questions from the following. Each question carries 2 marks.

11. What are the web resources in learning Chemistry?
12. What is a basis set ?
13. What are the major mechanisms of organic reactions ?
14. Distinguish between STO & GTO.
15. Explain the advantages of combinatorial synthesis.

16. What is meant by electrocyclic reaction. Give one example.
17. What are the applications of combinatorial synthesis.
18. What are multipins used in combinatorial synthesis
19. Explain kinetic requirements of reaction.
20. Explain Hammond postulate.
21. Explain +I and – I effects.
22. Explain isotopic labeling in the study of organic reactions. **2× 8 = 16**

SECTION C

Answer any six questions from the following. Each question carries 4 marks.

23. Draw the Z matrix of H2O & NH3
24. Why SEM is called parametrisation method
25. How can a eight – member dipeptide library is synthesized ?
26. Explain non-peptide libraries.
27. How are the intermediates detected?
28. Explain substitution reactions of naphthalene.
29. Explain the effect of leaving group in aliphatic substitution reactions.
30. What is self consistent field method.
31. Explain mix and split library synthesis. **6 X 4 = 24 Marks**

SECTION D

Answer any two questions from the following. Each question carries

32. (a)Explain MO theory of hydrogen molecule ion.
(b)Explain VB theory of hydrogen .
10 + 5 = 15 Marks
33. (a)Explain neighboring group participation with examples.
(b)Explain sterric effects and B-strain. 7.5 + 7.5 = 15 Marks

34. (a) How does the structure of substrate affect the aliphatic nucleophilic substitution?
(b) Comment on the effect of substituent on nucleophilic substitution reaction.
7.5 + 7.5 = 15 Marks

35. (a) Write a brief description of methods(a) ab initio(b)DFT (c) molecular mechanics.

5+ 5+ 5 = 15 Marks

UNIVERSITY OF KRALA
SYLLABUS FOR B.Sc. CHEMISTRY
FIRST DEGREE PROGRAMME
2020 Admission onwards

Semester	V1
Course	Elective Course
Course name	**POLYMER CHEMISTRY**
Course Code	**CH1651.3**
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	2-0-0

CO No.	**COURSE OUTCOME** *Upon completion of this course, students*	**Cognitive Level**	**PSO No.**
1	Differentiate between Natural and synthetic polymers	U	PSO14
2	Understand polymerization process of monomeric units	U	PSO12
3	Critically analyse the advantages and disadvantages of polymers	A	PSO12
4	Analyse different Applications of Polymers	A	PSO4
5	Identify the properties of polymers.	U	PSO11
6	Realize the necessity of biodegradable substitutes for a sustainable development	U,A	PSO12 PSO12

MODULE	**COURSE DESCRIPTION**	**Hrs**	**CO No.**
1	**Introduction to polymers**	**9**	**1**
1.1	Brief history of macromolecular science, general characteristics of polymers in comparison with common organic compounds.	2	
1.2	Nomenclatures. Distinction between plastics, elastomers and fibres. Natural polymers- cellulose, silk, gums and resin.	2	
1.3	Types of polymers- thermoplastics and thermosettings, functionality concept. Concept of cross linked polymers.	2	
1.4	Types of polymerization- addition, condensation, ionic, co-ordination. Addition – polymerisation – mechanism,	3	

	initiation , propagation and termination processes, initiators, inhibitors. Mechanism of ionic polymerization		
2	**Methods of polymerization**	**9**	**2**
2.1	Methods of polymerization-bulk, suspension, emulsion, solution necessity of copolymers and copolymerization, blocks and graft copolymers.	2	
2.2	Thermosetting polymers-examples, synthesis, chemistry, properties and applications of phenol- formaldehyde resins	2	
2.3	synthesis, chemistry, properties and applications of amino resins, urea-formaldehyde and melamine-formaldehyde resins	2	
2.4	synthesis, chemistry, properties and applications of polyurethanes epoxy resins- grades of epoxy resins, curing process and its importance with mechanism , poly carbonates, silicones	3	
3	**Elastomers-I**	**9**	**5**
3.1	thermoplastic polymers, Polyisoprene, polybutadiene, neoprene.	2	
3.2	synthesis, chemistry, properties and applications of Polyolefins, polyethylenes_HDPE, LDP,LLDP,	4	
3.3	synthesis, chemistry, properties and applications of polyvinyl chloride-grades of PVC, Teflon, Polystyrene-homopolymers, copolymers such as SBR, ABS, SAN.	3	
4	**Elastomers 2** .	**9**	**2**
4.1	Vinyl polymers- polyvinyl acetate and its modifications like PVA, PVB and polyacetals	3	
4.2	Polyamides - nylon -6, nylon-66 and other nylons.	2	
4.3	Poly ethers and poly esters, terephthalates. Cellulosics such as esters, ethers, acetates, butyrates, nitrate, CMC; regenerated cellulose	4	
5	**Experimental methods-1**	**9**	**2**
5.1	Molecular weight and molecular weight distribution – number , weight and viscosity average molecular weights of polymers	2	
5.2	methods of determining molecular weight, practical significance of molecular weight distribution, size of polymers.	2	
5.3	Introductory concepts of kinetics of polymerization and Carother's relation.	3	
5.4	Glassy state, glass transition temperature, TGA, factors affecting GTT, crystallinity in polymers.	2	

6	**Experimental Methods –II**	**9**	**2**
6.1	Viscosity, solubility, optical properties, electrical properties, thermal properties, mechanical properties of polymers	2	
6.2	Degradation of polymers by thermal, oxidative ,mechanical and chemical methods.	2	
6.3	Polymer processing- compression moulding, casting, extrusion , fibre spinning, injection moulding, thermoforming, vulcanization of elastomers	2	
6.4	Polymer industry in India.	1	
6.5	**Overall advantages and disadvantages of using synthetic polymers**	**1**	**3,6**
6.6	Necessity of biodegradable substitutes for a sustainable development	1	

References

1. Bllmeyer, “Textbook of polymer science”, John Wiley and Sons

2. D.D. Deshpande, “Physical chemistry of macromolecules”, Vishal publications,

   New Delhi, 1985

3. V.R. Gowariker, N.V. Viswanathan and J.Sreethan, “Polymer Science”, Wiley Eastern Ltd, 1986
4. K.J. Saunders, Organic Polymer Chemistry, 2nd Edn., Chapman and Hall, London, 1988
5. Gowri Sankar Misra, Introductory Polymer Chemistry, New Age International, New Delhi
6. P Ghosh, Polymer Science & Technology, Tata McGraw Hill Eduction, 1991
7. Jeol R.Fried, Polymer Science & Technology, Prentice Hall of India (P) Ltd. New Delhi, 1999.

UNIVERSITY OF KERALA

Model Question Paper of BSc Chemistry Programme

2020 Admission onwards

Course Code CH1651.3

SEMESTER VI ELECTIVE COURSE

POLYMER CHEMISTRY

Time: Three Hours **Maximum Marks: 80**

SECTION A

Each question carries 1 mark (Answer in one word\sentence)
Answer all questions

1. What are elastomers?
2. How is melamine-formaldehyde resin prepared?
3. Write a note on Nylon 66.
4. Mention the monomer unit of neoprene.
5. Define copolymers.
6. Explain extrusion.
7. Define fibre spinning.
8. Explain emulsion polymerisation
9. Give two examples of natural polymers 10. What is SBR and SAN?

SECTION B

Answer any eight questions. Each question carries 2 marks.

11. Write a note on Condensation polymerisation.
12. Explain the synthesis of HDPE.
13. Write a note on Polyurethanes.
14. Explain number, weight and viscosity average molecular weight.
15. Define graft copolymers.
16. Explain the preparation of PVC.
17. What are epoxy resins?
18. Explain the vulcanisation of ealstomers.
19. Write the mechanism of ionic polymerisation.
20. Explain the chemical methods of degradation of polymers.
21. Explain polymer processing.
22. Distinguish between thermoplastics and thermosetting plastics.

SECTION C

Answer any six questions. Each question carries 4 marks

23. Write a short note on silicones.
24. What are the methods of determining molar mass?
25. Write notes on (1) compression (2) moulding (3) casting
26. Discuss the synthesis and application of Teflon
27. Describe the role of initiators and inhibitors in addition polymerisation
28. Distinguish between plastics, elastomers and fibres
29. Describe the TGA of polymers.
30. Discuss the various aspects of molecular recognition involved in the structure of DNA.
31. Explain kinetics of polymerization and Carothers relation

SECTION D

Answer any two questions. Each question carries 15 marks.

32. Discuss the methods of
    (a) Determining molecular weight (9+6)
    (b)Practical significance of molecular weight distribution
33. Write a note on (6+9)
    (a) vinyl polymers
    (b) discuss about the methods of synthesis of PVA, PVB and Polyacetals.
34. (a) Explain crystallinity in polymers (6+9)
    (b) Explain thermal, electrical and mechanical properties of polymers.
35. Write notes on (5+5+5)
    (a) compression (b) moulding (c) casting

UNIVERSITY OF KERALA

Model Question Paper for BSc Chemistry Programme

2020 Admission onwards

Semester	V1
Course	Elective Course
Course name	**BIO CHEMISTRY**
Course Code	**CH1651.4**
Credit	2
Hours	54 hours
Lecture-Tutorial-Lab	2-0-0

CO No.	COURSE OUTCOME *Upon completion of this course, students*	Cognitive Level	PSO No.
1	Recognise the constituents of blood and blood coagulation factors	R,U	PSO21
2	Become aware of the role of organs, in maintaining health	U	PSO21
3	Realise applications of Analytical techniques and instruments for biochemical studies	U	PSO9

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MODULE	COURSE DESCRIPTION	Hrs	CO No.
1	**Blood** Constituents of blood cells and plasma, plasma proteins, albumin and globular - lipoproteins, functions (Details not expected), Coagulation - 'Coagulation factors, Hemoglobin - functions, Structure of hemoglobin, abnormal hemoglobin	9	1
2	**Respiration** Chemical and physiological events, affecting diffusion of O2 and CO2 during respiration, Transport of Oxygen in Blood O2 dissociation curve, Interrelationship between O2 and CO2 transport.	9	2
3	**Kidney Function** Body water balance, buffers in blood, Formation of Urine, Kidney function, Renal Threshold, Constituents of Urine, diseases associated with Kidney function	9	2
4	**Nutrition** Measurement of Energy Value of food , Calorific value, caloric requirement, Kilocalorie. Basal metabolic rate (BMR):- Significance, Condition, factors , measurement	9	3
5	**Digestion and Absorption of Food** Outline study of digestion and absorption of Carbohydrates, proteins, fats and enzymes involved , composition and functions of bile - Bile pigments, Bile acids, Bile salts.	9	2
6	**BiochemicalTechniques** Chromatography - Ion exchange, adsorption paper, TLC, GLC, affinity, Gel filtration Electrophoresis - paper, gel, ultracentrifugation	9	3

References

1.Gyton,"Text Book of Medical Physiology".

2. Ganog,"Text Book of Medical Physiology ".
3. David Randall, "Physiology".
4. Dr. A.C. Deb, "Fundamentals of Biochemistry".
5. Swaminathan, "Advanced Text Book on Food & Nutrition".
6. B. Srilakshmi, "Nutrition Science".

UNIVERSITY OF KERALA
B.Sc Chemistry Programme Model Question Paper

2020 Admission onwards

Semester VI Course Code CH1651 .4 Credit 2
ELECTIVE COURSE
BIOCHEMISTRY

Time: 3 hours **Maximum marks: 80**

SECTION A

Answer all questions (maximum two sentences each question carries 1 mark)

1. What is the normal pH of arterial blood?
2. What is the cause of sickle cell anemia?
3. Give an example for plasma protein.
4. What are anticoagulants?
5. Define BMR?
6. What is the renal threshold value of glucose?
7. What is NPN?
8. What is the calorific value of fat?
9. Name the bile pigments.
10. What is GLC?

(10x1=10 marks)

SECTION B

Answer any eight, each question carries 2 marks

11. Define renal threshold and its significance?
12. What are the normal constituents of urine?
13. What are the different types of hemoglobin?
14. Write a short note on protein digesting enzymes.
15. Draw the structure of heme
16. What are the constituents of blood?
17. What are the functions of plasma protein?
18. What is difference between plasma and serum?
19. What is adsorption chromatograpy?
20. What is the composition of bile?
21. Write about abnormal hemoglobin.
22. Discuss about ion exchange chromatography.

SECTION C

Answer any six each question each question carries 4 marks

23. Explain Oxygen dissociation curve and factors affecting its shift.
24. Describe gel electrophoresis.
25. Explain thin layer chromatography.
26. Explain briefly the buffers in blood.
27. Give an account of diseases affecting kidney function.
28. Discuss about ultracentrifugation.
29. Discuss the physiological events involved in the transport of oxygen and carbon dioxide.
30. Describe briefly about the various blood cells.
31. Briefly explain about lipoproteins and their functions.

(6 x 4 = 24 marks)

SECTION D

Answer any two (essay) Each question carries 15 marks

32.Discuss about
(i) Coagulation factors (ii) Anticoagulants (iii) Mechanism of blood clotting.

33. Discuss about the principle procedure and applications of
(i) SDS PAGE (ii) Affinity chromatography (iii) Gel filtration chromatography

34. Describe
(i) Body water balance (ii) Functions of kidney (iii) Formation of urine.

35. Discuss about the digestion and absorption of
(i) Carbohydrate (ii) Protein (iii) Fat

(15 x 2 =30 marks)

UNIVERSITY OF KERALA

Syllabus for
M. Sc. Programme in Branch III
CHEMISTRY

(Revised Syllabi under Semester System with effect from 2020 Admissions)

PREAMBLE

The syllabi of M.Sc programmes in Chemistry offered in the affiliated colleges of the University under Semester system have been revised and the revised syllabi are to be effective from 2020 admission. There are two independent PG programmes in Chemistry, namely **M.Sc. Programme in Branch III–Chemistry and M.Sc. Programme in Branch IV–Analytical Chemistry**. Both these PG programmes are equivalent in all respect for employment and higher studies. Each of these two PG programmes shall extend over a period of two academic years comprising of four semesters, each of 450 hours in 18 weeks duration. The syllabi and scheme of examinations of these two programmes are detailed below. The theory courses of the first three semesters and the practical courses of the first two semesters of the two programmes are common, and therefore, the examinations of these two PG programmes are to be conducted with common question papers for the first three semesters by a common Board of Examiners. These syllabi are effective from 2020 admission in affiliated colleges of the university.

M.Sc. PROGRAMME IN BRANCH III – CHEMISTRY

(Revised syllabus under semester system with effect from 2020 admission)

SYLLABUS AND SCHEME OF EXAMINATION

Course No and Title		Hours per week		Duration of ESA	Marks for CA	Marks for ESA	Total Marks
		L	P				
SEMESTER I*							
CH 211	Inorganic Chemistry I	5		3	25	75	100
CH 212	Organic Chemistry I	5		3	25	75	100
CH 213	Physical Chemistry I	5		3	25	75	100
CH 214	Inorganic Chemistry Practicals I		3	(To be continued in Semester II)			
CH 215	Organic Chemistry Practicals I		3	(To be continued in Semester II)			
CH 216	Physical Chemistry Practicals I		4	(To be continued in Semester II)			
						Total marks for Semester I	**300**
*Distribution of teaching hours/week: Theory–15 hours, Practical's –10 hours							
SEMESTER II*							
CH 221	Inorganic Chemistry II	5		3	25	75	100
CH 222	Organic Chemistry II	5		3	25	75	100
CH 223	Physical Chemistry II	5		3	25	75	100

CH 214	Inorganic Chemistry Practicals II		3	6	25	75	100
CH 215	Organic Chemistry Practicals II		3	6	25	75	100
CH 216	Physical Chemistry Practicals II		4	6	25	75	100
						Total marks for Semester II	**600**
*Distribution of teaching hours/week: Theory–15 hours, Practical's –10 hours							
SEMESTER III*							
CH 231	Inorganic Chemistry III	5		3	25	75	100
CH 232	Organic Chemistry III	5		3	25	75	100
CH 233	Physical Chemistry III	5		3	25	75	100
CH 234	Inorganic Chemistry Practicals II		3	(To be continued in Semester IV)			
CH 235	Organic Chemistry Practicals II		3	(To be continued in Semester IV)			
CH 236	Physical Chemistry Practicals II		4	(To be continued in Semester IV)			
						Total marks for Semester III	**300**
*Distribution of teaching hours/week: Theory–15 hours, Practical's –10 hours							
SEMESTER IV*							
CH 241	Chemistry of Advanced Materials	5		3	25	75	100
CH 242 (a)	Inorganic Chemistry IV	5		3	25	75	100
CH 242 (b)	Organic Chemistry IV						
CH 242 (c)	Physical Chemistry IV						
CH 234	Inorganic Chemistry Practicals II		3	6	25	75	100
CH 235	Organic Chemistry Practicals II		3	6	25	75	100
CH 236	Physical Chemistry Practicals II		4	6	25	75	100
CH 243 (a)	Dissertation**					50	50
CH 243 (b)	Visit to R&D Centre					5	5
Comprehensive viva-voce						45	45
						Total marks for Semester IV	**600**
						Grand Total (for semesters I – IV)	**1800**
*Distribution of teaching hours/week: Theory–10 hours, Practical's –10 hours , 5 hours for discussion on project							

** 10 marks out of the 50 marks for dissertation will be for dissertation viva-voce. The remaining 40 marks is to be distributed as follows_
Introduction to the work/ Statement of the Problem – 5, Review of Literature – 5 Materials and Methods – 5, Results and Discussion – 15, Language and style of presentation – 2, References – 3, Quality and Innovation – 5.

Programme Specific Outcomes

PSO 1 Develop a better understanding of the current chemical principles, methods and theories with the ability to critically analyse at an advanced level.

PSO 2 Acquire solid knowledge of classical and modern experimental techniques and interpretation of results; thereby acquire the ability to plan and carry out independent projects.

PSO 3 Develop the qualities of time management and organization, planning and executing experiments.

PSO 4 Have a good level of awareness of the problems associated with health, safety and environment.

PSO 5 Understand how chemistry relates to the real world and be able to communicate their understanding of chemical principles to a lay audience and as well apply the knowledge when situation warrants.

PSO 6 Learn to search scientific literature and databases, extract and retrieve the required information and apply it in an appropriate manner.

PSO 7 Demonstrate proficiency in undertaking individual and/or team-based laboratory investigations using appropriate apparatus and safe laboratory practices.

PSO 8 Develop analytical solutions to a diversity of chemical problems identified from application contexts; critically analyse and interpret qualitative & quantitative chemical information's.

PSO 9 Set the scene to make use of the wide range of career options open to chemistry graduates.

M.Sc. PROGRAMME IN BRANCH III – CHEMISTRY

(Revised syllabus Under Semester System w.e.f. 2020 Admission)

SEMESTER I

CH 211 INORGANIC CHEMISTRY I

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	employ crystal field theory in analysing the splitting of d orbitals in octahedral, tetragonal, square planar, tetrahedral, trigonal bipyramidal and square pyramidal fields, calculate Crystal Field Stabilization Energy and Interpret Octahedral Site Stabilization Energy.	Ap, An U	1
2.	apply Jahn-Teller theorem and demonstrate evidence for JT effect, static and dynamic JT effect.	Ap	1
3.	illustrate MOT for octahedral and tetrahedral complexes with and without pi bonds and construct MO diagrams.	An C	1
4.	critically evaluate data from a variety of analytical chemistry techniques and apply knowledge of the statistical analysis of data.	Ap, E	1, 2
5.	interpret complexometric titrations, redox titrations, gravimetric titrimetry and titrations in non-aqueous solvents.	E, U	1, 2
6.	apply TG, DTA and DSC in the study of metal complexes.	Ap, An	1, 2
7.	explain the functioning of the frontier materials in inorganic chemistry like Solid Electrolytes, Solid oxide fuel cells, Rechargeable battery materials, Molecular materials and fullerides.	U	1, 4, 6
8.	explain the preparation, properties and structure of isopoly acids of Mo, W and V and heteropoly acids of Mo and W.	U	1
9.	explain preparation and properties of xenon fluorides, and noble gas compounds, aluminosilicates, zeolites and silicones and identify the importance of shape selectivity.	U	1
10.	identify the chemical processes occurring naturally in earth's atmospheric, aquatic and soil environments and evaluates the impacts of human perturbations to these processes.	An, E	4

PSO–Programme Specific Outcome CO–Course Outcome

Cognitive Level: R–Remember U–Understanding Ap–Apply An–Analyse E–Evaluate C–Create

Module	Course Description	No. of Hrs	CO No.
1.0	**Coordination chemistry-I: Theories of metal complexes**	**18**	
1.1	Crystal field theory: Splitting of d orbitals in octahedral, tetragonal, square planar, tetrahedral, trigonal bipyramidal and square pyramidal fields.	4	1
1.2	Jahn-Teller theorem, evidence for JT effect, static and dynamic JT effect.	2	2
1.3	Crystal Field Stabilization Energy. CFSE for d^1 to d^{10} systems. Octahedral Site Stabilization Energy. Factors affecting the splitting parameter.	4	1
1.4	Spectrochemical series. Evidence of covalency in Metal-Ligand bond, introduction to Ligand field theory.	2	1
1.5	Molecular Orbital Theory. Sigma and pi bondings in complexes. MO diagrams of octahedral and tetrahedral complexes with and without pi bonds.	4	3
1.6	Experimental evidence of pi bond on the stability of sigma bond. Nephelauxetic effect.	2	3
2.0	**Analytical principles**	**18**	
2.1	Evaluation of analytical data: Accuracy and precision. Standard deviation, variance and coefficient of variation. Student 't' test, 'Q' test, and 'F' test. Confidence limits.	2	4
2.2	Errors: Classification, distribution, propagation, causes and minimization of errors. Significant figures and computation rules.	2	4
2.3	Correlation analysis: Scatter diagram. Correlation coefficient, r. Calculation of r by the method of least squares.	2	4
2.4	Volumetric methods: Classification of reactions in volumetry. Theory of indicators.	2	4
2.5	Complexometric titrations: Titration using EDTA-direct and back titration methods. Precipitation titrations. Redox titrations.	4	5
2.6	Titrations in non-aqueous solvents. Organic reagents used in gravimetry: Oxine, dimethylglyoxime and cupferron.	2	5
2.7	Applications of TG, DTA and DSC in the study of metal complexes.	4	6
3.0	**Frontiers in Inorganic Chemistry**	**18**	
3.1	Solid Electrolytes: Mixed oxides, cationic, anionic solid electrolytes, mixed ionic-electronic conductors,	4	7
3.2	Solid Oxide Fuel Cells (SOFC), Rechargeable battery	3	7

	materials.		
3.3	Solid state chemistry of metal nitrides and fluorides, chalcogenides, intercalation chemistry and metal-rich phases.	4	7
3.4	Inorganic pigments, Inorganic phosphors.	3	7
3.5	Molecular materials and fullerides, basic idea of molecular materials chemistry like One dimensional metals, Molecular magnets and Inorganic liquid crystals.	4	7
4.0	**Isopoly & Heteropoly acids, Silicon-Oxygen compounds, Xenon compounds**	**18**	
4.1	Isopoly: Preparation, properties and structure of isopoly acids of Mo,W and V.	4	8
4.2	Heteropoly acids: Heteropoly acids of Mo and W. Keggin Structure, Keggin anions, Polyoxometalates .	5	8
4.3	Silicon-oxygen compounds: Aluminosilicates, Zeolites as microporous materials and molecular sieves, Silicones and Polysiloxanes.	5	9
4.4	Xenon fluorides, Structure of XeF_2 (MO theory only), Perxenate ion, Organo xenon compounds, Coordination compounds of Xenon.	4	9
5.0	**Chemistry of Natural Environmental Processes**	**18**	
5.1	Chemistry of processes in atmosphere: Composition of the atmosphere. Automobile pollutants and the catalytic converter. Photochemical smog. Chemistry of the stratosphere. Catalytic destruction of ozone. Depletion of the ozone layer. Hazards of common air pollutants on the human health.	6	10
5.2	Chemistry of processes in hydrosphere: The hydrologic cycle. Cycling and purification. The unique properties of water. Acid-base properties.	6	10
5.3	Chemistry of processes in Lithosphere: Redox status in soil. pE, pH predominance diagrams for redox sensitive elements Fe and Cr. Acidity in soil materials. Acid neutralization capacity and the quantification of the soil acidity. Ion speciation in soil solution. Cation exchange capacity and exchange phase composition.	6	10

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12. E. James Girard, Principles of Environmental Chemistry, Jones and Bartlett Publishers, 3rd Edition, 2013
13. H.V. Jadhav, Elements of Environmental Chemistry, Himalya Publication House, 2010.
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CH 212 ORGANIC CHEMISTRY I

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	write down the IUPAC name of polycyclic, spirocyclic and heterocyclic compounds and draw the structures from the IUPAC name of these compounds.	U	1
2.	determine R and S, P and M, E and Z configuration of compounds with chiral centres, biphenyls, allenes, spiranes and draw the configurations in dash and wedge formula, or zig –zag configurations.	E	1
3.	detect prochirality in a compound and explain relevance of prochirality .	U, An	1
4.	explain chiral centre, chiral axis and chiral plane with examples, stability of conformations, stereoselective and stereospecific reactions.	An, E	1
5.	calculate Cotton effect of a compound from its structure and configuration.	E	1
6.	explain different methods for generation of free radical and different types of free radical reactions- Predict the products in a free radical reaction.	U, An	1
7.	describe different types mechanism of substitution, elimination, hydrolysis and addition reactions.	Ap	1
8.	differentiate the rate, mechanism and stereochemistry influenced by solvent, substrate structure, intermediate stability.	An	1
9.	predict the products or reactants or reagents in selected	U	1

	types of reactions.		
10.	design the mechanism of selected reactions.	C	1

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Module	Course Description	No. of Hrs	CO No.
1.0	**Stereochemistry**	**18**	
1.1	Nomenclature of organic compounds - Cyclic, fused polycyclic and bridged polycyclic hydrocarbons, bridged and fused hydrocarbon systems, Spirocyclic hydrocarbon systems, Heterocyclic systems containing Nitrogen and Oxygen.	3	1
1.2	Introduction to molecular symmetry and chirality, axial chirality, planar chirality and helicity, relative configuration, stereochemical nomenclature, R and S, E and Z (use only 3D formula, dash and wedge).	3	2
1.3	Prostereoisomerism, stereotopicity & stereoprojections. Prochiral centre and prochiral faces - Pro R and Pro S, Re face and Si face, Importance of prochirality in biological systems.	3	3
1.4	Axial stereochemistry: atropisomerism and its designation - biphenyls, allenes, spiranes- M and P configurations. Stereoselectivity: enantioselectivity, diastereoselectivity & stereoconvergence. Stereospecific and stereoselective synthesis.	2	4
1.5	Application of Cram's rule, Felkin–Ahn model. Basic introduction to chiral separation methods and estimation of enantiomeric excess, chiral pool, chiral auxiliary, chiral reagents, BINAP.	2	4
1.6	Conformational analysis of substituted cyclohexane, decalin and biased systems. Effect of conformation on reactivity of cyclohexanes.	2	4
1.7	Introduction to ORD, CD - their application in assigning configuration. Sector rules such as octant and axial haloketone rules. Cotton effect.	2	5
1.8	Importance of stereochemistry in drugs-Pthalidomide, Dopa, Ibuprofen.	1	2
2.0	**Reactions Involving Free Radicals, Nitrenes and Carbenes**	**18**	
2.1	Free radical Structure, stability and reactivity, Preparation of free radicals- Triphenyl methyl, TEMPO, AIBN, Dibenzoyl peroxide, NBS , Tributyl Tinhydride and AIBN.	5	6
2.2	Free radical reactions- Chlorination of alkane, addition of HX, SRN1 mechanism, Gomberg reaction, Pschorr	5	6

	ring closure, Hunsdieckers reaction, Ullman reaction, Kolbes electrolytic reaction.		
2.3	Acyloin condensation, Alkyne coupling reactions,. Mc Murry reaction, Pinacol coupling reaction.	3	6
2.4	Structure, formation, stability and reactions of carbenes and nitrenes (rearrangement reactions excluded).	5	6
3.0	**Nucleophilic substitution reaction**	**18**	
3.1	Nucleophilic substitution at sp^3 carbon - S_N1 and S_N2 mechanisms. Competition between S_N1 and S_N2 reactions. Walden inversion, stereochemistry. Effect of solvent, leaving group and substrate structure on rates of S_N1 and S_N2 substitutions.	4	7, 8
3.2	Neighbouring group participation, Nonclassical carbocations, S_N1', S_N2', S_Ni mechanisms.	3	7, 8
3.3	Mitsunobu reaction, Mechanism of esterification and ester hydrolysis-acid catalysed and base catalysed reactions.	3	7, 8
3.4	Aromatic Substitution reactions - Electrophilic substitution: mechanism and evidence- Reactions involving nitrogen, sulphur, carbon, halogen and oxygen electrophiles. Reimer-Tiemann, Vilsmeier-Haack reactions.	4	7, 8
3.5	Directive and rate controlling factors in aromatics with one or more substituents. Aromatic Nucleophilic Substitution reactions - S_N1, S_NAr, Elimination – Addition reactions (benzyne), evidence with examples, Chichibabin reaction.	4	7, 8
4.0	**Addition Reactions**	**18**	
4.1	Addition of H_2O, X_2, HX, and boranes to C=C systems, (hydroboration followed by oxidation only), stereo aspects, effect of substituents on the rate of additions, iodo lactonisation, one or two examples.	5	9, 10
4.2	Prilezhaev reactions. Cis and trans hydroxylation of cycloalkenes. Nucleophilic addition to activated C=C systems. Michael addition and Robinson Annulation.	5	9, 10
4.3	Aldol condensation (normal, crossed and directed), evidence for normal Aldol condensation. Stork enamine, Cannizzaro, Perkin, Ritter, Stobbe, Knoevenagel, Darzen, Reformatsky and benzoin condensations.	4	9, 10
4.4	Grignard, Mannich, Thorpe reactions, Dieckmann condensation, sulfur ylides (stabilized and unstabilised)-direct and conjugated addition to carbonyl. (Mechanisms expected for all reactions)	4	9, 10

5.0	**Elimination Reactions**	**18**	
5.1	Elimination reactions leading to C=C bond formation and their mechanisms. E_1, E_2 and E_1cb mechanisms.	5	9, 10
5.2	Stereo aspects of C=C bond formation in cyclic and acylic systems. Regioselectivity in elimination, Hoffmann and Saytzeff elimination. Effect of basicity, temperature, leaving group and substrate structure**.**	5	9, 10
5.3	Elimination vs substitution, Shapiro reaction, Peterson and Julia olefination, Wittig and Wittig - Horner reaction-stereochemistry.	4	9, 10
5.4	Cis elimination-esters, sulfoxides, selenoxides, Chugaev reaction, Cope elimination, Stereo aspects of cis elimination - cyclic bcyclic systems Sodium in liquid ammonia and Lindlars catalyst in conversion of alkynes to alkenes.	4	9, 10

References

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CH 213 PHYSICAL CHEMISTRY I

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	outline the development of quantum mechanics and its tools and apply them in determining the wave functions and energies of moving particles.	U, Ap, An	1
2.	recognize the nature of adsorption and propose theories and choose theoretical and instrumental methods of measurements of surface property.	U, Ap, An	1
3.	understand theory and mechanism of catalytic action.	U	1
4.	correlate thermodynamic properties and apply them in systems.	U, Ap, An	1
5.	understand theories, mechanism and, kinetics of reactions and solve numerical problems.	U, Ap, An	1
6.	identify point groups and construct character table and predict hybridisation and spectral properties of molecules.	U, Ap, C	1

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Module	Course Description	No. of Hrs	CO No.
1.0	**Quantum Chemistry I**	**18**	
1.1	Classical mechanics and its limitations –need of quantum mechanics, de Broglie relation and its experimental proof, uncertainty principle and its consequences.	1	1
1.2	Postulates of quantum mechanics: State function postulate: Born interpretation of the wave function, well behaved functions, orthonormality of wave functions.	2	1
1.3	Operator postulate: Operator algebra, linear and nonlinear operators, Laplacian operator, commuting and non-commuting operators, Hermitian operators and their properties.	2	1
1.4	Eigen value postulate: eigen value equation, eigen functions of commuting operators.	2	1
1.5	Expectation value postulate. Postulate of time Dependent Schrödinger equation, Quantization of angular momentum, quantum mechanical operators corresponding to angular momenta (Lx, Ly, Lz and L^2) - expression for (L_x, L_y, L_z and L^2) in polar coordinates.	2	1
1.6	Application of Quantum mechanics to Exactly Solvable Model Problems Translational motion: free particle in one dimension, particle in a box with infinite potential barrier one	3	1

	dimensional box three-dimensional box and cubical box-degeneracy.		
1.7	Particle with finite potential barriers, one potential barrier, two finite barriers. Quantum mechanical tunnelling (Qualitative concept only).	3	1
1.8	Vibrational motion: one-dimensional harmonic oscillator (complete treatment), Hermite equation (solving by method of power series), Hermite polynomials, recursion relation, wave functions and energies-important features of wave functions, Harmonic oscillator model and molecular vibrations.	3	1
2.0	**Surface Chemistry and Catalysis**	**18**	
2.1	The gas-solid interphase, types of adsorption. Heat of adsorption and its determination, differences between chemisorptions and physisorption.	2	2
2.2	Adsorption isotherms - Freundlich and Langmuir isotherms. Thermodynamic and statistical derivation of Langmuir adsorption isotherm. Multilayer adsorption-the BET theory and Harkins-Jura theory.	3	2
2.3	Determination of surface area of solids-Harkins–Jura absolute method, point B method, Langmuir method and BET method.	2	2
2.4	Adsorption from solutions: Gibb's adsorption equation and its verification. Adsorption with dissociation. Adsorption with interaction between adsorbate molecules.	2	2
2.5	Different types of surfaces, properties of surface phase. Thermodynamics of surface. Surface tension of solutions. Surfactants and micelles. Examination of surfaces- Low Energy Electron Diffraction (LEED).	2	2
2.6	Photoelectron spectroscopy, ESCA, scanning probe microscopy, Auger electron spectroscopy, SEM and TEM.	3	2
2.7	Surface films-different types, surface pressure and its measurement.	2	3
2.8	Catalysis: Mechanism and theories of homogeneous and heterogeneous catalysis. Bimolecular surface reactions. Langmuir–Hinshelwood mechanism. Enzyme catalysis.	2	3
3.0	**Classical Thermodynamics**	**18**	
3.1	Entropy - Dependence of entropy on variables of a system (S, T and V; S, T and P). Thermodynamic equations of state. Criteria for equilibrium and spontaneity, Euler's relation, Gibbs and Helmholtz free energy.	2	4
3.2	Maxwell relations and significance, temperature	2	4

	dependence of free energy, Gibbs Helmholtz equation and its applications.		
3.3	Partial molar quantities - Chemical potential, Gibbs Duhem equations, determination of partial molar properties-partial molar volume and partial molar enthalpy.	2	4
3.4	Fugacity - relation between fugacity and pressure, determination of fugacity of a real gas, variation of fugacity with temperature and pressure. Fugacity of liquid mixtures, fugacity of mixture of gases, Lewis-Randall rule.	3	4
3.5	Activity, activity coefficients, dependence of activity on temperature and pressure. Determination of activity and activity coefficients of electrolytes and non-electrolytes.	2	4
3.6	Thermodynamics of mixing, Duhem-Margules equation, Konowaloff's first and second laws, Henry's law, excess thermodynamic functions-determination of excess enthalpy and volume.	4	4
3.7	Chemical affinity and thermodynamic functions, effect of temperature and pressure on chemical equilibrium-van't Hoff reaction isochore and isotherm.	3	4
4.0	**Chemical kinetics**	**18**	
4.1	Theories of reaction rates: Collision theory and its failure. Transition state theory - Eyring equation. Comparison of the two theories. Thermodynamic formulation of the reaction rates. Potential energy surfaces.	3	5
4.2	Theories of unimolecular reactions - Lindemann theory. Lindemann-Hinshelwood mechanism, qualitative idea of RRKM theory.	2	5
4.3	Kinetics of complex reactions- Parallel reactions, opposing reactions, consecutive reactions and chain reactions, steady state treatment, kinetics of H_2-Cl_2 and H_2-Br_2 reactions, decompositions of ethane, acetaldehyde and N_2O_5. Rice-Herzfeld mechanism, branching chain reactions, Hinshelwood mechanism of chain reactions and explosion.	4	5
4.4	Fast reactions: Relaxation method, relaxation spectrometry, flow method, shock method, fast mixing method, field jump method, pulse method, flash photolysis and NMR method.	3	5
4.5	Reactions in solution: Factors affecting reaction rates in solutions, effect of dielectric constant and ionic strength, cage effect, Bronsted-Bjerrum equation.	3	5
4.6	Kinetic effects: Primary and secondary kinetic salt effect, influence of solvent on reaction rates,	3	5

	significance of volume of activation, linear free energy relationship. Hammet equation and Taft equation.		
5.0	**Molecular symmetry**	**18**	
5.1	Symmetry elements and symmetry operation. Matrix representation of symmetry operations. Block factored matrices, Character of a matrix. Conditions for a set of elements to form a group. Point groups and their systematic identification.	2	6
5.2	Multiplication of operations. Group multiplication table. Similarity transformation and classification of symmetry operation, Matrix representation of point group. Reducible and Irreducible representations.	3	6
5.3	The Great Orthogonality Theorem. Rules derived from GOT (proof not required).	1	6
5.4	Setting up of character table of C_{2v}, C_{3v} and C_{2h} groups. Direct product representations. Reduction formula, reduction of reducible representation to IRs. Transformation properties of atomic orbitals. Molecular symmetry and optical activity.	4	6
5.5	Applications of character tables: Hybridisation-identification of atomic orbitals taking part in hybridisation of triangular planar, square planar, trigonal bipyramidal, square pyramidal and tetrahedral molecules.	4	6
5.6	Spectroscopy-Determination of number of active IR and Raman lines taking simple molecules belongs to C_{2v}, C_{3v} and D_{4h} point groups as example.	4	6

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CH 214 INORGANIC CHEMISTRY PRACTICALS – I

Total 125 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.	U, E	3, 7, 8
2.	estimate volumetrically the concentration of Zn, Mg and Ni using EDTA and the volumetric estimation of Fe.	Ap, An	7, 8
3.	estimate volumetrically the hardness of water and concentration of Ca in water samples using EDTA.	Ap, An	7, 8
4.	estimate colorimetrically the concentration of Chromium – (using Diphenyl carbazide), Iron (using thioglycollic acid), Iron (using thiocyanate), Manganese (using potassium periodate), Nickel (using dimethyl glyoxime).	Ap, An	7, 8
5.	carry out the preparation of the metal complexes Potassium trioxalatochromate (III), Tetraammoniumcopper (II) sulphate, Hexamminecobalt (III) chloride.	Ap	7, 8
6.	record the UV spectra, IR spectra, magnetic susceptibility, TG, DTA and XRD of the complexes prepared.	Ap, An	2, 7, 8

Module	Course Description	No. of Hrs	CO No.
1.	Volumetric estimation using EDTA - Zn, Mg, Ni (back titration), Hardness of water, Ca (using murexide).	25	1, 2, 3
2.	Determine the hardness of water and the concentration of Ca in water samples using EDTA.	20	1, 2, 4
3.	Volumetric estimation of Fe.	10	1, 2, 3
4.	Colorimetric estimation of Chromium – (Diphenyl carbazide), Iron (thioglycollic acid), Iron (thiocyanate), Manganese (potassium periodate), Nickel (dimethyl glyoxime).	35	1, 2, 5
5.	Preparation of metal complexes - Record UV, IR, magnetic susceptibility, TG, DTA and XRD of the complexes prepared (a) Potassium trioxalatochromate (III) (b) Tetraammoniumcopper (II) sulpahte (c) Hexamminecobalt (III) chloride	35	1, 2, 6, 7

References

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CH 215 ORGANIC CHEMISTRY PRACTICALS – I

Total 125 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.	U, E	3, 7, 8
2.	determine the correct method for separation of a binary mixture and make the separated compounds in pure form.	An, E	2, 7, 8
3.	develop thin layer chromatogram of a compound and determine its purity.	C	2, 7, 8
4.	separate two compounds by column chromatography.	An	2, 7, 8
5.	utilize the synthetic procedures and reagents to convert a compound into another. Differentiate the products by spectroscopic methods.	An	2, 7, 8
6.	use green chemical principles in the synthesis.	Ap	2, 4
7.	solve GC MS and LC MS of a compound to ascertain purity and identity, apply the basic principles	Ap, E	2, 7

Module	Course Description	No. of Hrs	CO No.
1.	**Separation and identification of organic compounds-** a. Quantitative wet chemistry separation of a mixture of two components by solvent extraction. b. TLC of the purified samples along with the mixture in same TLC plates (component 1 with mixture and component 2 with mixture on separate TLC plate) and calculation of Rf values- Reporting and recording TLC in standard formats- preparation of sample solution, adsorbent, dimensions of the plate, saturation time, developing time, visualization and detection, Rf Value, Drawing - in the form of a table.	**30**	1, 4, 5
2.	**Separation of a mixture by column chromatography (not for end semester evaluation)** a. Malachite green and methylene blue, b. o-nitroaniline and p-nitroaniline.	20	1, 4
3.	**Preparation of compounds by two stages**. ▪ Recording UV, IR, ^{1}H–NMR and ^{13}C–NMR and EI mass spectra of synthesized compounds. ▪ Record and interpret GC–MS and LC–MS of the purified compound. ▪ TLC analysis-Stage 1 reactants and products on TLC plate 1 and stage 2 reactants and products on plate 2). ▪ Record TLC in standard format as in separation. ***All preparations must be restricted to 1 g level*** **I. Nitration** (1) Acetanilide → p-nitroacetanilide → p-nitroaniline (2) Methylbenzoate → methyl m-nitrobenzoate → m-nitrobenzoic acid **II. Bromination** (3) Acetanilide → p-bromoacetanilide → p-bromoaniline *using CAN for bromination* **III. Aldol condensation- Synthesis of heterocycles.** (4) Benzaldehyde → Dibenzylideneacetone → 1,5-Diphenyl-3-styryl-2-pyrazoline **IV. Diazocoupling** (5) Aniline → Diazoaminobenzene → p-aminoazobenzene **V. Rearrangement** (6) Pthalic anhydride → Pthalimide → Anthranilic acid **VI. Synthesis of Dyes** (7) N,N-Dimethylaniline → N,N-dimethyl-4-nitrosoaniline → methylene blue	75 *(average 12.5 hrs for preparation and analysis of each)*	1, 5, 6, 7

The board of examiners have to select either TLC of separated components OR TLC of preparation for an examination. But both TLC examinations are to be practiced and entered in the record of experiments.

References

1. B. S. Furniss, Vogel's text book of practical organic chemistry, 5th Edition, Longman, 1989.
2. D. L. Pavia, G. M. Lampman, G. S. Kriz and R. G. Engel, A microscale approach to organic laboratory techniques," Wadsworth Publishing, 5th Edition, 2012.
3. R. K. Bansal, Laboratory manual of organic Chemistry, Wiley Eastern, 199.4.
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7. P. F Shalz, Journal of Chemical Education, 1996, 173: 267.
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9. For spectral data of organic compounds, see: http://sdbs.riodb.aist.go.jp/sdbs/cgi-bin/direct frame top.cgi.

CH 216 PHYSICAL CHEMISTRY PRACTICALS – I

Total 125 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.	U, E	3, 7, 8
2.	construct the Freundlich and Langmuir isotherms for adsorption of acetic/oxalic acid on active charcoal/ alumina and determine the concentration of acetic/ oxalic acid	C, Ap, An	7, 8
3.	determine the rate constant, Arrhenius parameters, rate constant and concentration using kinetics	Ap	7, 8
4.	construct the phase diagram and determine the composition of an unknown mixture	Ap, An	7, 8
5.	construct the ternary phase diagram of acetic acid chloroform-water system and out the procedure in an unfamiliar situation to find out the composition of given homogeneous mixture.	C, Ap, An	7, 8
6.	construct the tie-line in the ternary phase diagram of acetic acid chloroform-water system	C, Ap, An	7, 8
7.	determine distribution coefficient using distribution law.	Ap	7, 8
8.	determine the equilibrium constant employing the distribution law.	Ap	7, 8
9.	determine the coordination number of Cu^{2+} in copper-	Ap	7, 8

	ammonia complex.		
10.	determine K_f of solid solvent, molar mass of non-volatile solute, mass of solvent and composition of given solution	Ap, An	7, 8
11.	determine K_T of salt hydrate, molar mass of solute, mass of salt hydrate and composition of given solution.	Ap, An	7, 8
12.	determine surface tension and parachor of liquids.	Ap	7, 8
13.	ascertain the relationship between surface tension with concentration of a liquid and use this to find out the composition of given homogeneous mixture.	Ap, An	7, 8
14.	determine the concentration of given strong acid/alkali.	Ap, An	7, 8
15.	determine the heat of ionisation of acetic acid.	Ap, An	7, 8
16.	determine the heat of displacement of Cu^{2+} by Zn.	Ap, An	7, 8

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Module	Course Description	No. of Hrs	CO No.
1.	**Adsorption** a) Freundlich and Langmuir isotherms for adsorption of acetic/oxalic acid on active charcoal/ alumina. b) Determination of concentration of acetic/ oxalic acid.	15	1, 2,
2.	**Kinetics** a) Determination of rate constant of acid hydrolysis of methyl acetate. b) Determination of Arrhenius parameters. c) Determination of concentration of given acid. d) Determination of rate constant of the saponification of ethyl acetate and evaluation of Arrhenius parameters. e) Determination of rate constant of reaction between $K_2S_2O_8$ and KI.	15	1, 3
3.	**Phase rule** **I. Solid-liquid equilibria** a) Construction of phase diagram and determination of the composition of unknown mixture (naphthalene/ biphenyl, naphthalene/ benzophenone, naphthalene/ diphenyl amine). b) Construction of phase diagram with simple eutectic - naphthalene/ metadinitrobenzene. **II. Partially miscible liquid pairs** a) CST of phenol-water system. b) Three component system - Construction of ternary phase diagram of acetic acid chloroform-water system and hence the composition of given homogeneous mixture. Construction of tie-line.	16	1, 3, 4, 5, 6
4.	**Distribution law** a) Distribution coefficient of ammonia between hexane and water. Determination of equilibrium constant of	20	1, 7, 8, 9

	copper - ammonia complex by partition method or coordination number of Cu^{2+} in copper-ammonia complex. b) Distribution coefficient of benzoic acid between toluene and water. c) Distribution coefficient of iodine between hexane and water. d) Determination of the equilibrium constant of the reaction $KI + I_2 \leftrightarrows KI_3$ and hence the concentration of given KI in hexane and water.		
5.	**Dilute Solutions** a) Determination of K_f of solid solvent, molar mass of non-volatile solute, mass of solvent and composition of given solution (Solvent-Naphthalene/ Biphenyl/ Benzophenone etc. Solute-Naphthalene/ Biphenyl/ Diphenylamine etc.) b) Determination of vant Hoff's factor for benzoic acid in Naphthalene. c) Determination of atomicity of sulphur.	17	1, 10
6.	**Transition temperature** Determination of K_T of salt hydrate, molar mass of solute, mass of salt hydrate and composition of given solution (Solvent - $Na_2S_2O_3.5H_2O/CH_3COONa.3H_2O$, Solutes glucose, sucrose, urea).	12	1, 11
7.	**Surface tension** a) Determination of surface tension of various liquids (water - ethanol, water - glycerol, water - sorbitol, nitrobenzene-toluene) by Stalagmometric method (drop number/ drop weight) and by Capillary rise method. b) Determination of parachors of molecules and various groups. c) Determination of concentration of a mixture. d) Determination of surface tension and parachor of liquids using double capillary method. e) Variation of surface tension with concentration. Unknown concentration of a mixture. Interfacial tension. f) Determination of surface excess and area per molecule.	15	1, 12, 13
8.	**Thermochemistry** a) Determination of the concentration of given strong acid/alkali. b) Thermometric titration of NaOH vs standard HCl. c) Heat of displacement of Cu^{2+} by Zn. d) Determination of the heat of ionisation of acetic acid.	15	1, 14 15, 16

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2. B. P. Levitt and J.A. Kitchener, Findlay's Practical Physical Chemistry, Longmans, London, 9th edn.,1973.
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5. R.C. Das and Behera, Experimental Physical Chemistry, Tata McGraw Hill, 1983.
6. B. Viswanathan, Practical Physical Chemistry, Viva Publications, 2012.
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Model Question Papers

General Instruction to question paper setters

- There will be a 15 main questions in each question paper divided into 3 sections – A, B and C
- Each of the sections A, B and C will have 5 questions each, **1 from each module**.
- Each question in Section A will have 3 sub questions (a), (b) and (c), of which the candidate has to answer any two (2 marks each).
- Each question in Section B will have 2 sub questions (a) and (b), of which the candidate has to answer any one (5 marks each).
- Candidate should answer any three out of the five questions in Section C (10 marks each).
- Section A carries a total of 20 marks, Section B carries 25 marks, and Section 3 carries 30 marks.
- The maximum marks will be 75 and the duration of the exam will be 3 hrs.

First Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry/ Branch IV – Analytical Chemistry
CH/CL 211: INORGANIC CHEMISTRY – I
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) Sketch the splitting of d orbitals in a triagonal bipyramidal complex.
   (b) Which among CN^- and NH_3 have a higher nephelauxetic effect? Why?
   (c) Calculate the CFSE for a d^4 ion.

2. (a) Differentiate accuracy from precision.

(b) What are metallochromic indicators? Give an example.
(c) What is a Student t test used for?

3. (a) CdS is an yellow pigment while CdSe is red. Given reason.
(b) What is NASICON?
(c) What are anti-stokes phosphors?

4. (a) What are zeolites? Explain their use as water softeners?
(b) Determine the probable structure of perxenate ion using VSEPR theory.
(c) What are polysiloxanes? Give it structure.

5. (a) List two conditions that favour the formation of photochemical smog.
(b) Discuss briefly a method to quantify soil acidity.
(c) How does chlorine free radicals tamper the ozone layer?

$[2 \times 10 = 20]$

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) State and illustrate Jahn-Teller distortion.
(b) Discuss the factors affecting the magnitude of Δ_o.

7. (a) What is a scatter diagram? What is its significance?
(b) Discuss briefly the principle behind EDTA titrations.

8. (a) What are SOFCs?
(b) Briefly discuss the structure of fullerides.

9. (a) Zeolites find applications as microporous materials and molecular sieves. Substantiate this statement.
(b) What are isopoly acids?

10. (a) List out five unique properties of water.
(b) Discuss on the various air pollutants and their effect on human health.

$[5 \times 5 = 25]$

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. Describe the Molecular orbital energy level diagrams for octahedral metal complexes with and without π–bonds.

12. Explain the utility of TG, DTA and DSC in the study of metal complexes.

13. Detail the types of solid electrolytes giving due importance to structural aspects.

14. Elaborate the properties of the heteropoly acids of Mo and W.

15. What are pourbaiux diagrams? Outline its role in explaining the chemistry of processes in lithosphere.

[10 × 3 = 30]

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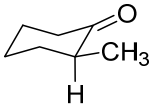
First Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry/ Branch IV – Analytical Chemistry
CH/CL 212: ORGANIC CHEMISTRY – I
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

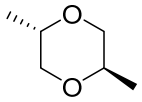
SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

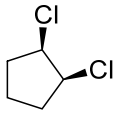
1. (a) Distinguish between conformation and configuration.
   (b) Draw the structure corresponding to diazabicyclo[2,2,2]octane.
   (c) Pick out the chiral/ achiral/ meso structures from the following.



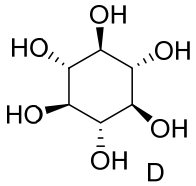
A



B

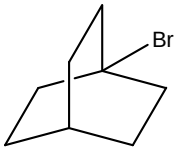


C

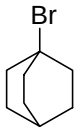


D

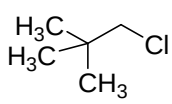
2. (a) What is AIBN?
   (b) Explain the peroxide effect in the addition of HBr to propene.
   (c) How you can synthesize the following molecule?

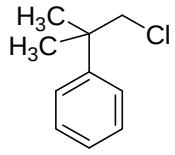


3. (a) Which of the following bromides will undergo a faster solvolysis? Explain

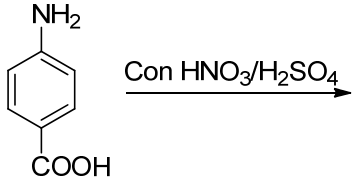
$(CH_3)_3CBr$ Or 

   (b) Given below are two chlorides. Which among them will go through a faster solvolysis? Give reasons for your answer.

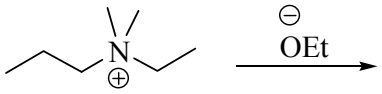


Or 

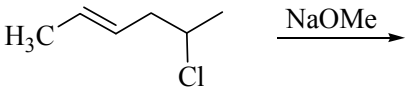
   (c) Complete the following reaction.



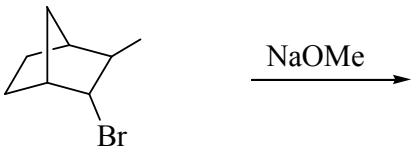
4. (a) Predict the product of the following reaction and indicate the major one. Give reasons.



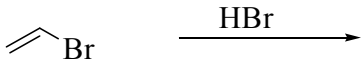
(b) What are the products obtained the reaction given below. Identify the major product in this case citing reasons.



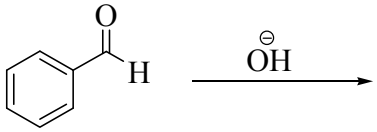
(c) Identify the major product in the following reaction. Substantiate your answer.



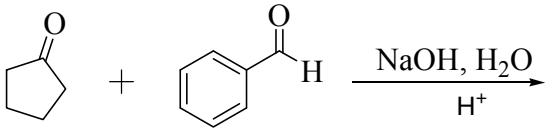
5. (a) Complete the reaction



(b) Predict the products in the following reaction



(c) Complete the following reaction

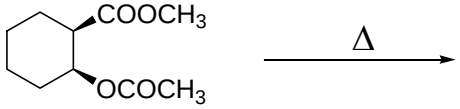


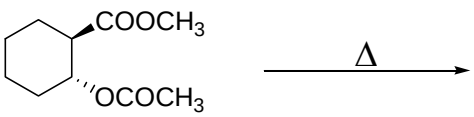
[2 × 10 = 20]

SECTION B

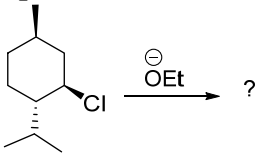
Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

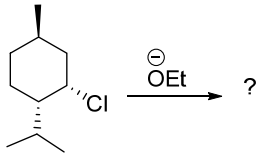
6. (a) Predict the product (s) of the following reactions

i 

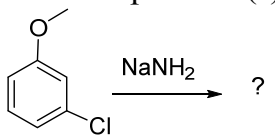
ii 

(b) Predict the product (s) of the following reaction and indicate the major one. Explain?

i. 

ii. 

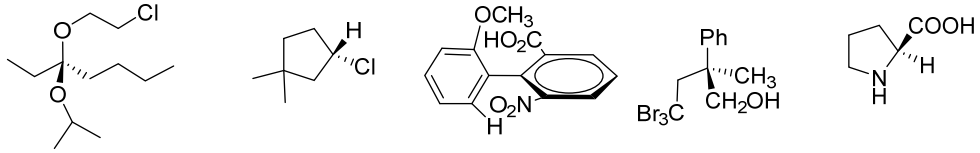
7. (a) Give the product (s) with mechanism. Explain?



(b) Discuss the mechanism of allylic bromination using NBS. Explain the stability of allyl radical.

8. (a) How will you convert isopropanol to n-propanol using a boron reagent? How does the addition of borane reagents to alkene differ from hydration? Illustrate with the help of an example.
(b) Discuss benzoin condensation. What is the importance of cyanide in the reaction?

9. (a) Assign the absolute configuration to the following compounds.



(b) What are atropisomers? Explain why atropisomerism disappears at higher temperature?

10. (a) How does leaving group affect the rate of S_N1 and S_N2 reactions? Explain.
(b) Give the major product obtained when methoxybenzene is nitrated. Discuss the directive effect with the help of resonance structures

[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. Discuss Cotton effect? What is octant rule? Explain ORD curve.

12. Discuss the structure, stability and reactions of carbenes. How will you distinguish between singlet and triplet carbenes by a chemical method?

13. Discuss the mechanism of
a) Robinson Annulation
b) Mannich reaction
c) Thorpe reaction
d) Ritter reaction and
e) Darzen reaction

14. Neighbouring group participation results retention in configuration. Justify the given statement with the help of suitable examples. What is meant by anchimeric assistance?

15. Explain Wittig and Wittig –Horner reactions with stereochemistry. Compare Witting reaction with Julia olefination.

[10 × 3 = 30]

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First Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry/ Branch IV – Analytical Chemistry
CH/CL 213: PHYSICAL CHEMISTRY – I
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) Check whether the function e^{-x^2} is an eigen function for kinetic energy operator. If so what is the eigen value?
   (b) Show that the momentum of particle in 1D box is quantised.
   (c) Write the general expression for Hermitte polynomial. Deduce first two polynomials.

2. (a) Distinguish between associative and dissociative chemisorption.
   (b) Under what condition can multilayer adsorption become more important than monolayer adsorption?
   (c) Explain one method of determination of surface pressure.

3. (a) Calculate ΔS of mixing when 2 moles of H_2, 3 moles of He and 2 moles of O_2 are mixed at fixed temperature assuming ideal behaviour and no chemical change.
   (b) Write any two Maxwell's relations and give their significance.
   (c) State 'Konowaloff's' rule.

4. (a) Give two reasons to show that conventional techniques are not suitable for the study of kinetics of fast reactions.
   (b) Explain steady state principle?
   (c) How volume of activation affects the reaction rate?

5. (a) Identify the symmetry elements present in the following and assign the point group
   (i) H_2 (ii) HCl
   (b) Explain improper axis of symmetry.
   (c) Cyclic groups are abelian. Explain.

[2 × 10 = 20]

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) For a particle in 3D box with $L_x = L_y = \frac{L_z}{2}$, what would be the energy when $n_x = 1$, $n_y = 2$ and $n_z = 2$ and when $n_x = 1$ $n_y = 1$ and $n_z = 4$. Use the calculations to explain the meaning of the term accidental degeneracy.

(b) H(x) is written as a power series in x as $H(x)=\sum_{j=0}^{n} a_j x^j$. Derive recursion formula.

7. (a) Write any two methods for the determination of surface area of a solid.
   (b) Explain Langmuir-Hinshelwood mechanism of surface catalyzed reactions.

8. (a) Derive Van't Hoff isotherm. How is this useful in the study of chemical equilibria?
   (b) Derive Gibbs-Duhem equation.

9. (a) Compare the rate constant as given by Arrhenius equation and collision theory and show that $E_a = E_0 + \frac{RT}{2}$
   (b) Derive the rate law for the decomposition of N_2O_5.

10. (a) Construct the group multiplication table for the symmetry operations of NH_3 molecule.
    (b) Determine the number of active IR and Raman lines in the vibrational spectrum of $POCl_3$.

[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. Set up the Schrodinger wave equation for a simple harmonic oscillator. Find the eigen functions and eigen values.

12. Explain any two instrumental techniques used for surface characterization.

13. Write a brief account of the methods for the determination of activity coefficient of electrolytes and non-electrolytes.

14. Explain chain reactions. Discuss Seminoff Henshelwood theory of branching chain reactions

15. a) Explain the hybridization scheme in BF_3 molecule using group theory.
    b) Show that the four elements of C_{2v} point groups forms 4 classes?

D_{3h}	E	$2C_3$	$3C_2$	σ_h	$2S_3$	$3\sigma_v$		
A_1'	1	1	1	1	1	1		$x^2 + y^2, z^2$
A_2'	1	1	−1	1	1	−1	R_z	
E'	2	−1	0	2	−1	0	(x, y)	$(x^2 - y^2, xy)$
A_1''	1	1	1	−1	−1	−1		
A_2''	1	1	−1	−1	−1	1	z	
E''	2	−1	0	−2	1	0	(R_x, R_y)	(xz, yz)

[10 × 3 = 30]

SEMESTER II

CH 221 INORGANIC CHEMISTRY II

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	obtain the term symbols of d^n system and determine the splitting of terms in weak and strong octahedral and tetrahedral fields.	E	1
2.	explain the correlation diagrams for d^n and d^{10-n} ions in octahedral and tetrahedral fields and interprets electronic spectra of complexes.	U, E	1
3.	applies magnetic measurements in the determination of structure of transition metal complexes.	Ap	1
4.	relates crystalline structure to X-ray diffraction data and the reciprocal lattice and explains the diffraction methods	U	1
5.	explains crystal defects .	U	1
6.	elaborates the structure of selected compounds of AX, AX_2, A_mX_2, ABX_3 and spinels.	C	1
7.	explains the electronic structure of solids using free electron theory and band theory.	E	1
8.	understands the differences in semiconductor and dielectric materials and their electrical and optical properties	U, E	1
9.	explain the structure and reactions of S–N, P–N, B–N, S–P compounds and boron hydrides.	U, E	1
10.	analyse the topological approach to boron hydride structure and estimates styx numbers and apply Wade's rules in borane and carboranes.	Ap, An, E	1
11.	identify the electronic configurations and term symbols of lanthanides and actinides.	Ap	1
12.	sketches the shapes of f orbital and shows their splitting in cubic ligand field.	U	1
13.	elaborates the importance of the beach sands of Kerala and their important components.	C	1

PSO–Programme Specific Outcome CO–Course Outcome

Cognitive Level: R–Remember U–Understanding Ap–Apply An–Analyse E–Evaluate C–Create

Module	Course Description	No. of Hrs	CO No.
1.0	**Coordination chemistry-II: Spectral and magnetic properties of transition metal complexes**	**18**	
1.1	Electronic spectra of metal complexes-Term symbols of d^n system, Racah parameters, splitting of terms in weak and strong octahedral and tetrahedral fields.	4	1

1.2	Correlation diagrams for d^n and d^{10-n} ions in octahedral and tetrahedral fields (qualitative approach), d-d transition, selection rules for electronic transition, effect of spin orbit coupling and vibronic coupling.	3	2
1.3	Interpretation of electronic spectra of complexes- Orgel diagrams, Tanabe-Sugano diagrams, calculation of Dq , B and β (Nephelauxetic ratio) values, charge transfer spectra.	3	2
1.4	Magnetic properties of complexes-paramagnetic and diamagnetic complexes, molar susceptibility, Gouy's method for the determination of magnetic moment of complexes, spin only magnetic moment.	4	3
1.5	Temperature dependence of magnetism. Temperature Independent Paramagnetism (TIP). Spin state crossover, Antiferromagnetism - inter and intra molecular interaction.	2	3
1.6	Application of magnetic measurements in the determination of structure of transition metal complexes.	2	3
2.0	**Crystalline state**	**18**	
2.1	Crystal symmetry- Introduction to point groups and space groups. Miller indices. Reciprocal lattice concept.	2	4
2.2	Close packed structures: BCC, FCC and HCP. Voids. Coordination number.	2	4
2.3	X-ray diffraction by crystals: Function of crystals. Transmission grating and reflection grating. Bragg's equation.	2	4
2.4	Diffraction methods: Powder and rotating crystal. Indexing and determination of lattice type and unit cell dimensions of cubic crystals.	3	4
2.5	Crystal defects: Perfect and imperfect crystals. Point, line and plane defects. Thermodynamics of Schottky and Frenkel defects.	2	5
2.6	Colour centers in alkali halide crystals. Defect clusters. Extended defects: Crystallographic shear structure and stacking faults. Dislocations and crystal structure.	3	5
2.7	Structure of compounds of AX (Zinc blende, Wurtzite), AX_2 (Rutile, fluorite, antifluorite), A_mX_2 (Nickel arsenide), ABX_3 (Perosvskite, Ilmenite), Spinels. Inverse spinel structures.	4	6
3.0	**Solid state chemistry**	**18**	
3.1	Electronic structure of solids. Free electron theory, band theory. Refinements to simple band theory, k space and Brillouin zones.	4	7
3.2	Conductors, insulators and semiconductors. Band	3	7

	structure of conductors, insulators and semiconductors and their applications.		
3.3	Intrinsic and extrinsic semiconductors, doping of semiconductors and conduction mechanism, the band gap.	3	7
3.4	Temperature dependence of conductivity, carrier density and carrier mobility in semiconductors.	2	7
3.5	Superconductivity, Photoconductivity, Photovoltaic effect. Colour in inorganic solids.	3	7
3.6	Dielectric properties. Dielectric materials. Ferroelectricity, pyroelectricity, piezoelectricity and ionic conductivity. Applications of ferro, piezo and pyroelectrics.	3	8
4.0	**Compounds of S, N, P and B**	**18**	
4.1	Sulphur-Nitrogen compounds: S_4N_4, S_2N_2, S_4N_2 and polythiazyl S_xN_y compounds. S-N cations and anions.	2	9
4.2	Sulphur-Phosphorus compounds: Molecular sulphides such as P_4S_3, P_4S_7, P_4S_9 and P_4S_{10}.	2	9
4.3	Phosphorous-Nitrogen compounds: Phosphazines. Cyclo and linear phosphazines.	2	9
4.4	Boron-Nitrogen compounds: Borazine, substituted borazines and boron nitride.	2	9
4.5	Boron hydrides: Reactions of diborane. Structure and bonding. Polyhedral boranes: Preparation, properties, structure and bonding.	3	9
4.6	The topological approach to boron hydride structure. Styx numbers. Importance of icosahedral framework of boron atoms in boron chemistry. Closo, nido and arachno structures. Wade's rules.	5	10
4.7	Carboranes and metallocarboranes.	2	10
5.0	**Lanthanides and actinides**	**18**	
5.1	Lanthanides: Characteristic properties. Electronic configurations and term symbols. Occurrence and extraction. Separation techniques.	4	11
5.2	Oxidation states of lanthanides. Spectral and magnetic properties of lanthanides. Lanthanide complexes as shift reagents.	3	11
5.3	Shapes of f orbital and their splitting in cubic ligand field.	2	12
5.4	Actinides: Occurrence and general properties. Extraction of thorium and uranium. Electronic configuration and term symbol. Oxidation states. Spectral and magnetic	4	11

	properties.		
5.5	Comparative properties of lanthanides and actinides. Trans-uranium elements and their stabilities.	2	11
5.6	Applications of lanthanide and actinide compounds.	1	13
5.7	Comprehensive study of the beach sands of Kerala and their important components such as monazite, ilmenite, zircon and sillimanite.	2	13

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6. L. V. Azaroff, Introduction to Solids, Mcgraw-Hill, 1960.
7. S. Cotton, Lanthanides and Actinides, Macmillan, 1991.
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9. A. Syamal and R. L. Datta, Elements of Magnetochemistry, Affiliated East-West Press, 1980.
10. C. Kittel, Introduction to Solid State Physics, Wiley and Sons, 8th edition, 2004.
11. N. N. Greenwood and A. Earnshaw, Chemistry of Elements, REPP Ltd, 2nd edition, 2005.
12. A. Earnshaw, Introduction to Magnetochemistry, Academic Press, 1968.

CH 222 ORGANIC CHEMISTRY II

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	discuss the fundamentals, operating principles and instrumentation of separation techniques.	R	1,
2.	differentiate the principle and applications of phase transfer catalysis with examples.	An	1
3.	describe the various methods of determining reaction mechanisms and basic thermodynamic principles of organic reactions.	U	1
4.	explain the Hammet parameters of reaction and design an experiment to confirm the mechanism of a reaction.	R, C	1
5.	identify different types of rearrangement reactions, determine the product of the reaction applying migratory aptitude, and reproduce the evidences for the mechanism of the reaction.	R, E	1

6.	understand that the outcomes of pericyclic reactions may be understood in terms of frontier orbital interactions, correlation diagram, Mobius and Huckel approach.	R	1
7.	recall and define the various types of pericyclic reaction; define such terms as 'conrotatory', 'suprafacial'.	R	1
8.	predict and rationalise the outcomes of pericyclic reactions including stereospecificity, regioselectivity, and stereoselectivity.	U	1
9.	state the synthetic importance of the above cycloaddition and rearrangement reactions, and give disconnections of target compounds corresponding to these reactions.	R	1
10.	describe the fate of excited molecule based on Jabolonoski diagram, predict the course of an organic photochemical reaction and identify the product with the type of functional group.	R, An	1
11.	propose synthetic routes to a variety of molecules, starting from simple precursors with correct stereochemistry and reagents of selected reactions.	Ap	1

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Module	Course Description	No. of Hrs	CO No.
1.0	**Separation Techniques**	**18**	
1.1	Classification of chromatographic methods. Theory of chromatography. Applications of chromatographic methods. Adsorption and partition chromatography. Paper, thin layer and column chromatographic methods.	4	1
1.2	Common Spray reagents and Developing agents in chromatography.	2	1
1.3	Centrifugal TLC, LC, pressure column chromatography, HPLC and GC, column matrices. Detectors. Affinity and chiral separations using HPLC.	4	1
1.4	GC MS and LC MS Principle, instrumentation and applications.	4	1
1.5	Normal and ultra-centrifugation. Gel and capillary electrophoresis and their applications.	2	1
1.6	Solvent extraction. Extraction using supercritical liquid CO_2, Craig's technique of liquid-liquid extraction.	2	1
2.0	**Physical Organic Chemistry**	**18**	
2.1	Phase transfer catalysis and its applications.	2	2
2.2	Kinetic and thermodynamic control of reactions with examples.	1	3
2.3	Reaction coordinates- difference between transition state and intermediates, Energy profiles, Curtin – Hammet Principle, Hammond postulate. Principle of microscopic	3	3

	reversibility. Reactivity in relation to molecular structure and conformation. Steric effects, F strain. Ortho effect, Bond angle strain.		
2.4	Solvent polarity and parameters, Y, Z and E parameters and their applications. Primary, secondary, inverse kinetic isotope effects. Salt effects and special salt effects in SN reactions.	3	3
2.5	Methods of determining reaction mechanisms-Product analysis, Isotopic studies, Primary and secondary kinetic isotope effects, Isolation and detection of intermediates, Cross over experiments.	4	3
2.6	Linear Free Energy Relations, The Hammett equation and its applications. Significance of sigma (σ) and rho (ρ) reactions with negative and positive ρ, low and high ρ, abnormal Hammet plot, Taft equation. Hammet plot for aromatic nucleophilic, electrophilic, S_N^1, S_N^2, electrophilic addition, Wittig reactions.	5	4
3.0	**Molecular Rearrangement and Transformation Reactions**	**18**	
3.1	Types of organic rearrangements: Anionic, cationotropic, prototropic, rearrangements involving carbene and nitrene intermediates.	4	5, 11
3.2	Mechanism with evidence of Wagner – Meerwein, Pinacol, Demjanov, Hofmann, Curtius, Schmidt, Lossen, Beckmann.	3	5, 11
3.3	Mechanism with evidence of Fries, Fischer–Hepp, Hofmann–Martius, von-Richter, Orton, Bamberger, Smiles.	3	5, 11
3.4	Mechanism with evidence of Dienone–phenol, Benzilic acid, Benzidine, Favorskii, Stevens, Dakin.	3	5, 11
3.5	Bucherer reaction, Rupe, Stevens, Claisen rearrangement.	2	5, 11
3.6	Rearrangements involving diazomethane – Arndt Eistert reaction, Wolf rearrangement.	3	5, 11
4.0	**Aromaticity and Pericyclic Reactions**	**18**	
4.1	Aromaticity and antiaromaticity. Non aromatic, homoaromatic, hetero and non–benzenoid aromatic systems. Aromaticity of annulenes, mesoionic compounds, metallocenes, cyclic carbocations, carbanions.	2	6, 7
4.2	Influence of aromaticity on physical and chemical properties, Diamagnetic anisotropic – benzene and paracylophane.	1	6, 7
4.3	Classification of pericyclic reactions, FMO, Correlation	4	6, 7,

	diagram, Mobius and Huckel theory of electrocyclic and cyclo addition reactions.		8, 9
4.4	Diels–Alder reaction–Stereo and regio selectivity , industrial applications–Aldrene, Dialdrene, endosulfan, anti stroke drug, Reserpine synthesis, fire retardant , Retro–Diels Alder, Alders ene, intramolecular Diels Alder reaction.	4	6, 7, 8, 9
4.5	1,3–Dipolar cycloaddition, nitrones, nitrile oxide, construction of heterocycles–oxazole, triazole, tetrazole, ozonide, Huisgen reaction.	3	6, 7, 8, 9
4.6	Sigmatropic rearrangement–classification [i,j], examples of [1,3], [1,5], [1,7], [3,3], [2,3] – FMO theory, stereochemistry of cope rearrangement, Claisen rearrangement.	4	6, 7, 8, 9
5.0	**Organic Photochemistry**	**18**	
5.1	Photochemical processes. Singlet and triplet states and their reactivity, Jablonski diagram, Energy transfer, sensitization and quenching.	3	10
5.2	Photoreactions of carbonyl compounds, enes, dienes and arenes. Norrish Type I and Type II reactions of acyclic ketones.	4	10
5.3	Patterno-Buchi and Barton reactions, Hofmann- Löffler-Freytag reaction, photo-Fries and Di-π methane, oxa di-π methane rearrangements.	4	10
5.4	Photoreactions of Vitamin D. Photosynthesis, photochemistry of vision.	3	10
5.5	Singlet oxygen generation and its reactions. Introduction to chemiluminescence.	2	10
5.6	Applications of photochemistry.	2	10

References

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CH 223 PHYSICAL CHEMISTRY II

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	apply quantum mechanical principles in solving both real and imaginary spherical harmonics systems-multi electron systems and analyse spectral lines.	U, Ap, An	1
2.	describe and explain the physical and chemical principles that underlie molecular structure determination techniques like microwave, vibrational, Raman and electronic spectroscopy.	R, U	1
3.	predict likely spectral characteristics of given molecular species, and be able to rationalise those characteristics on the basis of structural and electronic arguments.	Ap, An	1
4.	acquire knowledge of basics of statistical mechanics and compare statistical methods.	U, Ap	1
5.	understand and apply of theories of heat capacity.	U, Ap	1
6.	understand theories of electrolytes and electrochemical reactions.	R, U, Ap, An	1
7	ascertain the application of electrochemistry in industrial fields.	An	1
8.	understand the theories and applications behind various types of analytical techniques in electrochemistry.	U	1
9	acquire skill in solving numerical problems.	Ap	1

Module	Course Description	No. of Hrs	CO No.
1.0	**Quantum Chemistry II**	**18**	
1.1	Rotational motion: The wave equation in spherical polar coordinates-particle on a ring, the phi equation and its solution, wave functions in the real form.	3	1, 9
1.2	Non-planar rigid rotor and particle on a sphere-separation of variables, the phi and the theta equations and their solutions, Legendre and associated Legendre equations, Legendre and associated Legendre polynomials. Spherical harmonics (imaginary and real forms)-polar diagrams of spherical harmonics.	5	1, 9
1.3	Quantum Mechanics of Hydrogen-like systems: The wave equation in spherical polar coordinates: separation of variables – r, θ and ϕ equations and their solutions, wave functions and energies of hydrogen-like systems.	4	1, 9
1.4	Radial distribution functions, angular functions and their plots.	2	1
1.5	Wave functions for multi electron systems, wave equation for multi electron systems, symmetric and anti-symmetric wave functions, Pauli's anti-symmetry principle, and the postulate of spin. Spin orbitals. Spin-orbit coupling. Vector atom model-Term symbols, selection rules and explanation of spectral lines of hydrogen atom.	4	1
2.0	**Spectroscopy I**	**18**	
2.1	Rotational spectrum, selection rules, intensity of spectral lines, calculation of inter-nuclear distance.	2	2, 3
2.2	Non-rigid rotors and centrifugal distortion. Rotational spectra of polyatomic molecules-linear and symmetric top molecules. Introduction to instrumentation.	2	2, 3, 9
2.3	Vibrational spectra of harmonic and anharmonic oscillator. Selection rules. Morse curve, fundamentals and overtones. Determination of force constant.	3	2, 3, 9
2.4	Rotational fine structure, P, Q, R branches of spectra.	1	2, 3
2.5	Vibrational spectra of polyatomic molecules: Normal modes, classification of vibrational modes into stretching (asymmetric, symmetric), bending, parallel and perpendicular vibrations.	2	2, 3
2.6	Finger print region and group frequencies. Introduction to FTIR and instrumentation.	1	2, 3
2.7	Raman scattering, polarizability and classical theory of Raman spectrum.	1	2, 3
2.8	Rotational and vibrational Raman spectrum. Raman	2	2, 3

	spectra of polyatomic molecules. Complementarity of IR and Raman spectra. Mutual exclusion principle.		
2.9	Introduction to instrumentation. Laser Raman spectrum.	1	2, 3
2.10	Electronic spectra of diatomic molecules. Vibrational coarse structure and rotational fine structure of electronic spectrum. Franck-Condon principle.	2	2, 3, 9
2.11	Types of electronic transitions. Fortrat diagram. Predissociation.	1	2, 3
3.0	**Statistical Thermodynamics**	**18**	
3.1	Basic principle of permutation, combination, thermodynamic probability and entropy.	3	4
3.2	Microstates, concept of ensembles canonical and grand canonical ensemble.	1	4
3.3	Maxwell Boltzmann distribution.	2	4
3.4	Molecular partition functions - Translational (1D, 2D and 3D), vibrational, rotational and electronic partition functions. Total partition functions.	4	4
3.5	Relationship between partition functions and thermodynamic properties, Sackur-Tetrode equation. The principle of equi-partition of energy.	4	4
3.6	Chemical equilibrium, Law of mass action, Transformation of the equilibrium expressions. Statistical derivation.	4	4
4.0	**Quantum statistics**	**18**	
4.1	Bose-Einstein statistics, Thermodynamic probability, Bose Einstein distribution function. Examples of particles.	3	4
4.2	Fermi-Dirac statistics. Examples of particles- Fermi-Dirac distribution function. Thermionic emission	3	4
4.3	Relation between Maxwell Boltzmann, Bose Einstein and Fermi-Dirac statistics.	3	4
4.4	Quantum theory of heat capacity - calculation of heat capacity of gases; limitation of the method.	3	5
4.5	Heat capacity of solids. Dulong and Petit's law, Kopp's law; limitations.	2	5
4.6	Einstein theory of heat capacity; limitations.	2	5
4.7	The Debye theory of specific heat capacity of solids.	2	5
5.0	**Electrochemistry**	**18**	
5.1	Ionics: Activity and activity coefficient of electrolytes, determination of activity coefficient.	1	6
5.2	Debye-Huckel theory of strong electrolytes, Debye-Huckel-Onsager equation and its derivation, limitation of the model, conductance at high frequencies and high	2	6

	potentials –Wein effect and Debye - Falkenhagen effect.		
5.3	Ionic strength, Debye - Huckel limiting law, mean ionic activity coefficient.	1	6, 9
5.4	Electrodics: Different type of electrodes. Electrochemical cells, EMF of concentration cells, liquid junction potential and its determination, cells without liquid junction potential.	2	6, 9
5.5	Calculation of thermodynamic properties. Electrical double layer and electro capillarity.	2	6, 9
5.6	Electrokinetic phenomena.	1	6, 7
5.7	Over potentials: Butler-Volmer equation. Tafel and Nernst equation, Tafel plot and its significance.	3	6 7
5.8	Fuel cells: H_2-O_2, zinc-air and solid oxide fuel cells.	1	7
5.9	Potentiometric titrations involving redox reaction. Conductometric titrations. Coulometric titrations.	2	8
5.10	Voltammetry: principle and method of polarography, cyclic voltammetry, stripping voltammetry and amperometry.	3	8

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Model Question Papers

General Instruction to question paper setters

- There will be a 15 main questions in each question paper divided into 3 sections – A, B and C
- Each of the sections A, B and C will have 5 questions each, **1 from each module**.
- Each question in Section A will have 3 sub questions (a), (b) and (c), of which the candidate has to answer any two (2 marks each).
- Each question in Section B will have 2 sub questions (a) and (b), of which the candidate has to answer any one (5 marks each).
- Candidate should answer any three out of the five questions in Section C (10 marks each).
- Section A carries a total of 20 marks, Section B carries 25 marks, and Section 3 carries 30 marks.
- The maximum marks will be 75 and the duration of the exam will be 3 hrs.

Second Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry/ Branch IV – Analytical Chemistry
CH/CL 221: INORGANIC CHEMISTRY – II
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) Which among $Ni(CO)_4$ and $Fe(CO)_5$ has an intense d–d transition ? Why?
   (b) The effective magnetic moment of a complex is 4.90 BM. Calculate the number of unpaired electrons per unit complex.
   (c) The electronic spectra of metal complexes are broad. Why?

2. (a) Differentiate H-centre from V-centre in NaCl crystals.
   (b) What effects do Schottky and Frenkel defects have on the density of a crystal?
   (c) What are spinels? Give the general formula of spinels.

3. (a) What is meant by band gap of a substance?
   (b) The conductance of metals decreases with increase in temperature. Why?
   (c) What are intrinsic and extrinsic semiconductors

4. (a) Complete the reactions given below
   (i) $B_2H_6 + H_2O \rightarrow$
   (ii) $S_4N_4 + Cl_2 \rightarrow$
   (b) Which undergoes addition reactions faster – Benene or Borazine? Why?
   (c) Clasify the following into closo, nido and archano.
   B_2H_6, $C_2B_9H_{11}$, $B_{12}H_{12}^{2-}$, B_5H_{11},

5. (a) Actinides form oxocations but lanthanides don't. Give reason?
   (b) What is misch metal?
   (c) Which among lanthanides and actinides has a higher tendency to form complexes? Why?

$[2 \times 10 = 20]$

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) Discuss the Orgel diagram and electronic spectra of $[Ti(H_2O)_6]^{3+}$.
   (b) What is meant by a charge transfer spectra?

7. (a) Detail the line and plane defects in solids.
   (b) Describe the principle and procedure of X-ray diffraction method.

8. (a) Examine the various types of dielectric properties exhibited by crystals.

(b) What is photovoltaic effect? Which type of materials exhibit this property?

9. (a) How is polythiazyl synthesized? Describe its structure. Why is it treated as a one dimensional conductor?
   (b) Obtain the styx number of B_4H_9.

10. (a) Detail the ion exchange method employed in the separation of lanthanides.
    (b) Brifely describe the industrial importance of the beach sands of Kerala.

[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. Explain the Guoy's methods used to determine magnetic susceptibility. How is it important in structure determination?

12. Discuss in detail the perovskite structure by taking $SrTiO_3$ as the example.

13. Discuss the salient features of the band theory of solids and compare it with the free electron theory of solids.

14. What are carboranes? How are they obtained?

15. Compare the spectral and magnetic properties of lanthanides and actinides.

[10 × 3 = 30]

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Second Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry/ Branch IV – Analytical Chemistry
CH/CL 222: ORGANIC CHEMISTRY – II
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) What is retention time? Explain its significance.
   (b) Write any two spraying reagents for detection of alkaloids.
   (c) What is meant by reversed phase HPLC.

2. (a) What is F strain?
   (b) Explain microscopic reversibility.
   (c) Describe Taft equation and its terms?

3. (a) Show how vicinal diols are converted to ketones by rearrangement?
   (b) Give the mechanism of Curtius rearrangement.
   (c) Briefly explain Fisher-Hepp reaction.

4. (a) Why is [10] annulene a non aromatic compound?
   (b) Azulene posses dipole moment of 1.4 D. Why?
   (c) State Woodward and Hoffman rules for pericyclic reaction?

5. (a) What is photo-Fries rearrangement?
   (b) Distinguish singlet and triplet states in photochemistry.
   (c) Write an example for Barton reaction.

[2 × 10 = 20]

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) Describe the instrumentation of GC-MS
   (b) What are the information's obtained from a LC-MS chromatogram?

7. (a) Design a cross over experiment for Claisen rearrangement and predict your observation.
   (b) Hammet ρ value of nitration of benzene is negative while that of Wittig reaction is positive Explain.

8. (a) Explain the migratory aptitude in Baeyer-Villager rearrangement with three examples
   (b) Discuss the mechanism and applications of Dienone-phenol rearrangement

9. (a) Write the product of photochemical ring closure of 2E, 4E hexadiene with correct stereochemistry and FMO explanation
   (b) Draw a correlation diagram to show that supra-supra 4+2 cycloaddition is thermally allowed.

10. (a) Discuss the chemistry behind the process of vision.
    (b) Explain Patterno-Buchi reaction

[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. Describe the experimental procedures for thin layer chromatography and column chromatography.

12. Explain any four reactions where isotopic studies support the mechanism.

13. Describe with evidences the mechanism of
    a) Wagner-Meerwein rearrangement b) Pinacol rearrangement
    c) Demjanov rearrangement d) Hofmann rearrangement

14. Describe the stereoselectivity and regioselectivity of Diels-Alder reactions

15. Write a note on fate of excited state molecule with a Jablonski diagram and

photochemistry of vitamin-D.

[10 × 3 = 30]

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Second Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry/ Branch IV – Analytical Chemistry
CH/CL 223: PHYSICAL CHEMISTRY – II
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) Write the determinantal form of wave function for lithium atom.
   (b) By inspecting the hydrogen like wave function,
   $\varphi_{(nlm)} = \frac{\sqrt{2}}{81\sqrt{\pi}} Z^{3/2}(6 - Zr)Zr \exp^{(-Zr/3)} \cos\theta$, find the quantum numbers *n*, *l* and *m*.
   (c) What is a radial distribution function? Mention it's importance.

2. (a) How would one determine the theoretical force constant of the C–C bond?
   (b) Anti-stokes lines are usually weak. Why?
   (c) What is the effect of nuclear spin on the intensity of spectral lines?

3. (a) Differentiate between Bosons and Fermions.
   (b) Explain the concept of ensembles and give the difference in properties of each category
   (c) How can you explain partition function is a measure of number of available energy levels?

4. (a) Calculate the value of C_v for any element when its temperature is equal to the Debye characteristics temperature.
   (b) What is Sterling's approximation? How this approximation helps to arrive at thermodynamic probability.
   (c) Distinguish between Dulong Pettit law and Kopps law.

5. (a) Draw the graph and explain the theory of conductometric titration of a weak acid against a strong base.
   (b) What is the significance of half-wave potential?
   (c) Calculate the mean activity coefficient of 0.01 M $BaCl_2$in water at 25°C.

[2 × 10 = 20]

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) Verify that F = $1/\sqrt{2}\ \pi \exp(iM\varphi)$ constitute an orthonormal set for particle

in a ring.

(b) Write the Schrodinger equation for hydrogen atom in polar coordinates and separate the variables.

7. (a) Spacing between adjacent lines in HCl molecule is 10 cm^{-1}. Force constant is $1.38\times10^{-23}JK^{-1}$, Calculate maximum population at room temperature.

(b) Explain the origin of P and R branches in rotational-vibrational spectrum.

8. (a) Deduce Sackur-Tetrode relation using Partition function.

(b) State and prove Boltzman's theorem connecting entropy and probability.

9. (a) Considering free electrons in a metal to form a Fermi gas. Obtain the Richardson – Dushmam equation for thermionic emission for electrons.

(b) Deduce Fermi-Dirac distribution law; hence obtain an expression for energy.

10. (a) Explain the term ionic mobility. The H^+ ion because of its heavy hydration and consequent large size and shape, should have a low mobility but actually its mobility is very high. How would you account for it? Why does H^+ ion move about 50 times more rapidly in ice than in liquid water.

(b) The exchange current density of a Pt/H_2, $H^+(aq)$ electrode is 0.79mA cm^{-2}. What current flows through a standard electrode of total area 5 cm^2 when the potential difference across the electrode is 5 mV, the temperature 25°C and the proton activity unity?

[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. (i) Apply Schrodinger equation for particle in a ring. Find eigen values andeigen functions.

(ii) Show that any two associated Legendre functions satisfy orthogonality condition.

(7+3)

12. (i) The rotational Raman spectrum recorded for $^{14}N_2$ molecule using monochromatic laser source of wave length 336.86 nm, first three Stokes lines were observed respectively at 28677.3, 29669.3 and 29661.4 cm^{-1}. Find the bond length of the molecule.

(ii) How is the rotational spectrum of a diatomic molecule affected by isotopic substitution?

(5+5)

13. (i) How thermo dynamic functions like internal energy, entropy and specific heat capacity are related to partition function? Derive the relation.

(ii) Explain Maxwell-Boltzman distribution law.

(7+3)

14. What are the limitations of Einstein's theory of heat capacity? How Debye theory attempted to rectify this? Discuss Debye theory of specific heat capacity of solids.

15. (i) What is exchange current density? How the concept is understood using Butler-Volmer equation?
    (ii) Describe the theory and application of cyclic voltametry.

(5+5)

[10 × 3 = 30]

SEMESTER III

CH 231 INORGANIC CHEMISTRY III

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	demonstrate knowledge of advanced content in the areas of inorganic chemistry such as in organometallic compounds, bioinorganic compounds, spectroscopic methods in inorganic Chemistry and nuclear chemistry.	U	1
2.	examine the bonding in simple and polynuclear carbonyls with and without bridging and complexes with linear π donor ligands.	U, An	1
3.	explain the structure and bonding of ferrocene and dibenzenechromium with the help of MO theory.	U, An, C	1
4.	understand fundamental reaction types and mechanisms in organometallics and to employ them to understand selected catalytic processes in industry.	U, An, C	1
5.	contrasts the thermodynamic and kinetic stability of complexes, analyses the factors affecting stability of complexes and explains the methods of determining stability constants.	An, E	1
6.	classifies ligand substitution reactions and explains its kinetics and various mechanisms.	U, E	1
7.	analyze the chemical and physical properties of metal ions responsible for their biochemical action as well as the techniques frequently used in bioinorganic chemistry such as oxygen transport, e-transfer, communication, catalysis, transport, storage etc.	U, An	1
8.	explain the principles of spectroscopic methods employed in inorganic chemistry and their applications in the study of metal complexes.	An, E	1
9.	demonstrate a knowledge of fundamental aspects of the structure of the nucleus, radioactive decay, nuclear reactions, counting techniques.	R, U	1
10.	evaluate the role of nuclear chemistry to find the most suitable measures, administrative methods and industrial solutions to ensure sustainable use of the world's nuclear resources.	U, E, C	1, 4

PSO–Programme Specific Outcome CO–Course Outcome

Cognitive Level: R–Remember U–Understanding Ap–Apply An–Analyse E–Evaluate C–Create

Module	Course Description	No. of Hrs	CO No.
1.0	**Organometallic compounds**	**18**	

1.1	Nomenclature of organometallic compounds. Hapto nomenclature. 18 and 16 electron rule, isoelectronic and isolobal analogy.	2	1
1.2	Metal carbonyls, bonding in metal carbonyls. Synthesis, structure and bonding of polynuclear carbonyls with and without bridging.	2	2
1.3	Complexes with linear π donor ligands: Olefins, acetylenes, dienes and allyl complexes. Complexes with cyclic π donors: Cyclopentadiene, benzene complexes.	2	2
1.4	Structure and bonding of ferrocene and dibenzenechromium complexes (MO treatment).	4	3
1.5	Oxidative addition and reductive elimination, insertion and elimination reactions	3	4
1.6	Catalysis by organometallic compounds: Alkene hydrogenation using Wilkinson's catalyst, hydroformylation of olefins using cobalt and rhodium catalyst, polymerization reaction by Ziegler-Natta catalyst, Monsanto acetic acid process, Palladium catalysed oxidation of ethylene-the Wacker process.	5	4
2.0	**Coordination chemistry-III: Reactions of metal complexes**	**18**	
2.1	Energy profile of a reaction - Thermodynamic and kinetic stability, Stability of complex ions in aqueous solutions: Formation constants. Stepwise and overall formation constants. Factors affecting stability of complexes.	2	1, 5
2.2	Determination of stability constants: spectro photometric, polarographic and potentiometric methods.	3	1, 5
2.3	Stability of chelates. Thermodynamic explanation, macrocyclic effects.	1	1, 5
2.4	Classification of ligand substitution reactions-kinetics and mechanism of ligand substitution reactions in square planar complexes, trans effect theory and synthetic applications.	3	1, 6
2.5	Kinetics and mechanism of octahedral substitution-water exchange, dissociative mechanism, associative mechanism - Eigen-Wilkins mechanism, Eigen - Fuoss equation, base hydrolysis, racemisation and isomerisation reactions.	3	1, 6
2.6	Electron transfer reactions: Outer sphere mechanism-Marcus theory, inner sphere mechanism - Taube mechanism.	3	1, 6
2.7	Photochemical reactions-substitution and redox reactions of Cr(III), Ru(II), and Ru(III) complexes. Photo-isomerisation and photo-aquation reactions of metal complexes.	3	1, 6

3.0	**Bioinorganic chemistry**	**18**	
3.1	Essential and trace elements in biological systems, structure and functions of biological membranes, mechanism of ion transport across membranes, sodium-potassium pump.	2	1, 7
3.2	Photosynthesis, porphyrin ring system, chlorophyll, PS I and PS II. Synthetic model for photosynthesis.	2	1, 7
3.3	Role of calcium in biological systems - blood coagulation, muscle contraction.	1	1, 7
3.4	Oxygen carriers and oxygen transport proteins-haemoglobin and myoglobin.	2	1, 7
3.5	Non-haeme iron-sulphur proteins involved in electron transfer-ferredoxin and rubredoxin.	3	1, 7
3.6	Iron storage and transport in biological systems ferritin and transferrin.	3	1, 7
3.7	Redox metalloenzymes-cytochromes, cytochrome P-450, peroxidases and superoxide dismutase and catalases. Nonredox metalloenzymes- Carboxypeptidase A - structure and functions.	3	1, 7
3.8	Nitrogeases, biological nitrogen fixation. Vitamin B_{12} and coenzymes. Toxic effects of metals (Cd, Hg, Cr and Pb).	2	1, 7
4.0	**Spectroscopic Methods in Inorganic Chemistry**	**18**	
4.1	Infrared spectra of coordination compounds. Structural elucidation of coordination compounds containing the following molecules/ ions as ligands- NH_3, H_2O, CO, NO, OH^- , SO_4^{2-} , CN^- , SCN^- , NO_3^-, NO_2^-, CH_3COO^- and X^- (X=halogen). Changes in ligand vibration on coordination with metal ions.	5	1, 8
4.2	Vibrational spectra of metal carbonyls–CD and ORD spectra of metal complexes.	3	1, 8
4.3	ESR spectra: Application to Cu(II) complexes and inorganic free radicals such as PH_4, F_2^- and $[BH_3]^-$.	3	1, 8
4.4	Nuclear Magnetic Resonance Spectroscopy: The contact and pseudocontact shifts, some applications including biological systems, an overview of NMR of metal nuclides with emphasis on ^{11}B, ^{31}P and ^{19}F NMR.	4	1, 8
4.5	Mossbauer Spectroscopy: Application of the technique to the studies of iron and tin complexes.	3	1, 8
5.0	**Nuclear Chemistry**	**18**	
5.1	Nuclear structure, mass and charge. Nuclear moments. Binding energy. Semiempirical mass equation. Stability rules. Magic numbers.	3	1, 9

5.2	Nuclear models: Shell, Liquid drop, Fermi gas, collective and optical models.	3	1, 9
5.3	Equation of radioactive decay and growth. Half life and average life. Radioactive equilibrium. Transient and secular equilibria.	3	1, 9
5.4	Nuclear reactions: Direct nuclear reactions, heavy ion induced nuclear reactions, photonuclear reactions. Neutron captures cross section and critical size.	3	1, 9
5.5	Nuclear fission as a source of energy, Nuclear chain reacting systems. Principle of working of the reactors of nuclear power plants. Breeder reactor. Nuclear fusion reaction, stellar energy.	3	1, 10
5.6	Principles of counting technique such as G.M. counter, proportional, ionization and scintillation counters. Cloud chamber.	3	1, 9

References

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CH 232 ORGANIC CHEMISTRY III

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	describe and explain the physical and chemical principles that underlie molecular structure determination techniques such as UV-visible, IR, mass and NMR spectroscopy.	U, An	1
2.	apply knowledge of molecular structure determination using UV-visible, IR, mass and NMR spectroscopic techniques to identify and/or characterise chemical compounds from experimental data.	Ap, An	1, 8
3.	calculate λ_{max} of a compound, apply IR frequency table to determine the functional groups present in the molecule, interpret mass spectrum of compound from fragmentation.	U, Ap	1, 8
4.	predict likely spectral characteristics of given molecular species; solve the structures of unknown molecules using appropriate spectroscopic techniques.	U, Ap, An	1, 8
5.	devise a 2 D NMR of a compound based on learned principles and solve the structure of a compound based on NMR data.	C, Ap	1, 8
6.	discuss organic transformations with organometallic compounds and predict the products of the reactions.	U	1
7.	propose the retro synthetic pathways to a variety of molecules	U, Ap, C	1
8.	propose mechanisms for chemical reactions, given starting materials, reagents, conditions, and/or products.	U, Ap, C	1
9.	compare the reactions and mechanism and determine the products of a selected set of reactions; identify protecting group strategies.	Ap, E	1
10.	devise combinatorial method to create a library of compounds.	C	1, 6
11.	give examples of stereoselective, regioselective and chemoselective reductions and oxidations.	U	1

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Module	Course Description	No. of Hrs	CO No.
1.0	**UV-vis and IR Spectroscopy and Mass spectrometry**	**18**	
1.1	Electronic transitions and analysis of UV spectra of enes, enones and arenes. Woodward Fieser rules. Effect	4	1, 2, 3

	of solvent polarity on UV absorption.		
1.2	Principle of characteristic group frequency in IR. Identification of functional groups and other structural features by IR, Hydrogen bonding and IR bands. Sampling techniques.	4	1, 2, 3
1.3	Mass spectrometry-Soft and hard ionization techniques; EI, CI, FAB, Electrospray and MALDI ion sources. Magnetic, High resolution (Double focusing), TOF and quadrupole mass analysers. Characteristic EIMS fragmentation modes and MS rearrangements.	6	1, 2, 3
1.4	Mass spectral fragmentation patterns of long chain alkanes, alkenes, alkynes, alcohols, ethers, thiols, aromatic compounds, aldehydes, ketones, acids, amides, nitro, amino and halo compounds.	4	1, 2, 3
2.0	**NMR spectroscopy and Structural elucidation**	**18**	
2.1	Theory of NMR spectroscopy, chemical shifts, anisotropic effects and coupling constant. Spin-spin interactions in typical systems. First order and higher order spectra.	5	1, 2,
2.2	Simplification methods of complex spectra by high field NMR, shift reagents, chemical exchange and double resonance.	5	1, 2
2.3	^{13}C NMR chemical shifts. Applications of NOE, DEPT, and 2D techniques such as COSY-HSQC, HMQC and HMBC (basic principles only).	5	1, 2, 5
2.4	Spectral interpretation and structural elucidation. Solving of structural problems on the basis of numerical and spectrum based data.	3	1, 4
3.0	**Organometallic compounds in organic synthesis**	**18**	
3.1	Preparation of organo Mg, Al, Li, Cu, Zn, Cr, Grignard reagents in organic synthesis. Alkylation, oxirane addition, carbon dioxide addition, carbonyl addition, enone addition (1,2 - and 1,4 - additions), reduction, and enolisation reactions. Selectivity in Grignard reactions.	5	6, 8
3.2	Reactions of organo Li reagents, Li exchange reaction, its use in the preparation of RLi compounds, addition to C=O, COOH and $CONR_2$, Li dialkylcuprates (Gilman reagent)-preparation and reaction with alkyl halides, aryl halides and enones.	5	6, 8
3.3	Alkynyl Cu(I) reagents, Glasier coupling. Dialkyl cadmium compounds preparation and reaction with acyl halides.	4	6, 8
3.4	Benzene tricarbonyl chromium - preparation and reaction with carbanions. Tebbe's reagent, Silane carbanion and its reactions.	4	6, 8

4.0	**Methods in organic synthesis**	**18**	
4.1	Retrosynthetic analysis and disconnection approach-synthons, synthetic strategy, reliable reaction, disconnect after heteroatom, chemoselectivity, two group disconnections (use of epoxide), creation of cis and trans double bonds, retro synthesis of amines.	3	7, 9
4.2	Regioselectivity in enol alkylation,Lithium enolates, Zimmerman-Taxler model, enamine alkylation, aza enolate, silyl enol ether, alkylation of nitriles, nitro compounds, acids, ketones, aldehydes.	3	7, 9
4.3	Olefin metathesis – first and second generation Grubbs' catalysts. Umpolung concept-1,3-Dithiane, benzoin condensation.	3	7, 9
4.4	Coupling reactions - Heck, Negishi, Sonagashira, Kumada and Suzuki coupling, Stepens-Castro coupling, Stille coupling,	4	7, 9
4.5	Protecting group strategy: Tetrahydropyranyl, silyl, t-butyl, trichloroethyl, acetal and thioacetal as hydroxyl, thiol, carboxyl and carbonyl protecting groups in synthesis.	3	7, 9
4.6	Introduction to combinatorial synthesis - split and pool method only.	2	10
5.0	**Oxidation and Reduction reactions in organic chemistry**	**18**	
5.1	Reduction using boranes and hindered boranes - 9 BBN, disiamylborane, pinacolborane	2	11
5.2	Sodium borohydride and lithium aluminium hydride,$NaCNBH_3$ DIBAL-H, bulky metal hydrides, Li trialkylborohydrides, tri-n-butyltin hydride, diimide, and aluminium alkoxide.	4	11
5.3	Birch reduction, Clemmensen reduction and Wolff - Kishner reduction, Huang - Minlon modification, Rosenmund reduction.	3	11
5.4	McFadeyan-Stevens reaction, allylic and benzylic oxidation, Sharpless epoxidation, oxidation using SeO_2, manganese (IV) oxide, lead tetraacetate, ozone, peracids, DDQ, silver carbonate and Cr(VI) reagents.	5	11
5.5	Jones oxidation, chemo and region selectivity in reductions and oxidations. Swern oxidation, Moffatt oxidation, Sommelet reaction. Applications of HIO_4, Dess-Martin periodinane, OsO_4 and mCPBA.	4	11

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CH 233 PHYSICAL CHEMISTRY III

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	understand the theories of chemical bonding and their application with help of approximate methods predict the nature of orbitals and molecular spectra.	U, Ap, An	1

2.	compare MO and VBT.	An	1
3.	understand the properties of gases and liquids and the nature of the intermolecular forces in them.	U, Ap, An	1
4.	describe the principle behind the determination of surface tension and coefficient of viscosity.	U	1
5.	describe and explain the physical and chemical principles that underlie molecular structure determination techniques like NMR, ESR, Mossbauer, NQR and PES spectroscopy.	U, Ap, An	1
6.	judge the degrees of freedom of systems and understand theories of irreversible thermodynamic systems.	U, Ap, An, E	1
7.	understand the quantum mechanical and non-quantum mechanical methods in computational chemistry, potential energy surface and basis functions.	U, An	1
8.	write the Z matrix of simple molecules.	U, Ap	1
9.	acquire skill in solving numerical problems.	Ap	1

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Module	Course Description	No. of Hrs	CO No.
1.0	**Approximate methods and Chemical Bonding**	**18**	
1.1	Approximate methods: Method of Variation-variation theorem and its proof. Linear variation functions. Secular equations and secular determinants.	2	1
1.2	Method of Perturbation-successive correction to an unperturbed problem. Detailed treatment of first order non-degenerate case only. Hartree-Fock Self-Consistent Field (HF-SCF) method for atoms, Hartree-Fock equations (derivation not required) & the Fock operator.	3	1
1.3	MO theory- The Born-Oppenheimer approximation -MO Theory-LCAO MO method applied to H_2 and H_2^+.	2	1
1.4	MO diagram of homo nuclear diatomic molecules Li_2, Be_2, B_2, C_2, O_2 and F_2 and hetero nuclear diatomic molecules LiH CO, NO and HF.	2	1
1.5	Spectroscopic term symbols for homodiatomic molecules, selection rules for molecular spectra.	1	1
1.6	Valance bond theory - VB treatment of hydrogen molecule only.	2	1
1.7	Comparison of MO and VB theories.	1	2
1.8	Quantum mechanical treatment of sp, sp^2 and sp^3 hybridisation.	2	1
1.9	HMO theory of conjugated systems. Bond order and charge density calculations, free valance. Application of HMO method to ethylene, allyl, butadiene and benzene systems.	3	1, 9
2.0	**Gaseous and Liquid State**	**18**	
2.1	Maxwell's distribution of molecular velocities,	4	3, 9

	influence of temperature, types of molecular velocities- derivation of molecular velocities from Maxwell's equation.		
2.2	Transport phenomena in gases – viscosity of gases, Chapman equation, determination of viscosity of gases, calculation of mean free path.	3	4, 9
2.3	Thermal conductivity, diffusion	3	3
2.4	Degrees of freedom of gaseous molecules - Translational, Rotational and vibrational.	1	3
2.5	Equation of state of real gases- van der Waal's equation, Other equation of states - Virial equation, second virial coefficient and determination of diameter of a molecule.	3	3, 9
2.6	Inter molecular forces - Dipole-dipole interaction, induced dipole-dipole, induced dipole-induced dipole interactions.	1	3
2.7	Liquid state: Liquid vapour equillibria, vapour pressure- methods of measuring vapour pressure - barometric method and dynamic method - equation of state for liquids, structure of liquids-short range order.	1	3
2.8	X-ray diffraction of liquids. Vacancy model for a liquid, radial distribution function.	1	3
2.9	Surface tension - determination of surface tension by drop weight method and drop number method. Viscosity - determination of coefficient of viscosity by Ostwald viscometer.	1	4, 9
3.0	**Spectroscopy II**	**18**	
3.1	Resonance spectroscopy: Nuclear Magnetic resonance Spectroscopy, Nuclear spin. Interaction between nuclear spin and applied magnetic field.	2	5
3.2	Proton NMR. Population of energy levels.	1	5
3.3	Nuclear resonance. Chemical shift. Relaxation methods. Spin-spin coupling. Fine structure.	2	5
3.4	Introduction to instrumentation Fourier Transformation (FT) NMR Spectroscopy: Instrumentation - experimental aspects magnets, radio frequency transmitter, NMR probe and computer. Radio frequency pulses effect of pulses, rotating frame reference, FID, FT technique - data acquisition and storage, signal averaging. Pulse sequences- pulse width, spins and magnetisation vector.	3	5, 9
3.5	ESR spectroscopy: Electron spin. Interaction with magnetic field. Kramer's rule. The g factor. Fine structure and hyperfine structure. Analytical applications of ESR, Determination of reaction rates and mechanisms by ESR, Structural determination by ESR. Elementary idea of ENDOR and ELDOR.	4	5, 9

3.6	Mossbauer spectroscopy: Basic principles. Doppler effect, chemical shift, recording of spectrum, application. Quadrupole effect, Effect of magnetic field.	3	5
3.7	NQR spectroscopy- Principle and application.	2	5
3.8	Photoelectron spectroscopy: Introduction to UV photoelectron and X-ray photoelectron spectroscopy.	1	5
4.0	**Applications of Thermodynamics**	**18**	
4.1	Simple examples of irreversible processes.	1	6
4.2	General theory of non-equilibrium processes. The phenomenological relations. Onsager reciprocal relation. Principle of minimum entropy production.	2	6
4.3	Generalized equation for entropy production, Entropy production from heat flow, matter flow and current flow.	3	6, 9
4.4	Application of irreversible thermodynamics to diffusion. Thermal diffusion, thermo osmosis and thermo-molecular pressure difference.	4	6
4.5	Electro-kinetic effects, the Glansdorf-Pregogine equation. Far from equilibrium region.	3	6
4.6	Three component systems: Graphical representation. Three component liquid systems with one pair of partially miscible liquids. Influence of temperature. Systems with two pairs and three pairs of partially miscible liquids.	3	6
4.7	Solid- liquid system: Two salts and water systems-no chemical combination, double salt formation, one salt forms hydrate, double salt forms hydrate, Isothermal evaporation.	2	6
5.0	**Computational Chemistry**	**18**	
5.1	Introduction to computational chemistry: As a tool and its scope. Potential energy surface-stationary point, saddle point or transition state, local and global minima. Basis functions-Slater type orbitals (STO) and Gaussian type orbitals (GTO).	3	7
5.2	Basis sets: minimal, split valence, polarized and diffuse basis sets, contracted basis sets, Pople's style basis sets and their nomenclature.	2	7
5.3	Quantum mechanical computational methods - Abinitio methods: Introduction to SCF. RHF, ROHF and URHF. (no need of calculation). Wave functions for open shell state, Slater determinants, Roothan concept.	2	7
5.4	Semi empirical methods: Huckels and extended Huckel methods. Strengths and weaknesses. PPP, ZDO, NDDO, INDO, MNDO (AM1, PM3) and CNDO	2	7

	approach.(Mentioning only).		
5.5	Density functional theory methods (DFT) - Electron correlation and introduction to post HF methods. Hohenberg-Kohn theorems, Exchange correlational functional Kohn-Sham orbitals, Local density approximation. Generalized gradient approximation (Only the basic principles and terms to be introduced).	2	7
5.6	Non-quantum mechanical computational methods - Molecular mechanics: Force fields - bond stretching, angle bending, torsional terms, non-bonded interactions, electrostatic interactions and the corresponding mathematical expressions. Commonly used forcefields - AMBER and CHARMM.	2	7
5.7	Construction of Z-matrix for simple molecules. H_2O, H_2O_2, H_2CO, CH_3CHO, NH_3 and CO_2.	2	8
5.8	Structure drawing and energy calculation (geometry optimization) using free software Arguslab, Tinker, NAMD, DL-POLY	3	7

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CH 234 INORGANIC CHEMISTRY PRACTICALS – II

Total 125 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.	U, An	3, 7, 8
2.	estimate a simple mixture of ions (involving quantitative separation) by volumetric and gravimetric methods.	An	7, 8
3.	perform COD, BOD, DO, TDS analysis.	Ap, An	4, 7, 8
4.	predict likely spectral characteristics of given metal compexes solve the structures of unknown metal compexes using appropriate spectroscopic techniques and magnetic measurements .	Ap, An	6, 8
5.	analyse the XRD of simple substances.	An	8
6.	interpret TG and DTA curves.	An	8

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Module	Course Description	No. of Hrs	CO No.
1.	Estimation of simple mixture of ions (involving quantitative separation) by volumetric and gravimetric methods. a) Iron (gravimetric) and Chromium (volumetric) b) Iron (gravimetric) and Zinc (volumetric) c) Copper (volumetric) and Nickel (gravimetric) d) Iron and Copper	40	1, 2

	e) Copper and Nickel		
2.	Environmental Analysis – COD, BOD, DO, TDS	20	1, 3
3.	Spectral Interpretation of metal complexes using IR, UV-vis. spectral data. Supplementary information like metal estimation, CHN analysis, conductivity measurements and magnetic measurements to be provided to the students. Assessment is based on arriving at the structure of the complex and assignment of IR spectral bands.	25	4
4.	Analysis of XRD of simple substances.	15	5
5.	Interpretation of TG and DTA curves .	25	6

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1. A. I. Vogel, A Text Book of Quantitative inorganic Analysis, Longman, 4th edition, 1978.
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3. W. W. Wendlandt, Thermal Methods of Analysis, Inter-Science, New York, 1964.
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CH 235 ORGANIC CHEMISTRY PRACTICALS – II

Total 125 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.	U, An	3, 7, 8
2.	predict likely spectral characteristics of given molecular species; solve the structures of unknown molecules using appropriate spectroscopic techniques	Ap, An	6, 7, 8
3.	develop paper chromatogram of a compound and determine its purity	C	7, 8
4.	estimate quantitatively the Aniline, Phenol, glucose, Ascorbic acid and Aspirin in a sample	Ap	7, 8
5.	estimate colorimetricaly paracetamol, protein and ascorbic acid	Ap	7, 8
6.	use green chemical principles in the synthesis	Ap	4, 7, 8

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Module	Course Description	No. of Hrs	CO No.
A.	**Volumetric estimation of** 1) Aniline 2) Phenol 3) Glucose 4) Ascorbic acid 5) Aspirin	25	4
B.	**Colorimetric estimation** 6) paracetamol with potassium ferricyanide 7) protein by biuret method 8) Ascorbic acid by folin-phenol reagent or phosphotungstic acid methods	25	5
C.	**Spectral identification** 9) UV, IR, ^{1}H NMR, ^{13}C NMR, EI mass spectral identification of Organic compounds from a library of organic compounds (Each students have to record the spectral analysis of a minimum of 40 compounds)	40	1, 2
D.	**Separations of mixtures by Paper Chromatography** 10) Identification of amino acids	10	3
E.	**Single stage preparation of organic compounds by green chemistry**	25	4
	11) Preparation of p-bromoacetanilide using CAN.		
	12) Radical coupling – 1,1-Bis-2-napthol.		
	13) Synthesis of dihydropyrimidinone.		
	14) Synthesis of dibenzalacetone - with lithium hydroxide.		
	15) Photoreduction of benzophenone to benzopinacol (not for end semester evaluation).		
The board of examiners have to choose the combination of a volumetric estimation, a colorimetric estimation, a green synthesis OR paper chromatography and spectral analysis.			

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1. B. S. Furniss, Vogel's text book of practical organic chemistry, 5th Edition, Longman, 1989.
2. D. L. Pavia, G. M. Lampman, G. S. Kriz and R. G. Engel, A microscale approach to organic laboratory techniques, Wadsworth Publishing, 5th Edition, 2012.
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9. For spectral data of organic compounds, see: http://sdbs.riodb.aist.go.jp/sdbs/cgi-bin/direct_frame_top.cgi

CH 236 PHYSICAL CHEMISTRY PRACTICALS – II

Total 125 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.	U, E	3, 7, 8
2.	determine the strength of strong/ weak acids by conductometric titrations.	Ap	7, 8
3.	verify Onsager equation and Kohlraush's law conductometrically .	An, E	7, 8
4.	determine the activity and activity coefficient of electrolyte.	Ap, An	7, 8
5.	determine the concentration of a solution potentiometrically or pH metrically.	Ap, An	7, 8
6.	employ spectrophotometry in determining unknown concentration.	Ap, An	7, 8
7.	determine the viscosity of liquid mixtures and use this in determining the concentration of a component in a mixture.	Ap, An	7, 8
8.	determine the concentration of a liquid mixture using a refractometer .	Ap, An	7, 8
9.	determine the unknown concentration of a given glucose solution.	Ap, An	7, 8

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Module	Course Description	No. of Hrs	CO No.
1.	**Conductometry** a) Determination of strength of strong and weak acids in a mixture b) Determination of strength of a weak acid. c) Precipitation titration ($BaCl_2 \times K_2SO_4$) d) Titration of dibasic acid ($H_2C_2O_4/H_2SO_4$). e) Verification of Onsager equation. f) Verification Kohlraush's law. g) Determination of activity and activity coefficient of electrolyte.	20	1, 2, 3, 4
2.	**Potentiometry** a) Determination of emf of Daniel cell and temperature dependence of emf of a cell. b) Titrations involving redox reactions – Fe^{2+} vs $KMnO_4$, $K_2Cr_2O_7$, $(NH_4)_2Ce(SO_4)_2$ and KI vs $KMnO_4$ c) Determination of the emf of various $ZnSO_4$ solutions and hence the concentration of unknown $ZnSO_4$	20	1,5

	solution. d) Determination of activity and activity constant of electrolytes. e) Determination of thermodynamic constants of reactions.		
3.	**pH metric titrations.** a) Acid alkali titrations using Quinhydrone electrode. b) Titrations(double) involving redox reactions – Fe^{2+} vs $KMnO_4$, $K_2Cr_2O_7$, $(NH_4)_2Ce(SO_4)_2$ and KI vs $KMnO_4$ c) Determination of strengths of halides in a mixture. d) Determination of pH of buffer solutions and hence to calculate the E^o of quinhydrone electrode	15	1, 5
4.	**Spectrophotometry** a) Verification of Beer-Lambert's law. b) Absorption spectra of conjugated dyes (malachite green, methylene blue). c) Determination of concentration of potassium dichromate and potassium permanganate in a mixture. d) To study the complex formation between Fe^{3+} and salicylic acid. e) Determination of pKa of an indicator.	20	1, 6
5.	**Polarimetry** a) Measurement specific rotation of glucose. b) Determination of specific rotation of sucrose c) Determination of unknown concentration of glucose solution and rate constant of its hydrolysis in presence of HCl	15	1, 7
6.	**Viscosity**: a) Viscosity of liquids and mixtures of liquids. b) Verification of Kendall's equation. c) Composition of unknown mixtures. d) Determination of molecular masses polymers by viscosity measurements (Mark-Houwink equation)	15	1, 8
7.	**Refractometry** a) Determination of molar refraction of pure liquids b) Determination of concentration of KCl solution/glycerol solution c) Determination of solubility of KCl in water. d) Determination of molar refraction of solid KCl e) Study the stoichiometry of potassium iodide-mercuric iodide complex. f) Determination of concentration of KI solution.	20	1, 9

References

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Model Question Papers

General Instruction to question paper setters

- There will be a 15 main questions in each question paper divided into 3 sections – A, B and C
- Each of the sections A, B and C will have 5 questions each, **1 from each module**.
- Each question in Section A will have 3 sub questions (a), (b) and (c), of which the candidate has to answer any two (2 marks each).
- Each question in Section B will have 2 sub questions (a) and (b), of which the candidate has to answer any one (5 marks each).
- Candidate should answer any three out of the five questions in Section C (10 marks each).
- Section A carries a total of 20 marks, Section B carries 25 marks, and Section 3 carries 30 marks.
- The maximum marks will be 75 and the duration of the exam will be 3 hrs.

Third Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry/ Branch IV – Analytical Chemistry
CH/CL 231: INORGANIC CHEMISTRY – III
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) Represent diagrammatically the dative bonding seen in metal-cyano complexes.
   (b) Give an example each for a hexahapto ligand and a heptahapto ligand.
   (c) Verify whether $[IrBrCO(PPh_3)_2]$ obeys 18 electron rule or not.

2. (a) List the factors that affect the stability of coordination compounds.
   (b) What is meant by trans effect?
   (c) What is the Kurnakovs test?

3. (a) Give two examples for metallo-enzymes containing iron.
   (b) Briefly discuss the coordination environment of the metal ion in Vitamin B_{12}.
   (c) Explain the mechanism of oxygen binding in haemocyanin.

4. (a) Explain doppler broadening with an example.
   (b) What is superhyperfine splitting in esr spectra?
   (c) How many signals are obtained in the ^{19}F nmr spectra of the following (i) SF_6 (ii) SF_4 (iii) $XeOF_4$. Give reasons for your answer

5. (a) List any two differences between GM counter and Proportional counter.
   (b) Distinguish between half life and average life. How are they related?
   (c) Summarise the liquid drop model of the nucleus.

[2 × 10 = 20]

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) IR spectroscopy provides vital information in during the study of metal carbonyls. Explain.
   (b) Discuss the characteristics of oxidative addition and reductive elimination reactions of organometallic compounds.

7. (a) Give an account of the photochemical reactions of complexes.
   (b) Using $[PtCl_4]^{2-}$ as the starting material, how can the cis and trans isomers of $[PtCl_2(NH_3)(PPh_3)]$ and $[PtCl_2(NO_2)(NH_3)]^-$ be prepared

8. (a) Explain the role played by calcium in blood clotting.
   (b) Briefly discuss nitrogen fixation.

9. (a) Discuss the application of ESR spectroscopy to Cu (II) complexes.
   (b) Discuss the utility of Mossbauer spectroscopy in the study of complexes of iron.

10. (a) Give a brief note on nuclear shell model
    (b) What is meant by radioactive equilibrium? The ratio between atoms of two radioactive elements A & B at equilibrium was found to be 3.1×10^9:1. If the half life period of A is 2×10^{10} years what is the half life of B.

[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. Construct the MO diagram of dibenzene chromium and explain the bonding using MOT.

12. What are inner sphere and outer sphere reactions? Explain the salient features.

13. Discuss in detail the function of PS-I and PS-II in photosynthetic activity.

14. How is CD and ORD employed in the structure determination of metal complexes?

15. Explain the principle involved in the working of the reactors in nuclear power plants

[10 × 3 = 30]

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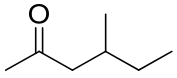
Third Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry/ Branch IV – Analytical Chemistry
CH/CL 232: ORGANIC CHEMISTRY – III
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

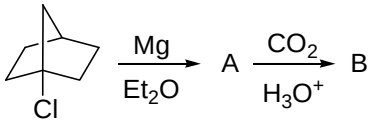
Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) What is the effect of solvent polarity on n–π* transition?
   (b) How will you distinguish between Intramolecular hydrogen bonding and intermolecular hydrogen bonding using IR spectroscopy?
   (c) Predict the fragmentation pattern of the following molecule

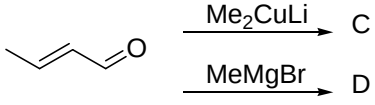


2. (a) How many peaks do you expect in the nmr spectrum of N,N-dimethyl formamide? Explain.
   (b) How does the coupling constant differ between a geminal and vicinal hydrogens?
   (c) What are shift reagents? Give an example

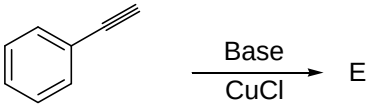
3. (a) Complete the reaction



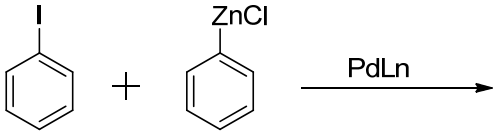
   (b) Predict the structure of the products C and D in the reaction given below



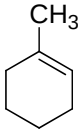
   (c) Write the structure of the compound E in the reaction given below



4. (a) Identify the reaction and predict the product

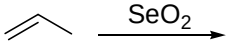


(b) Suggest a retrosynthetic route for the following compound

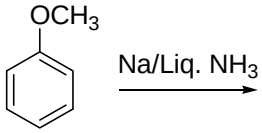


(c) Give any two protecting groups for hydroxyl group.

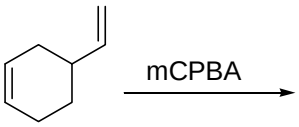
5. (a) Complete the reaction



(b) Identify the product in the reaction given below



(c) What is the product obtained in the following reaction?



[2 × 10 = 20]

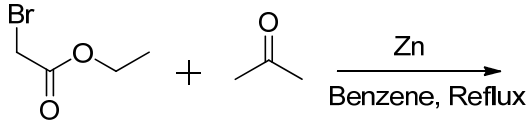
SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

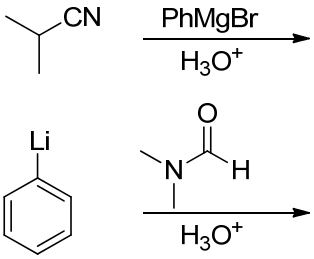
6. (a) Discuss the principle and applications of MALDI.
   (b) Give the mass fragmentation pattern of toluene and phenol.

7. (a) Explain the anomaly in the chemical shift value of acetylene and benzene.
   (b) Write on any two 2D NMR technique.

8. (a) Complete the following reaction and suggest a suitable mechanism



(b) Predict the product (s) of the following reactions with mechanism



9. (a) Convert benzaldeyde to ethylbenzene using umpolung strategy.
   (b) Discuss the mechanism for Stille coupling with the help of an example.

10. (a) Illustrate Sharpless asymmetric epoxidation with the help of an example.
    (b) Give a brief outline of four Cr(VI) reagents used for oxidation reactions.

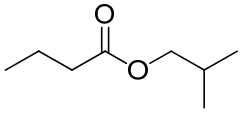
[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. a) Discuss the mass spectral fragmentation pattern of aromatic compounds, ketones and amides.
    b) Write on FAB.

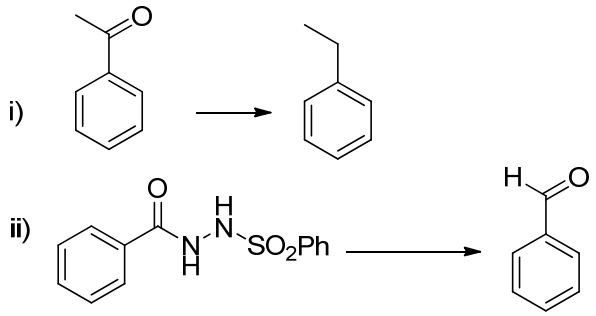
12. a) ^{1}H NMR spectrum of a compound gives the following spectral data. δ9.78(1H, s), 7.75(2H, d), 6.90(2H,d), 3.8(3H, s). Identify the compound
    b) Discuss DEPT nmr of



13. a) Discuss the preparation and reactivity of Tebbe's reagent.
    b) Illustrate the synthetic utility of silyl carbanions using examples

14. a) Discuss Suzuki and Heck coupling with the help of mechanism.
    b) Write in brief on olefin metathesis

15. a) Comment on the reactivity of various bulky metal hydrides using suitable examples.
    b) How will you bring about the following conversion? Suggest a suitable mechanism



[10 × 3 = 30]

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Third Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry/ Branch IV – Analytical Chemistry
CH/CL 233: PHYSICAL CHEMISTRY – III
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) Arrange O_2, O_2^+, O_2^- in the increasing order of stability. Justify your answer.
   (b) Write briefly about 'Perturbation theory'.
   (c) Write the Hamiltonian for He atom and suggest a suitable trial wave function for it.

2. (a) Predict and justify the condition at which a real gas obeys the following equation of state PV= RT+ Pb.
   (b) The van der Waals constant a for two gases are 4.17 and 0.024 $dm^6atm\ mol^{-2}$ respectively. Explain which is easily liquefiable and why?
   (c) At what pressure does the mean free path of argon gas at 25°C become comparable to the diameter of the atoms themselves? Given $\sigma = 0.36\ nm^2$.

3. (a) The shift in frequency shown by a proton from TMS is 180 Hz, when measured on a 100 MHz instrument. Calculate the chemical shift in ppm.
   (b) Calculate the ESR frequency of an unpaired electron in a magnetic field 0.33Tesla.Given for free electron g=2, $\beta=9.273\times10^{-27}$ J/T.
   (c) Explain the basic principle of X-ray photo electron spectroscopy.

4. (a) Apply phenomenological equation in thermal diffusion.
   (b) How is temperature influence the miscibility curve of a three-component system forming one pair of partially miscible liquids?
   (c) What are the conditions under which linear relations are valid to understand irreversible processes?

5. (a) How do parameterization techniques help to reduce the task of computation?
   (b) Construct the z-matrix of CO_2 molecule.
   (c) Differentiate STO and GTO.

$[2 \times 10 = 20]$

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) Calculate the first order correction to the energy levels for a one dimensional box with a slanted bottom whose potential energy varies as

v_x/a where a is the length of the box.

(b) Apply HMO theory to butadiene molecule and discuss the molecular orbitals and their corresponding energy levels.

7. (a) Calculate Cv for the following gases at room temperature.
i) He ii) HCl iii) CO_2
Discuss the principle of equipartition of energy.
(b) Which among CO_2 and O_2 undergo effusion faster. Justify your answer.

8. (a) Write a brief account of NMR spectroscopy.
(b) Discuss the application of Mossbauer spectroscopy.

9. (a) Derive expressions for entropy production in the case of system contains both the matter flow and current flow.
(b) Verify the Onsager reciprocal relation in the case of simple chemical reaction $A \rightleftharpoons B$.

10. (a) Write a note on non-quantum mechanical method of energy calculation.
(b) What is potential energy surface? Explain its significance.

$[5 \times 5 = 25]$

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. Discuss the bonding in H_2 molecule by valence bond theory.

12. Discuss about the transport properties of gas. Show that the ratio of thermal conductivity to that of coefficient of viscosity = Cv/M

13. a) Explain the principle and applications of NQR spectroscopy.
b) When N_2 gas is excited with radiation of energy 21.22 eV from a helium lamp, electrons are ejected with kinetic energies 5.63eV and 4.53 eV. What are their binding energies?

(7+3)

14. a) Draw the phase diagram of a three-component liquid system with three pairs of partially miscible liquids. Explain.
b) How would you understand (i) thermo osmosis and (ii) thermal diffusion from irreversible thermo dynamics?

(5+5)

15. a) Write briefly on ab-initio methods used in computational chemistry? What are the merits and demerits of the method?.
b) Explain the terms i) force field ii) contracted Gaussians.

(7+3)

$[10 \times 3 = 30]$

SEMESTER IV

CH 241 CHEMISTRY OF ADVANCED MATERIALS

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	understand dimensions, synthesis, physicochemical properties of nanomaterials and its applications.	U, Ap, An	1
2.	understand and apply characterization tools for analysing nano structures.	U, Ap, An	1
3.	outline and recognize the types of polymerization, kinetics and mechanisms.	U, Ap, An	1
4.	understand the stereochemical aspects and methods for the determination of molecular weights of polymers.	U, Ap, An	1
5.	discuss the synthesis and applications of selected classes of speciality polymers.	U, Ap, An	1, 5
6.	distinguish the types and important applications of smart materials.	U, Ap, An	1, 5

PSO–Programme Specific Outcome CO–Course Outcome
Cognitive Level: R–Remember U–Understanding Ap–Apply
An–Analyse E–Evaluate C–Create

Module	Course Description	No. of Hrs	CO No.
1.0	**Introduction to Nanomaterials and Nanotechnology**	**18**	
1.1	Nanomaterials: 0D, 1D, 2D and 3D nanomaterials-fundamental physicochemical principles - size dependence of the properties of nanomaterials - quantum confinement. Nanocomposites.	3	1
1.2	Synthesis of nanomaterials: Sol-Gel, colloidal precipitation, co-precipitation, hydrothermal, vapour deposition, and sonochemical method.	3	1
1.3	Carbon nanostructures and clusters: Graphenes, carbon nanotubes and fullerenes (C_{60}) - Synthesis, properties and applications.	4	1
1.4	Metal nanoparticles: Synthesis and properties (optical, electronic, magnetic), surface plasmon resonance.	3	1
1.5	Evolving interfaces of nanotechnology: Nanobiotechnology, nanoelectronics, nano sensors, nano-biosensors, nano tweezers, elementary ideas about nano catalysts, nano photocatalysts, nanofiltration.	3	1
1.6	Nanomedicines-nanoparticles for medical imaging and targeting cancer cells and nano encapsulation for drugdelivery to tumours. Nanotoxicology.	2	1

2.0	**Characterization Tools in Nanotechnology**	**18**	
2.1	Electron microscopies: Scanning electron microscopy (SEM), Transmission Electron Microscopy (TEM), High Resolution Transmission Electron Microscopy (HR-TEM).	4	2
2.2	Probe microscopies: Atomic Force Microscopy (AFM), Scanning tunnelling microscopy (STM), Scanning tunnelling electron microscopy (STEM).	4	2
2.3	X-ray methods: X-ray diffraction (XRD), X-ray Photoelectron spectroscopy (XPS), Energy Dispersive X-ray Spectroscopy (EDAX), X-ray Fluorescence (XRF)	4	2
2.4	Laser scattering method: Dynamic light scattering (DLS)	1	2
2.5	Spectroscopic techniques: IR spectroscopy for surface functionalization of nanoparticles, UV-visible - Diffused reflectance spectroscopy, photoluminescence, Raman spectroscopy. (Basic understanding of each technique with special emphasis on characterization at nano scale).	5	2
3.0	**Polymerization processes**	**18**	
3.1	Free radical addition polymerization-kinetics and mechanism. Chain transfer. Cationic and anionic polymerization: Kinetics and mechanism. Step growth polymerization - Polymer characterization – Molecular weights.	3	3
3.2	Linear vs cyclic polymerization. Other methods of polymerization - bulk, solution, melt, suspension, emulsion and Dispersion techniques.	3	3
3.3	Polymer stereochemistry: Configuration and conformation, Tacticity, Chiral polymers.	3	4
3.4	Molecular weight distribution and molecular weight control. Methods for determining molecular weights-static, dynamic, viscometry, light scattering and GPC.	4	4
3.5	Crystalline and amorphous states - Glassy and rubbery states. Glass transition temperature and crystalline melting of polymers. Degree of crystallinity - X-ray diffraction.	3	4
3.6	Thermal stability of polymers - Application of DSC.	2	3
4.0	**Speciality Polymers**	**18**	
4.1	Industrial Polymers: carbon chain and hetero chain polymers-synthesis and applications. Polymeric reagents, catalysts and substrates.	3	5
4.2	Conducting polymers: Synthesis & applications of	3	5

	polyacetylenes, polyanilines, polypyrroles & polythiophines.		
4.3	Photo responsive and photorefractive polymers. Polymers in optical lithography.	3	5
4.4	Drug delivery - Drug carriers - Polymer based nanoparticles.	3	5
4.5	Basic concepts about polymer based LEDs and lithium-polymer batteries.	3	5
4.6	Liquid crystalline polymers - Main chain and side chain liquid crystalline polymers. Phase morphology.	3	5
5.0	**Smart materials**	**18**	
5.1	Piezoelectric, magnetostrictive, halochromic, chromogenic, electrochromic, thermochromic, magnetocaloric and thermoelectric materials.	4	6
5.2	Chemistry behind photochromism in spiropyrans, spirooxazines, diarylethenes, azobenzenes, quinones. Examples for photochromic coordination compounds.	4	6
5.3	Shape-memory polymers, pH-sensitive polymers, Temperature-responsive polymers, dielectric elastomers.	4	6
5.4	Self-healing polymers and concept of mechanophores.	3	6
5.5	Introduction to ferrofluids, concept of pseudo elasticity.	3	6

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CH 242 (a) INORGANIC CHEMISTRY IV

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	explain the schemes for σ and π bonding with examples.	U	1
2.	explain MO and Ligand field theory with the support of group theory and construct the MO diagram of octahedral complexes.	U, C	1
3.	apply character tables to find out the Infrared and Raman active modes for C_{2v}, C_{3v} and D_{4h}.	Ap, An	1
4.	assimilate the concepts of molecular recognition, self-assembly, dynamic combinatorial chemistry and supramolecular chirality, and be aware of the most important work in the field.	U	1
5.	understand the nature of bonding in metal atom clusters and distinguish Low nuclearity and High nuclearity carbonyl clusters.	U, An	1
6.	perform the electron counting schemes in cluster compounds.	Ap, An	1
7.	differentiate the different types of cluster molecules and understand their utility in catalysis.	An	1
8.	understand and explain the role of metal ions in biological systems and give examples for the use of metals in medicine.	U, An	1
9.	differentiate the defects arising due to deficiency and excess presence of metal ions in the body.	An	1
10.	explain the acid base concept in non aqueous media and identify the reactions taking place in selected non aqueous solvents.	An	1

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Module	Course Description	No. of Hrs	CO No.
1.0	**Applications of group theory**	**18**	
1.1	Hybrid orbitals and molecular orbitals for simple molecules. Transformation properties of atomic orbitals. Hybridisation schemes for σ and π bonding with examples.	3	1
1.2	MO theory for AB_n type molecules. Molecular orbitals for regular octahedral, tetrahedral and metals and sandwich compounds.	3	2
1.3	Ligand field theory: Splitting of d orbitals in different environments using group theoretical considerations.	3	2
1.4	Construction of energy level diagrams. Correlation diagram. Method of descending symmetry. Tanabe-Sugano diagrams. Selection rules for electronic spectra.	3	2
1.5	Molecular orbitals in octahedral complexes. Formation of symmetry adapted group orbitals of ligands. MO diagram.	3	2
1.6	Symmetry and selection rules: Symmetry properties of common orbitals. Application of character tables to infrared and Raman spectroscopy. Infrared and Raman active modes for C_{2v}, C_{3v} and D_{4h}.	3	3
2.0	**Supramolecular Chemistry**	**18**	
2.1	Concepts and language. Molecular recognition: Molecular receptors for different types of molecules, design and synthesis of coreceptors and multiple recognition.	4	4
2.2	Strong, weak and very weak Hydrogen bonds. Utilisation of H-bonds to create supramolecular structures. Use of H bonds in crystal engineering and molecular recognition.	4	4
2.3	Supramolecular reactivity and catalysis. Transport processes and carrier design.	3	4
2.4	Supramolecular devices. Supramolecular photochemistry, supramolecular electronic, ionic and switching device.	4	4
2.5	Some examples of self-assembly in supramolecular chemistry.	3	4
3.0	**Metal-Metal bonds and Metal Clusters**	**18**	
3.1	Metal–Metal bonds and metal atom clusters. Conditions favourable for formation of M–M bonds, Compounds with M–M multiple bonds.	4	5
3.2	Dinuclear compounds of Re, Cu and Cr, metal-metal multiple bonding in $(Re_2X_8)^{2-}$.	3	5
3.3	Tri , Tetra and hexa nuclear clusters, Isoelectronic and isolobal relationships, Low nuclearity and High nuclearity carbonyl clusters (LNCCs and HNCCs).	3	5

3.4	Hetero atoms in metal atom clusters, electron counting schemes for HNCCs – Capping Rule.	3	6
3.5	Cubane Clusters, Chalcogenide Clusters, Chevrel Phases. Zintl Anions and Cations.	4	7
3.6	Molecular Clusters in catalysis	1	7
4.0	**Selected topics in Bioinorganic Chemistry**	**18**	
4.1	Copper on biochemical systems. Oxidase activity, superoxide dismutase activity. Electron transport in biology.	4	8
4.2	Structure and function of copper proteins in electron transport process. Oxygen transport copper proteins. Hemocyanin-copper transport, copper enzymes-Azurin, plastocyanin.	4	8
4.3	Inorganic medicinal chemistry. Metals in medicine. Metal deficiency and diseases. Toxic effects of metals. Effect of deficiency and excess of essential metal ions.	3	9
4.4	Toxicity due to non essential elements and speciation. Detoxification mechanism.	3	8
4.5	Role of lithium and aluminium in biological systems. Chelation therapy and chemotherapy.	2	9
4.6	Anticancer drugs and vanadium based diabetics drugs.	2	9
5.0	**Acids, Bases and Non-aqueous Solvents**	**18**	
5.1	Acid base concept in non aqueous media-HSAB concept, solvent effects, linear free energy relationship – mechanism and methods of determination, super acids	4	10
5.2	Reactions in non-aqueous solvents. Ammonia-solutions of metals in liquid ammonia.	3	10
5.3	Protonic solvents: anhydrous sulfuric acid, hydrogen halides.	3	10
5.4	Aprotic solvents: non-polar solvents, non-ionizable polar solvents, polar solvents undergoing autoionization, liquid halogens, interhalogen compounds, oxyhalides, dinitrogentetroxide, sulphurdioxide.	8	10

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CH 242 (b) ORGANIC CHEMISTRY IV

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	define secondary metabolites from plants and animals.	R	1
2.	explain the biosynthesis of terpenes and sterols, illustrate the structural elucidation and synthesis of natural products.	U, An	1
3.	list the forces involved in molecular recognition and recognize molecular receptors.	U	1
4.	quote molecular recognition events in biological systems.	U	1
5.	discuss the methods of creating combinatorial libraries and its processing to locate lead molecule.	U	1
6.	explain the various stages in drug development process, and outline the synthesis of paracetamol, phenobarbital, diazepam, sulphamethoxazole, benzylpenicillin, and chloramphenicol.	R, U, C	1
7.	construct a solid phase synthesis of tripeptide from any three aminoacids, explain protection, deprotection and automated synthesis of peptides and nucleotides.	U, C	1
8.	describe twelve principles green chemistry.	R	1, 4
9.	illustrate reactions in which green chemistry principles are applied and calculate atom economy.	Ap, An	1, 4

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Module	Course Description	No. of Hrs	CO No.

1.0	**Chemistry of natural products and biomolecules**	**18**	
1.1	Introduction to primary and secondary metabolites in plants. Extraction methods of chemical constituents from plants, such as fractionation using solvents, specific extraction of alkaloids and supercritical fluid extraction. Characterizations of isolated compounds (terpenes, sterols, alkaloids, carbohydrates, flavonoids and poly phenols) by colour reactions and spray reagents.	6	1
1.2	Biosynthesis of terpenes from acetyl coenzyme A, sterols via squalene.	3	2
1.3	Determination of carbon skeleton of alkaloids (Hofmann, Emde and Von Braun degradation methods). Structural elucidation of ephedrine, atropine.	3	2
1.4	Classification of pigments, structure elucidation of β-carotene.	3	2
1.5	Synthesis of quercetin, synthesis of testosterone, androsterone, progesterone (from cholesterol), estrone.	3	2
2.0	**Molecular recognition and supramolecular chemistry**	**18**	
2.1	Introduction to supramolecular chemistry. The concepts of molecular recognition, host, guest and receptor systems. Forces involved in molecular recognition. Hydrogen bonding, ionic bonding, π-stacking, van der Waals and hydrophobic interactions	4	3
2.2	Introduction to molecular receptors, tweezers, cryptands and carcerands, cyclophanes, cyclodextrins and calixarenes- typical examples.	4	3
2.3	Non-covalent interactions in biopolymer structure organization. Role of self-organization and self-association in living systems-tobacco mosaic virus, cell membrane.	4	4
2.4	Importance of molecular recognition in DNA and protein structure, their function and protein biosynthesis – basic aspects only.	4	4
2.5	Supramolecular systems like Organic zeolite, Clathrate hydrates of gases, Helicates, liquid crystals – elementary idea only	2	4
3.0	**Medicinal chemistry**	**18**	
3.1	Combinatorial organic synthesis, introduction, methodology, automation, solid supported and solution phase synthesis, study of targeted or focused libraries and small molecule libraries. Application - drug discovery.	5	5

3.2	Drug design and development-Discovery of a drug, a lead compound. Development of drug-Pharmacophore identification, modification of structure, structure-activity relationship, structure modification to increase potency. Lipophilicity.	5	6
3.3	Computer assisted drug design. Receptors and drug action. Natural products and drug development. Different classes of drugs with examples.	4	6
3.4	Synthesis of paracetamol, phenobarbital, diazepam, sulphamethoxazole, benzylpenicillin, chloramphenicol.	4	6
4.0	**Chemistry of biopolymers and polymers**	**18**	
4.1	Peptide bond formation methods. SPPS, Mechanism, amino and carboxy protection in SPPS. Synthesis of tripeptides, A, G, C, T, U, adenosine, ADP and ATP. Automated polypeptide and oligonucleotide synthesis.	6	7
4.2	Structure organization of proteins and poly nucleotides. Protein sequencing by Edmans method. Protein denaturation.	6	7
4.3	Synthesis of stereo regular polymers. Ziegler-Natta catalyst. Polymers in organic synthesis - supports, reagents and catalysts. Biodegradable polymers.	6	7
5.0	**Green chemistry**	**18**	
5.1	Twelve principles of green chemistry. Green chemical strategies for sustainable development- Reaction mass balance, atom economy evaluation for chemical reaction efficiency, green solvents, reaction media- Synthesis under water, solventless, fluorous and ionic liquid media.	6	8, 9
5.2	Synthesis using scavenger resins, catalysis and biocatalysis. Green computation. Green processes-microwave synthesis- fundamentals of microwave synthesis - Two principal mechanisms for Interaction with matter - The Microwave Effect with examples - Single-Mode and Multimode Microwave cavities.	6	8, 9
5.3	Microwave technology-Techniques and applications. Sonochemical synthesis. Applications of sonication in the synthesis of organic compounds.	6	8, 9

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CH 242 (c) PHYSICAL CHEMISTRY IV

Total 90 h

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	apply the group theory in the identification of IR and Raman active normal modes in molecules coming under various point groups such as C_{2v}, C_{3v}, C_{4v}, $D_{3h,}$ Td and Oh.	Ap	1
2.	apply group theory in solving spectroscopic problems.	Ap	1
3.	solve the problems in Exactly solvable systems like Simple Harmonic Oscillator, rigid rotor and the Hydrogen atom.	Ap, An	1
4.	explain the approximation methods used in quantum mechanics	U	1
5.	illustrate trial wave functions for calculation of H atom and particle in a 1D box as examples.	U, Ap	1
6.	set up secular determinants	C	1

7.	explain the variation in the state of a system with time	U, An	1
8.	apply computational methods as potential tools for practicing chemistry	An	1
9	construction of Z-matrices of simple molecules H_2, H_2O, H_2O_2, H_2CO, CH_3CHO, CH_4, C_2H_6 and with dummy atom, CO_2, NH_3, C_6H_6.	C	1
10.	explain the commonly using force fields (MM3, MMFF, AMBER and CHARMM) and Softwares.	Ap	1
11.	Compare Molecular Mechanics, Ab-initiomethod, Semi-empirical method and DFT method of computations.	E	1

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Module	Course Description	No. of Hrs	CO No.
1.0	**Applications of group theory**	**18**	
1.1	Spectroscopic applications: Transition moment integral transition moment operator. Vanishing matrix element. Symmetry selection rule for IR, Raman and electronic spectra. Dipole and polarizability transition moment operator.	3	1, 2
1.2	Identification of IR and Raman active normal modes in molecules coming under various point groups such as C_{2v}, C_{3v}, C_{4v}, D_{3h}, Td and Oh.	3	1, 2
1.3	Mutual exclusion and complementarity principle of IR and Raman spectra and their use in the identification of molecular structures	3	1, 2
1.4	Probability of overtone and combination bands. Identification of allowed and forbidden electronic transitions in carbonyl groups. Vibronic transitions.	3	1
1.5	Application to MO theory: Symmetry adapted LCAO-MO theory of π (pi)-bonded hydrocarbons	3	1
1.6	Projection operator and its use in the construction of wave functions of π – molecular orbitals, secular equations and use of symmetry for simplifying the calculations of energy and wave functions of ethylene, butadiene and carbocyclic systems such as benzene and naphthalene.	3	1
2.	**Exactly solvable systems**	**18**	
2.1	Simple Harmonic Oscillator: Wave equation for 1D harmonic oscillator. Complete solution and their properties. 3D Harmonic oscillator. Potential energy in three dimension and Schrodinger wave equation in Cartesian coordinate. Separation of variables and solution of the equation for energy and wave function. Degeneracy.	3	3
2.2	Rigid rotor: Schrodinger equation in polar Coordinate. Angular momentum operator for rigid rotor. Separation of variables and complete solution for ϕ and θ equations.	3	3

2.3	Legendre polynomials and associated Legendre functions. Normalisation of associated Legendre functions and evolution of the values of orbital angular momentum quantum number. Recursion relations. Rigid rotor wave function and energy.	3	3
2.4	The Hydrogen atom: Schrodinger wave equation in polar coordinate. Separation of variables and complete solution of the radial part. The associated Laguarre polynomial. Normalisation. The evolution of the value of the principal quantum number.	3	3
2.5	The spherical harmonics and the radial part of the wave function. The total wave function of H atom. The wave functions of Hydrogen like atomic orbitals and explanations for the shapes of various orbitals.	3	3
2.6	Angular momentum, angular momentum operators (L_x, L_y, L_z and L_2) and their commutation properties. Spherical harmonics as eigen functions of angular momentum operator L and L^2. Ladder operator method for angular momentum. Space quantisation.	3	3 $_z$
3.0	**Approximate method I**	**18**	
3.1	Schrodinger wave equation for He atom and anharmonic oscillator and difficulty to get the exacts solution.	3	4
3.2	The Variation method: Variation theorem and its proof. The variation integral and its properties. Variational parameters. Trial wave functions.	3	4
3.3	Illustration of trial wave functions for calculation of H atom and particle in a 1D box as examples.	3	5
3.4	Trial functions as linear combination of orthonormal functions, linear combinations of functions containing variational parameters as trial functions.	3	5
3.5	Setting up of secular determinants. Variation methods of normal state of He.	3	6
3.6	The SCF method, SCF and variation method. Strength and limitation of the method.	3	6
4.0	**Approximate method II**	**18**	
4.1	The perturbation method. The generalised perturbation method. The idea of successive correction to unperturbed systems.	3	4
4.2	First order perturbation. Correction of wave function and energy. Theory of non - degenerate level perturbation. The normal Helium atom.	3	4
4.3	The first order perturbation of the degenerate level. The hydrogen atom.	3	4
4.4	Second order perturbation theory. Correction for wave	3	4

	function and energy. Stark effect.		
4.5	Time dependant wave equation: Variation in the state of a system with time. Emission and absorption of radiation.	3	7
4.6	The Einsteins transition probability and its calculation. Selection rules and intensity of spectrum for harmonic oscillator, rigid rotor and hydrogen atom.	3	4
5.0	**Computational methods**	**18**	
5.1	Computational methods as potential tools for practicing chemistry. Potential energy surface, saddle point, local minima and global minima. Geometry optimisation. Exchange and overlap integrals. Difficulty in evaluating them with H-like wave functions. Slater Type functions (STO), approximation of STO with Gaussian type functions. Contracted Gaussians.	3	8
5.2	Basis sets: minimal basis set, split valance basis set, polarised basis set and diffused basis set. Model chemistry and notations. Geometry input - in terms of Cartesian coordinates and internal coordinates. Z-matrix, construction of Z-matrices of simple molecules H_2, H_2O, H_2O_2, H_2CO, CH_3CHO, CH_4, C_2H_6 and with dummy atom, CO_2, NH_3, C_6H_6.	3	9
5.3	Molecular mechanics method: Force fields, potential energy expressions for bond stretching, bending, torsion, non-bonded interactions, electrostatic interaction and H-bonding. Setting up of force field expressions. Method of parameterisation. Use of molecular mechanics. Brief introduction to commonly using force fields (MM3, MMFF, AMBER and CHARMM) and Softwares.	3	10
5.4	Ab-initio method: Hartree-Fock Self Consistent Field method. Slater determinant. Post Hartree-Fock methods –Configuration Interaction (CI) and Moller Plesset (MP) methods.	3	11
5.5	Semi empirical method: Basic principle of the method. Its variants, ZDO, CNDO and INDO.	3	11
5.6	Density Functional method: Functional. Hohenberg-Kohn theorems. Kohn-Sham orbitals. Basic idea of Local Density (LD) approximation, Generalised Gradient approximation and hybrid (BLYP, B3LYP) methods. Comparative study of Molecular Mechanics, Ab-initiomethod, Semi-empirical method and DFT method of computations.	3	11

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CH 243 (a) Dissertation

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	demonstrate an advanced theoretical and technical knowledge of chemistry as a creative endeavour; analyse, interpret and critically evaluate scientific information.	Ap, An	1
2.	present information, articulate arguments and conclusions, in a variety of modes, to audiences in their field of research.	E, C	5, 8
3.	as part of a team or individually, design, conduct, analyse and interpret results of an experiment, and effectively communicate these in written reports and other formats.	Ap, An	3, 7
4.	develop an understanding of the requirements to undertake independent research in a chemistry field.	U	6, 9
5.	demonstrate an understanding of the relationship between scientific research and the progress of new knowledge in a global scenario.	An	5, 6, 9

CH 243 (b) Visit to R & D Centre

CO No.	Expected Course Outcomes *Upon completion of this course, the students will be able to*	Cognitive Level	PSO No.
1.	Understand the relevance of independent supervised research in a chemistry field and the need of well-developed judgement, adaptability and accountability as a practitioner or learner	U, An	2, 9

Model Question Papers

General Instruction to question paper setters

- There will be a 15 main questions in each question paper divided into 3 sections – A, B and C.
- Each of the sections A, B and C will have 5 questions each, **1 from each module**.
- Each question in Section A will have 3 sub questions (a), (b) and (c), of which the candidate has to answer any two (2 marks each).
- Each question in Section B will have 2 sub questions (a) and (b), of which the candidate has to answer any one (5 marks each).
- Candidate should answer any three out of the five questions in Section C (10 marks each).
- Section A carries a total of 20 marks, Section B carries 25 marks, and Section 3 carries 30 marks.
- The maximum marks will be 75 and the duration of the exam will be 3 hrs.

Fourth Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry/ Branch IV – Analytical Chemistry
CH/CL 241: CHEMISTRY OF ADVANCED MATERIALS
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) What is meant by quantum confinement?
   (b) Explain the synthesis of metal nanoparticles with an example.
   (c) Write a short note on nano toxicology?

2. (a) What is EDAX?
   (b) How XPS is used in nano technology?
   (c) How diffused reflectance spectroscopy is used in characterisation of nanoparticles?

3. (a) What do you mean by chain transfer in polymerization process?
   (b) Mention two advantages and two disadvantages of solution polymerization over bulk polymerization.
   (c) Explain briefly “auto acceleration” in radical polymerization? Why does it happen?

4. (a) What are conducting polymers?
   (b) Name any two polymeric reagents.
   (c) Which are the polymers used in optical lithography?

5. (a) What are halochromic materials?
   (b) Write a note on pH-sensitive polymers.

(c) What are piezo electric materials?

[2 × 10 = 20]

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) Explain the relation between size and properties of nano-materials.
   (b) Explain the CVD method used in the preparation of nanoparticles.

7. (a) Explain the use of powder XRD in determination of particle size of nanomaterials.
   (b) How is electron microscopy used as characterisation techniques?

8. (a) What are chain transfer agents? Describe their effect on rate expression and molecular weight obtained in the presence of chain transfer agent.
   (b) Unlike radical polymerisation both cationic and anionic polymerization show a marked dependence on the type of solvent used. Discuss on this.

9. (a) Discuss the structure and working principle of lithium polymer batteries.
   (b) Explain in detail the synthesis of polythiophenes.

10. (a) Explain the chemistry behind photochromism in spirooxazines and quinones.
    (b) Write short note on synthesis and application of ferrofluids.

[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. Explain application and role of metal nano particles in catalysis with examples.

12. Discuss the applications of DLS and IR spectroscopy in the analysis of nanomaterials.

13. Elaborate any two methods to determine the molecular weight of polymers.

14. Explain the application of polymers in drug delivery and in catalysis.

15. Describe with proper examples:
    (a) magnetostrictive materials
    (b) thermoelectric materials
    (c) self-healing polymers
    (d) dielectric elastomers.

[10 × 3 = 30]

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Fourth Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry
CH 242(a): INORGANIC CHEMISTRY – IV
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) What is the point group of NO_3^-? How does it's symmetry change when complexed as unidentate ligand?
   (b) Give the splitting of d-orbitals in a square pyramidal geometry?
   (c) Demonstrate that C_3 and C_3^2 belong to the same class in C_{3v} point group.

2. (a) What is meant by macrocyclic effect?
   (b) Give any two examples of self-assembly in supramolecular chemistry.
   (c) What are the three basic functions of supramolecular species?

3. (a) What are anionic clusters? Give examples
   (b) Explain Wade's rules to calculate the number of framework electrons in clusters.
   (c) Clusters of $Co(CO)_{12}$ and $Co_3FeH(CO)_{12}$ are isolobal to each other. Explain

4. (a) What is cisplatin? What is it's importance?
   (b) What is the role of Lithium in biological systems?
   (c) Write any two diseases caused by the deficiency of copper in the body.

5. (a) Give examples of room–temperature molten salts that could be used as non-aqueous solvents?
   (b) What is meant by levelling effect of solvent?
   (c) Which species would act as a base in (1) BrF_2 and (2) liquid SO_2.Why?

[2 × 10 = 20]

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) Give the salient features of Tanabe-Sugano diagram taking d^5 ion as an example.
   (b) Discuss the application of group theory in arriving at the selection rules for the electronic spectrum of metal complexes.

7. (a) Explain the importance of supramolecular chemistry in the field of catalysis
   (b) What are the advantages and applications of supramolecular chemistry in Nanotechnology?

8. (a) Explain the concept of Chevrel phases.
   (b) What are LNCC's? Give eg: Discuss their structures.

9. (a) The toxicity of metals have been variously correlated with their (1) electronegativity, (2) insolubility of sulphides and (3) stability of chelates. Discuss.
   (b) What are dismutation reactions? Give eg: What type of metal is in superoxide dismutase?

10. (a) What are the advantages and disadvantages of using protic solvents asnon-aqueos solvents?
    (b) Write a note on the reactions in liquid HF.

[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. Deduce the normal modes of trans-N_2F_2 molecule and predict the IR and Raman activity of the modes. Given the character table for C_{2h}.

C_{2h}	E	C_2	i	σ_h		
A_g	1	1	1	1	R_z	x^2, y^2, z^2, xy
B_g	1	–1	1	–1	R_x, R_y	xz, yz
A_u	1	1	–1	–1	z	
B_u	1	–1	–1	1	x,y	

12. Discuss with suitable examples the different types of interaction in supramolecular compounds.

13. Discuss and draw the structure and bonding of $(Re_2X_8)^{2-}$.

14. Explain the structure and functions of hemocyanin and plastocyanin

15. Write a detailed account of the reactions in the following non-aqueous solvents: (1) NH_3 and (2) N_2O_4.

[10 × 3 = 30]

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Fourth Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry
CH 242(b): ORGANIC CHEMISTRY – IV

(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) How will you characterize alkaloids and flavonoids by colour reagents?
   (b) Give the structure of an alkaloid. How will you determine its carbon skeleton through Hofmann degradation?

(c) Explain supercritical fluid extraction method for the chemical constituents from plants.

2. (a) What are calixarenes? Give one example.
   (b) Explain the term π–π stacking.
   (c) What are the biomaterials needed for protein synthesis?

3. (a) Narrate the importance of chiral drugs.
   (b) Draw the structure of paracetamol. Discuss its synthesis.
   (c) Differentiate between solid phase and solution phase combinatorial organic synthesis.

4. (a) Explain the synthesis of adenine from thiourea.
   (b) Give two examples of amino and carboxy protecting groups.
   (c) Explain the structure of glycogen.

5. (a) Define atom economy?
   (b) Give two advantages of scavenger resins.
   (c) What are designer solvents? Give one example.

[2 × 10 = 20]

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) Discuss the biosynthesis of terpenes from acetyl coenzyme A.
   (b) Elucidate the structure of atropine.

7. (a) Briefly discuss the 'host-guest' relationship in molecular recognition.
   (b) Explain self organization and self association in living systems.

8. (a) Narrate the steps involved in drug design.
   (b) Give the synthetic route for diazepam and benzylpenicillin.

9. (a) Write a note on biodegradable polymers.
   (b) Briefly discuss Edmans method of protein sequencing.

10. (a) What is sonochemistry? What are the principles of sonochemistry?
    (b) Briefly explain organic reactions involving ionic liquids.

[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. a) Explain primary and secondary metabolites in plants.
    b) Discuss the Anner Meischer synthesis of estrone.

12. a) Explain different forces involved in molecular recognition.
    b) Write short notes on following supramolecular systems
       (i) Liquid crystals (ii) Helicates

13. a) Explain different classes of drugs with examples.
    b) Briefly discuss computer assisted drug design.

14. a) Explain Solid Phase Peptide Synthesis. What are the advantages of this method?
    b) What is the principle of Ziegler-Natta catalyst?

15. a) What are the twelve principles of green chemistry?
    b) Green chemistry is sustainable chemistry. Explain.

[10 × 3 = 30]

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Fourth Semester M.Sc. Degree Examination – Model question paper
Branch III – Chemistry
CH 242(c): PHYSICAL CHEMISTRY – IV
(2020 Admission Onwards)

Time: 3 Hrs Max. Marks: 75

SECTION A

Answer **two** among **(a)**, **(b)** and **(c)** from each. Each sub question carries 2 marks

1. (a) Differentiate SAGO and SALC
   (b) Explain vanishing and non vanishing integral with one example each
   (c) Discuss the mutual exclusion principle using group theory

2. (a) Explain space quantization
   (b) Express the angular momentum operators in terms of spherical coordinates
   (c) Write the three Legendre polynomials when m = 0 and l = 1,2,3

3. (a) Write one trial function to solve Helium by variation method. Justify your answer.
   (b) Briefly discuss Self Consistent Field method
   (c) State and explain variation theorom.

4. (a) State and explain selection rules for vibrational transitions in simple harmonic oscillator
   (b) The potential energy term for an harmonic oscillator is $\frac{1}{2}kx^2 + bx^3$. Predict the correction term according to first order perturbation method. Justify your answer
   (c) What is Stark effect?

5. (a) What is the meaning of the notation 3-21G**?
   (b) What is parametrisation?. How does it simplify abinitio calculations?
   (c) Write the z-matrix of Ammonia molecule/

[2 × 10 = 20]

SECTION B

Answer either **(a)** or **(b)** from each question. Each sub question carries 5 marks

6. (a) HCHO belongs to C_{2v} point group. Using group theory, find out the lowest energy electronic transition.

   (b) Find the IR and Raman active vibrations of NH_3? C_{3v} character table given.

C_{3v}	E	$2C_3$	$3\sigma_v$		
A_1	1	1	1	z	x^2+y^2, z^2
A_2	1	1	−1	R_z	
E	2	−1	0	$(x,y), (R_x, R_y)$	$(x^2-y^2, xy)\ (xz, yz)$

7. (a) Write Schrodinger wave equation for a rigid rotor. Transform it into the Lagendre equation

   (b) Solve the time independent Schrödinger wave equation for a three dimensional harmonic oscillator whose potential energy is

$$V_{(x,y,z)} = \frac{1}{2}(k_1x^2 + k_1y^2 + k_1z^2)$$

8. (a) Estimate the ground state energy of normal Helium using variation method

   (b) What are the strength and limitations of variation method?

9. (a) Show that the first order Stark effect on the ground state of hydrogen atom is zero.

   (b) Find the ground state energy of a particle in one dimensional box with slanted bottom using first order perturbation method.

10. (a) Explain DFT method of computational chemistry.

    (b) Discuss the need of Post Hartree-Fock method

[5 × 5 = 25]

SECTION C

Answer any **three** questions. Each question carries 10 marks

11. Find energy of π molecular orbitals of benzene using HMO method. Use C_6 character table.

12. Apply Schrodinger wave equation for simple harmonic oscillator. Find eigen function and eigen values.

13. What is linear variation method? Illustrate using one example.

14. Briefly discuss time dependent perturbation theory.

15. Discuss the various computational methods based on wave function. Make a critical comparison.

[10 × 3 = 30]

UNIVERSITY OF KERALA

First Degree Programme in Chemistry

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

CHEMISTRY COMPLEMENTARY COURSES

SCHEME AND SYLLABI

2017 ADMISSION ONWARDS

General Instructions to Complementary courses

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

B Sc Chemistry ComplementaryComplementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Semester	Hours per week		Number Of Credits	Course code*	Instructional Hours
	Theory	Lab			
1	2	2	2	CH1131 .1	2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .1	2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .1	3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .1 CH1432 .1	3×18 =54 2×18 = 36

- Course code of physics majors is used as an example

GENERAL ASPECTS OF EVALUATION

CONTINUOUS EVALUATION FOR LECTURE COURSES

The Continuous evaluation will have 20 marks and will be done continuously during the semester. CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) Assignment /seminar and

(iii) Test

. The weightage is shown in Table I.1. There will be two class tests for which, the better of the two grades obtained will form part of CE. Seminar for each course to be organized by the course teacher and assessed along with a group of teachers in the Department. The topic selection by the student for assignments/seminar will be with the approval of the course teacher.

No	Component	Marks
1	Attendance	5
2	Assignment / Seminar	5
3	Tests	10
	Total	20

QUESTION PAPER PATTERN FOR CONTINIOUS EVALUATION TEST

1. The theory examination has a duration of 1.5 hours
2. Each question paper has three parts: A, B , C
3. Part A contains ten questions. Each question carries1mark. The questions may be in the forms – one word/one sentence.
4. Part B contains twelve questions. Out of these twelve questions, the students have to answer 7 questions. Each question carries 2 marks. Each answer should contain four points. (Short Answer type).
5. Part C contains nine questions of which the candidate has to answer 4 questions. Each question carries 4 marks. The answer must contain 8 points (Short Essay type). Question paper should contain 20% hard, 60% medium and 20% easy questions

QuestionPaperPatternforTest		
QuestionNo	*Typeof Question*	*Marks*
Part A: 1-10	All / one word/one sentence	1X10=10
Part B: 11-22	7out of 12; Short Answer	7 X2=14
Part C: 23-31	4 out of 9; Short Essay	4 X4= 16
TOTAL		40 marks

CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation will have 20 marks. The ESE of laboratory courses will be done only in the IV semester. But the corresponding CE are calculated from all the semesters in which there is attendance for laboratory sessions?

No	Component	Marks
1	Attendance	5
2	Lab test	5
3	Record	5
4	Punctuality	5
	Total	20

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I. 2. 1. EVALUATION OF THE RECORD

On completion of each experiment, a report should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note -book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, and tables of data collected, equations, calculations, graphs, and other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

CE for Laboratory Record		
No	Sub Component	Marks

1	Punctual submission and Neat presentation	All four sub-components present & satisfactory 5 Only three : 4 Only two : 3 Only one : 2
2	Record of more than 90% experiments in the syllabus	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

During ESE external examiner has to verify the Lab report of experiments certified by the tutor and HOD. The scheme of examination for lab exams may be framed by the Board of examiners.

END SEMESTER QUESTION PAPER PATTERN & GUIDELINE FOR QUESTION PAPER SETTERS

1. The theory examination has a duration of 3 hours
2. Each question paper has four parts: A, B, C and D
3. Part A contains ten questions. Each question carries1mark. The questions may be in the forms – one word/one sentence.
4. Part B contains twelve questions. Out of these twelve questions, the students have to answer eight questions. Each question carries 2 marks. Each answer should contain four points. (Short Answer type).
5. Part C contains nine questions of which the candidate has to answer six questions. Each question carries 4 marks. The answer must contain 8 points (Short Essay type).
6. Part D contains four questions of which the candidate has to answer two. Each question carries 15marks.Essay type question. Each question carries two or three subdivisions (10+5) or (5+5+5) pattern.
7. The total weightage for the entire questions to be answered is 80 marks.
8. Question paper should contain 20% hard,60% medium and 20% easy questions.
9. Question paper setter shall submit a detailed scheme of evaluation along with question paper.

QuestionPaperPatternforTest		
QuestionNo	*TypeofQuestion*	*Marks*
Part A: 1-10	10 one word/one sentence	1x10=10
Part B: 11-22	8 out of 12; Short Answer	2x8=16
Part C: 23-31	6 out of 9; Short Essay	4x6=24
Part D: 32-35	2 out of 4; Essay	2x15=30
		Total = 80-80 marks

SYLLABUS OF COMPLEMENTARY COURSE

(For students of Physics Majors)

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course*	Title of Course	Instructional Hours
1	2	2	2	CH1131 .1		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .1		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .1		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .1 CH1432 .1		3×18 =54 2×18 = 36

I B.Sc Complementary

THEORETICAL CHEMISTRY

(For students of Physics majors)

(Common for Physics and Geology students)

SEMESTER I Complementary Course N o. – 1 Course Code- CH1131 .1 Credit-2

Total Hour : 36 L–T-P- 2-0-2

Module I –Atomic Structure 9hrs

Atomic spectrum of Hydrogen – different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (no derivation mention only) concept of orbitals, the four quantum numbers and their significances. Orbital wise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, stability of filled and half filled orbitals

Module II - Chemical bonding 9hrs.

Energetic of bond formation – Types of Chemical bonds – Energetics of ionic bond formation – Lattice energy – Born Haber Cycle - Fajan's rules.

Polarity of covalent bond its relation with electronegativity – electro negativity scales – Paulings and Mullikan's approaches, factors influencing polarity , dipole moment – its relation to geometry. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility.

Hybridisation and structure of molecules – SP, SP^2, SP^3, dSP^2, dSP^3, SP^3d^2, and SP^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia VSEPR theory, geometry of molecules with bond pairs of electrons only, geometry of molecules containing bond pairs and lone pairs of electrons, limitations. A brief review of molecular orbital approach, LCAO method – bond order, bond distance and stability of O_2,O_2^{2+},O_2^{2-},NO,NO+,CO and HF.

Module–III:Radioactivity
9hrs.

Radio active equilibrium (qualitative idea only) detection of radio activity by Wilson's cloud chamber and Geiger Muller Scintillation counter – units of radio activity – curie and rutherford – Radio carbon dating , Rock dating, Neutron activation analysis Applications in agriculture and medicine. A brief study of the biological effects of radiation such as pathological and genetic damage, Dosimetry – Units – rad, gray and roentgen. Fricke dosimeter and ceric sulphate dosimeter. Nuclear Chemistry – stability of Nucleus – n/p ratio, artificial transmutation and radio activity, mass defect, binding energy, atomic fission and fusion.

Module IV: Analytical principles9 Hrs

Analytical methods in Chemistry – principles of volumetric analysis, primary standard, standard solution, normality and molarity, theory of acid - base titration, permanganometric and dichrometric titration, theory of acid – base and redox indicators.

Inorganic qualitative analysis, common ion effect- solubility product- precipitation of cations- chromatography- principle and applications of paper and thin layer chromatography.

References

1. Atomic structure and chemical bonding withintroduction to molecular spectroscopy- Manas Chandra.
2. Inorganic chemistry- Puri, Sharma and Kalia
3. Fundamental concepts of inorganic chemistry- E S Gilreath
4. Inorganic chemistry-Madan
5. Basic inorganic chemistry-F A Cotton, G Wilkinson and P L Guas
6. Elements of nuclear chemistry- Arnicker
7. Text book of qualitative analysis- A I Vogel
8. Text book of quantitative inorganic analysis- A I Vogel

9. Quantitative analysis: Laboratory manual- Day and Underwood

First semester B.Sc Degree Examination Model question paper

Complimentary course for PhysicsCH1131.1: THEORETICALCHEMISTRY

(2017 admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. Write the electronic configuration of Chromium?
2. Name the principle according to which an orbital can accommodate only two electrons?
3. What is the shape of IF_7 molecule?
4. Write the hybridization of Boron in BF_3?
5. What is the bond order of O_2^+ ?
6. Emission of ------ from a radioactive element does not bring any change in charge or mass.
7. What is the base of radiocarbon dating.
8. What is the result of the beta emission of group 15 element?
9. A useful indicator for the titration of acetic acid versus sodium hydroxide is --------.
10. Calculate the normality of 10% NaOH solution.

SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. State Hund's rule.
12. Give the general equation for the frequency of the lines in the Balmer series for hydrogen?
13. Write the Schrodinger wave equation and explain the terms?
14. NH_3 and CH_4 have SP^3 hybridization. Shapes of these molecules are different. Why?
15. Distinguish between intermolecular and intramolecular hydrogen bonding?
16. The bond energy of NO^+ is larger than that of NO. Why?
17. Define Soddy's group displacement law?
18. The half life period of Ra^{226} is 1620 years. Calculate the value of K for its decomposition in $years^{-1}$?

19. What are beta rays? Which element is formed when beta particle is emitted from Cl-38?
20. Phenolphthalein is not suitable for the titration of strong acid X weak base. Why?
21. How would you prepare 100ml of 0.05M Mohr's slat solution?
22. What are primary standards? Give two examples. SECTION C

(Answer any six questions. Each question carries 4 mark)

23. Why is Bohr model of atom considered inadequate?
24. Explain hydrogen spectrum?
25. Explain why CO_2 and CCl_4 molecules are non polar but $CHCl_3$ molecule is polar?
26. Explain the shape of SF_6 molecule.
27. Water exists as liquid at room temperature while H_2S is a gas at the same temperature. Account for the reason.
28. Explain neutron activation analysis and its application?
29. Write a note on (i) Geiger-Muller counter and (ii) Wilson cloud Chamber.
30. Explain the principle and application of paper chromatography?
31. Explain the theory of redox indicators.

SECTION D

(Answer any two questions. Each question carries 15 mark)

32. (i) What are quantum numbers? Give the significance of each? (5 marks)

    (ii) Write the postulates of Bohr model of atom? (5 marks)

    (iii)Define Aufbau principle with example and explain the stability of half-filled and fully filled orbital? (5 marks)

33. (i) write a short note on Born- Haber cycle?

(ii) Draw and explain the MO diagram for O_2 molecule.

(iii) Describe the different approaches of electronegativity?

34. (i) Derive an equation for the decay constant of a radioactive material.

    (ii) If at the end of 67.5 years only 3.125% of a radioactive material remains without decay.

    What is the half life of the decay?

    (iii) Give an example each for proton, neutron and deuteron induced reactions.

35. (i) what are acid base indicators?

    (ii) explain the use of indicators in acid base titrations.

    (iii) Discuss the titration curves for the titration of strong acid – strong base and weak acid –strong base?

SYLLABUS OF COMPLEMENTARY COURSE
(For students of Physics majors)
(Common for Physics and Geology students)

Physical chemistry-I

SEMESTER II Complementary Course No.- 2 Course Code-CH1231 .1Credit – 2

Total Hours - 36 L-T-P 2-0-2

ModuleI –Thermodynamics 9hrs

First law of thermodynamics, mathematical form, intrinsic energy, enthalpy, reversible, process and maximum work, work of expansion of an ideal gas in reversible isothermal process. Heat capacity of gases at constant volume and constant pressure, derivation of CP – CV = R. Second law of thermodynamics, entropy and free energies, significance of Δ G, Δ H and available work – criteria of equilibrium, and spontaneity on the basis of entropy and free energy – Gibbs-Helmholtz equation.

Module II Thermochemistry:9hrs

Enthalpies of formation, combustion, neutralization, solution and hydration. Relation between heat of reaction at constant volume and constant pressure, variation of heat of reaction with temperature. Kirchoff's equation, Hess's law and application – bond dissociation energies and bond energies of different types of bonds, their calculation and enthalpies of reaction.

Module III –Chemical Equilibrium 9 hrs

Reversible reactions – KP, KC, and KX and their inter relationships – Free energy change and chemical equilibrium (thermodynamic derivation) – van't Hoff reaction isotherm and isochore - influence of pressure and temperature on the following reactions.

(i) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (ii) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ (iii) $2SO_2 + O_2 \rightleftharpoons 2SO_3$ Le Chatelier's principle and the discussion of the above reactions on its basis.

Module IV–Ionic Equilibrium9hrs

Concepts of Acids and Bases, ionization of weak electrolytes. Influence of solvent on acid strength – leveling effect - pH and its determination of potentiometric method. Buffer solutions and calculations of their pH. Henderson equation. Hydrolysis of salt – degree of

hydrolysis and hydrolytic constant, derivation of relation between Kw and Kh for salts of strong acid – weak base, weak acid - strong base and weak acid – weak base.

References

1. Principles of physical chemistry-Puri, Sharma and Pathania
2. Advanced physical chemistry-Gurudeep Raj
3. Thermodynamics for chemists- S Glastone
4. Elements of physical chemistry- Glastone and Lewis
5. A text book of physical chemistry-K L K Kapoor
6. Physical chemistry-P C Rakhit

Second semester B.Sc Degree Examination Model question paper

Complimentary course for Physics Majors

Semester II Complementary Course No.- 2 Course Code-CH1231 .1Credit – 2

PHYSICAL CHEMISTRY- I

(2017 Admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. What is a reversible process?
2. Write the first law of thermodynamics.
3. What is an isochoric process?
4. What is standard enthalpy of formation?
5. Write one example for an exothermic reaction.
6. What is enthalpy of hydration?
7. What is rate constant?
8. What is the significance of ΔG?
9. What is common ion effect?
10. What is the P^H of 0.01M HCl?

SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. One mole of an ideal gas at 25oc is allowed to expand isothermally and reversibly form a volume of 10 liters to 20 liters. Calculate the work done by the gas?
12. State the first law of thermodynamics. What are its limitations?
13. Write the relation between ΔG, ΔH and ΔS. What is the condition for spontaneity of a process?

14. Calculate the enthalpy of hydrogenation, C_2H_4 (g) + H_2(g) ___ C_2H_6 (g).Given that bond energy of H-H= 433kJ, C=C =615kJ and C-C= 347kJ and C-H = 413kJ.
15. Define Enthalpy of formation.
16. What is bond dissociation energy?
17. State Le Chatlier principle.
18. What is isochoric process?
19. What are the characteristics of equilibrium constant?
20. Define Lewis acid and base.
21. What is meant by levelling effect?
22. What is ionic product of water?

SECTION C

(Answer any six questions. Each question carries 4 mark)

23. What do you understand by heat capacity of a system? Show from thermodynamic considerations that Cp - Cv = R.
24. Derive Gibb's Helmohtz equation.
25. In a certain process 675 J of heat is absorbed by a system while 290 J of work is done on the system. What is the change in internal energy for the system?
26. State and explain Hesse's law.
27. Derive relation between heat of reaction at constant volume and constant pressure.
28. Calculate the equilibrium constant for a reaction at 25^0C. ΔG^0=20kcal.
29. Predict the effect of pressure on the dissociation of PCl_5.
30. What is meant by Buffer solution? Give an example of acidic and basic buffer solution? Explain its mechanism?
31. Write Henderson equation. What is its significance? SECTION D

(Answer any two questions. Each question carries 15 mark)

32. (i) Derive an expression for work done in the reversible isothermal isothermal expansion of an ideal gas. (ii) Define
    (a) Work function
    (b) Gibbs free energy function
    (c) Entropy
    (d) Internal energy
33. (i) State Kirchhoff's equation. Indicate how it can be used to evaluate ΔH of a reaction from heat capacity data of reactants and products.

(ii) Calculate the heat of formation of CO_2. Given that CO (g)+H_2O (l) $\rightleftharpoons$ CO_2 (g)+ H_2(g); ΔH=0.7 kcal. Heat of formation of H_2O (l) and CO (g) are -68.3 and -26.4 kcalmol^{-1} respectively.

34. (i) Derive van't Hoff equation.

    (ii) Derive relation between Kp and Kc.

    (iii)The equilibrium constant of a reaction doubles on raising the temperature from 25^{0}C to 35^{0}C. Calculate ΔH^0 of the reaction?

35. (i) Define pH of a solution. Calculate the pH of 0.2M acetic acid in 0.5M sodium acetate at 298K. Dissociation constant of acetic acid at 298K is 1.8 x10^{-5}?

    (ii) Write a note on salt hydrolysis?

SYLLABUS OF COMPLEMENTARY COUSRSE (For students of Physics Majors)

PHYSICAL CHEMISTRY- II

SEMESTER III Course-3 Credit-3Course Code – CH1331.1

L-T-P 3-0-2 54 Hrs

Module 1: Gaseous State 9hrs

Maxwell's distribution of molecular velocities (No derivation) average, most probable and rms velocities, collision number and collision frequency, mean free path, deviation of gases from ideal behaviour – Boyle temperature, derivation of vander waals constants and critical constants – Law of corresponding states – reduced equation of state, Joule Thomson effect, liquefaction of gases – Linde's and claude's processes

Module II – Crystalline State 9hrs

Isotropy and anisotropy – symmetry elements in crystals – the seven crystal systems. Miller indices, Bravais lattices, primitive, bcc and hcc of cubic crystals – Representation of lattice planes of simple cubic crystal - Density from cubic lattice dimension – calculation of Avogadro number - Bragg equation, diffraction of Xrays by crystals – single crystal and powder method. Detailed study of structures of NaCI and KCl crystals.

Module III - Electro Chemistry 9hrs

Transport number – definition, determination by Hittorfs method and moving boundary method, application of conductance measurements. Conductometric titrations involving strong acid – strong base, strong acid – weak base, weak acid – strong base and weak acid – weak base.

EMF – Galvanic cells, measurement of emf, cell and electrode potential, IUPAC sign convention, Reference electrodes, SHE and calomel electrode, standard electrode potential,

Nernst equation, anion and cation reversible electrodes, redox electrode with examples, quinhydrone electrode, glass electrode concentration cell without transference, potentiometric titration, Fuel cells – H2 – O2 and hydrocarbon – O2 type.

Module IV – Catalysis and Photo Chemistry 9hrs

General Characteristics of catalytic reactions. Different types of catalysis – examples – theories of catalysis (Outline of intermediate compound formation theory and adsorption theory). Enzyme catalysis – Michaelis-Menten mechanism.

Photo Chemistry:- Laws of Photo Chemistry, Grothus – Drapter law, Beer Lambert's law, Einstein's laws, quantum yield, H2 – Cl2 reaction, H2 – Br2 reaction – Fluorescence and phosphorescence, chemiluminescence and photo sensitization.

Module – V: Chemical Kinetics 9 Hrs

Rates of reaction, various factors influencing rates of reactions – order and molecularity – Zero, first, second and third order reaction, derivation of integrated rate equation, fractional life time, units of rate constants, influence of temperature on reaction rates. Arrhenius equation, calculation of Arrhenius parameters – collision theory of reaction rates.

Module VI-Group theory 9 Hrs

Group theory- elements of symmetry- proper and improper axis of symmetry- plane of symmetry-center of symmetry- identity elements, combination of symmetry elements-point group- C_{2v}, C_{3v} and D_{3h}- group multiplication table of C_{2v}- determination of point group of simple molecules like water, NH_3, BF_3

References

1. Principles of physical chemistry-Puri, Sharma and Pathania
2. Advanced physical chemistry-Gurudeep Raj
3. Physical chemistry- PW Atkins
4. Physical chemistry-F Daniel and R A Alberty
5. Physical chemistry-E A Moelwyn
6. Introduction to solids- L V Azaroff
7. Solid state chemistry- N B Hannay
8. Group theory in chemistry-V Ramakrishnan and M S Gopinathan
9. Group theory and its applications in chemistry- A Salahuddin kunju and G krishnan

Third Semester B.Sc Degree Examination Model Question Paper

Complimentary course for Physics

CH1331 .1: PHYSICAL CHEMISTRY- II

(2017 Admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1.What is the ratio of observed molar volume to ideal molar volume is?

2. Define Boyle temperature?
3. How many unit cell are possible in cubic crystal?
4. Why amorphous solids are said to be isotropic?
5. In a Galvanic cell electron flows from …… to ……
6. What is the potential of SHE.
7. What is the quantum yield of H_2-Cl_2 reaction?
8. Define chemiluminescence
9. What is the order of the reaction with rate constant $2x10^{-2}$ $molL^{-1}s^{-1}$
10. NH_3 belongs to which point group?

SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. Define critical temperature and explain its significance?
12. What is virial equation of states?
13. Explain the term Space lattice and Unit cell.
14. Both NaCl and KCl have fcc structures but KCl behaves towards X-rays like simple cubic lattice. Why?
15. What is liquid junction potential? How can it be eliminated?
16. What are reference electrodes? Give their significance?
17. State Einstein's law of photochemical equivalence?
18. What is meant by chemiluminescence?
19. What is meant by autocatalysis?
20. Define order and molecularity of a reaction?

21. A substance decomposes following first order kinetics. The half life period of a reaction is 35 minutes. What is the rate constant of the reaction?

22. What is meant by point group?

SECTION C

(Answer any six questions. Each question carries 4 mark)

23. What is the law of corresponding states? How is it derived from the vander waal's equation?

24. Calculate the constants a and b, if Tc=31^{0}C, Pc=72.8atm and R=0.082lit atm/K?

25. What are the Miller indices? How are they determined?

26. EMF of a standard Daniel Cell is 1.01832 V at 298K. Temperature coefficient of the cell is 5x10^{-5}V/K. Calculate ΔG, ΔH, and ΔS of the cell reaction?

27. Write a brief note on Calomel electrode?

28. State and explain Beer-Lambert's law? What are its limitations?

29. Explain pseudo order reactions with suitable examples?

30. Give the group multiplication table for C_{2V}

31. Explain the different symmetry elements?

SECTION D

(Answer any two questions. Each question carries 15 mark)

32. (i) Explain Linde's and Claude's method of liquefaction of gases?

    (ii)Do all gases obey gas laws? Discuss some experimental results to explain the deviation and point out the causes which account for this behavior?

    (iii) explain the terms: collision frequency and collision diameter.

33. (i) Derive Bragg's equation for the diffraction of of X-rays by crystal lattice? How is this equation used in elucidating the crystal structure?

    (ii) In fcc lattice of NaCl the distance between Na^+ and Cl^- ions is 281 pm and the density of NaCl is 2.165g/cm^3. Compute Avogadro's no. from the given data. The molar mass of NaCl is 58.5g/mol.

    (iii) Assign the point groups of the molecule BF_3 and H_2O

34. (i) Write a brief note on fuel cells? (ii) State and explain Nernst equation (iii) Explain the principle of potentiometric titrations?

35. (i) What is catalysis? What are the general characteristics of catalyst? (ii) Derive an expression for rate constant of a first order reaction? (iii) Explain the influence of temperature on reaction rates?

SYLLABUS OF COMPLEMENTARY COUSRSE

(For students of Physics Majors)

Spectroscopy and Material Chemistry

SEMESTER IV Course-4 Credit-3 Course Code – CH1431 .1

L-T-P 3-0-2 Total 54hrs

Module I - Spectroscopy-I 9hrs

Regions of electromagnetic spectrum – different units to represent energy such as erg, joule, calorie, cm^{-1}, Hz and eV, their interconversions – interaction of radiation with matter, different types of energy levels of molecules – rotation, vibration and electronic levels. Rotation spectroscopy Microwave spectrum of diatomic molecules – expressions for rotational energy, selection rule – frequency separation and determination of bond length – vibrational spectrum – harmonic oscillator, equation for frequency of vibration, expression for vibrational energy,

selection rule, frequency separation, calculations of force constant, Electronic spectroscopy –types of transition and regions where they absorb.

Module II- SPECTROSCOPY- II 9 hrs

Raman spectroscopy – stokes and anti stokes lines, quantum theory of Raman spectrum – advantages and disadvantages of Raman spectrum, rotational Raman spectrum, selection rules and frequency separation. Vibrational Raman spectrum – Complementary with IR spectrum, mutual exclusion principle, NMR spectroscopy, principle of NMR spectroscopy, nuclear spin, interaction with external magnet, energy spacing, transition between nuclear energy levels in hydrogen nucleus, low resolutionspectrum, chemical shift, spin – spin

coupling – fine structure spectrum, application to simple molecule

Module III Coordination Chemistry 9 Hrs

Types of ligands, Werner's coordination theory, Valence bond theory of bonding in octahedral and tetrahedral complexes, Drawbacks of valence bond theory crystal field theory of octahedral and tetrahedral complexes, examples – high and low spin complexes, magnetic properties ,application in qualitative and quantitative analysis. 9 hrs

Module IV – Metallurgy 9 Hrs

General principles of occurrence and extraction of metals – purification, roasting, calcination and smelting, reduction to metal, different method with examples, refining of metals- electrolytic and zone refining. Van – Arkel method. Metallurgy of titanium, cobalt, nickel, thorium and uranium.

Module V :Chemistry of Nano Materials 9hrs

Evolution of Nano science – Historical aspects – preparations containing nano gold in traditional medicine, Lycurgus cup – Faraday's divided metal etc.

Nanosystems in nature.

Preparation of Nano particles – Top – down approach and bottom – top approach, sol – gel synthesis, colloidal precipitations, Co- precipitation, combustion technique. Properties of nano particles: optical, magnetic and mechanical properties.

Tools for measuring nano structure – XRD, Atomic force Microscopy (AFM), Scanning Tunneling

Microscopy (STM), and Scanning Electron Microscopy (SEM) Transmission Electron Microscopy (TEM). Applications of nano materials in electronics, robotics, computers, sensors, mobile electronic devices, Medical applications (use Au, Ag,ZnO and ZnO2 as examples)

Module VI- Advanced Materials 9hrs

Magnetic materials-classification-applications- conducting polymers- polyacetylene-ployanilines- synthesis- applications- photoconducting polymers-examples-super conducting materials - Liquid crystals – mesomorphic state, types of liquid crystals applications and examples. .

References

1. Fundamental of molecular spectroscopy- C N Banwell
2. Atomic structure and chemical bonding in molecular spectroscopy- Manas Chandra
3. Physical chemistry-R Stephen Berry, Sturt A Rice and John Rose
4. Inorganic chemistry-J E HuheeCoordination chemistry- Bosolo and Johnson
5. Coordination chemistry- S F A Kettle
6. Inorganic chemistry- Puri, Sharma and Kalia
7. NANO: the essentials –T Pradeep
8. Introduction to Solid State Physics- Charles Kittel

Fourth semester B.Sc Degree Examination Model question paper

Complimentary course for Physics

CH1431 .1: Spectroscopy and Material Chemistry
(2017 Admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. Which of the following give pure rotational spectrum: H_2, N_2, CO_2, HCl?
2. What is Rayleigh scattering?
3. What is the selection rule for vibrational transition?
4. What is the condition for a molecule to be NMR active?
5. What is Wilkinson's catalyst?
6. What is nano shells?
7. Write an example for a chelate.
8. What are the ores of titanium?
9. Name the nano meterials used in semiconductors?
10. What are ferromagnetic materials?

SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. What is Born Oppenheimer approximation?
12. The force constant of HF molecule is 970Nm-1. Calculate the fundamental vibrational frequency as well as the zero-point energy?
13. What is Raman Effect? What is the cause of Raman effect?
14. Explain the terms shielding and deshielding with regard to NMR spectroscopy.
15. What is chemical shift?
16. Explain the effect of solvent in UV spectroscopy.
17. What is the difference between a double salt and a complex compound?
18. $[Fe(CN)_6]^{3-}$ paramagnetic. Why?
19. Explain Van Arkel method of refining of metals.
20. What is froth flotation?
21. What is STM and its basic principle?
22. Explain the synthesis of polyaniline from aniline. SECTION C

(Answer any Six questions. Each question carries 4 mark)

23.Why are anti-stokes lines intense than the stokes lines in the Raman spectrum?

24. Taking the example of HCl show how rotation of the molecule causes dipole moment fluctuations?
25. State and illustrate the Frank-Condon principle.

26. Define the terms: Bathochromic shift, Hypsochromic shift, hyperchromic shift, hypochromic shift.
27. Discuss Werner's theory of coordination compounds.
28. Explain the formation of low spin and high spin complexes with the help of crystal field theory.
29. Outline the principles involving electrolytic refining.
30. Explain the properties of nano particles.
31. Give a short note on superconducting materials. SECTION D

(Answer any twot questions. Each question carries 15 mark)

32. (i) Derive an expression for allowed energies of rotational levels ina diatomic molecule.
    (ii) Show that for a rigid diatomic rotor the moment of inertia is given by $I = \mu r^2$.
    (iii) Discuss the quantum theory of Raman spectroscopy 33.(i) Explain the underlying principle in an NMR spectrum.
    (ii)What are the different kinds of protons indicated in an NMR spectrum. How do they produce their characteristics signals?
    (iii)How can the NMR method be used to distinguish between the structures of 1propanol and 2-propanol?
34. (i) Give an account of crystal field theory?
    (ii) What are applications of coordination compounds in qualitative analysis? (iii) Give an account of hydrometallurgy.
35. (i) Explain the applications of nanomaterials in electronic and robotics.
    (ii) Explain working principle of SEM and TEM.
    (iii)Give a note on types of liquid crystals.

SYLLABUS FOR LABORATORY COURSES FOR B.Sc COMPLEMENTARY CHEMISTRYCourse V
Course CodeCH1432 .1 Credit 2 For Physics & Geology MajorsSemesters 1, 2, 3 & 4

Reactions and identification of cations : Hg^{+}, Pb^{2+}, Ag^{+}, Hg^{2+}, Bi^{3+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+}, Sn^{4+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Cd^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+} and NH_4^{+}

The cations must be provided in solutions. A student must analyse at least ten mixtures containing two cations each.

Volumetric analysis- one burette method only

A. Acidimetry and Alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. (Estimation of a strong base and a weak base using standardized HCl)
Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

[d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.]

(e. Estimation of a strong acid using standardized NaOH))

B. Permanganometry

a. Standardisation of KMnO4 by oxalic acid sodium oxalate and Mohr's salt

b. Estimation of oxalic acid / sodium oxalate.

c. Estimation of Mohr's Salt. d. Estimation of calcium.

C. Dichrometry

e. Preparation of Std. K2Cr2O7 and estimation of ferrous iron by external and internal indicators.

f. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodometry and Iodimetry

g. Standardization of sodium thiosulphate using std. potassium dichromate. h. Estimation of copper in a solution

i. Estimation of iodine

E. Complexometric titrations

j. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution

k. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Physical Chemistry Experiments

1. Conductometric titrations- HCl Vs NaOH

2. Potentiometric titrations- Ferrous iron Vs Dichromate

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} semesters

SYLLABUS OF COMPLEMENTARY COURSE
(For students of Geology Majors)
(Common for Physics and Geology
students)I B.Sc Complementary
THEORETICAL CHEMISTRY
SEMESTER I Complementary Course – 1 Course Code- CH1131 .2 Credit-2

Total Hour : 36 L–T-P- 2-0-2

Module I –Atomic Structure 9hrs

Atomic spectrum of Hydrogen – different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (no derivation mention only) concept of orbitals, the four quantum numbers and their significances. Orbital wise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, stability of filled and half filled orbitals

Module II - Chemical bonding 9hrs.

Energetic of bond formation – Types of Chemical bonds – Energetics of ionic bond formation – Lattice energy – Born Haber Cycle - Fajan's rules.

Polarity of covalent bond its relation with electronegativity – electro negativity scales – Paulings and Mullikan's approaches, factors influencing polarity , dipole moment – its relation to geometry. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility.

Hybridisation and structure of molecules – SP, SP^2, SP^3, dSP^2, dSP^3, SP^3d^2, and SP^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia VSEPR theory, geometry of molecules with bond pairs of electrons only, geometry of molecules containing bond pairs and lone pairs of electrons, limitations. A brief review of molecular orbital approach, LCAO method – bond order, bond distance and stability of O_2,O_2^{2+},O_2^{2-},NO,NO+,CO and HF.

Module–III:Radioactivity
9hrs.

Radio active equilibrium (qualitative idea only) detection of radio activity by Wilson's cloud chamber and Geiger Muller Scintillation counter – units of radio activity – curie and rutherford – Radio Carbon dating , Rock dating, Neutron activation analysis Applications in agriculture and medicine. A brief study of the biological effects of radiation such as pathological and genetic damage, Dosimetry – Units – rad, gray and roentgen. Fricke dosimeter and ceric sulphate dosimeter. Nuclear Chemistry – stability of Nucleus – n/p ratio, artificial transmutation and radio activity, mass defect, binding energy, atomic fission and fusion.

Module IV: Analytical principles9 Hrs

Analytical methods in Chemistry – principles of volumetric analysis, primary standard, standard solution, normality and molarity, theory of acid - base titration, permanganometric and dichrometric titration, theory of acid – base and redox indicators.

Inorganic qualitative analysis, common ion effect- solubility product- precipitation of cations- chromatography- principle and applications of paper and thin layer chromatography.

References

1. Atomic structure and chemical bonding withintroduction to molecular spectroscopy- Manas Chandra.
2. Inorganic chemistry- Puri, Sharma and Kalia
3. Fundamental concepts of inorganic chemistry- E S Gilreath
4. Inorganic chemistry-Madan
5. Basic inorganic chemistry-F A Cotton, G Wilkinson and P L Guas
6. Elements of nuclear chemistry- Arnicker
7. Text book of qualitative analysis- A I Vogel
8. Text book of quantitative inorganic analysis- A I Vogel
9. Quantitative analysis: Laboratory manual- Day and Underwood

First semester B.Sc Degree Examination Model question paper

Complimentary course for Geology CH1131.2: THEORETICALCHEMISTRY

(2017 admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. Write the electronic configuration of Chromium?
2. Name the principle according to which an orbital can accommodate only two electrons?
3. What is the shape of IF_7 molecule?
4. Write the hybridization of Boron in BF_3?
5. What is the bond order of O_2^+ ?
6. Emission of ------ from a radioactive element does not bring any change in charge or mass.
7. What is the base of radiocarbon dating.
8. What is the result of the beta emission of group 15 element?
9. A useful indicator for the titration of acetic acid versus sodium hydroxide is --------.

10. Calculate the normality of 10% NaOH solution. SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. State Hund's rule.
12. Give the general equation for the frequency of the lines in the Balmer series for hydrogen?
13. Write the Schrodinger wave equation and explain the terms?
14. NH_3 and CH_4 have SP^3 hybridization. Shapes of these molecules are different. Why?
15. Distinguish between intermolecular and intramolecular hydrogen bonding?
16. The bond energy of NO^+ is larger than that of NO. Why?
17. Define Soddy's group displacement law?
18. The half life period of Ra^{226} is 1620 years. Calculate the value of K for its decomposition in $years^{-1}$?
19. What are beta rays? Which element is formed when beta particle is emitted from Cl-38?
20. Phenolphthalein is not suitable for the titration of strong acid X weak base. Why?
21. How would you prepare 100ml of 0.05M Mohr's slat solution?
22. What are primary standards? Give two examples. SECTION C

(Answer any six questions. Each question carries 4 mark)

23. Why is Bohr model of atom considered inadequate?
24. Explain hydrogen spectrum?
25. Explain why CO_2 and CCl_4 molecules are non polar but $CHCl_3$ molecule is polar?
26. Explain the shape of SF_6 molecule.
27. Water exists as liquid at room temperature while H_2S is a gas at the same temperature. Account for the reason.
28. Explain neutron activation analysis and its application?
29. Write a note on (i) Geiger-Muller counter and (ii) Wilson cloud Chamber.
30. Explain the principle and application of paper chromatography?
31. Explain the theory of redox indicators.

SECTION D

(Answer any two questions. Each question carries 15 mark)

32. (i) What are quantum numbers? Give the significance of each? (5 marks)

    (ii) Write the postulates of Bohr model of atom? (5 marks)

(iii)Define Aufbau principle with example and explain the stability of half-filled and fully filled orbital? (5 marks)

33. (i) write a short note on Born- Haber cycle?

(ii) Draw and explain the MO diagram for O_2 molecule.

(iii) Describe the different approaches of electronegativity?

34.(i) Derive an equation for the decay constant of a radioactive material.

(ii) If at the end of 67.5 years only 3.125% of a radioactive material remains without decay.

What is the half life of the decay?

(iii) Give an example each for proton, neutron and deuteron induced reactions.

35.(i) what are acid base indicators?

(ii) explain the use of indicators in acid base titrations.

(iii)Discuss the titration curves for the titration of strong acid – strong base and weak acid –strong base?

SYLLABUS OF COMPLEMENTARY COURSE
(For students of Geology majors)
(Common for Physics and Geology students)
Physical chemistry-I

SEMESTER II Complementary Course No.- 2 Course Code-CH1231 .2Credit – 2

Total Hours - 36 L-T-P 2-0-2

ModuleI –Thermodynamics 9hrs

First law of thermodynamics, mathematical form, intrinsic energy, enthalpy, reversible, process and maximum work, work of expansion of an ideal gas in reversible isothermal process. Heat capacity of gases at constant volume and constant pressure, derivation of CP – CV = R. Second law of thermodynamics, entropy and free energies,significance of Δ G, Δ H and available work – criteria of equilibrium, and spontaneity on the basis of entropy and free energy – Gibbs-Helmholtz equation.

Module II Thermochemistry 9hrs

Enthalpies of formation, combustion, neutralization, solution and hydration. Relation between heat of reaction at constant volume and constant pressure, variation of heat of reaction with temperature. Kirchoff's equation, Hess's law and application – bond dissociation energies and bond energies of different types of bonds, their calculation and enthalpies of reaction.

Module III –Chemical Equilibrium 9 hrs

Reversible reactions – KP, KC, and KX and their inter relationships – Free energy change and chemical equilibrium (thermodynamic derivation) – van't Hoff reaction isotherm and isochore - influence of pressure and temperature on the following reactions.

(i) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (ii) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ (iii) $2SO_2 + O_2 \rightleftharpoons 2SO_3$ Le Chatelier's principle and the discussion of the above reactions on its basis.

ModuleIV–Ionic Equilibrium 9hrs

Concepts of Acids and Bases, ionization of weak electrolytes. Influence of solvent on acid strength – leveling effect - pH and its determination of potentiometric method. Buffer solutions and calculations of their pH. Henderson equation. Hydrolysis of salt – degree of hydrolysis and hydrolytic constant, derivation of relation between Kw and Kh for salts of strong acid – weak base, weak acid - strong base and weak acid – weak base.

References

1. Principles of physical chemistry-Puri,Sharma and Pathania
2. Advanced physical chemistry-Gurudeep Raj
3. Thermodynamics for chemists- S Glastone
4. Elements of physical chemistry- Glastoneand Lewis
5. A text book of physical chemistry-K L K Kapoor
6. Physical chemistry-P C Rakhit

B.Sc Degree Examination Model question paper

Complimentary course for Geology Majors

Semester II CH1231.2: PHYSICAL CHEMISTRY- I

(2017 Admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. What is a reversible process?
2. Write the first law of thermodynamics.
3. What is an isochoric process?
4. What is standard enthalpy of formation?
5. Write one example for an exothermic reaction.
6. What is enthalpy of hydration?
7. What is rate constant?

8. What is the significance of ΔG?
9. What is common ion effect?
10. What is the P^H of 0.01M HCl?

SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. One mole of an ideal gas at 25oc is allowed to expand isothermally and reversibly form a volume of 10 liters to 20 liters. Calculate the work done by the gas?
12. State the first law of thermodynamics. What are its limitations?
13. Write the relation between ΔG, ΔH and ΔS. What is the condition for spontaneity of a process?
14. Calculate the enthalpy of hydrogenation, C_2H_4 (g) + H_2(g) C_2H_6 (g).Given that bond energy of H-H= 433kJ, C=C =615kJ and C-C= 347kJ and C-H = 413kJ.
15. Define Enthalpy of formation.
16. What is bond dissociation energy?
17. State Le Chatlier principle.
18. What is isochoric process?
19. What are the characteristics of equilibrium constant?
20. Define Lewis acid and base.
21. What is meant by levelling effect?
22. What is ionic product of water?

SECTION C

(Answer any six questions. Each question carries 4 mark)

23. What do you understand by heat capacity of a system? Show from thermodynamic considerations that Cp - Cv = R.
24. Derive Gibb's Helmohtz equation.
25. In a certain process 675 J of heat is absorbed by a system while 290 J of work is done on the system. What is the change in internal energy for the system?
26. State and explain Hesse's law.
27. Derive relation between heat of reaction at constant volume and constant pressure.
28. Calculate the equilibrium constant for a reaction at 25^0C. ΔG^0=20kcal.
29. Predict the effect of pressure on the dissociation of PCl_5.

30. What is meant by Buffer solution? Give an example of acidic and basic buffer solution? Explain its mechanism?

31. Write Henderson equation. What is its significance? SECTION D

(Answer any two questions. Each question carries 15 mark)

32. (i) Derive an expression for work done in the reversible isothermal expansion of an ideal gas.

    (ii) Define

    (a) Work function

    (b) Gibbs free energy function

    (c) Entropy

    (d) Internal energy

33. (i) State Kirchhoff's equation. Indicate how it can be used to evaluate ΔH of a reaction from heat capacity data of reactants and products.

    (ii) Calculate the heat of formation of CO_2. Given that CO (g)+H_2O (l) $\Longleftrightarrow$ CO_2 (g)+ H_2(g); ΔH=0.7 kcal. Heat of formation of H_2O (l) and CO (g) are -68.3 and -26.4 $kcalmol^{-1}$ respectively.

34. (i) Derive van't Hoff equation.

    (ii) Derive relation between Kp and Kc.

    (iii)The equilibrium constant of a reaction doubles on raising the temperature from 25 ^{0} C to 35^{0}C. Calculate ΔH^0 of the reaction?

35. (i) Define pH of a solution. Calculate the pH of 0.2M acetic acid in 0.5M sodium acetate at 298K. Dissociation constant of acetic acid at 298K is 1.8 $x10^{-5}$?

    (ii) Write a note on salt hydrolysis?

Complementary Chemistry

(For Geology Majors)

Physical , Analytical and Inorganic ChemistrySemester III Course-3
Credit-3Course Code – CH1331 .2

L-T-P 3-0-2 Total 54 hrs

Module I – Gascous State

Maxwell's distribution of molecular velocities (no derivation), average, most probable and RMS velocities collision number and collision frequency, mean free path, deviation of gases from ideal behaviour – Boyle temperature, derivation of Vander Waal's constants and critical constants, law of corresponding states – reduced equation of state, Joule Thomson coefficient, liquefaction of gases –Linde's and Claudes process. 9 Hrs

Module II – Crystalline State

Isotropy and anisotropy – symmetry elements in crystals – the seven crystal systems – Miller indices, Bravais lattices, primitive, bcc and fcc lattices of cubic crystals – Bragg equation - diffraction of X rays by crystals – single crystal and powder method. Detailed study of structure of NaCl and KCl crystals. Liquid crystals – mesomorphic state, types of liquidcrystals, application and examples. 9 hrs

Module III – Chemical Cycles and Group Properties

Carbon, Sulphur, Nitrogen, phosphorous and hydrologic cycle.

Group properties (reactions) of anions in common minerals – Carbonate, Sulphate, Phosphate, Sulphides and fluorides.

Classification of oxides – Acidic, Basic, Amphoteric and neutral 9 hrs

Module IV: Surface Chemistry and Colloids (9 Hrs)

Adsorption – types of adsorption of gases by solids, factors influencing adsorption,Freundlich adsorption isotherm – Langmuir adsorption isotherm (derivation not required).

Colloids:True solution, colloidal solution and suspension. Classification of colloids: Lyophilic, lyophobic, macromolecular, multimolecular and associated colloids with examples. Purification of colloids by electrodialysis and ultrafiltration. Properties of colloids: Brownian movement – Tyndall effect – Electrophoresis. Origin of charge and stability of colloids – Coagulation - Hardy Schulze rule – Protective colloids - Gold number. Emulsions. Applications of colloids: Application of colloids Cottrell precipitator – purification of water, coagulation, reverse osmosis, electro dialysis, delta formation, medicines, cleaning action of detergents and soaps.

Module V Inorganic Polymers9hrs

General properties of inorganic polymer, phosphazenes – preparation of linear and cyclo phosphazene with examples, properties, and application, silicones – General methods of preparation and properties examples. Application of Silicones, Silicone rubber, silicone resins. 9 hrs

Module VI Soil and Water Chemistry 9 hrs

Soil – Composition, mineral matter in soil process of soil formation, weathering –

physical (mention), chemical (detail) + biological (mention)

Saline and alkaline soil (brief explanation) Rocks – different types (Igneous, sedimentary and Meta morphic.) Analysis of lime stone qualitative treatment only.

Water Analysis Water quality parameters COD, BOD, main quality characteristics of water (alkalinity, hardness, total solids and oxidation)

Water treatment including chemical (Precipitation, aeration, osonisation,chlorination) and physical methods of sterilization.

References

1) Physical Chemistry-Rakshit
2) Principles of Physical Chemistry- Puri,Sharma, Pathania
3) Instrumental methods of Chemical Amalysis- B.K.Sharma
4) Vogel's Text book of Quantitative Chemical Analysis –VI Edition
5) Atomic structure with introduction to Molecular Spectroscopy – Manas Chanda
6) Physical Chemistry- N.M.Kapoor
7) Soil and Noise pollution- B.K.Sharma
8. Industrial Chemistry – B.K.Sharma.

Model Question Paper Chemistry (complementary) for Geology majors (2017 admission onwards)

Semester III Course Code: CH1331 .2 Course – III

Physical, Analytical and Inorganic Chemistry

Time: Three Hours Maximum marks: 80

Section A. Answer all questions. Mark 1.

1. Write the general formula of silica.
2. How oxides are classified?
3. Explain the term mean free path.
4. Name two classification of colloids based on solvent?
5. Explain Bravais lattices
6. Write the expression for RMS velocity.
7. What is inorganic rubber?
8. Define Brownian movement.
9. Define glass transition temperature.
10. Mention any two chemical methods of water sterilization.

Section B. Answer any eight questions. Each question carries 2 marks.

11. Distinguish between most probable velocity and average velocity.
12. State law of corresponding states.
13. Differentiate between isotropy and anisotropy.
14. Find the Miller indices of a crystal plane with intercepts 2a,2b and 3c.
15. Explain COD and BOD.
16. How will you analyse limestone qualitatively?
17. What is CMC
18. Draw Langmuir adsorption isotherm
19. What is the difference between colloid and suspension?
20. Define Boyle temperature.
21. What is Bragg's equation?
22. What is Joule- Thomson coefficient?

Section C. Answer any six questions. Each question carries 4 marks.

23. What are the causes for the deviation of real gases from ideality? How is it solved?
24. Explain symmetry elements in crystals.
25. Give an account of weathering with emphasis to chemical weathering.
26. What are inorganic polymers? How do they differ from organic polymers?
27. Give any one method for the preparation of silicones. What are the important applications of silicones?
28. Explain Hardy Schulze rule with the help of an example.
29. Give an account of carbon cycle.
30. Explain Linde's process of liquefaction of gases.

Section D. Answer any two questions. Each question carries 15 marks.

31. (a) Explain liquid crystals with examples for each type (b) Give a detailed account on the structure of NaCl.

32. Write a note on (a) Nitrogen cycle (b) different types of rocks and (c) main quality characteristics of water.
33. Give an account of the preparation, properties and important applications of (a) silicates (b) phosphazenes.
34. (a) Write a note on different types of adsorption of gases by solids.
    (b) Describe the applications of colloids.
35. (a) Write a short note on the various purification methods of water.
    (b) Calculate the average velocity and root mean square velocityof a molecule in a sample of oxygen at 0 °C?

Semester IV – Geology Majors

Physical and Analytical Chemistry -II Course-4

Credit -3Course Code – CH1431 .2

L-T-P 3-0-2 Total 54 Hrs

Module I Metallurgy

Metallurgy of Titanium, Iron, cobalt, Nickel, Thorium, Uranium. Extraction of lanthanides. 9 Hrs

Module II Petro Chemicals

Introduction to crude oil, exploratory methods, constitution of crude oil, natural gas - constituents. Distillation of crude oil, separation of natural gas and different fractions. Meaning of terms such as ignition point, flash point, octane number. Types of hydrocarbon fuels and their characteristics. Cracking – catalytic cracking, hydro cracking, isomerisation, reforming, sulphur, hydrogen, petroleum, coke and nitrogen compounds from petroleum. 9Hrs

Module III Chemical Kinetics

Rates of reactions, various factors influencing rates of reactions – order and molecularity - Zero, first, second and third order reactions – derivation of integrated rate equation, fractional life time – units of rate constants, influence of temperature on reaction rates – Arrhenius equation, calculation of Arrhenices parameters – Collision theory of rates. 9 hrs

Module IV Catalysis and Photo Chemistry 9hrs

Theories of catalysis, outline of intermediate compound formation theory and adsorption theory.

Photo Chemistry:Laws of photo Chemistry .Grotthus Draper Law, Einstein's law, Beer lambert law, Photo Chemical equivalence and quantum yield, explanation for high and low quantum yields, H2-Cl2 reaction, H2-Br2 reaction, Photosensitisation and Chemiluminescence.

Module V - Electro Chemistry 9hrs

Transport number – definition, determination by Hittorfs method and moving boundary method, application of conductance measurements. Conductometric titrations involving strong acid – strong base, strong acid – weak base, weak acid – strong base and weak acid – weak base.

EMF – Galvanic cells, measurement of emf, cell and electrode potential, IUPAC sign convention, Reference electrodes, SHE and calomel electrode, standard electrode potential, Nernst equation, anion and cation reversible electrodes, redox electrode with examples, quinhydrone electrode, glass electrode concentration cell without transference, potentiometric titration, Fuel cells – H2 – O2 and hydrocarbon – O2 type.

ModuleVI Instrumental Methods of Analysis9 hrs

Spectral methods – Atomic Absorption Spectroscopy (AAS) principle, measurement, advantages, disadvantages, and applications. Flame Emission Spectroscopy (FES) principle, measurement,(single beam method) applications.

Thermal methods: Thermo gravimetric analysis (TG) principle and method, Factors affecting thermogravimetric analysis, Application, Differential Thermal Analysis (DTA) principle, method, factors affecting DTA Applications.

References

1. Physical Chemistry-Rakshit
2. Principles of Physical Chemistry- Puri,Sharma, Pathania
3. Instrumental methods of Chemical Amalysis- B.K.Sharma
4. Vogel's Text book of Quantitative Chemical Analysis –VI Edition
5. Atomic structure with introduction to Molecular Spectroscopy – Manas Chanda

6. Physical Chemistry- N.M.Kapoor

7. Soil and Noise pollution- B.K.Sharma

8.IndustrialChemistry–B.K.Sharma.

Model Question Paper Chemistry (complementary) for Geology majors (2017 admission onwards)

Semester IV Course Code: CH1431.2 Course IV

Physical and Analytical Chemistry II

Time: Three Hours Maximum marks: 80

Section A. Answer all questions. Mark 1.

1. Write Arrhenius equation.
2. State Beer Lambert law.
3. Explain catalytic cracking.
4. Give an example of a negative catalyst with the chemical reaction which it catalyses.
5. The rate law for a reaction is $r = k [A] [B]^2$. Write the order of the reaction.
6. Define octane numbe r.
7. Name two important ores of Uranium.
8. Draw the shape of graph for the titration of a strong acid Vs strong base.
9. What you meant by flash point?
10. Conductance of an electrolyte depends on ……. and …….

Section B. Answer any eight questions. Each question carries 2 marks.

11. What is the influence of temperature on reaction rate?
12. A substance decomposes following first order kinetics. The half life period of the reaction is 35 minutes. What is its rate constant?
13. State Einstein's law of photochemical equivalence.
14. Define quantum yield of a photochemical reaction.
15. Explain van't Hoff reaction isotherm.
16. Illustrate SHE.
17. Write the principle of AAS.
18. How do you differentiate a TG curve from a DTA curve?
19. What is smelting.
20. Distinguish between order and molecularity?
21. What is Grotthus- Draper law?
22. Explain chemiluminescence.

Section C. Answer any six questions. Each question carries 4 marks.

23. Give the Arrhenius equation. How will you determine the Arrhenius parameters?
24. Explain photosensitization reaction with an example.
25. Explain the method used to determine transport number of an electrolite.
26. What is the principle of flame emission spectroscopy? Mention its important applications.
27. What are the general methods for refining of metals?

28. Give an account of different types of hydrocarbon fuels and their characteristics.
29. Distinguish between isotherm and isochore.
30. Explain quantum yield in terms of H_2-Cl_2 reaction.

Section D. Answer any two questions. Each question carries 15 marks.

31. (a) Derive the expression for the rate constant of a first order reaction. (b) How will you express the units of rate constant for reactions of order 1, 2 and 3?
32. Write a note on (a) Extraction of lanthanides (b) Types of hydrocarbon fuels and their characteristics (c) Photosensitisation.

33. Give a detailed account on the principle and applications of (a) TG and (b) DTA.
34. (a) Discuss the principle, measurement and applications of Flame Emission Spectroscopy (FES)
    (b) Explain Collision theory of rates.
35. (a)Explain the method used to determine transport number of an electrolyte.
    (b) A solution of silver nitrate containing 12.14 g of silver in 50 ml of solution was electrolysed between platinum electrodes. After electrolysis, 50 ml of the anode solution was found to contain 11.55 g of silver, while 1.25 g of metallic silver was deposited on the cathode. Calculate the transport number of Ag+ and – NO3 ions.

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY Course CodeCH1432 .2 Credit 2 For Physics & Geology Majors

Semesters 1, 2, 3 & 4

Reactions and identification of cations : Hg^{+}, Pb^{2+}, Ag^{+}, Hg^{2+}, Bi^{3+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+}, Sn^{4+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Cd^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+} and NH_4^{+}

The cations must be provided in solutions. A student must analyse at least ten mixtures containing two cations each.

Volumetric analysis

A. Acidimetry and Alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl)

Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH.

B. Permanganometry

a. Standardisation of KMnO4 by oxalic acid sodium oxalate and Mohr's salt b. Estimation of oxalic acid / sodium oxalate

c. Estimation of Mohr's Salt.

d. Estimation of calcium

C. Dichrometry

e. Preparation of Std. K2Cr2O7 and estimation of ferrous iron by external and internal indicators.

f.Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodometry and Iodimetry

g. Standardization of sodium thiosulphate using std. potassium dichromate. h. Estimation of copper in a solution

i. Estimation of iodine

E. Complexometric titrations

j. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution

k. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals.

2. Estimation of barium chloride solution.

Physical Chemistry Experiments

1. Conductometric titrations- HCl Vs NaOH

2. Potentiometric titrations- Ferrous iron Vs Dichromate

This laboratory based course reinforces the qualitative and quantitative chemical analysis that

the student has learned in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} semesters

Complementary Chemistry offered to Botany Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry ComplementaryComplementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .3		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .3		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .3		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .3 CH1432 .3		3×18 =54 2×18 = 36

SYLLABUS FOR COMPLEMENTARY COURSE COURSE

Theoretical Chemistry (Common for Botany/Zoology/Microbiology)

(For Students of Botany Majors)

SEMESTER 1 Complementary Course 1 Course Code-CH1131 .3 Credit-2

L-T-P 2-0-2 36 Hours

Module I – Atomic Structure (9 hrs)

Atomic spectrum of hydrogen - different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (mention only, no derivation), concept of orbitals, the four quantum numbers and their significances. Orbitalwise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, Stability of filled and half filled orbitals.

Module II – Chemical Bonding (9 hrs)

Energetics of bond formation – Born-Haber cycle. Hybridisation and structure of molecules – sp, sp^2, sp^3, dsp^2, dsp^3, sp^3d^2 and sp^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia. VSEPR theory with regular and irregular geometry –. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility. Partial covalent character of the ionic bond – Fajan's Rules. A brief review of molecular orbital approach

– LCAO method – bond order, bond distance and stability of O2, $O2^{2+}$, $O2^{2-}$, NO, NO^+

Module III – Analytical Principles (9 hrs)

Principles of volumetric analysis – primary standard – standard solutions normality and molarity, theory of acid-base titrations, permagnometric and dichrometric titrations, iodometry and complexometric titrations. Theory of acid-base indicator – redox indicators. Beer- Lambert law- Principles of colorimetry – Estimation of Iron and phosphate.

Module IV – Environmental Chemistry (9 hrs)

Nature of environmental threats and role of chemistry. Green house effect, ozone layer and its depletion.. Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis.-Dissolved oxygen-BOD,COD

References

1. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
2. Concise Inorganic Chemistry – J.D. Lee
3. Environmental Chemistry A. K. De

4. Modern Inorganic Chemistry A.D. Madan
5. A. I. Vogel, “Text book of Qualitative Analysis”
6. A. I. Vogel, “Text book of Quantitative Inorganic Analysis”.
7. S. K. Banerji, “Environmental Chemistry”.
8. A. K. De “Environmental Chemistry - An introduction”
9. B. K. Sharma “Air Pollution”.
10. V. K. Ahluwalia “Environmental Chemistry”
11. G.W. vanLoon and S. J. Duffy “Environmental Chemistry: A global perspective”

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
SEMESTER I Complementary CourseBotany majors. Course Code -CH1131 .3 THEORETICAL CHEMISTRY

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the electronic configuration of Copper (atomic umber 29) 2. The quantum numbers n = 2 and l = 1 corresponds to which orbital?
3. What are the shapes of molecules with sp and sp3 hybridization?
4. Calculate the bond order of H2 molecule.
5. Give the structure of XeO3.
6. What is Lattice Energy?
7. What is meant by primary standards?
8. Define Molality.
9. What is the optimum value of DO for good water quality?
10. What is meant by BOD?

Section-B

Short answer type. Answer any 8 questions. Each question carries two marks

11. What is Bohr Bury’s rule?
12. Write down the Schrodinger Equation and explain the terms involved.
13. Explain the failures of Bohr’s theory?
14. What are the limitations of VSEPR Theory?
15. What are polar and non polar covalent bonds?
16. Mention the rules for adding electrons to molecular orbitals?
17. What are dichrometric titrations?

18. How would you prepare 100ml of 0.05M Mohr's salt solution?
19. Methyl orange is not a suitable indicator for the titration of weak acid with strong base. Why?
20. Which are green house gases? Mention their sources.
21. What is reverse osmosis? How it is useful in the purification of waste water?
22. What are chief factors responsible for water pollution?

Section-C

Short essay. Answer any 6 questions from the following. Each question carries four marks.

23. If the energy difference between two electronic states of hydrogen atom is 214.68 $KJmol^{-1}$. What will be the frequency of light emitted when the electrons jump from the higher to the lower level?
24. Explain the stability of half filled and completely filled orbitals.
25. Give an account of permanganometric titrations.
26. Discuss the theory of Acid – Base indicators.
27. Explain the energetic of ionic bond formation.
28. Define hybridization. Mention the types of hybridization involved in SF6, PCl5, BF3.
29. Explain Born-Haber Cycle considering the formation of NaCl as an example.
30. Write a note on agricultural pollution.
31. Explain briefly the different methods for the treatment of industrial waste water.

Section-D

Essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32. (a) Discuss Bohr Theory, highlighting its merits and demerits. (b)What are quantum numbers? Give its significance.
    (c) Explain various rules regarding electronic configuration.
33. (a) Discuss the titration curves for the titration of strong acid with strong base and weak acid with strong base.
    (b) Explain the theory of redox indicators.
    (c) explain Beer's Law, Lambert's Law and Beer – Lambert Law.
34. (a) Write a note on Hydrogen bonding and its consequences.
    (b) How electronic configuration of molecules related to molecular behavior? Explain.
    (c) Explain Fajan's Rule.
35. (a) Discuss the formation and importance of ozone layer.
    (b) What is meant by pollution and pollutants? Explain the classification of air pollutants. (c) What are the sources of important air pollutants.

Complementary Chemistry for BOTANY Majors
SEMESTER II Course code-CH1231 .3 Credit-2
Inorganic and bioinorganic chemistry(Common for Botany/Zoology/Microbiology)
L-T-P 2-0-2 (36 hrs)

Module I :Organometallics (9 hrs)

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications. Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses. Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture. Environmental aspects of Organometallic compounds.

Module II Nuclear Chemistry (9 hrs)

Natural radioactivity, modes of decay, Geiger–Nuttal rule, artificial transmutation and artificial radioactivity- nuclear stability, n/p ratio, mass defect and binding energy, nuclear fission and nuclear fusion, -applications of radioactivity- ^{14}C dating, rock dating , neutron activation analysis and isotope as tracers

Module III - Coordination Chemistry (9 hrs)

Nomenclature, Coordination number and geometry - chelates – isomerism – structural and stereo isomerism valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – colour and magnetic properties of transition metal complexes. Application of metal complexes in qualitative and quantitative analysis.

Module IV – Bio inorganic compounds (9 hrs)

Metalloporphyrins – cytochromes – chlorophyll photosynthesis and respiration – haemoglobin and myoglobin, mechanism of O2 – CO2 transportation, nitrogen fixation, carbon fixation and carbon cycle. Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems.

References

1. Co-ordination Chemistry – Bosolo and Johns
2. Chemistry of Organometallics – Rochoco.
3. Concise Inorganic Chemistry – J.D. Lee
4. Puri, Sharma and Kalia “Inorganic Chemistry”
5. Modern Inorganic Chemistry A.D. Madan

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
SEMESTER II Complementary CourseBotany majors. Course Code CH1231.3
INORGANIC AND BIOINORGANIC CHEMISTRY

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the structure of Zeise's salt.
2. Write any one of the preparation methods of organolithium compounds.
3. What is ferrocene? How is it synthesized?
4. What are alpha particles?
5. Define the term radioactivity.
6. Write the IUPAC name of K3[Co(NO2)4Cl2]
7. What are low spin complexes?
8. What do you mean by chelate?
9. What are metalloporphyrins?
10. Give an example of anaerobic respiration.

Section-B

Short answer type . Answer any 8 questions from the following. Each question carries two marks

11. What is reformatsky reaction?
12. What is cisplatin? Give its significance.
13. How are organomercurials prepared?
14. Explain Geiger Nuttal Rule.
15. What are half life period and average life period?
16. Define mass defect and binding energy.
17. Write the postulates of Werner's Coordination Theory.
18. What are poly dentate ligands? Give an example.
19. Explain the colours of transition metal complexes.
20. Differentiate respiration and photosynthesis.
21. What are trace elements?

22.What is the role of chlorophil in photosynthesis?

Section-C

Short essay. Answer any 6 questions from the following. Each question carries four marks.

23.Write a note on organotin compounds.
24.Write a brief note on the applications of organometallic compounds in agriculture and horticulture.
25.One microgram of phosphorus- 32 was injected into a living system for biological tracer studies. The half life period of P-32 is 14.3 days. How long will it take for the radioactivity to fall to 10% of the initial value?
26.Explain the relation between nuclear stability and n/p ratio.
27.Write the biological effects of radiation.
28.Suggest the structure of [NiCl4] on the basis of Valence Bond Theory.
29.Explain the magnetic properties of octahedral complexes with suitable examples.
30.Discuss briefly the biochemistry of iron toxicity and nutrition.
31.Metal ions play a variety of roles in biological systems. Explain.

Section-D

Essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32.(a) Explain the synthesis and applications or Grignard reagent. (5 marks)
(b) What are Frankland reagents? Give its significance. (5 marks)
(c) Explain about organosilicon compounds in medicine. (5 marks)

33.(a) Explain carbon dating and rock dating. (5 marks)
(b) Give the principle of neutron activation analysis. (5 marks)
(c) Explain the terms nuclear fission and fusion with suitable examples. (5 marks)

34.(a) Write a note on Crystal Field Theory. (5 marks)
(b) Explain the applications of complexes in qualitative analysis. (5 marks) (c) Write a brief note on isomerism in coordination complexes. (5 marks)

35.(a) Give brief outline of carbon cycle. (5 marks)
(b) Explain nitrogen Fixation. (5 marks)
(c) Write a short note on hemoglobin. (5 marks)

SYLLABUS OF COMPLEMENTARY COURSE

Physical Chemistry

(For Students of Botany Majors)

SEMESTER III Course-3 Credit-3 Course Code – CH1331 .3

L-T-P 3-0-2 Total: 54 Hours

Module I. Chemical kinetics 9 Hrs

Chemical kinetics, catalysis, rate of reactions, various factors influencing rate, order, molecularity, zero, first, second, third order reactions (derivation of first order only) fractional life time, units of rate constants, influence of temperature on reaction rates, Arrehinius equation, Calculation of Arrhenius parameters, Collision theory, catalysis, different types of catalysis, intermediate compound formation theory and adsorption theory.

Module II -Ionic equilibrium 9 Hrs

Arrhenius, Lowry- Bronstead and lewis concept of acids and bases, Kw and pH, pH of strong and weak acids, Ka and Kb, mechanism of buffer action, pH of buffer, He nde rson e quati on, Hydrolysis of salt, Degree of hydrolysis and hydrolysis constant .

Module III. Solutions 9 Hrs

Completely miscible liquid pairs, vapour pressure - composition curve, boiling point-composition curve- ideal and non ideal solutions, fractional distillations, azeotropes. Partially miscible liquids - CST, phenol- water, nicotine-water system, Effect of impurities on miscibility and CST, immiscible liquid pairs, steam distillation- Distribution law and its limitations, applications of solvent extractions.

Module IV UV and NMR spectroscopy 9Hrs

UV-Visible Spectroscopy- absorption, types of electronic transitions, effect of conjugation, concept of chromophore, auxochrome, bathochrome, hypochromic shifts, hyperchromic and hypochromic effects. UV-Visible spectra of enes. Calculation of λmax. Applications of UV spectroscopy - conjugation, functional group and geometrical isomerism. Principle of NMR, nuclear spin, chemical shift, spin-spin coupling, τ and δ, PMR of simple organic molecules $CHBr_2CH_2Br$, CH_3CH_2Br and CH_3CH_2OH. Principle of MRI .

Module V Dilute solutions: 9hrs

Molarity, molality and molefraction - Colligative property – relative lowering of vapour pressure – elevation in boiling point – depression in freezing point – osmotic pressure – experimental determination of osmotic pressure – Isotonic solution – reverse osmosis - abnormal molecular mass - van't Hoff factor.

Module VI colloids- 9hrs

Colloidal state: Types of colloids, preparation of colloids-Purification of colloids – ultra filtration and electrodialysis, Kinetic, optical and electrical properties of colloids. Ultra microscope, Electrical double layer and zeta potential. Coagulation of colloids, Hardy-Schulz rule. Micelles and critical micelle concentration, sedimentation Application of colloids – Cottrell precipitator, purification of water and delta formation.

References

1. Organic Chemistry of Natural Products, Chatwal,Gurdeep.R, Himalaya Publications
2. Principles of physical chemistry, Puri Shrama Pathania, Vishal
3. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
4. Elementary organic spectroscopy, Y.R Sharma, S chand & Company
5. Principles of Physical Chemistry, B.R.Puri, R.L.Sharma & Pathania, Vishal Publishing
6. Essentials of Physical Chemistry, B.S. Bahl., G.D. Tuli & Arun Bahl , S.Chand & Co., New Delhi.
7. Simplified Course in Physical Chemistry, R.L. Madan, G.D. Tuli , S.Chand & Co.
8. Chromatography, .B.K .Sharma, GOEL Publishing house, Meerut

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
SEMESTER III Complementary Course. Course Code CH1331 .3
(For Students of Botany Majors)

PHYSICAL CHEMISTRY

Time:3hours Maximum Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. What are the units of rate constants for first and second order reactions?
2. Give one example of a reaction in which order and molecularity have different values.
3. Define pH.
4. State Hardy-Schulze rule.
5. Distinguish between lypophilic colloids and lypophobic colloids.
6. Define chemical shift.
7. Explain chromophore with an example.

8. What is meant by a buffer solution? Give one example each for acid buffer and basic buffer solution.
9. What is meant by the term ideal solution?
10. Define Van't Hoff factor.

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. What are the factors which affect the rate of a chemical reaction?
12. Write down the expression that gives the dependence of the rate constantof a chemical reaction on the absolute temperature and explain the terms involved. 13.Explain briefly Lewis concept of acids and bases with two examples
14. What is zeta potential? How does it arise?
15. What is critical micelle concentration? Discuss the structure of micelles in polar and nonpolar media
16. Tetra Methy Silane (TMS) is chosen as a reference compound in NMR studies. Give reasons
17. What are the different types of electronic transitions?
18. Differentiate between molarity and molality.
19. A solution containing 7g of a non volatile solute in 250g of water boils at 373.26 K. Find the molecular mass of the solute.(Kb for water is 0.52K/m)
20. Explain the terms Degree of hydrolysis and hydrolysis constant.
21. Explain reverse osmosis.
22. Calculate the mole fraction of alcohol, C_2H_5OH and water in a solution made by dissolving 9.2g of alcohol in 18g of water.

(8 X 2 = 16 Marks)

SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. What is energy of activation? What happens to the energy of activation in presence of a catalyst.

24. Explain Half life period of a reaction. A first order reaction has a specific reaction rate of $2.31x10^{-3}$ s^{-1}. Calculate the half life period of the reaction.

25. Calculate the pH of a buffer solution containing 0.2 mole of NH_4Cl and 0.1mole of NH_4OH per litre. Kb for NH4OH = $1.85x10^{-5}$.

26. Derive the relation between K_h, K_w and K_a.

27. Give an account of applications of colloids

28. Explain ultra filtration and electrodialysis techniques used for the purification of colloids

29. Which of the following will show spin- spin coupling in their NMR spectra? If coupling is observed, give the spin multiplicity : (a) $ClCH_2CH_2Cl$ (b) CH_3COCH_3 (c) CH_3CHO (d) $ClCH_2CH_2I$

30. What is osmotic pressure? How will you determine the molecular mass of a substance with this method?

31. Explain the principle of Fractional Distillation

(6 X 4 = 24marks)

SECTION – D

(*Answer any 2 question. Each question carries 15 marks*)

32. (a)Differentiate between Molecularity and order of a reaction with examples (5 marks)
    (b) Discuss the Kinetic, optical and electrical properties of colloids (5 marks)
    (c) Explain the protective action of colloids(5 marks)

33. (a) Which of the following has the highest osmotic pressure: 0.1M sucrose, 0.1M acetic acid, 0.1M KCl and 0.1M Na_2SO_4 all in water? Why?
    (b) Why do you get abnormal molecular masses of the substances by using colligative properties of the solution.
    (c) Discuss in detail about the determination of molecular mass of a non volatile compound from elevation in boiling point and depression in freezing point

34. (a) Discuss the factors responsible for deviation from Raoult's law by taking suitable examples. (b) Define critical solution temperature. Explain systems having upper and lower CST using examples
    (c) Explain the applications of UV spectroscopy

35. (a)Discuss the advantages of Bronsted-Lowery concept over Arrhenius concept and also the limitations of the Bronsted-Lowery concept.
    (b) The salt of strong acid and strong base does not undergo hydrolysis. Explain.

(c) Explain the underlying principle in an NMR spectrum and interpret the low resolution NMR spectrum of ethanol molecule.

(15 X 2 = 30marks)

SYLLABUS OF COMPLEMENTARY COURSE
Organic Chemistry (For Students of Botany Majors)
SEMESTER IV Course-4 Credit -3 Course Code CH1431 .3

L-T-P 3-0-2 Total 54 Hours

Module I - Chromatography (9 Hrs)

Outline study of adsorption and partition chromatography, paper , thin layer, ion exchange ,gas chromatography- principle-instrumentation and applications and HPLC - Rf and Rt value – Introduction to zone electrophoresis and capillary electrophoresis.

Module II Amino acids, Proteins (9 hrs)

Amino acids: - Classification, structure and stereochemistry of amino acids, essential and non essential amino acids, zwitter ion, isoelectric point, General methods of preparation and reactions of a - amino acids.

Peptides: structure and synthesis (Carbobenzoxy method, Sheehan method only). Proteins:- Structure of proteins, denaturation and colour reactions.

Nucleic acids: - Classification and structure of DNA and RNA. Replication of DNA, Genetic Codes.Translation- Transcription

Module III Sterochemistry (9 hrs)

Optical Isomerism : Chirality and elements of symmetry – DL notation – Enantiomers – optical isomerism in glyceraldehydes, lactic acid and tartaric acid – Diastereoisomers – mesocompounds – Cahn-Ingold-Prelog rules – R-S notations for optical isomers with one and two asymmetric carbon atoms.- erythro and threo representations. Racemic mixture – resolution – methods of resolution

Module IV Oils, Fats, Detergents, Alkaloids, Vitamins and Terpenes (9 hrs.)

Oils and Fats: - Occurrence and extraction. Common fatty acids, soap, saponification value, iodine value, acid value, Alkaloids: - Extraction and structural elucidation of conine, nicotine and importance of quinine, morphine and codeine. Terpenes: - Essential oils, isolation of citral and geraniol (No structural elucidation) Isoprene and special isoprene rule. Vitamins: - Classification, structure functions and deficiency diseases (structures of vitamin A, B1 and C but no structural elucidation).

Module V Dyes (9hrs)

Theory of colour and constitution, classification of dyes, Natural dyes, indigo- Synthesis of methyl orange, congo red, malachite green, phenolphthalein, Schiffs reagent.

Module VI Drugs (9Hrs)

Classification of drugs- analgesic, antipyretic, antibiotic, hypnotics, suphadrugs, antacids, antimalarials, Synthesis of aspirin, sulphaguanidine, chloramphenicol, Drugs of plant origin anticancer compounds from plants.

References

1. Organic Chemistry of Natural Products, Chatwal,Gurdeep.R, Himalaya Publications
2. Principles of physical chemistry, Puri Shrama Pathania, Vishal
3. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
4. Elementary organic spectroscopy, Y.R Sharma, S chand & Company
5. Principles of Physical Chemistry, B.R.Puri, R.L.Sharma & Pathania, Vishal Publishing
6. Essentials of Physical Chemistry, B.S. Bahl., G.D. Tuli & Arun Bahl , S.Chand & Co., New Delhi.
7. Simplified Course in Physical Chemistry, R.L. Madan, G.D. Tuli , S.Chand & Co.
8. Chromatography, .B.K .Sharma, GOEL Publishing house, Meerut
9. Text Book of Pharmaceutical Chemistry, . Atherden L.M, Bentley and Driver, Oxford. University Press

University of Kerala

Model Question Paper of BSc Botany Programme

2017 Admission onwards

SEMESTER IV Complementary Chemistry Course Code CH1431 .3

ORGANIC CHEMISTRY

Time:3hours Max.Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. What is meant by Rf value?
2. Define Racemic mixture.
3. Represent the configurations of D and L glyceraldehyde.
4. Give two example of essential aminoacids.
5. Describe a colour test for proteins.
6. Define Iodine value.
7. What are antipyretics?
8. State Special isoprene rule?

9. What is mordant dye? Give one example.
10. Give the deficiency disease of Vitamin C. (10 X 1 =10Marks)

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. Give the principle of adsorption chromatography.
12. What is meant by denaturation of proteins.
13. Discuss the importance of Morphine.
14. Which of the following are optically active ? Why?
    (i)2-chloropropane (ii)2-chlorobutane (iii)3-chloropentane
15. Give four differences between enantiomers and diastereoisomers.
16. Write a note on the different types of RNA and its functions.
17. How are alkaloids extracted from natural sources?
18. Give the classification of Vitamins.
19. What are antacids. Explain.
20. Give the structure of Vitamin A.
21. Name three anticancer compounds from plant.
22. Explain saponification.

(2 X 8 = 16 Marks)SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. Discuss the optical isomerism of tartaric acid.
24. Write a note on DNA replication .
25. Give the synthesis of Tryptophan.
26. What is meant by Isoelectric point of aminoacids.
27. Determine the R & S notations of meso tartaric acid and L- glyceraldehyde.
28. Give a brief account on Thin Layer Chromatography.
29. Write a note on the methods of isolation of terpenoids. 30.Give the synthesis of Methyl Orange

31.Explain the cleansing action of soap.

(4x6 = 24marks)

SECTION – D

(*Answer any 2 question. Each question carries 15 marks*)

32. (a) Explain Ion exchange Chromatography. (5 marks)
    (b)Give the structure elucidation of Conine. (5 marks)
    (c) Describe the structure of DNA. (5 marks)
33. (a) Discuss briefly the structure of Protein.
(b) Explain Sheehan's method.
(c) Discuss the classification of dyes on the basis of application.

34. (a) What is resolution? Explain different methods of resolution.
(b) What are meso compounds ? Are they optical activite ? Explain with a suitable example.
(c) Discuss the isolation, structure and uses of geraniol.
35. (a) Give the synthesis of the following drugs (i) Aspirin (ii) sulphaguanidine (b) Define Oils and fats and discuss the different methods of extraction .
(c) Write a note on detergents.
(15 X 2 = 30marks)

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY

Course V Course Code CH1432 .3 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science, Biochemistry and Microbiology majors.

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1. Acetanilide from aniline
2. Meta dinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

A. Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

b. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH

B. Permanganometry

a. Standardization of KMnO4 by oxalic acid/sodium oxalate and Mohr's salt b. Estimation of oxalic acid/sodium oxalate

c. Estimation of Mohr's salt d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. K2Cr2O7 and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodimetry and Iodometry

a. Standardisation of sodium thiosulphate using std potassium dichromate b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Chromatography

a.Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars

b.Separation of a mixture of dyes by column chromatography.

Gravimetric Analysis

1. Estimation of water of hydration in barium chloride crystals
2. Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} semesters

Complementary Chemistry offered to Zoology Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry ComplementaryComplementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .4		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .4		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .4		3×18 = 54 2×18 = 36

4	3	2	3 4	CH1431 .4 CH1432 .4		3×18 =54 2×18 = 36

SYLLABUS OF COMPLEMENTARY COURSE

Theoretical Chemistry-I(Common for Botany/Zoology/Microbiology)

(For Students of Zoology Majors)

SEMESTER 1 Complementary Course No. - 1 Course Code-CH1131 .4 Credit-2

L-T-P 2-0-2 36 Hours

Module I – Atomic Structure (9 hours)

Atomic spectrum of hydrogen - different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (mention only, no derivation), concept of orbitals, the four quantum numbers and their significances. Orbital wise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, Stability of filled and half filled orbitals.

Module II – Chemical Bonding (9 hours)

Energetics of bond formation – Born-Haber cycle. Hybridisation and structure of molecules – sp, sp^2, sp^3, dsp^2, dsp^3, sp^3d^2 and sp^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia. VSEPR theory with regular and irregular geometry –. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility. Partial covalent character of the ionic bond – Fajan's Rules. A brief review of molecular orbital approach

– LCAO method – bond order, bond distance and stability of O2, $O2^{2+}$, $O2^{2-}$, NO, NO^+,

Module III – Analytical Principles (9 hours)

Principles of volumetric analysis – primary standard – standard solutions normality and molarity, theory of acid-base titrations, permagnometric and dichrometric titrations, iodometry and complexometric titrations. Theory of acid-base indicator – redox indicators. Beer- Lambert law- Principles of colorimetry - estimation of Iron and phosphate

Module IV – Environmental Chemistry (9 Hrs)

Nature of environmental threats and role of chemistry. Green house effect, ozone layer and its depletion. Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis.Dissolved oxygen-BOD,COD

References

12. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
13. Concise Inorganic Chemistry – J.D. Lee
14. Environmental Chemistry A. K. De
15. Modern Inorganic Chemistry A.D. Madan
16. A. I. Vogel, "Text book of Qualitative Analysis"
17. A. I. Vogel, "Text book of Quantitative Inorganic Analysis".

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
Complementary CourseZoology majors.
SEMESTER I Course Code CH1131 .4 THEORETICAL CHEMISTRY

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the electronic configuration of Copper (atomic umber 29) 2. The quantum numbers n = 2 and l = 1 corresponds to which orbital?
3. What are the shapes of molecules with sp and sp3 hybridization?
4. Calculate the bond order of H2 molecule.
5. Give the structure of XeO3.
6. What is Lattice Energy?
7. What is meant by primary standards?
8. Define Molality.
9. What is the optimum value of DO for good water quality?
10. What is meant by BOD?

Section-B

Short answer type (not to exceed one paragraph). Answer any 8 questions from the following. Each question carries two marks

11. What is Bohr Bury's rule?
12. Write down the Schrodinger Equation and explain the terms involved.
13. Explain the failures of Bohr's theory?
14. What are the limitations of VSEPR Theory?
15. What are polar and non polar covalent bonds?

16. Mention the rules for adding electrons to molecular orbitals?
17. What are dichrometric titrations?
18. How would you prepare 100ml of 0.05M Mohr's salt solution?
19. Methyl orange is not a suitable indicator for the titration of weak acid with strong base. Why?
20. Which are green house gases? Mention their sources.
21. What is reverse osmosis? How it is useful in the purification of waste water?
22. What are chief factors responsible for water pollution?

Section-C

Short essay (not exceed 120 words). Answer any 6 questions from the following. Each question carries four marks.

23. If the energy difference between two electronic states of hydrogen atom is 214.68 KJmol1. What will be the frequency of light emitted when the electrons jump from the higher to the lower level?
24. Explain the stability of half filled and completely filled orbitals.
25. Give an account of permanganometric titrations.
26. Discuss the theory of Acid – Base indicators.
27. Explain the energetic of ionic bond formation.
28. Define hybridization. Mention the types of hybridization involved in SF6, PCl5, BF3.
29. Explain Born-Haber Cycle considering the formation of NaCl as an example.
30. Write a note on agricultural pollution.
31. Explain briefly the different methods for the treatment of industrial waste water.

Section-D

Long essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32. (a) Discuss Bohr Theory, highlighting its merits and demerits. (b)What are quantum numbers? Give its significance.
    (c) Explain various rules regarding electronic configuration.
33. (a) Discuss the titration curves for the titration of strong acid with strong base and weak acid with strong base.
(b) Explain the theory of redox indicators.
(c) explain Beer's Law, Lambert's Law and Beer – Lambert Law.
34. (a) Write a note on Hydrogen bonding and its consequences.
(b) How electronic configuration of molecules related to molecular behavior? Explain.
(c) Explain Fajan's Rule.
35. (a) Discuss the formation and importance of ozone layer.

(b) What is meant by pollution and pollutants? Explain the classification of air pollutants.
(c) What are the sources of important air pollutants.

Complementary Chemistry for Zoology Majors
Inorganic Chemistry-I(Common for Botany/Zoology/Microbiology Majors)
SEMESTER II Course code-CH1231 .4 Credit-2
(For Students of Zoology Majors)

L-T- P 2-0-2

36 hours

Module I Organometallics (9 hours)

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications. Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses. Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture. Environmental aspects of Organometallic compounds.

Module II : Nuclear Chemistry (9hours)

Natural radioactivity, modes of decay, Geiger –Nuttal rule, artificial transmutation and artificial radioactivity- nuclear stability, n/p ratio, mass defect and binding energy, nuclear fission and nuclear fusion, -applications of radioactivity- ^{14}C dating, rock dating , neutron activation analysis and isotope as tracers

Module III - Coordination Chemistry (9 hours)

Nomenclature, Coordination number and geometry - chelates – isomerism – structural and stereo isomerism valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – colour and magnetic properties complexes. Application of metal complexes in qualitative and quantitative analysis.

Module IV – Bio inorganic compounds (9 hours)

Metalloporphyrins – cytochromes – chlorophyll photosynthesis and respiration – haemoglobin and myoglobin, mechanism of O2 – CO2 transportation, nitrogen fixation, carbon fixation and carbon cycle. Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems.

References

6. Co-ordination Chemistry – Bosolo and Johns
7. Chemistry of Organometallics – Rochoco.
8. Concise Inorganic Chemistry – J.D. Lee

9. Puri, Sharma and Kalia “Inorganic Chemistry”
10. Modern Inorganic Chemistry A.D. Madan

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
Complementary CourseZoology majors.
SEMESTER II Course Code CH1231.4
INORGANIC AND BIOINORGANIC CHEMISTRY - I(Common for Botany/Zoology/Microbiology)

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the structure of Zeise’s salt.
2. Write any one of the preparation methods of organolithium compounds.
3. What is ferrocene? How is it synthesized?
4. What are alpha particles?
5. Define the term radioactivity.
6. Write the IUPAC name of K3[Co(NO2)4Cl2]
7. What are low spin complexes?
8. What do you mean by chelate?
9. What are metalloporphyrins?
10. Give an example of anaerobic respiration.

Section-B

Short answer type (not to exceed one paragraph). Answer any 8 questions from the following. Each question carries two marks

11. What is reformatsky reaction?
12. What is cisplatin? Give its significance.
13. How are organomercurials prepared?
14. Explain Geiger Nuttal Rule.
15. What are half life period and average life period?
16. Define mass defect and binding energy.
17. Write the postulates of Werner’s Coordination Theory.
18. What are poly dentate ligands? Give an example.
19. Explain the colours of transition metal complexes.

20.Differentiate respiration and photosynthesis.
21.What are trace elements?
22.What is the role of chlorophil in photosynthesis?

Section-C

Short essay (not exceed 120 words). Answer any 6 questions from the following. Each question carries four marks.

23.Write a note on organotin compounds.
24.Write a brief note on the applications of organometallic compounds in agriculture and horticulture.
25.One microgram of phosphorus- 32 was injected into a living system for biological tracer studies. The half life period of P-32 is 14.3 days. How long will it take for the radioactivity to fall to 10% of the initial value?
26.Explain the relation between nuclear stability and n/p ratio.
27.Write the biological effects of radiation.
28.Suggest the structure of $[NiCl_4]$ on the basis of Valence Bond Theory.
29.Explain the magnetic properties of octahedral complexes with suitable examples.
30.Discuss briefly the biochemistry of iron toxicity and nutrition.
31.Metal ions play a variety of roles in biological systems. Explain.

Section-D

Long essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32.(a) Explain the synthesis and applications or Grignard reagent.
(b) What are Frankland reagents? Give its significance.
(c) Explain about organosilicon compounds in medicine.

33.(a) Explain carbon dating and rock dating.
(b) Give the principle of neutron activation analysis.
(c) Explain the terms nuclear fission and fusion with suitable examples.

34.(a) Write a note on Crystal Field Theory.
(b) Explain the applications of complexes in qualitative analysis.
(c) Write a brief note on isomerism in coordination complexes.

35.(a) Give brief outline of carbon cycle.
(b) Explain nitrogen Fixation.
(c) Write a short note on hemoglobin.

ORGANIC CHEMISTRY

Complementary Chemistry for ZOOLOGY MAJORS

SEMESTER III Course-3 Credit-3 Course Code – CH1331 .4

L-T-P 3-0-

2Total - 54 hoursModule I – Mechanisms in organic substitution reactions (9 hours)

Electron displacement in organic compounds – Inductive, electromeric and mesomeric effects, influence of inductive effect on acidic and basic properties of organic compounds, hyperconjugation and steric effect. Reaction mechanism - Bond fission, rate determining step, nucleophilic substitution of alkyl halides SN1 & SN2 reactions. Effect of structure on reactivity as illustrated by methyl, ethyl, isopropyl and tertiary butyl groups. Electrophilic addition to ethene and propene –Markownikoff's rule, free radical addition, peroxide effect.

Module II – Stereochemistry (9hours)

Optical isomerism, chirality, recemisation and resolution, relative and absolute configuration, asymmetric synthesis, optical isomerism due to restricted rotation. Geometrical isomerism, E and Z nomenclature. Aldoximes and ketoximes.

Rotational isomerism. Rotation about carbon – carbon single bond, conformation of ethane, propane, butane, cyclohexane, axial and equatorial bonds.

Module III – Carbohydrates (9 hours)

Classification, configuration, glyceraldehyde, erythrose, threose, ribose, 2-deoxy ribose, arabinose, glucose, fructose and mannose. Preparation and properties of glucose and fructose - Pyranoside structures of glucose and fructose, furanoside structure of fructose (structure elucidation not expected). Mutarotation and epimerization. Conversion of glucose into fructose and viceversa.

Module IV – Amino acid and Proteins (9 hours)

Classification and properties – synthesis of glycine, alanine and tryptophan – polypeptides and proteins, peptide linkage, peptide synthesis, polypeptides, primary,secondary, tertiary and quarternary structure of proteins, test for proteins, Enzymes – Characteristics, catalytic action, theory of enzyme catalysis – Michaelis – Menton theory – Co-enzymes.

Module V– Nucleic acids and Lipids (9 hours)

RNA, DNA – their biological role, hydrolysis of nucleoproteins, elementary idea regarding the structure of nucleic acids.

Lipids – Classification oils, fats and waxes, iodine value and saponification value, properties of oils and fats – phospholipids

Module VI – Polymers (9 hours)

Classification with example – natural and synthetic polymers – condensation and addition polymerization. Elastic fibres, thermoplastics and thermosetting plastics. Terpenes – classification, isoprene rule, essential oils, elementary study of citral and geraniol (structure elucidation not required) Rubber - structure – Vulcanisation of rubber – synthetic rubber – neoprene, butyl rubber, Buna S, Buna N

Referances
1. Organic Chemistry Vol I and II – I.L. Finar
2. Biophysical Chemistry – Principles and Techniques – A. Upadhyay. K.Upadhyay& N. Nath 3. Reaction Mechanism in Organic Chemistry – Mukherjee and Singh – Macmillan
4. Physical Chemistry – Rakshit
5. Essentials of Physical Chemistry – Bahl, Tuli & Arun Bahl
6.Principles of Organic Chemistry – M. K. Jain, S. Nagin &Co .

University of Kerala
Model Question Paper of BSc Zoology Major
2017 Admission onwards
SEMESTER IV Complementary Chemistry Course Code CH1431 .4
ORGANIC CHEMISTRY

Time:3hours Max.Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. Which is more acidic acetic acid or trichloro acetic acid? Why?
2. Explain Markonikoff's rule with example
3. Represent the configurations of D and L glyceraldehyde
4. Draw the ring structures of glucose and fructose
5. Define mutarotation
6. Give two example of essential aminoacids .
7. Describe a colour test for proteins
8. Define saponification value
9. Give the name and structure of the base present in RNA but not in DNA.
10. What is vulcanization of rubber?

(1 X 10 =10Marks)

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. Describe hyperconjugative effect with suitable examples
12. Discuss the optical isomerism of tartaric acid.
13. Which of the following are optically active ? Why?
    (i)2-chloropropane (ii)2-chlorobutane (iii)3-chloropentane
14.Give four differences between enantiomers and diastereoisomers.

15. What is meant by denaturation of proteins?
16. Distinguish between mutarotation and epimerization.
17. Classify the carbohydrates on the basis of behavior towards hydrolysis.
18. What are lipids? How will you classify them? 19.Give a test to distinguish RNA and DNA
20. How is terpenes classified?.
21. What is polymerization? Give an example of linear polymers?
22. Draw the structure of geraniol

(2 X 8 = 16 Marks)

SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. Explain SN1 and SN2 reactions? Give examples
24. Give an account of inductive effect and show how it is applied to predict the strength of organic acids?
25. Give an account of asymmetric synthesis.
26. Determine the R & S notations of meso tartaric acid and L- glyceraldehyde.
27. What are essential oils? Explain ts function with examples.
28. How is glucose is converted into fructose and vice- versa?
29. What is meant by Isoelectric point of aminoacids. 30.Classify polymers based on molecular forces

31.Explain the cleansing action of soap.

(4x6 = 24marks)

SECTION – D

(*Answer any2 question. Each question carries 15 marks*)

32. (a) Explain the effect of structure on reactivity.
    (b) Explain electrophilic addition reactions with examples
    (c) What are meso compounds ? Are they optical activite ? Explain with a suitable example.

33. (a) Write notes on different conformations of ethane and cyclohexane
    (b) Give an account of the configurations of monoaccharides (c) Discuss briefly the structure of Protein.

34. (a) Discuss general physical and chemical properties of oils and fats
    (b)Describe the functions of RNA and DNA
    (c)Explain the structure of DNA

35. (a) Give an account of synthetic rubbers

(b) Discuss the classification of polymers on the basis of structure (c) Write a note on detergents.

(15 X 2 = 30marks)

PHYSICAL CHEMISTRY

Complementary Chemistry for ZOOLOGY MAJORS

SEMESTER IV Course-4 Credit-3 Course Code CH1431 .4 L-T-P 3-0-2

Total 54 hours

Module I. Chemical kinetics 9 hours

Chemical kinetics, catalysis, rate of reactions, various factors influencing rate, order, molecularity, zero, first, second, third order reactions (derivation of first order only) fractional life time, units of rate constants, influence of temperature on reaction rates, Arrhenius equation, Calculation of Arrhenius parameters, Collision theory, catalysis, different types of catalysis, intermediate compound formation theory and adsorption theory.

Module II. Ionic equilibrium 9 hours

Arrhenius, Lowry- Bronstead and Lewis concept of acids and bases, Kw and pH, pH of strong and weak acids, Ka and Kb, mechanism of buffer action, Henderson equation - pH of buffer, Hydrolysis of salt, Degree of hydrolysis and hydrolysis constant .

Module III Colloids 9 hours

Colloidal state: Types of colloids, preparation of colloids-Purification of colloids – ultra filtration and electrodialysis, Kinetic, optical and electrical properties of colloids. Ultra microscope, Electrical double layer and zeta potential. Coagulation of colloids, Hardy-Schulz rule. Micelles and critical micelle concentration, sedimentation Application of colloids – Cottrell precipitator, purification of water and delta formation.

Module IV Spectroscopy 9 hours

UV-Visible Spectroscopy- absorption, types of electronic transitions, effect of conjugation, concept of chromophore, auxochrome, bathochrome, hypochromic shifts, hyperchromic and hypochromic effects. UV-Visible spectra of enes. Calculation of λmax. simple applications of UV spectroscopy, conjugation, functional group and geometrical isomerism

Principle of NMR, nuclear spin, chemical shift, spin-spin coupling, τ and δ, PMR of simple organic molecules, principle of MRI .

Module V- Instrumental methods of Chemical Analysis 9 hours

Principle – instrumentation and applications of Atomic absorption spectroscopy- flame emission spectroscopy- Thermal methods - thermogravimetry (TG) - Differential thermal analysis (DTA) - Gas Chromatography- HPLC – Introduction to zone electrophoresis and capillary electrophoresis.

Module VI Solutions 9 hours

Liquid-Liquid system:- Completely miscible, ideal and non-ideal mixtures, Raoult's law, vapour pressure- composition and temperature-composition curves, fractional distillation, deviation from Raoult's law, Azeotropic mixtures, partially miscible liquid system, critical solution temperature, Conjugate layers, example for upper, lower and upper cum lower CST, Theory of steam distillation

Referances

1. Organic Chemistry of Natural Products, Chatwal,Gurdeep.R, Himalaya Publications
2. Principles of physical chemistry, Puri Shrama Pathania, Vishal
3. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
4. Elementary organic spectroscopy, Y.R Sharma, S chand & Company
5. Principles of Physical Chemistry, B.R.Puri, R.L.Sharma & Pathania, Vishal Publishing
6. Essentials of Physical Chemistry, B.S. Bahl., G.D. Tuli & Arun Bahl , S.Chand & Co., New Delhi.
7. Simplified Course in Physical Chemistry, R.L. Madan, G.D. Tuli , S.Chand & Co. 8.Chromatography, B.K .Sharma, GOEL Publishing house, Meerut

University of Kerala
Model Question Paper for Zoology Major
2017 Admission onwards
SEMESTER IV Complementary Course.IV Course Code CH1431 .4
PHYSICAL CHEMISTRY

Time:3hours Max.Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. What are the units of rate constants for first and second order reactions?
2. Give one example of a reaction in which order and molecularity have different values.
3. Define P^H.
4. State Hardy-Schulze rule.
5. Distinguish between lypophilic colloids and lypophobic colloids.
6. Define chemical shift
7. Explain chromophore with an example.

8. What is meant by a buffer solution? Give one example each for acid buffer and basic buffer solution.
9. What is meant by the term ideal solution?
10. Write a short note on zone electrophoresis

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. What are the factors which affect the rate of a chemical reaction?
12. Write down the expression that gives the dependence of the rate constantof a chemical reaction on the absolute temperature and explain the terms involved. 13.Explain briefly Lewis concept of acids and bases with two examples
14. What is zeta potential? How does it arise?
15. What is critical micelle concentration? Discuss the structure of micelles in polar and nonpolar media
16. Tetra Methy Silane (TMS) is chosen as a reference compound in NMR studies. Give reasons
17. What are the different types of electronic transitions?
18. Explain the working of Hollow Cathod Lamp
19. What is the difference between GC and HPLC?
20. Explain the terms Degree of hydrolysis and hydrolysis constant.
21. What are the conditions at which the solutions deviate from ideal behaviour?
22. Calculate the mole fraction of alcohol, C_2H_5OH and water in a solution made by dissolving 9.2g of alcohol in 18g of water.

(8 X 2 = 16 Marks)

SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. What is energy of activation? What happens to the energy of activation in presence of a catalyst.
24. Explain Half life period of a reaction. A first order reaction has a specific reaction rate of $2.31x10^{-3}$ s^{-1}. Calculate the half life period of the reaction.
25. Calculate the pH of a buffer solution containing 0.2 mole of NH_4Cl and 0.1mole of NH_4 OH per litre. Kb for NH4OH = $1.85x10^{-5}$.
26. Derive the relation between K_h, K_w and K_a.
27. Give an account of applications of colloids
28. Explain ultra filtration and electrodialysis techniques used for the purification of colloids

29. Which of the following will show spin- spin coupling in their NMR spectra? If coupling is observed, give the spin multiplicity : (a) $ClCH_2CH_2Cl$ (b) CH_3COCH_3 (c) CH_3CHO (d) $ClCH_2CH_2I$

30. Briefly explain TGA taking suitable example

31. Explain the principle of Fractional Distillation

(6 X 4 = 24marks)

SECTION – D

(*Answer any2 question. Each question carries 15 marks*)

32.(a)Differentiate between Molecularity and order of a reaction with examples

(b) Discuss the Kinetic, optical and electrical properties of colloids

(c) Explain the protective action of colloids

33.(a) Discuss the principle and applications of AAS

(b) Distinguish between AAS and FES

(c) Explain the applications of TGA and DTA

34.(a) Discuss the factors responsible for deviation from Raoult's law by taking suitable examples.

(b) Define critical solution temperature. Explain systems having upper and lower CST using examples

(c) Explain the applications of UV spectroscopy

35.(a)Discuss the advantages of Bronsted-Lowery concept over Arrhenius concept and also the limitations of the Bronsted-Lowery concept.

(b) The salt ofstrong acid and strong base does not undergo hydrolysis. Explain.

(c) Explain the underlying principle in an NMR spectrum and interpret the low resolution NMR

spectrum of ethanol molecule. (15 X 2 = 30marks)

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY Course V

Course Code CH1432 .4 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science Biochemistry and Microbiology majors

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given

Organic preparations

1.Acetanilide from aniline

2.Metadinitrobenzene from nitro benzene

3.Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

I.Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. HCl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH

II.Permanganometry

d. Standardization of KMnO4 by oxalic acid/sodium oxalate and Mohr's salt e. Estimation of oxalic acid/sodium oxalate

f. Estimation of Mohr's salt

g.Estimation of calcium

III.Dichrometry

h. Preparation of Std. K2Cr2O7 and estimation of ferrous iron by external and internal indicators.

i.Estimation of ferric iron by reduction with stannous chloride (internal indicator).

IV.Iodimetry and Iodometry

j. Standardisation of sodium thiosulphate using std potassium dichromate k. Estimation of copper in a solution

l. Estimation of iodine.

V.Complexometric titrations

m. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

n. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Chromatography

a.Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars

b.Separation of a mixture of dyes by column chromatography.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals

2.Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} semesters

Complementary Chemistry offered to Homescience and Biochemistry Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry ComplementaryComplementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .5		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .5		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .5		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .5 CH1432 .5		3×18 =54 2×18 = 36

Syllabus for complementary courses

(Common for Homescience & Biochemistry)

(for Homescience Majors)

Semester-1 Complementary Course No. - 1 Course Code CH1131.5

Credit-2

Inorganic and Analytical Chemistry L-T-P 2-0-2 36 hrs

Module I –Atomic structure 9 hrs

Atomic spectra of hydrogen,-different series, Rydberg equation. Bohr theory-postulates –statement of Bohr energy equation –derivation of spectral frequency from Bohr equation-Schrodinger wave equation(mention only), concepts of orbitals, the four quantum numbers and their significance- Orbital wise electron configuration, energy sequence rule, Pauli's principle, Hund's rule, stability of filled and half filled orbitals.

Module II- Analytical Principles 9 hrs

Principles of volumetric analysis, primary standards, Standard solutions, normality and molarity, numerical problems, theory of acid base titrations, permanganometric and dichrometric titrations, theory of acid base and redox indicators.(Numerical problems are to be worked out) .

Module III- Radioactivity and Nuclear Chemistry 9 hrs

Radio active decay series, Radioactive equilibrium, Average life, Half life detection of radio activity-Geiger Muller Counter, Wilson cloud chamber, Units of radioactivity-Curie and Rutherford. Applications of radio activity- in medicine and agriculture, biological effects of radiation, pathological and genetic damage, Units of radiations, Nuclear Chemistry-stability of nucleus, n/p ratio, artificial transmutation and radioactivity, mass defect, binding energy, neutron activation analysis

Module IV- Organometallics and biomolecules 9 hrs

Organometallic compounds –Definition and classification, Biological and environmental aspects of organometallics-organometallics in medicine ,Organo mercury, boron, silicon and arsenic compounds. Biomolecules –Metallo porphyrins, Haemoglobin and Myoglobin. References

1. Concise Inorganic Chemistry J. D. Lee

2. Inorganic Chemistry Puri and Sharma

3. Chemistry of Organometallics Rochow

4. Organic Chemistry Vol 2 I.L. Finar

5. Chemistry of natural products Vol. 1 Gurdeep Chatwal

6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

7. Modern Inorganic Chemistry R D Madan

Model Question paper for S1 Complementary Chemistry Course - II Semester

1 CH1231 .5 (For Students of Homescience and Biochemistry majors)

Organic Chemistry

Time : Three Hours Total marks : 80

Section – A

(Very short answer questions)

Answer all questions. Each question carries 1 mark (1×10=10)

1. Give the relationship between wavelength, frequency and velocity of electromagnetic radiation?
2. What is the Rydberg equation for calculating the wave number of radiation?
3. Give Schrodinger equation which describes the behaviour of electron in an atom?
4. Indicator used for the titration between strong base and weak acid?
5. Give two examples of primary standard?
6. What is meant by transmutation?
7. Name two units of radioactivity?
8. What is meant by half life period?
9. Give two examples of Organomercuric comounds in medicine ?
10. What are organometallic comounds?

Section – B

(Short Answer Questions)

Answer any eight. Each question carries 2 marks (2×8=16)

11. Explain the Hund's rule with a suitable example?
12. Draw the shapes of d-orbitals?
13. What is meant by normality and molarity?
14. Why HCl is not used in Permanganomertic titration?
15. Calculate the weight of Na_2Co_3 required to prepare250ml N/10 solution?
16. What is binding energy?
17. What is meant by radio carbon dating??
18. Name four radioactive elements used in medicine?
19. What are organo boron compounds? Give one example?
20. What are anti tumour drugs??
21. What are biomolecules? Give two examples?
22. What are silatranes?

Section – C

(Short Essay Questions)

Answer any six. Each question carries 4 marks (4×6=24)

23. i)Explain the wave nature of material objects? ii) What is uncertainty principle?
24. Explain the concepts of orbitals?
25. Explain the theory of acid base titrations?
26. Write a note on dichromatic titration?
27. Write the stability of nucleus with respect to n/p ratio ?

28. What is meant by biological effect of radiation?
29. How will you detect radioactivity by Wilson cloud Chamber?
30. What are the functions of Haemoglobin?
31. Write a note on Organoarsenic compounds in medicine?

Section – D

(Long Essay Questions)

Answer any two. Each question carries 15 marks (15×2=30)

32. Derive the Bohr frequency equation?(10marks)
    b) Explain quantum numbers.
33. a)Write notes on Acid base indicators? (10mark) b)Explain the Permanganometric titration? (5mark)
34. a)What are the applications of radioactivity in medicine and agriculture? (10mark)
    b).What is meant by neutron activation analysis? (5mark)
35. a) Write in detail the classification of Organometallic compounds with examples? (10Mark)
    b) Explain the biological aspects of myoglobin? (5marks)?

Syllabus(Complementary course Chemistry)

(For Students of Homescience Majors)

(Common for Homescience &Biochemistry)SEMESTER 2 Course No. 2

Course Code . CH1231 .5 Credit 2 Organic Chemistry

L-T-P 2-0-2 36 hrsModule I: Carbohydrates 9hrs

Classification, configuration of glyceraldehydes, erythrose, threose, ribose,2- deoxy ribose, arabinose, glucose, fructose and mannose. Reactions of glucose and fructose Pyranoside structures of glucose and fructose Furanoside structure of fructose (structure elucidation not expected), muta rotation, epimerization, conversion of glucose into fructose and vice versa

Module II Vitamins 9hrs

Classification, source, isolation, physiological function and deficiency diseases caused by Vitamin A1(retinol), A2(axerophthol), Vitamin B-B1 (thiamine), B2(riboflavin and folic acid), B5(niacin), B6(Pyridoxine), B12 (Cyano cobalamine) Vitamin C (ascorbic acid),–Vitamin,D2 (ergocalciferol), Vitamin E (Tochopherols), Vitamin H(biotin) and Vitamin K

Module III :Aminoacids and Proteins 9hrs

Classification,synthesis of glycine, alanine, phenyl alanine and aspartic acid, zwitter ion, isoelectric point,, reactions of aminoacids, peptide linkage, peptide synthesis, polypeptides, primary, secondary, tertiary and quarternary structure of proteins, classification, biological importance and tests for proteins.

Module IV: Enzymes and Hormones 9hrs

Enzymes- Characteristics, classification, factors influencing enzyme action, mechanism of enzyme action, Michaelis –Menton theory, enzyme inhibitors.

Hormones- Introduction, isolation, functions and abnormalities due to oxytocin, thyroxin, adrenalin, glutathione, progesterone, estrogens, cortisone, corticosterone, adrenalin References

1. Concise Inorganic Chemistry — J. D. Lee
2. Inorganic Chemistry — Puri and Sharma
3. Chemistry of Organometallics — Rochow
4. Organic Chemistry Vol 2 — I.L. Finar
5. Chemistry of natural products Vol. 1 — Gurdeep Chatwal
6 The Text Book of Organic Chemistry — P.L Soni, H.M. Chowla
7. Modern Inorganic Chemistry — R D Madan

Model Question paper for S2 Complementary Chemistry Course - II Semester 2
CH1231 .5 (For Students of Homescience and Biochemistry majors)
Organic Chemistry

Time : Three Hours Total marks : 80

Section – A
(Very short answer questions)
Answer all. Each question carries 1 mark. (1×10=10)

1. Write the name of a neutral aminoacid?
2. Give the name of an essential aminoacid?
3. What is peptide linkage?
4. Give the name of a monosaccharide?
5. Write one reaction of glucose?
6. What is a carbohydrates?
7. Give the other name of oxytocin?
8. Give the name of two enzymes?
9. Give two functions of enzymes?
10. Which vitamin is called antihaemorrhagic vitamin?

Section – B

(Short Answer Questions)

Answer any eight. Each question carries 2 marks (2×8=16)

11. What are peptides?
12. What is Zwitter ion?
13. What is the building block of proteins?
14. Give a test for protein?
15. What are enzyme inhibitors?
16. What is a substrate?
17. What is optimum temperature for enzyme action?
18. What are hormones?
19. Draw the structure of vitamin A?
20. What is epimerization?
21. What is Mannose?
22. What is mutarotation?

Section – C

(Short Essay Questions)

Answer any six. Each question carries 4 marks (4×6=24)

23. What is the reaction of amino acid with nitrous acid?
24. Explain the isoelectric point of an aminoacid?
25. Give the method of synthesis of glycine?
26. What are the factors affecting enzyme action?
27. Give the functions and deficiency diseases of vitaminC ?
28. What is Michaeli's Menton theory of enzyme action?
29. Write a note on Furanoside structure of fructose?
30. How will you convert a glucose into a fructose?
31. Write configuration of glyceraldehydes and erythrose?

Section – D

(Long Essay Questions)

Answer any two. Each question carries 15 marks (2×15=30)

32. a) Explain the structure of protein. (10 marks)
    b) Write a note on the synthesis of aspartic acid (5 marks)
33. a) Write notes on the different types of vitamins. (10 marks)
    b) Explain the deficiency disease caused by vitamin B and D. (5 marks)
34. Discuss about

a) The different types of hormones. (10 marks)
b) Enzyme inhibitors. (5 marks)

35. Write in detail
a) The classification of Carbohydrates. (10 marks)
b) Ergocalciferol (5 marks)

Syllabus (Complementary course Chemistry)
(For Students of Home Science majors)
SEMESTER 3 Course-3 Credit-3 Course Code – CH1331 .5L-T-P 3-0-2
Organic Chemistry II Total - 54 hrs

Module 1: Colloids 9hrs

Introduction, dispersed phase, dispersion medium, classification, multi molecular, macromolecular and associated colloids. Preparation - condensation and dispersion methods, purification -dialysis and ultra filtration, properties of colloidal solution-optical, kinetic and electrical properties, coagulation, Hardy-Schultz rule, protective colloid, applications of colloidal systems, emulsions, emulsifiers and cleansing action of soap.

Module 2: Adsorption and Chromatography 9hrs

Adsorption-Adsorbent, adsorbate, desorption, types of adsorption, physical and chemical adsorption, kinds of adsorption, interactions, adsorption of gases and solutions on solids, importance of adsorption phenomena(applications)- adsorption in catalysis, Chromatography-Column, TLC, paper and gas chromatography.

Module 3: Colour and constitution, Dyes 9hrs

Colours, complimentary colours, chromophore-auxochrome theory, modern theory of colours, classification of dyes, preparation and uses of para red and methyl orange, phenolphthalein and fluorescein , Alizarin, malachite green

Module 4: Terpenes 9hrs

Introduction, isolation, occurrence, isoprene rule, classification, physical and chemical properties and uses of citral, geraniol, menthol and camphor. An elementary idea of the structure of natural rubber, synthetic rubber, Buna-N, Buna-S, Neoprene and Thiokol.

Module 5: Alkaloids 9hrs

Occurrence, general methods of isolation, functional group analysis, functional nature of oxygen containing groups -OH,-COOH,-CHO, >C= O groups, nature of nitrogen, Hoffmann exhaustive methylation, structure and physiological actions of coniine, nicotine, quinine, morphine and codeine (structure elucidation is not expected)

Module 6: Polymers 9hrs

Natural and synthetic polymers, preparation and uses of vinyl polymers-PE, PVC, PVA, PS, PVF, PMMA, PTFE, Synthetic fibres-Nylon, Nylon 66,Terylene, Di methyl teraphthalat, polymers in medicine and surgery

References

1. Chemistry of natural products Vol. 1 — Gurdeep Chatwal
2. The Text Book of Organic Chemistry — P.L Soni, H.M. Chowla
3. Organic Chemistry Vol 1 & 2 — I.L. Finar
4. The Text Book of Organic Chemistry — Arun Bahl & B S Bahl
5. Polymer Chemistry — B.K Sharma
6. Inorganic Polymer Chemistry — G S Misra

Model question paper for S_3
Complementary Chemistry for Home Science
Semester III Course Code CH 1331.5 Course III

Total Mark:80

Time: 3 hours

Section A

Answer all questions (Marks -1 for each)

1. What are gels.
2. What is meant by Brownian movement.
3. An alkaloid present in hemlock herb.
4. Enthalpy of adsorption is negative .true or false 5 Name an adsorbent in paper chromatography.
6. What are complimentary colours?
7. Explain chromophore with an example.
8. Draw the structure of citral.
9. How many isoprene units are in sesquiterpenes ?
10. Write any two uses of PVC.

Section B

Answer any 8 questions (Marks-2 for each)

11. Write a note on electrical double layer and zeta potential.
12. Distinguish between coagulation and peptisation.

13 Write a note on Gibb's adsorption isotherm.

14. Write any two applications of adsorption.

15. How will you prepare phenolphthalein?

16.What is mordant dye? Give an example

17.What is Buna rubber?

18. Write the reaction of citral with silver oxide.

19.Draw the structure if morphine.

20. How is the functional nature of OH analysed in alkaloids ?

21. What is Bakelite?

22. Give the structure of Nylon 66.

Section C

Answer any 6 questions (Marks -4 for each)

23.What are micelles. Define critical micelle concentration.

24. What is gold no.explain protective colloid ?

25. What do you understand by physical and chemical adsorption?

26. Explain the isomerism shown by citral and geraniol

27. What is Hoffmann exhaustive methylation

28. Write the structure and physiological actions of nicotine

29. What are terpenes. Discuss isoprene and special isoprene rule.

30. How is polystyrene synthesized?

31. Write a note on polymers in medicine and surgery.

Section D

Answer any 2 questions (Marks -15 for each)

32. a)Explain adsorption chromatography b) Write a note on partition chromatography ?

33.Give preparation and uses of 1)PVC 2)PMMA 3)Terylene 4)PTFE 5)PVF?

34. Discuss the various theory of a) colour b) constitution.

35. a) What are emulsifiers? Explain the cleansing action of soap. b) Explain the Hardy- ` ` Schultz rule?

Syllabus (Complementary course Chemistry)
(For Students of Home Science majors)
SEMESTER 4 Course-4 Credit-3Course Code – CH1431 .5Organic and Medicinal Chemistry

L-T-P 3-0-2 **Total- 54 hrs**

Module-1: **Medicinal Chemistry** 9hrs

Chemo therapy-Drugs- Classification, Elementary study of analgesics, antipyretics, antibiotics, antimalarials, sulphadrugs, mode of action of drugs, synthesis of aspirin and paracetamol

Module-2: Food additives 9hrs

Preservatives –Calcium propionate, sodium benzoate and sodiumbisulphite antioxidants-Structure and functions of Butylated hydroxy anisole(BHA), Butylat hydroxy toluene(BHT),Vitamine A,E and C. Artificial sweeteners –Structure and applications of saccharin, aspartame and cyclamate. Emulsifiers-chitin

Module-3: Heterocyclics 9hrs

Introduction, Classification and nomenclature. Isolation, preparation, physical properties, acidic and basic character, addition , substitution, oxidation and resonance structures of of pyrrole, furan, thiophene and pyridine.

Module-4: **Insecticides and pesticides** 9hrs

Insecticides - classification and preparation of compounds like DDT, DDE and BHC. Methoxy chlor, malathion, parathion and carbamates(mention only).

An elementary study of antiseptics, disinfectants, pesticides, rodenticides, herbicides and fungicides.

Module-5:Environmental Chemistry -I 9hrs

Air and soil pollution-Introduction, different types of air and soil pollution, air pollutants SO_2, SO_3, NO,.NO_2 and smog. Acid rains, CO_2, CO, green house effect, O_3, importance of ozone layer, causes and effects of ozone layer depletion. Aerosol, photochemical oxidants, PAN, hydrocarbons, particulates, dust, smoke, asbestos, lead mercury, cadmium. Control of air pollution

Module-6:Environmental Chemistry - II 9hrs

Water pollution-Factors affecting the purity of water, sewage water, Industrial waste, agricultural pollution such pesticides, fertilizers, detergents; treatment of industrial waste, water using activated charcoal, synthetic resins, reverse osmosis and electro dialysis.

References

1.An Introduction to Medicinal Chemistry Graham L Patrick Indian Edn

2.Food Chemistry L. H. Mayer

3. The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

4. Organic Chemistry Vol 1 & 2 I.L. Finar

5. The Text Book of Organic Chemistry Arun Bahl & B S Bahl

6. K. Banerji, “Environmental Chemistry”.

7. A. K. De “Environmental Chemistry - An introduction”

8. B. K. Sharma “Air Pollution”

9.G.W. vanLoon and S. J. Duffy “Environmental Chemistry: A global perspective

Model question paper for S_4

Complementary Chemistry for Home Science majors
Semester 1V Course Code CH 1331.5 Course IV

Total Mark:80

Time: 3 hours

Section A

Answer all questions (Marks -1 for each)

1. What are antimalarials? Give one example?
2. Name a sulpha drug?
3. Write two examples for food preservatives?
4. Draw the structure of aspartame?
5 What are Heterocyclics? And give any one hector cyclic compounds?
6. Give the reaction showing the acidic character of furan?
7. What is DDT, DDE?
8. What is an acid rain?
9. What is a smog ?
10. What are detergents?

Section B

Answer any 8 questions (Marks-2 for each)

11. Name two antibiotics?
12. What is BHT? What are its fuctions?
13 How thiophene is isolated?
14. What is an aerosol? Give an example?
15. What are herbicides and fungicides?
16. How will you control of air pollution?
17. What are photochemical oxidants?
18. What is reverse osmosis?
19. What is meant by green house effect. And name two green house gases?
20. Write two chemicals used for sterilization?
21. What are the uses of methoxychlor?
22. What is chitin?

Section C

Answer any 6 questions (Marks -4 for each)

23.What are the mode of action of drugs?.

24. Give the synthesis of aspirin ?

25. Explain the preparation and properties of furan?

26. What are the different types of pollutants in air?

27. Explain the electro dialysis?

28. How will you synthesis paracetamol?

29. Write of Butylated hydroxy anisole(BHA)?

30. Draw the resonance structure of pyridine?

31. Write a note on disinfectants and rodenticides?

Answer any 2 questions (Marks -15 for each)

32. a) Give an outline of a) air pollution b) soil polution?

33.Write the importance of a)ozone layer b) causes and effects of ozone layer depletion?

34. Write the structure and applications of saccharine, aspartane and cyclamate?

35. a) What are the factors affecting the purity of water. b) Explain the treatment of industrial waste?

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY Course V
Course Code CH1432 .5 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science, Biochemistry and Microbiology majors.

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1.Acetanilide from aniline

2.Metadinitrobenzene from nitro benzene
3.Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

I.Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. i)Estimation of a strong base and a weak base using standardized HCl

ii)Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH

II.Permanganometry

a.Standardization of $KMnO_4$ by oxalic acid/sodium oxalate and Mohr's salt b.Estimation of oxalic acid/sodium oxalate

c.Estimation of Mohr's salt

d.Estimation of calcium

II.Dichrometry

a.Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b.Estimation of ferric iron by reduction with stannous chloride (internal indicator).

III.Iodimetry and Iodometry

a.Standardisation of sodium thiosulphate using std potassium dichromate

b.Estimation of copper in a solution

c.Estimation of iodine

IV.Complexometric titrations

a.Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution. b.Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Chromatography

a.Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars

b.Separation of a mixture of dyes by column chromatography.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals

2.Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} semesters

Complementary Chemistry offered to Biochemistry Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry Complementary

Complementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .6		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .6		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .6		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .6 CH1432 .6		3×18 =54 2×18 = 36

Syllabus for complementary courses

(for Bio Chemistry Majors)

Semester-1 Complementary Course No. - 1 Course Code-CH1131 .6Credit-2

Inorganic and Analytical Chemistry 36 hrs

L-T-P 2-0-2

Module I –Atomic structure 9 hrs

Atomic spectra of hydrogen,-different series, Rydberg equation. Bohr theory-postulates –statement of Bohr energy equation –derivation of spectral frequency from Bohr equation-Schrodinger wave equation(mention only), concepts of orbitals, the four quantum numbers and their significance- Orbital wise electron configuration, energy sequence rule, Pauli's principle, Hund's rule, stability of filled and half filled orbitals.

Module II- Analytical Principles 9 hrs

Principles of volumetric analysis, primary standards, Standard solutions, normality and molarity, numerical problems, theory of acid base titrations, permanganometric and dichrometric titrations, theory of acid base and redox indicators.(Numerical problems are to be worked out) .

Module III- Radioactivity and Nuclear Chemistry 9 hrs

Radio active decay series, Radioactive equilibrium, Average life, Half life detection of radio activity-Geiger Muller Counter, Wilson cloud chamber, Units of radioactivity-Curie and Rutherford. Applications of radio activity- in medicine and agriculture, biological effects of radiation, pathological and genetic damage, Units of radiations, Nuclear Chemistry-stability of nucleus, n/p ratio, artificial transmutation and radioactivity, mass defect, binding energy, neutron activation analysis

Module IV- Organometallics and biomolecules 9 hrs

Organometallic compounds –Definition and classification, Biological and environmental aspects of organometallics-organometallics in medicine ,Organo mercury, boron, silicon and arsenic compounds. Biomolecules –Metallo porphyrins, Haemoglobin and Myoglobin. References

1. Concise Inorganic Chemistry J. D. Lee

2. Inorganic Chemistry Puri and Sharma

3. Chemistry of Organometallics Rochow

4. Organic Chemistry Vol 2 I.L. Finar

5. Chemistry of natural products Vol. 1 Gurdeep Chatwal

6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

7. Modern Inorganic Chemistry R D Madan

Model Question paper for S1 Complementary Chemistry Course - II
Semester
1 CH1231 .5 (For Students of Biochemistry majors)
Organic Chemistry

Time : Three Hours Total marks : 80

Section – A
(Very short answer questions)

Answer all questions. Each question carries 1 mark (1×10=10)

1. Give the relationship between wavelength, frequency and velocity of electromagnetic radiation?
2. What is the Rydberg equation for calculating the wave number of radiation?
3. Give Schrodinger equation which describes the behaviour of electron in an atom?
4. Indicator used for the titration between strong base and weak acid?
5. Give two examples of primary standard?
6. What is meant by transmutation?
7. Name two units of radioactivity?
8. What is meant by half life period?
9. Give two examples of Organomercuric comounds in medicine ?
10. What are organometallic comounds?

Section – B
(Short Answer Questions)

Answer any eight. Each question carries 2 marks (2×8=16)

11. Explain the Hund's rule with a suitable example?
12. Draw the shapes of d-orbitals?
13. What is meant by normality and molarity?
14. Why HCl is not used in Permanganomertic titration?
15. Calculate the weight of Na_2Co_3 required to prepare250ml N/10 solution?
16. What is binding energy?
17. What is meant by radio carbon dating??
18. Name four radioactive elements used in medicine?
19. What are organo boron compounds? Give one example?
20. What are anti tumour drugs??
21. What are biomolecules? Give two examples?
22. What are silatranes?

Section – C
(Short Essay Questions)

Answer any six. Each question carries 4 marks (4×6=24)

23. i)Explain the wave nature of material objects? ii) What is uncertainty principle?
24. Explain the concepts of orbitals?

25. Explain the theory of acid base titrations?
26. Write a note on dichromatic titration?
27. Write the stability of nucleus with respect to n/p ratio ?
28. What is meant by biological effect of radiation?
29. How will you detect radioactivity by Wilson cloud Chamber?
30. What are the functions of Haemoglobin?
31. Write a note on Organoarsenic compounds in medicine?

Section – D

(Long Essay Questions)

Answer any two. Each question carries 15 marks (15×2=30)

32. Derive the Bohr frequency equation?(10marks)
    b) Explain quantum numbers.
33. a)Write notes on Acid base indicators? (10mark) b)Explain the Permanganometric titration? (5mark)
34. a)What are the applications of radioactivity in medicine and agriculture? (10mark)
    b).What is meant by neutron activation analysis? (5mark)
35. a) Write in detail the classification of Organometallic compounds with examples? (10Mark)
    b) Explain the biological aspects of myoglobin? (5marks)?

Syllabus for complementary courses

(for Bio Chemistry Majors)

(Common for Homescience &Biochemistry) Semester-II Complementary Course No. - 1 Course Code-CH1231 .6Credit-2 L-T-P 2-0-2

Module I: Carbohydrates 9hrs

Classification, configuration of glyceraldehydes, erythrose, threose, ribose,2- deoxy ribose, arabinose, glucose, fructose and mannose. Reactions of glucose and fructose Pyranoside structures of glucose and fructose Furanoside structure of fructose (structure elucidation not expected), muta rotation, epimerization, conversion of glucose into fructose and vice versa

Module II Vitamins 9hrs

Classification, source, isolation, physiological function and deficiency diseases caused by Vitamin A1(retinol), A2(axerophthol), Vitamin B-B1 (thiamine), B2(riboflavin and folic acid), B5(niacin), B6(Pyridoxine), B12 (Cyano cobalamine) Vitamin C (ascorbic acid),–Vitamin,D2 (ergocalciferol), Vitamin E (Tochopherols), Vitamin H(biotin) and Vitamin K

Module III :Aminoacids and Proteins 9hrs

Classification,synthesis of glycine, alanine, phenyl alanine and aspartic acid, zwitter ion, isoelectric point,, reactions of aminoacids, peptide linkage, peptide synthesis, polypeptides, primary, secondary, tertiary and quarternary structure of proteins, classification, biological importance and tests for proteins.

Module IV: Enzymes and Hormones 9hrs

Enzymes- Characteristics, classification, factors influencing enzyme action, mechanism of enzyme action, Michaelis –Menton theory, enzyme inhibitors.

Hormones- Introduction, isolation, functions and abnormalities due to oxytocin, thyroxin, adrenalin, glutathione, progesterone, estrogens, cortisone, corticosterone, adrenalin References

1. Concise Inorganic Chemistry J. D. Lee
2. Inorganic Chemistry Puri and Sharma
3. Chemistry of Organometallics Rochow
4. Organic Chemistry Vol 2 I.L. Finar
5. Chemistry of natural products Vol. 1 Gurdeep Chatwal
6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla
7. Modern Inorganic Chemistry R D Madan

UNIVERSITY OF KERALA

Model Question paper for Complementary Chemistry Course - II Semester 2

CH1231 .6 (For Students of biochemistry majors)

Organic Chemistry

Time : Three Hours Total marks : 80

Section – A(Very short answer questions)

Answer all. Each question carries 1 mark. (1×10=10)

1. Write the name of a neutral aminoacid?
2. Give the name of an essential aminoacid?
3. What is peptide linkage?
4. Give the name of a monosaccharide?
5. Write one reaction of glucose?
6. What is a carbohydrates?
7. Give the other name of oxytocin?
8. Give the name of two enzymes?
9. Give two functions of enzymes?

10. Which vitamin is called antihaemorrhagic vitamin?

Section – B
(Short Answer Questions)

Answer any eight. Each question carries 2 marks (2×8=16)

11. What are peptides?
12. What is Zwitter ion?
13. What is the building block of proteins?
14. Give a test for protein?
15. What are enzyme inhibitors?
16. What is a substrate?
17. What is optimum temperature for enzyme action?
18. What are hormones?
19. Draw the structure of vitamin A?
20. What is epimerization?
21. What is Mannose?
22. What is mutarotation?

Section – C
(Short Essay Questions)

Answer any six. Each question carries 4 marks (4×6=24)

23. What is the reaction of amino acid with nitrous acid?
24. Explain the isoelectric point of an aminoacid?
25. Give the method of synthesis of glycine?
26. What are the factors affecting enzyme action?
27. Give the functions and deficiency diseases of vitamin C ?
28. What is Michaeli's Menton theory of enzyme action?
29. Write a note on Furanoside structure of fructose?
30. How will you convert a glucose into a fructose?
31. Write configuration of glyceraldehydes and erythrose?

Section – D
(Long Essay Questions)

Answer any two. Each question carries 15 marks (2×15=30)

32. a) Explain the structure of protein. (10 marks)
    b) Write a note on the synthesis of aspartic acid (5 marks)
33. a) Write notes on the different types of vitamins. (10 marks)
    b) Explain the deficiency disease caused by vitamin B and D. (5 marks)
34. Discuss about
    a) The different types of hormones. (10 marks)
    b) Enzyme inhibitors. (5 marks)

35. Write in detail
    a) The classification of Carbohydrates. (10 marks)
    b) Ergocalciferol (5 marks)

Syllabus for complementary course
(for Biochemistry Majors)
Semester-3 Course-3 Credit-3Course Code – CH1331 .6Inorganic and Organic Chemistry and Spectroscopy Total - 54hrsL-T-P 3-0-2Module I: Chemical Bonding
9hrs

Energies of bond formation Born-Haber cycle, hybridization and structure of molecules-sp, sp^2,sp^3,dsp^2,dsp^3,sp^3d^2 hybridisation with examples, explanation of bond angle in water and ammonia, VSEPR Theory with regular and irregular geometry , polarity of covalent bond, its relation with electronegativity, electronegativity scale-Paulings and Mullickens approaches, factors influencing polarity, dipole moment, its relation to geometry, hydrogen bond, intra and intermolecular hydrogen bond, its consequence on BP, volatility and solubility, partial covalent character of ionic bond, Fajan's rule

Module II: Coordination Chemistry 9hrs

Nomenclature, coordination number, geometry, chelates, isomerism, structural and stereoisomerism, Valence Bond theory of bonding in octahedral and tetrahedral complexes, high spin and low spin complexes, drawbacks of Valence Bond theory, magnetic properties and application in qualitative and quantitative analysis

Module III :Mechanism in Organic Substitution Reactions 9hrs

Electron displacement in organic molecules, inductive, electromeric and mesomeric effects, hyper conjugation and steric effect , bond fission, rate determining step nucleophilic substitution of alkyl halides, SN1, SN2 reactions, effect of structure on reactivity as illustrated by methyl, ethyl, isopropyl and tertiary groups, aromatic electrophilic substitution

reactions, directive influence Module IV: Stereochemistry
9hrs

Optical isomerism, chirality, racemisation and resolution, relative and absolute configuration, asymmetric synthesis, optical isomerism, E and Z nomenclature, aldoxims and ketoxims, rotational isomerism, rotation about carbon – carbon single bond, conformation of ethane, propane, butane, cyclohexane, axial and equatorial bonds

Module V : Spectroscopy – I 9hrs

Regions of electromagnetic spectrum interaction radiation with matter, different types of energy levels in molecules, rotation , vibration and electronic levels, various types of molecular spectra, microwave spectroscopy, spectra of diatomic molecules, expression for rotational energy, selection rules, frequency separation, equation for frequency of vibration, expression for vibrational energy, selection rule, calculation of force constant

Module VI: Hetrocyclics and Alkaloids 9hrs

An outline study of the preparation and propertifs of Furan, Pyrrole, Thiophene, Pyridine, Hoffmans exhaustive methylation, Alkaloids, general method of isolation, general properties, physiological action of alkaloids, conine, morphine and nicotine(no structural elucidation expected) References :

1. Basic Inorganic Chemistry : F. A. Cotton G. Wilkinson and P. L. Gaus, Wlley
2. Concise Inorganic Chemistry : J. D. Lee, ELBS
3. Inorganic Chemistry : J. E. Huheey
4. Coordination Chemistry : Bosolo and Johns
5. Organic Chemistry : Peter Sykes
6. Organic Chemistry : F. A. Carey, Mc Graw Hill
7. Organic Chemistry : Morrison & Boyd
8. Reaction Mechanism of Organic Chemistry : S. M. Mukherji and S. P. Singh, Mc Millan

9.Spectrscopy Y R Sharma.

10.Advanced Organic Chemistry :Jerry March

Model Question Paper for Complementary Chemistry for Biochemistry Majors Semester III Course Code CH 1331.5

Total Mark:80

Time: 3 hours

Section A

Answer all questions (Marks -1 for each)

1.What is meant by hybridization?

2. What is the structure of SP_2molecule.
3. What is the geometry of SF_6 ?
4. What is the non-linear hybridisation in octahedral complexes?
5. What are chelates?
6. What is inductive effect?
7. Which is the most stable conformation of ethane?
8. Write the selection rule for vibrational spectrum ?
9. Write an expression for force constant ?
10. Write any two properties of alkaloids? **Section B**

Answer any 8 questions (Marks-2 for each)

11. Explain VSEPR theory?
12. What is meant by structural isomerism?

13 What is meant by hyperconjugation?

14. Write a note on steric effect?
15. Explain the conformation of ethane?
16. What are axial and equatorial bonds?
17. What are ketoximes?
18. What are the various types of molecular spectra?
19. Discuss the various types of energy level in molecule?
20. What are the physiological action of alkaloids? ?
21. Write the properties of nicotin?
22. Write the structure of Thiophene?

Section C

Answer any 6 questions (Marks -4 for each)

23.Explain Pauling's electronegativity scale?

24. Explain using valance bond theory, the bonding in tetra hedral complexes ?
25. What are high spin and low spin complexes?
26. Write in detail about hydrogen bonding?
27. What is Hoffmann's exhaustive methylation?
28. Give the expression for the frequency of vibration in vibrational spectroscopy and explain the terms?
29. Explain asymmetric synthesis with an example?
30. Write a note on the isolation of alkaloids?
31. How will you determine bond length in a molecule using microwave spectra?

Section D

Answer any 2 questions (Marks -15 for each)

32. Explain a) Born- Haber cycle (b) Derive an expression for vibrational energy?
33. a)Explain the magnetic properties of co-ordination compounds b) Explain the methods of resolution?
34. a)What are the difference between SN_1 andSN_2 reaction. b) Effect of the structure of bond reactivity on methyl, ethyl, isopropyl and tertiary groups?
35. a)What are alkaloids b)Explain the preparation and properties of Furan, Pyrrole, Pyridine.

c) Write a note on the Physiological action of morphine, conine?

Syllabus for complementary course
(for Biochemistry students)
Semester-4 Course-4 Credit-3Course Code –CH1431
.6Organic Chemistry and Spectroscopy-II

L-T-P 3-0-2 Total 54hrs

Module I: Chromatography 9hrs

Adsorption and partition chromatography, column, paper and thin layer chromatography, Rf value, applications, gas chromatography, applications, ion- exchange chromatography, applications

Module II :Nucleic acids and Lipids 9hrs

Nucleic acids: RNA and DNA, their biological role, hydrolysis of nucleoproteins, elementary idea regarding the structure of nucleic acids, Lipids: Classification, oils, fats and waxes, iodine value, saponification value, properties of oils and fats, phospholipids

Module III :Polymers and Terpenes 9hrs

Polymers- Classification with examples- natural and synthetic condensation and addition polymerization, elastic fibre, thermoplastics and thermosetting plastics, Rubber structure, lectrophores of rubber, neoprene, butyl rubber, Buna-S, Buna-N, synthetic polymers, Nylon-6, Nylon-66, Bakelite, elementary idea of the structure of natural rubber, Terpenes- classification, isoprene rule, essential oils, elementary study of citral and geraniol(structural elucidation not required)

Module IV :Biophysical Analysis 9hrs

Osmosis osmotic pressure, isotonic solution, determination of molar mass by osmotic pressure method, reverse osmosis, adsorption – types of adsorption, applications factors influencing adsorption, Langmuir theory of adsorption

Module V: Colloids 9hrs

Properties of colloids , Tyndal effect, ultra microscope, Brownian movement, lectrophoresis, electroosmosis, sedimentation and streaming potential stability of colloids, Zeta potential, Hardy- Schultz protective colloids, gold number, emulsion, gels, application of colloids, delta formation, medicines, sewage disposal, emulsification and cleansing action of detergents and soaps.

Module VI :Spectroscopy II 9hrs

Raman spectroscopy, stokes and antistokes lines, quantum theory of Raman spectrum, advantages and disadvantages of Raman spectrum, rotational Raman, vibrational Raman spectrum, complementary with IR spectrum, mutual exclusion principle, NMR spectroscopy, principle of NMR spectroscopy, nuclear spin, interaction with external magnetic field, chemical schift, spin-spin coupling, applications

References :

1. Basic Inorganic Chemistry : F. A. Cotton G. Wilkinson and P. L. Gaus, Wlley

2. Organic Chemistry, Vol. I &II I. L. Finar, Longman
3. Advanced Organic Chemistry : Jerry March
4. Polymer Chemistry B.K Sharma
5. Bio Physical Chemistry Principles and techniques Avinash Upadhyay.Kakoli Upadhyay.Nirmalendu Nath
6. Spectroscopy B K Sharma
7. Spectroscopy Y R Sharma

Model Questions Semester IV (for Bio chemistry Majors) Course Code CH1431 .6 Course – IV

Organic Chemistry and Spectroscopy II

Time : Three Hours Maximum marks: 80 marks

Section A

Answer all.(answer in one word \ sentence)

1.What is Rf value?
2.The chromatographic method where the components are separated in stacks is called
3.Which sugar is present in RNA?
4.Write the expression of Langmuir's adsorption isotherm 5.Write the expansion of DNA.
6. Name one lipid.
7. Name the components obtained on hydrolysin nucleoprotein.
8. Name the two main types of polymers.
9. W h a t i s Nylon 66 ?
10. Which is the monomer of natural rubber?

Section B

Answer any 8. Each question carries 2 marks (short answer type)

11. What are Stokes and anti Stokes lines?
12. Write in brief "Ion exchange chromatography."
13. What is paper chromatography.
14. What is iodine value ?
15. Explain saponification value.
16. What are terpenes ?
17. Explain the stereochemistry of double bond in natural rubber..
18. What are isotonic solutions ?
19. What is Tyndall effect ?

20. What is Hardy-Schultz rule?
21. Explain mutual exclusion rule ?
22. What is chemical shift? 1×8 = 8

Section C

Answer any 6. Each question carries 4 marks (short e ssay)

23. Write a note on partition chromatography.
24. Explain biological roles of RNA and DNA.
25. Distinguish between addition and condensation polymerization.
26. Distinguish between thermoplastics and thermosetting plastics.
27. Which are the different types of adsorption and the factors influencing adsorption.
28. Define elecrophoresis and electro osmosis.
29. Explain the terms (1) emulsion (2) gel
30. Explain spin-spin coupling in nmr spectroscopy.
31. Draw the high resolution nmr spectrum of ethanol and explain the peaks.

4×6 = 24

Section D

Answer any 2. Each question carries 15 marks (essay)

32. (a)Briefly explain the theory and principle of NMR spectroscopy.
(b) Why Raman spectrum is complementary with IR spectrum.

33. (a) Write a short note on the applications of chromatography. (b) Write a note on the biological role of nucleic acid.

34.(a) How is molar mass determined by osmotic pressure method.
(b) Writ a note on cleansing action of soaps and detergents.

35.(a) Explain in detail the applications of colloids.
(b) Explain isoprene rule with an example. 2x15=30

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY

Course V Course Code CH1432 .6 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science Biochemistry and Microbiology majors

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – polynuclear hydrocarbons, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1.Acetanilide from aniline

2.Metadinitrobenzene from nitro benzene

3.Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

I.Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. i)Estimation of a strong base and a weak base using standardized HCl

ii)Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH

II.Permanganometry

a.Standardization of KMnO4 by oxalic acid/sodium oxalate and Mohr's salt

b.Estimation of oxalic acid/sodium oxalate
c.Estimation of Mohr's salt

d.Estimation of calcium

III.Dichrometry

a.Preparation of Std. $K2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b.Estimation of ferric iron by reduction with stannous chloride (internal indicator).

IV.Iodimetry and Iodometry

a.Standardisation of sodium thiosulphate using std potassium dichromate

b.Estimation of copper in a solution

c.Estimation of iodine

V.Complexometric titrations

a.Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution. b.Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals
2.Estimation of barium in barium chloride solution.

Chromatography

a.Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars

b.Separation of a mixture of dyes by column chromatography.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st} ,2^{nd} , 3^{rd} and 4^{th} semesters

Complementary Chemistry offered to Microbiology Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry ComplementaryComplementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .7		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .7		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .7		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .7 CH1432 .7		3×18 =54 2×18 = 36

QuestionPaperPatternforTest		
QuestionNo	*Typeof Question*	*Marks*
Part A: 1-2	One word or a sentence	1
Part B: 3-6	2 out of 4; Short Answer	2
Part C: 7-8	1 out of 2; Short Essay	4
Part D: 9-10	1 out of 2; Long Essay	15
		Total = 25

SYLLABUS OF COMPLEMENTARY COURSE

Theoretical Chemistry(Common for Botany/zoology/Microbiology) (For Students of Microbiology Majors)

SEMESTER 1 Complementary Course No. - 1 Course Code-CH1131 .7 Credit-2

L-T-P 2-0-2 36 hours

Module I – Atomic Structure (9 hrs)

Atomic spectrum of hydrogen - different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (mention only, no derivation), concept of orbitals, the four quantum numbers and their significances. Orbitalwise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, Stability of filled and half filled orbitals. Electronic configuration of lanthanides and actinides, Lanthanide contraction

Module II – Chemical Bonding (9 hrs)

Energetics of bond formation – Born-Haber cycle. Hybridisation and structure of molecules – sp, sp^2, sp^3, dsp^2, dsp^3, sp^3d^2 and sp^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia. VSEPR theory with regular and irregular geometry –. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility. Partial covalent character of the ionic bond – Fajan's Rules. A brief review of molecular orbital approach

– LCAO method – bond order, bond distance and stability of O2, $O2^{2+}$, $O2^{2-}$, NO, NO^+, CO and

HF.

Module III – Analytical Principles (9 hrs)

Principles of volumetric analysis – primary standard – standard solutions normality and molarity, theory of acid-base titrations, permagnometric and dichrometric titrations, iodometry and complexometric titrations. Theory of acid-base indicator – redox indicators. Principles of colorimetry – estimation of iron and phosphorous.

Module IV – Environmental Chemistry (9hrs)

Nature of environmental threats and role of chemistry. Green house effect, ozone layer and its depletion. Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis.Dissolved oxygen-BOD,COD analysis.

References:

1. " Atomic structure and chemical bonding with introduction to molecular spectroscopy" – Manas Chanda
2. " Concise Inorganic Chemistry" – J.D. Lee
3. "Inorganic chemistry", Puri, Sharma and Kalia

4. “A text book of Quantitative analysis” A.I.Vogel
5. “Qunatitative analysis: laboratory manual”: Day & Underwood.
6. “Theoretical Principles of Inorganic Chemistry”: Manku.
7.S. K. Banerji, “Environmental Chemistry”.
8.A. K. De “Environmental Chemistry - An introduction”
9.B. K. Sharma “Air Pollution”.
10.V. K. Ahluwalia “Environmental Chemistry”
11.G.W. vanLoon and S. J. Duffy “Environmental Chemistry: A global perspective”

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
SEMESTER I Complementary CourseMicrobiology majors. Course Code CH1131.7
THEORETICAL CHEMISTRY

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the electronic configuration of Copper (atomic umber 29) 2.
The quantum numbers n = 2 and l = 1 corresponds to which orbital?
3. What are the shapes of molecules with sp and sp3 hybridization?
4. Calculate the bond order of H_2 molecule.
5. Give the structure of XeO_3.
6. What is Lattice Energy?
7. What is meant by primary standards?
8. Define Molality.
9. What is the optimum value of DO for good water quality?
10. What is meant by BOD?

Section-B

Short answer type (not to exceed one paragraph). Answer any 8 questions from the following. Each question carries two marks

11. What is Bohr Bury's rule?
12. Write down the Schrodinger Equation and explain the terms involved.
13. Explain the failures of Bohr's theory?
14. What are the limitations of VSEPR Theory?
15. What are polar and non polar covalent bonds?
16. Mention the rules for adding electrons to molecular orbitals?
17. What are dichrometric titrations?
18. How would you prepare 100ml of 0.05M Mohr's salt solution?
19. Methyl orange is not a suitable indicator for the titration of weak acid with strong base. Why?

20. Which are green house gases? Mention their sources.
21. What is reverse osmosis? How it is useful in the purification of waste water?
22. What are chief factors responsible for water pollution?

Section-C

Short essay (not exceed 120 words). Answer any 6 questions from the following. Each question carries four marks.

23. If the energy difference between two electronic states of hydrogen atom is 214.68 KJmol1. What will be the frequency of light emitted when the electrons jump from the higher to the lower level?
24. Explain the stability of half filled and completely filled orbitals.
25. Give an account of permanganometric titrations.
26. Discuss the theory of Acid – Base indicators.
27. Explain the energetic of ionic bond formation.
28. Define hybridization. Mention the types of hybridization involved in SF6, PCl5, BF3.
29. Explain Born-Haber Cycle considering the formation of NaCl as an example.
30. Write a note on agricultural pollution.
31. Explain briefly the different methods for the treatment of industrial waste water.

Section-D

Long essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32. (a) Discuss Bohr Theory, highlighting its merits and demerits. (b)What are quantum numbers? Give its significance.
    (c) Explain various rules regarding electronic configuration.
33. (a) Discuss the titration curves for the titration of strong acid with strong base and weak acid with strong base.
    (b) Explain the theory of redox indicators.
    (c) explain Beer's Law, Lambert's Law and Beer – Lambert Law.
34. (a) Write a note on Hydrogen bonding and its consequences.
    (b) How electronic configuration of molecules related to molecular behavior? Explain.
    (c) Explain Fajan's Rule.
35. (a) Discuss the formation and importance of ozone layer.
    (b) What is meant by pollution and pollutants? Explain the classification of air pollutants.
    (c) What are the sources of important air pollutants.

SYLLABUS OF COMPLEMENTARY COURSE Inorganic & Bioinorganic chemistry (Common for Botany/Zoology/Microbiology) (For Students of Microbiology Majors)SEMESTER II Course Code-CH1231 .7 Credit-2

L-T-P 2-0-2 36 hours

Module I –Organometallics (9 hrs)

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications. Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses. Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture. Environmental aspects of Organometallic compounds.

ModuleII – Nuclear Chemistry (9hrs)

Natural radioactivity, modes of decay, Geiger –Nuttal rule, artificial transmutation and artificial radioactivity- nuclear stability, n/p ratio, mass defect and binding energy, nuclear fission and nuclear fusion, -applications of radioactivity- ^{14}C dating, rock dating , neutron activation analysis and isotope as tracers

ModuleIII-Coordination Chemistry (9hrs)

Nomenclature, Coordination number and geometry of chelates – isomerism – structural and stereo isomerism - valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – magnetic properties.

Application of coordination complexes in qualitative and quantitative analysis.

Module IV – Bio inorganic compounds (9 hrs)

Metalloporphyrins – cytochromes – chlorophyll photosynthesis and respiration – haemoglobin and myoglobin, mechanism of O_2 – CO_2 transportation, nitrogen fixation, carbon fixation and carbon cycle. Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems.

References

1. Co-ordination Chemistry – Bosolo and Johns
2. Chemistry of Organometallics – Rochoco.
3. Concise Inorganic Chemistry – J.D. Lee
4. Puri, Sharma and Kalia “Inorganic Chemistry” 5.Modern Inorganic Chemistry A.D. Madan University of Kerala

Model Question Paper of BSc Chemistry Programme

2017 Admission onwards

SEMESTER II Complementary CourseMicrobiology majors. Course Code CH1231.7

INORGANIC AND BIOINORGANIC CHEMISTRY

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the structure of Zeise's salt.
2. Write any one of the preparation methods of organolithium compounds.
3. What is ferrocene? How is it synthesized?
4. What are alpha particles?
5. Define the term radioactivity.
6. Write the IUPAC name of K3[Co(NO2)4Cl2]
7. What are low spin complexes?
8. What do you mean by chelate?
9. What are metalloporphyrins?
10. Give an example of anaerobic respiration.

Section-B

Short answer type (not to exceed one paragraph). Answer any 8 questions from the following. Each question carries two marks

11. What is reformatsky reaction?
12. What is cisplatin? Give its significance.
13. How are organomercurials prepared?
14. Explain Geiger Nuttal Rule.
15. What are half life period and average life period?
16. Define mass defect and binding energy.
17. Write the postulates of Werner's Coordination Theory.
18. What are poly dentate ligands? Give an example.
19. Explain the colours of transition metal complexes.
20. Differentiate respiration and photosynthesis.
21. What are trace elements?
22. What is the role of chlorophil in photosynthesis?

Section-C

Short essay (not exceed 120 words). Answer any 6 questions from the following. Each question carries four marks.

23. Write a note on organotin compounds.

24.Write a brief note on the applications of organometallic compounds in agriculture and horticulture.
25.One microgram of phosphorus- 32 was injected into a living system for biological tracer studies. The half life period of P-32 is 14.3 days. How long will it take for the radioactivity to fall to 10% of the initial value?
26.Explain the relation between nuclear stability and n/p ratio.
27.Write the biological effects of radiation.
28.Suggest the structure of [NiCl4] on the basis of Valence Bond Theory.
29.Explain the magnetic properties of octahedral complexes with suitable examples.
30.Discuss briefly the biochemistry of iron toxicity and nutrition.
31.Metal ions play a variety of roles in biological systems. Explain.

Section-D

Long essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32.(a) Explain the synthesis and applications or Grignard reagent. (5 marks)
(b) What are Frankland reagents? Give its significance. (5 marks)
(c)Explain about organosilicon compounds in medicine. (5 marks)

33.(a) Explain carbon dating and rock dating. (5 marks)
(b) Give the principle of neutron activation analysis. (5 marks)
(c)Explain the terms nuclear fission and fusion with suitable examples. (5 marks)

34.(a) Write a note on Crystal Field Theory. (5 marks)
(b) Explain the applications of complexes in qualitative analysis. (5 marks)
(c)Write a brief note on isomerism in coordination complexes. (5 marks)

35.(a) Give brief outline of carbon cycle. (5 marks)
(b) Explain nitrogen Fixation. (5 marks)
(c)Write a short note on hemoglobin. (5 marks)

Majors)SEMESTER III Course Code-CH1331 .7 Credit-3T-P 3-0-2
Total - 54 hrs

Module I – Mechanisms in organic substitution reactions (9 hrs)

Electron displacement in organic compounds – Inductive, electromeric and mesomeric effects, influence of inductive effect on acidic and basic properties of organic compounds, hyperconjugation and steric effect.

Reaction mechanism - Bond fission, rate determining step, nucleophilic substitution of Alkylhalides, SN1& SN2 reactions. Effect of structure on reactivity as illustrated by Methyl, ethyl, isopropyl and tertiary butyl groups. Electrophilic addition to ethene and propene – Markownikoff's rule, free radical addition, peroxide effect.

Module II – Stereochemistry (9 hrs)

Optical isomerism, chirality, recemisation and resolution, relative and absolute configuration, asymmetric synthesis, optical isomerism due to restricted rotation. Geometrical isomerism, E and Z nomenclature. Aldoximes and ketoximes.

Rotational isomerism. Rotation about carbon – carbon single bond, conformation of ethane, propane, butane cyclohexane, axial and equatorial bonds.

Module III – Carbohydrates (9 hours)

Classification, configuration, glyceraldehyde, erythrose, threose, ribose, 2-deoxy ribose, arabinose, glucose, fructose and mannose. Preparation and properties of glucose and fructose Pyranoside structures of glucose and fructose, furanoside structure of fructose (structure elucidation not expected). Mutarotation and epimerization. Conversion of glucose into fructose and viceversa.

Module IV – Amino acid and Proteins (9 hrs)

Classification and properties – synthesis of glycine, alanine and tryptophan – polypeptides and proteins, peptide linkage, peptide synthesis, polypeptides, primary,secondary, tertiary and quarternary structure of proteins, test for proteins, Enzymes – Characteristics, catalytic action, theory of enzyme catalysis – Michaelis – Menton theory – Co-enzymes.

Module V : Heterocyclic compounds (9hours)

Heterocyclic systems – 5 membered, 6 membered and condensed systems. Structure of pyrrole, Furan and Thiophene. Electrophilic substitution in pyrrole, Furan and Thiophene. Reactivity and orientation – Structure and properties of pyridine. Electorphilic and nucleophilic substitution reactions in pyridine – Basicity and reduction. Structure of purine and pyramidine bases present in nucleic acids.

Module VI– Nucleic acids and Lipids (9 hrs)

RNA, DNA – their biological role, hydrolysis of nucleoproteins, elementary idea regarding the structure of nucleic acids.

Lipids – Classification oils, fats and waxes, iodine value and saponification value, properties of oils and fats – phospholipids.

References:

1 . Principles of Organic Chemistry – M. K. Jain, S. Nagin & Co
2. The Text Book of Organic Chemistry – P.L.Soni

3. The Text Book of Organic Chemistry – Arun Bahl & B.S. Bahl
4. Reaction Mechanism in Organic Chemistry – Mukherjee and Singh – Macmillan
5. Organic Chemistry Vol I and II – I.L. Finar
6. K.S.Tewari, N.K.Vishnoi and S.N.Mehrotra, A textbook of Organic Chemisty, Vikas Publishing House (Pvt) Ltd., New Delhi.

MODEL QUESTION PAPER

SEMESTER III

Complementary Course for Microbiology Majors

COURSE CODE CH1331.7ORGANIC CHEMISTRY

Time: 3 hours Maximum marks: 80

SECTION A

(Answer allquestions. Each question carries 1 Mark)

1)What is heterolytic bond fission?
2) Explain the term rate determining step.
3) Draw the most stable conformer of methyl cyclohexane.
4) Write the epimer of D-Glucose.
5) What are polysaccharides?
6) What are zwitter ions?
7) Relationship between the base sequence in DNA and the amino acid sequence in protein is known as ……..
8) Write the structure of tryptophan.
9) What are heterocyclics? Give examples.
10) Name the purine bases present in DNA. (10x1=10 marks)

SECTION B

(Answer any 8 question. Each question carries 2 Marks)

11) Explain hyper conjugation with an example.
12) Explain Markownikoff's rule with example.
13) What is asymmetric synthesis? Illustrate.
14) Explain racemisation.
15) How will you convert glucose to fructose?
16) Why pyrrole undergoes electrophilic substitution at 3-position.
17) Explain saponification value.
18) What is zwitter ion?
19) Draw the structure of D-Arabinose, D-Ribose, L-Glyceraldehyde and L-Erythrose.
20) Whar are phospholipids?
21) Name the products of hydrolysis of nucleoproteins.
22) Compare the basicity of pyridine and pyrrole.

(8x2=16 marks)

SECTION C

(Answer any 6 question. Each question carries 4 Marks)

23) What is inductive effect? How it influences the acidity of organic acids?
24) Explain the E & Z notation of geometrical isomers with examples.
25) Explain mutarotation and epimerization.
26) Explain the following denaturation and colour reactions of protein.
27) How pyridine is prepared? Explain it important nucleophilic substitution reactions.
28) What are lipids? Give examples. Enumerate their functions.
29) (i) What is peroxide effect? (ii) Draw the different conformers of n-butane.
30) What are enzymes? Give their general characteristics.
31) What is iodine value? Write its importance.

(6x4=24marks)

SECTION D

(Answer any 2question. Each question carries 15 Marks)

32) (a) Discuss the mechanism and influence of structure on SN2 reactions.
    (b) Discuss the mechanism of addition of HBr to propene in presence of organic peroxide and in the absence of organic peroxides.
    (c) Assign the R and S configuration of D- & L- Lactic acid.
33) (a) What is resolution? Explain any two methods.
    (b) Write short notes on (i) the configuration of aldoxime and ketoxime and (ii) Optical isomerism due to restricted rotation.
    (c) Discuss the ring structure of glucose.
34) (a) Explain two methods of synthesizing peptides.
    (b) Discuss primary and secondary structure of proteins.
    (c) Discuss the electrophilic substitution in pyrrole.
35) (a) Describe the classification of oils.
    (b) Discuss the structure of DNA.
    (c) How glucose reacts with the following (i) Br_2 water (ii) Phenylhydrazine (iii) CH_3OH and dry Conc.HCl.

(2x15=30 marks)

SYLLABUS OF COMPLEMENTARY COURSE

Physical chemistry-(For Students of Microbiology Majors)

SEMESTER IV Course Code-CH1331 .7 Credit-3

T-P 3-0-2 Total - 54 hrs

Module I. Chemical kinetics & Enzyme catalysis 9 Hrs

Chemical kinetics, rate of reactions, various factors influencing rate, order, molecularity, zero, first, second, third order reactions - derivation of first order kinetics - fractional life time, units of rate constants, influence of temperature on reaction rates, Arrhenius equation, Calculation of Arrhenius parameters

Enzyme Catalysis: Classification of enzymes.General properties of Enzymes. Mechanism of enzyme action- Enzyme substrate interaction, Activation energy, Rate of reaction and Michaelis constant. MichaelisMenton equation.

Module II - Ionic equilibrium 9 hrs

Arrhenius, Lowry- Bronstead and Lewis concept of acids and bases, Kw and pH, pH of strong and weak acids, Ka and Kb, mechanism of buffer action, pH of buffer, Hydrolysis of salt, Degree of hydrolysis and hydrolysis constant.

Module III - colloids 9hrs

Colloidal state: Types of colloids, preparation of colloids-Purification of colloids – ultra filtration and electrodialysis, Kinetic, optical and electrical properties of colloids. Ultra microscope, Electrical double layer and zeta potential. Coagulation of colloids, Hardy-Schulz rule. Micelles and critical micelle concentration, sedimentation Application of colloids – Cottrell precipitator, purification of water and delta formation

Module IV- Instrumentation Method 9hrs

Ultracentrifuge: Principle and application

Spectroscopic techniques: Principle and applications of UV and Visible spectroscopy – types of electronic transitions, concept of chromophore and auxochrome – red and blue shifts – applications.

NMR spectroscopy – nuclear spin – principle of NMR – chemical shift – spin-spin interation – PMR of simple organic molecules $CHBr_2CH_2Br$, CH_3CH_2Br and CH_3CH_2OH. Principle of MRI .

Chromatographic techniques : Principle and application of TLC and HPLC .

Electropheresis: Principle and application of Zone electrophoresis and capillary electrophoresis.

Module V - Thermodynamics - 9 hrs

Basic concepts – System – surroundings – open, closed and isolated systems – Isothermal – isochoric and isobaric process – work – heat – energy – internal energy – Heat capacity at constant volume (Cv) and at constant pressure (Cp) – relation between Cp and Cv – First law– The second law – Enthalpy-Entropy-and Free energy-Criteria for reversible and irreversible process Gibbs –Helmholtz equation, concepts of spontaneous and non spontaneous processes.

Module VI Dilutie solutions: 9hrs

Molarity, molality and molefraction - Colligative property – relative lowering of vapour pressure – elevation in boiling point – depression in freezing point – osmotic pressure – experimental determination of osmotic pressure – Isotonic solution – reverse osmosis - abnormal molecular mass - van't Hoff factor.

References:

1) Physical Chemistry-Rakshit

2) Principles of Physical Chemistry- Puri,Sharma, Pathania

3) Instrumental methods of Chemical Analysis- B.K.Sharma

4) Essentials Of Physical Chemistry - Arun Bahl & B.S. Bahl

5). Y.R.Sharma, Elementary Organic Spectroscopy, Pearson Education, New Delhi

6) Physical Chemistry- N.M.Kapoor

MODEL QUESTION PAPER SEMESTER IV

Complementary Course for Microbiology Majors

COURSE CODE CH1431.7 PHYSICAL CHEMISTRY

Time: 3 hours Maximum marks: 80

SECTION A

(Answer all questions. Each question carries 1 Mark)

1)What is unit of second order rate constant?

2) Give an example for enzyme catalysed reaction.

3) What are Arrhenius acids and bases?

4) Calculate the pH of a decimolar HCl.

5) What is sol?

6) What are lyophobic colloids?

7) What are chromophores?

8) How many peaks will you get for 1,2-dibromoethane in its H-NMR spectrum?

9) Define the term isobaric process.

10) What is cryoscopic constant? (10x1=10 marks)

SECTION B

(Answer any 8 question. Each question carries 2 Marks)

11) Prove half life of a first order reaction is independent of initial concentration.

12) Differentiate order and molecularity. 13)Explain the term conjugate pair.

14) Explain the terms Ka, Kb and Kw

15)State and explain Hardy-Schule rule?

16) What is CMC?

17) What is chemical shift?

18) State first law of thermodynamics. Write its mathematical form.

19) Explain the different systems in thermodynamics.

20) What is R_f value? Write any two factor influencing R_f value.

21) A 5.13% solution of cane sugar (M=342) is isotonic with 0.9% solution of unknown solute. Calculate the molar mass of the solute 22)Define the term (i) molarity and (ii) molality.

(8x2=16 marks)

SECTION C

(Answer any 6 question. Each question carries 4 Marks)

23) For the decomposition of a compound, k = 2.46 x $10^{-5}s^{-1}$ at 273K and 1.63 x 10^{-3} s^{-1} at 303K. Calculate the energy of activation of the reaction.

24) What is buffer? Give examples. Explain buffer action with an example.

25) Describe any two methods of purifying colloids.

26) Explain red and blue shifts in UV-Vis spectroscopy.

27) Write the principle and application of zone electrophoresis.

28) Derive the relationship between Cp and Cv.

29) Derive an expression for the isothermal reversible expansion work of an ideal gas.

30) What is van't Hoff factor? What is its application?

31) Describe the experimental determination of osmotic pressure.

(6x4=24marks)

SECTION D

(Answer any 2question. Each question carries 15 Marks)

32) (a) Derive the expression for the rate constant in a first order reaction.
(b) Discuss the different factors influencing the rate of reaction.
(c) (i) Explain the general properties of enzymes.
(ii) Briefly discuss the Michaelis-Menton mechanism of enzyme catalysis.

33) (a) Obtain expression for the hydrolysis constant and degree of hydrolysis for the salt of a strong acid and weak base.
(b) Discuss the kinetic and optical properties of colloids.
(c) Write the important applications of colloids.

34) (a) Explain the principle of NMR spectroscopy
(b) Explain spin-spin interaction taking CHBr2-CH2Br as an example. (c) Explain the principle of HPLC.

35) (a) Free energy change is a measure of spontaneity of reactions. Substantiate the statement.
(b) What are collogative properties? Mention different types of colligative properties. The lowering of freezing point of benzene was 2.33K when 0.412g of a solute of unknown molar was dissolved in 9.31g of benzene. Calculate the molar mass of the solute. Molal depression constant of benzene is 5.1K/m. (c) Explain the following (i) Reverse osmosis (ii) Applications of UV-Vis spectroscopy.

(2x15=30 marks)

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY Course V
Course Code CH1432 .7 Credit 2 Semesters 1,2,3 & 4For students of Botany, Zoology, Home Science, Biochemistry and Microbiology majors.

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1. Acetanilide from aniline
2. Metadinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

A.Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard
b. Estimation of a strong base and a weak base using standardized HCl)

Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH

B. Permanganometry

a. Standardization of $KMnO_4$ by oxalic acid/sodium oxalate and Mohr's salt b. Estimation of oxalic acid/sodium oxalate

c. Estimation of Mohr's salt d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodimetry and Iodometry

a. Standardisation of sodium thiosulphate using std potassium dichromate b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Chromatography

a.Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars

b.Separation of a mixture of dyes by column chromatography.

Gravimetric Analysis

1. Estimation of water of hydration in barium chloride crystals

2. Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1st ,2nd , 3rd and 4th semesters.

The scheme of practical examination may be framed by the Board of Examiners.

UNIVERSITY OF KERALA

B.Sc. DEGREE PROGRAMME IN CHEMISTRY

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

SCHEME AND SYLLABI

2017 ADMISSION ONWARDS

Core Courses, Foundation Course II, Open and ElectiveCourses

Aim and Objective of the Syllabi

Aim

The B.Sc. Degree Programme in Chemistry covers three academic years consisting of six semesters and aims to provide the students with an in-depth understanding of and training in chemical sciences. The syllabus has been designed to stimulate the interest of the students in chemistry and prepared in order to equip the students with a potential to contribute to the academic and industrial requirements of the society. The new, updated syllabus is based on an interdisciplinary approach and is infused with a new vigour and more depth. Chemistry being an experimental science, due importance is given to the development of laboratory and instrumentation skills.

Objective

The main objective is to provide to the students an in-depth understanding of the basic concepts of chemical sciences and enable them with tools needed for the practice of chemistry, which remains a discipline with much stress on experimentation. It attempts to provide a detailed knowledge of the terms, concepts, methods, principles and experimental techniques of chemistry.

Course structure

The First Degree programme in Chemistry comprises of fourteen core courses, one project course, two elective courses, one core-specific foundation course in addition to one area-specific foundation course, the complementary courses and language courses. Among the two open/elective courses, the one offered in the fifth semester is open to students from other Majors. The details of the Course Structure are given in Table I. Table II gives the details of the contact hours and credits for the Core Courses, Foundation Course II, Open Course and Elective Course, Table III gives the details of Open Courses and Table IV gives the details of the Elective Courses and Table V gives distribution of Complementary Courses in different Semesters.

First Degree Programme in Chemistry

Table I : Course structure, Scheme of Instruction and Evaluation

Semester	Course Code	Study component	Instructional hrs/Week		Credit	Duration of Uty. Exam	Evaluation marks		Total Credit
			T	P			CE	ESE	
I	EN1111	English I	5		4	3hrs	20	80	18
	1111	Additional Language I	4		3	3hrs	20	80	
	EN1121	Foundation Course I	4		2	3hrs	20	80	
	MM1131.2	Complementary Course I	4		3	3hrs	20	80	
	PY1131.2	Complementary Course II	2		2	3hrs	20	80	
		Complementary Course Lab of PY1131.2		2	-	-	-	-	
	CH1141	Core Course I	2		4	3hrs	20	80	
		Core Course Lab I of CH1141		2	-	-	-	-	
II	EN1211	English II	4		3	3hrs	20	80	18
	EN1212	English III	5		4	3hrs	20	80	
	1211	Additional Language II	4		3	3hrs	20	80	
	CH1221	Foundation Course II	2	2	3	3hrs	20	80	
	MM1231.2	Complementary Course III	4		3	3hrs	20	80	
	PY1231.2	Complementary Course IV	2		2	3hrs	20	80	
		Complementary Course Lab of PY1231.2		2	-	-	-	-	

Contd……..

First Degree Programme in Chemistry Course structure, Scheme of Instruction and Evaluation

Semester	Course Code	Study component	Instructional hrs/Week		Credit	Duration of Uty. Exam	Evaluation		Total Credit
			T	P			CE	ESE	
III	EN1311	English IV	5		4	3hrs	20	80	18
	1311	Additional Language III	5		4	3hrs	20	80	
	MM1331.2	Complementary Course V	5		4	3hrs	20	80	
	PY1331.2	Complementary Course VI	3		3	3hrs	20	80	
		Complementary Course Lab of PY1331.2		2	-	-	-	-	
	CH1341	Core Course II	3		3	3hrs		80	
		Core Course Lab I of CH1341		2	-	-	-	-	
IV	EN1411	English V	5		4	3hrs	20	80	24
	1411	Additional Language IV	5		4	3hrs	20	80	
	MM1431.2	Complementary Course VII	5		4	3hrs	20	80	
	PY1431.2	Complementary Course VIII	3	2	3	3hrs	20	80	
	PY1432.2	Complementary Course Lab of PY1131.2, PY1231.2, PY1331.2 & PY1431.2			4	3hrs	20	80	
	CH1441	Core Course III	3		3	3hrs	20	80	
	CH1442	Core Course IV-Lab I of CH1141, CH1341 & CH1441		2	2	3hrs	20	80	

Contd……..

Semester	Course Code	Study component	Instructional		Credit	Duration of Uty. Exam	Evaluation		Total Credit
			T	P			CE	ESE	
V	CH1541	Core Course V	3		4	3hrs	20	80	
	CH1542	Core Course VI	4		4	3hrs	20	80	voce
	CH1543	Core Course VII	4		4	3hrs	20	80	
	CH1544	Core Course VIII Lab II		5	0	3hrs	20	80	
	CH 1545	Core Course IX Lab III		4	0	3hrs	0	0	
	1551	Open Course	3		2	3hrs	0	0	
		Project		2	-	-	-	-	14
VI	CH1641	Core Course X	3		4	3hrs	20	80	28
	CH1642	Core Course XI	4		4	3hrs	20	80	
	CH1643	Core Course XII	4		4	3hrs	20	80	
	CH1544	Core Course VIII Lab II		8	3	6hrs	20	80	
	CH 1545	Core Course IX Lab III			2				
	CH1644	Core Course XIII Lab IV			3	6hrs	20	80	
	CH1645	Core Course XIV Lab V			2				
	CH1661.1/ CH1661.2/ CH1661.3/ CH1661.4	Elective Course	3		2	3hrs	20	80	
	CH1646	Project and Factory Visit		3	4	Viva	-	100	

A) Language Courses = 9, B) Foundation Courses = 2, C) Complementary Courses = 9, D) Core Courses = 14, E) Open Course = 1, F) Elective Course = 1, G) Project = 1 Total Courses = 9+2+9+14+1+1+1 = 37.

Total Credits = 18+18+18+24+14+28 =120.

B.Sc. Degree Programme in Chemistry

Table II. Scheme of Instruction of Core Courses, Foundation Course II, Open Course and Elective Course

Course number	Course Code	Course Title	Semester I			Semester I			Semester III			Semester IV			Semester V			Semester VI			Total	
			Hrs			credit			hrs		credit	hrs		credit	hrs		Credit	hours			Hrs	
			T	P		T	P		T	P		T	P		T	P		T	P	credit		credit
C.C. I	CH1141	Inorganic Chemistry I	2		4																2	4
F.C. II	CH1221	Methodology and Informatics				2	2	3													4	3
C.C. II	CH1341	Inorganic Chemistry II							3		3										3	3
C.C. III	CH1441	Organic Chemistry I										3		3							3	3
C.C. IV	CH1442	Lab I of CH1141,CH1341,CH 1441(Inorganic Qualitative Analysis)		2						2			2	2							6	2
C.C. V	CH1541	Physical Chemistry I													3		4				3	4
C.C. VI	CH1542	Inorganic Chemistry III													4		4				4	4
C.C. VII	CH1543	Organic Chemistry II													4		4				4	4
C.C. VIII	CH1544	Lab Course II of CH1541, CH1542 & CH1543 (Inorganic volumetric analysis)														5	3				5	3
C.C. IX	CH1545	Lab Course III of CH1541, CH1542 & CH1543 (Physical chemistry experiments)														4	2				4	2
O. C	CH1551	Any One of the Options													3		2				3	2
C.C. X	CH1641	Physical Chemistry II																3		4	3	4
C.C. XI	CH1642	Organic Chemistry III																4		4	4	4
C.C. XII	CH1643	Physical Chemistry III																4		4	4	4
C.C. XIII	CH1644	Lab Course IV (Organic chemistry experiments)																	5	3	5	3
C.CXIV	CH1645	Lab Course V (Gravimetry)																	3	2	4	2
E.C.	CH1661	Any one of the options																3		2	3	2
C.C.XV	CH1646	Project														2			3	4	5	4
		Factory Visit																				

C.C.- Core Course, F.C.-Foundation Course, O.P.-Open Course, E.C- Elective Course T-Theory, P-Practical.
Since the other requirements as the components of continuous evaluation are satisfied, for each of the practical courses in semester V is given a credit of 2 even though the examinations are on semester 6.

B.Sc. Degree Programme in Chemistry

Table III. Distribution of Open Course offered to students of other disciplinesSemester V

Semester	No. of Hours / Week		Credits	Course Code	Title of the Course	Instructional Hours
	Lectures	Practicals				
5	3	-	2	CH1551.1	Essentials of Chemistry	54
				CH 1551.2	Fundamentals of Chemistry & Its Application to Everyday Life	
				CH 1551.3	Environmental Chemistry	

B.Sc. Degree Programme in Chemistry

Table IV. Distribution of Elective Course offered in Semester VI

Semester	No. of Hours / Week		Credits	Course Code	Title of the Course	Instructional Hours
	Lectures	Practicals				
6	3	-	2	CH1661.1	Supramolecular, Nano Particles and Green Chemistry	54
				CH 1661.2	Computational, Combinatorial and Physical Organic Chemistry	
				CH 1661.3	Polymer chemistry	
				CH 1661.4	Biochemistry	

Table V

Distribution of Complementary Courses in different SemestersComplementary Courses -4
Total Credits – 14One Semester – 18Weeks

Sem	Hours/Week		Number Of Credits	Course	Title of Course	Instructional Hours
	Theory	Practical				
1	2	2	2	CH1131		2×18 = 36 2×18 = 36
2	2	2	2	CH1231		2×18 = 36 2×18 = 36
3	3	2	3	CH1331		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 CH1432		3×18 =54 2×18 = 36

GENERAL ASPECTS OF EVALUATION

MODE OF EVALUATION - COMMON TO CORE, ELECTIVE, COMPLEMENTARY AND FOUNDATION COURSES

Evaluation of each course shall involve Continuous Evaluation (CE) of 20 marks and End Semester evaluation (ESE) of 80 marks .

CONTINUOUS EVALUATION FOR LECTURE COURSES

The Continuous evaluation will have 20 marks and will be done continuously during the semester. CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) Assignment /seminar and

(iii) Test

The weightage is shown in Table I.1. There will be two class tests for which, the better of the two marks obtained will form part of CE. Seminar for each course to be organized by the course teacher and assessed along with a group of teachers in the Department. The topic selection by the student for assignments/seminar will be with the approval of the course teacher.

No	Component	Marks
1	Attendance	5
2	Assignment / Seminar	5
3	Tests	10
	Total	20

EVALUATION OF THE ASSIGNMENTS AND SEMINAR

The assignment typed/written on A4 size paper should be 4-6 pages. The minimum duration of the seminar is fifteen minutes and the mode of delivery may use audio-visual aids if available. The seminar is to be conducted within the contact hour allotted for the course.

Mode of Assignments / Seminar Evaluation		
No	Main Component	Marks
1	Adherence to overall structure &submission deadline	All four main components present &satisfactory : 5 Only three : 4 Only two : 3 Only one : 2
2	Content & grasp of the topic	
3	Lucidity / Clarity of presentation	
4	References / Interaction/Overall effort	

The following explanatory guide lines in Table I.1.1.1 are suggested tentatively for the assessment of each of the above main components as satisfactory or not.

QUESTION PAPER PATTERN FOR CONTINIOUS EVALUATION TEST

1. The theory examination has a duration of 1.5 hours and a maximum mark of 40
2. Each question paper has three parts: A, B & C
3. Part A contains ten questions. Each question carries 1 mark. Students have to answer all 10 questions. The answer may be in the forms – one word/one sentence.
4. Part B contains twelve questions. Out of these twelve questions, the students have to answer 7 questions. Each question carries 2 marks. Each answer should contain four points. (Short Answer type).
5. Part C contains nine questions of which the candidate has to answer 4 questions. Each question carries 4 marks. The answer must contain 8 points (Short Essay type).

Question paper should contain 20% hard,60% medium and 20% easy questions

QuestionPaperPatternforTest		
QuestionNo	*Typeof Question*	*Marks*
Part A: 1-10	All / one word/one sentence	1X10=10
Part B: 11-22	7out of 12; Short Answer	7 X2=14
Part C: 23-31	4 out of 9; Short Essay	4 X4= 16
TOTAL	1 out of 2; Essay	40 marks

CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation will have 20 marks. The ESE of inorganic qualitative analysis will be done only in the IV semester and similarly the ESE of physical chemistry experiments and volumetric analysis will be done only in the VI semester. But the corresponding CE are calculated from all the semesters in which there is attendance for laboratory sessions.

No	Component	Marks
1	Attendance	5
2	Lab test	5
3	Record	5
4	Punctuality	5
	Total	20

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I. 2. 1. EVALUATION OF THE RECORD

On completion of each experiment, a report should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note-book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, and tables of data collected, equations, calculations, graphs, and other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

CE for Laboratory Record		
No	Sub Component	Marks
1	Punctual submission and Neat presentation	All four sub-components present &satisfactory : 5 Only three : 4 Only two : 3 Only one : 2
2	Record of more than 90% experiments in the syllabus	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

During ESE external examiner has to verify that the Lab report of experiments and certified by the tutor and HOD

END SEMESTER QUESTION PAPER PATTERN & GUIDELINE FOR QUESTION PAPER SETTERS

1. The theory examination has a duration of 3 hours
2. Each question paper has four parts: A, B , C and D
3. Part A contains ten questions. Student have to answer all 10 questions. Each question carries1mark. The answer may be in the forms – one word/one sentence.
4. Part B contains twelve questions. Out of these twelve questions, the students have to answer eight questions. Each question carries 2 marks. Each answer should contain four points. (Short Answer type).
5. Part C contains nine questions of which the candidate has to answer six questions. Each question carries 4 marks. The answer must contain 8 points (Short Essay type).
6. Part D contains four questions of which the candidate has to answer two. Each question carries 15marks.Essay type question. Each question carries two or three subdivisions (10+5) or (5+5+5) pattern.
7. The total weightage for the entire questions to be answered is 80 marks.
8. Question paper should contain 20% hard,60% medium and 20% easy questions.
9. Question paper setter shall submit a detailed scheme of evaluation along with question paper.
10. Question paper setters should refer standard text books for setting question papers, based on the syllabus.

QuestionPaperPatternforTest		
QuestionNo	*TypeofQuestion*	*Marks*
Part A: 1-10	10 one word/one sentence	10

Part B: 11-22	8 out of 12; Short Answer	16
Part C: 23-31	6 out of 9; Short Essay	24
Part D: 32-35	2 out of 4; Essay	30
		Total = 80-80 marks

SYLLABUS FOR B.Sc. CHEMISTRY PROGRAMME

Semester – I Core Course - 1 Course Code– CH1141 Credit-4

Inorganic Chemistry I

Lecture -Tutorial-Lab: 2-0-2 *36hrs.*

Aim of the Course

The course builds on the plus-two level introductory chemistry and familiarizes theoretical aspects of atomic structure and periodicity. Subsequently, it delves into the principles of acids, bases and nonaqueous solvents. The course will be highlighting the chemistry of hydrogen as well as s-block elements. The course also introduces the students an idea about environmental chemistry and different types of pollution.

Course objectives

The course helps to learn the students to understand the structure of atom, periodicity and non-aqueous solvents. Upon course completion, the student will be able to appreciate how the inner structure of elements dictates the chemical properties of elements and also understand how the elements are arranged in the periodic table and the properties and application of s -block elements, hydrogen and their compounds.

Course outline

Module I- Atomic Structure and Periodicity *6 hrs.*

Introduction to the structure of atom - Dual nature of electron - de Broglie equation - matter waves and electromagnetic waves - experimental verification of de Broglie relation - Heisenberg's uncertainty principle - expression and significance. Wave mechanical concept of the atom - Schrodinger equation (Derivation not required) -. Quantum numbers - Pauli's exclusion Principle - Aufbau Principle – Hund's rule - Electronic configuration of atoms - classification of elements into s, p, d, f blocks - electronegativity- Pauling's scale, Mulliken and Allred - Rochow scale-(Including numerical problems)

Module II-Hydrogen 6hrs

Position of hydrogen in the periodic table. - Similarities and difference in properties compared with alkali metals and halogens- Atomic and physical properties of hydrogen; Preparation of hydrogen- Reactions of hydrogen. Nascent, atomic and active hydrogen- Ortho and para hydrogen -Deuterium and tritium –Uses of hydrogen- Hydrogen as next generation fuel-Hydrides- Types of hydrides, properties; water; Hydrogen bond-types-consequences of hydrogen bond. Hydrates; Hardness of water- types- different methods water softening. Heavy water- preparation and properties.

Module III-S-Block Elements 9hrs

General characteristics, atomic and ionic radii, ionisation enthalpy, electropositive character, formation of univalent positive ions, hydration of ions, reducing properties, Electrode potentials, characteristic flame colouration, lattice enthalpy, chemical properties, , comparison of lithium with other members of the family, resemblance of lithium and magnesium, uses of alkali metals, properties of alkali metals and their uses, compounds of elements of group 1 – comparative study-oxides, hydroxides, halides, carbonates and bicarbonates General characteristics of group II-atomic and ionic radii, ionisation enthalpy, reducing properties, electrode

potentials, characteristic flame colouration, chemical properties, gradation in properties, comparison of beryllium with other members of the family, Uses of alkaline earth metals, Compounds of alkaline earth metals-Beryllium oxide, beryllium chloride, calcium oxide, calcium hydroxide, calcium cyanamide- preparation and properties. comparison of solubility products of hydroxides and sulphates, Portland cement.

Module IV -Acids, Bases and Non Aqueous Solvents *6hrs*

Lowery-bronsted and Lewis concepts of acids and bases-introduction to SHAB principle. General properties- classification- self ionization and levelling effect- reaction in non-aqueous solvents - protic and aprotic non aqueous solvents- examples- solutions of metals in liquid ammonia- self ionization of liquid ammonia- liquid SO_2, liquid HF, alkali metals in liquid ammonia

Module V - Environmental Chemistry – Air, Water and Soil Pollution *9 hrs.*

Air pollution - ozone layer depletion, ozone hole, protection of ozone umbrella –Air pollution caused by fire works, harmful effects of fireworks, acid rain, green house effect, smog –Classic and photochemical Smog-management of air pollution.

Water pollution: Causes- Heat, industrial waste, sewage water, detergents, agricultural pollutants - treatment of industrial waste water-Activated charcoal, Synthetic resin, reverse osmosis and electro dialysis - Quality of drinking water - Indian standard and W H O standard - Dissolved oxygen - BOD, COD.
Soil pollution - Pesticides, Fertilizers, Industrial waste, plastics - Control of pollution

References

1. T.F.Gieryn, Cultural boundaries of science Univ. Chicago Press 1999.
2. The Golem : What everyone should know about science. H.Collins and T.Pinch. Cambridge Univ Press 1993
3. Alexis Leon & Mathews Leon, Computers Today, Leon Vikas
4. SotiSivendraChanthra Contemporary Science Teaching,
5. ManasChanda, "Atomicstructure and Chemical Bonding including Molecular spectroscopy"
6. E.S. Gilreath "Fundamental concepts of Inorganic Chemistry"
7. Puri, Sharma and Kalia "Inorganic Chemistry"
8. Madan "Inorganic Chemistry".
9. Manku , "Theoretical principles of Inorganic Chemistry" -
10. M. C. Dey and J. Selbin "Theoretical Inorganic Chemistry".
11. F A Cotton and G. Wilkinson "Basic Inroganic Chemistry".
12. S. K. Banerji, "Environmental Chemistry".
13. A. K. De "Environmental Chemistry - An introduction"
14. B. K. Sharma "Air Pollution".
15. V. K. Ahluwalia "Environmental Chemistry"
16. G.W. vanLoon and S. J. Duffy "Environmental Chemistry: A global perspective"
17. Puri, Sharma and Kalia "Inorganic Chemistry"

University of Kerala

Model Question Paper of B.Sc. Chemistry Programme

2017 onwards

Semester -I Core Course-1 Course Code - CH1141 Credit-4INORGANIC CHEMISTRY ITime: Three Hours

Maximum Marks: 80

SECTION A (Answer all questions in one word/one sentence. Each question carries 1 mark)

1. Mention about the flame colouration of II group elements.
2. Write an example of classic smog.
3. State Heisenberg's uncertainty principle.
4. What are matter waves?
5. Which is the conjugate base of HF.
6. Define covalent radius.
7. Write the reason for eutrophication?
8. In the stratosphere, fluorine from the CFC's change to which compound.
9. What is active hydrogen?
10. Mention any use of alkali metals.

(1 X 10 = 10marks)

SECTION B (Answer any 8 questions. Each question carries 2 Marks)

11. Calculate the wavelength of electron moving with a velocity of 10^6 ms^{-1}.
12. A cricket ball weighing 100g is to be located within $0.1A^o$. What is the uncertainty in its velocity?
13. What are eigen values and eigen functions?
14. How first element differs from other elements in a group?
15. What is COD?
16. What are ortho and para hydrogens.
17. Write SHAB principle?
18. Comment about the hydration of alkali metals?
19. State and illustrate Pauli's Exclusion Principle.
20. Distinguish between levelling solvents and differentiating solvents.
21. Write a note on green house effect.
22. What is acid rain? Explain the various types of hydrogen bonds.

(2 X 8 = 16marks)

SECTION C (Answer any 6 questions. Each question carries 4 Marks)

23. Discuss the following reactions in liquid SO_2?(i) Solvation (ii) acid- base reaction
24. Discuss the structure of beryllium chloride
25. Derive Schrodinger wave equation.
26. Briefly explain about the Davisson and Germer's experimental verification of wave nature of electron.
27. What is smog? What are the different types of smog?
28. How ozone layer is depleted?
29. What is the trend of Ionization enthalpy and electron gain enthalpy in the periodic table?
30. What are hydrides? Explain.
31. Discuss about the redox property of alkali metals

(4 X 6 = 24marks)

SECTION D

(Answer any 2 questions. Each question carries 15 Marks)

32.(a) Briefly discuss about the various air pollutants (5 Marks)

(b) Write a note on Ozone depletion (5 Marks)

(c) Explain about the various water quality parameters (5 Marks)

33.(a) What are quantum numbers? Explain (5 Marks)

(b) Write a note on various electronegativity scales (5 Marks)

(c) Explain about the various rules for writing electronic configuration. (5 Marks)

34.(a) What is the difference between inter and intra molecular hydrogen bonding with example.

(b) Discuss the topic hydrogen as next generation fuel

(c)Liquid ammonia is a better solvent for organic compounds. Why?

35.(a) What are the common characteristics of solvents?

(b) Discuss the various methods for removal of permanent hardness

(c) Compare the solubility products of hydroxides and sulphates of alkaline earth metals.

(15 X 2 = 30marks)

SYLLABUS FOR B.Sc. CHEMISTRY PROGRAMME

SEMESTER- II Foundation Course – II COURSE CODE- CH1221 Credit-2

Methodology and Perspectives of Sciences and General Informatics 36Hours

Lecture-Tutorial-Lab: 2-0-2 hours per week; eighteen 5-day weeks per semester. Contact hours per semester: 36 hrs lecture and 36 hrs related lab instruction.

Aim of the Course

The aim is to familiarize the student with the methodology and perspectives of Science and the importance of Science in the development of culture. The course introduces the student to the history of evolution of chemistry as a major branch of science. The course also focuses the various elementary aspects of research in chemistry. The contents emphasize the role of informatics in understanding Chemistry and to learn computer based application in analysis and presentation of experimental data.The course also focuses the various elementary aspects of analytical principles and safety measures in the laboratory.

Objective of the Course

On completion of the course the students will be able to understand how Science or in special Chemistry works. They will get a basic understanding to do self-directed experimentation work and research in chemistry under the guidance and supervision of a mentor. Analytical chemistry helps the students to understand about the experimental parts of the theory and the safety measures which could follow when doing experiments using chemicals.

Course out line

Module – 1 : Methods and Tools of Science & Experimentation in Science ------6 Hrs

Laws of science – Basis for scientific laws and factual truths -hypothesis – observations and proofs. Revision of scientific theories and laws. Importance of models, simulations and virtual testing in chemistry-Design of an experiment – experimentation - observation – data collection – types of data – examples-interpretation and deduction –repeatability and replication-units and dimensions,unit conversions . Documentation of experiments – record keeping

Module II – Evolution of Chemistry as a discipline of science ----------6Hrs

Evolution of Chemistry - ancient speculations on the nature of matter, early form of chemistry-alchemy, Robert Boyle and the origins of modern chemistry in the latter 1600s - Antoine Lavoisier and the revolution in chemistry -Chemical atomism—background and thought of John Dalton. Atom models- Daltons, J. J. Thomson, Rutherford, Bohr model – Major contributions of Friedrich Wöhler, Mendeleev, Michael Faraday and Marie Skłodowska-Curie. Structure of chemical science: scope of chemical science, branches of chemistry. Basic ideas of interdisciplinary areas involving Chemistry

Module III Research in Chemistry 6 Hrs

Selecting a topic – hypothesis- Design of an experiment –- observation – data collection – experimentation. Documentation of experiments – nature and types of data – typical example. interpretation and deduction – necessity of units and dimensions – Accuracy and precision, variables, correlation and causality, sampling, use of controls, experimental bias, analysis, results, discussion of results, models., statistical analysis of experimental data using computers, mean, mode, deviation, standard deviation. -Plotting graph, preparation of seminar papers, project. using computers.

Study of latest Nobel prize topics in chemistry (only one in the year of study of S2 course from Nobel web site).

Module IV – Overview of Information Technology & Introduction to Cheminformatics 6 Hrs

Features of the modern personal computer and peripherals computer network and internet – Operating systems and softwares. Data information and knowledge. Knowledge management – Internet as a knowledge repository, Creating your cyber presence – open access. – Open active publishing models – Basic concepts of IPR, copy right and patents – plagiarism – Cybercrime. Introduction to use of IT in teaching and learning process – Educational softwares – INFLIBNET, NICNET, BRNET, NPTEL, VIRTUAL LABS OF MHRD academic services (elementary level only).

Basics of cheminformatics, applications of cheminformatics, storage & retrieval, file formats – MOL, SDF, CML,PDB formats, SYBYL Line Notation, SMILES of simple molecules like methane, benzene , cyclohexane. Structure drawing, spread sheet and chemistry related softwares. Molecular visualization tools. Chemical Databases.

Module V - Analytical Principles 6 hrs.

Inorganic qualitative analysis - Common ion effect - solubility product - precipitation of cations. Microscale analysis – Advantages

Quantitative Analysis - Theory of titration - acid-base, redox, precipitation and complexometric titrations. Theory of indicators - acid-base, redox, adsorption and metallochromic indicators.

Chromatography - classification of methods - Elementary study of adsorption chromatography Column and thin layer- partition chromatography-paper- ion exchange and gas chromatographic methods.

Module VI - Gravimetric Analysis&*Safety measures in Laboratory* *6 hrs.*

Gravimetric Analysis - Mechanism of precipitate formation - Factors affecting solubility of precipitates – co-precipitation and post precipitation - Effect of digestion - washing, drying and ignition of precipitates.

Introduction to lab safety-regulatory requirements-labels, material safety.Knowledge of hazard warning information and symbols. Explosive compounds(idea), potentially dangerous mixtures- Fire hazards(idea about flammable solvents, ignition sources used in laboratories, metal hydrides),Emergency procedures in chemical splashes to skin and eyes, burns and electric shock.

Reactive inorganic reactants and their toxicity (strong acids, bases, halogens, chromates). Hazards due to chemicals, toxic- solids, liquids, gases, and other harmful substances - carcinogenic substances.

References

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2.The Golem : What everyone should know about science. H.Collins and T.Pinch. Cambridge Univ Press 1993
3.Alexis Leon & Mathews Leon, Computers Today, Leon Vikas
4.Soti SivendraChanthra Contemporary Science Teaching,
5.Alexis & Mathews Leon, Fundamentals and Information Technology. Leon Vikas ISBN 08125907890. 6.Ramesh Bangia, 'Learning Computer Fundamentals, Khanna Book Publishers, ISBN 818752252b
7.Barbara Wilson, Information Technology, The Basics, Thomas Learning.
8.Calvin W Tayler and Frank Barron Scientific Creativity : Its Recognition and Development,
9.Louise Cohen, Lawrence Manion& Keith Morrison A Guide to Teaching Practice.
10.Encyclopaedia of Modern Methods of Teaching and Learning, Edited V K Rao
11.Haseen Taj Current Challenges in Education.
12.Radha Mohan Research Methods in Education.
13.R T Mishra Teaching of information Technology.
14.M Ravikumar Information Technology for Higher Education.
15.Kolasani Sunil Kumar, K Ramakrishna and DigumartiBhaskara Rao Methods of Teaching Chemistry.
16.V. Rajaram, Introduction to Information Technology , Prentice Hall.
17.Newton R G The Truth of Science : New Delhi 2nd edition.
18.Andrew R. Leach and V.J. Gillet An Introduction to Chemoinformatics
19.N.C. Datta The Story of Chemistry , University Press.
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22.A. I. Vogel, "Text book of Quantitative Inorganic Analysis".
23.Day & Underwood "Quantitative analysis: laboratory manual"
24.Comprehensive Practical organic chemistry by A.H Ahluwalia,Renu Aggarwal, 2000, universities press.
25.Hazards in chemical laboratories and guide to safe practices in chemical laboratories published by Royal Society of Chemistry.
26.Vogel's text book of practical organic chemistry new edition
27. *1. https://www.nobelprize.org*

University of Kerala

Model Question PaperofB.Sc.Chemistry Programme

2017onwards

SemesterII Foundation Course 2Course Code CH1221 Credit-2 Methodology and Perspectives of Sciences and General Informatics Time:Three Hours

Maximum Marks:80

Section- A

Each question carries one mark

Answer all Questions. Answer in one word / sentence. Each question carries 1 mark.

1.Who is the father of modern chemistry?
2.Define null hypothesis.
3.What is NPTEL?
4.What you meant by plagiarism?
5.What are the contributions of Dmitri Mendeleev?
6.What are variables?
7.Define common ion effect
8.What are redox indicators?
9.Define accuracy
10. Write the name of two toxic chemicals used in chemistry laboratory.

Section B (short answer type)

(Answerany8questionsfromthefollowing. Each answer carries 2 mark)

11. What is co-precipitation?
12. Define standard deviation.
13. Write a short note on a chemical which is skin irritant.
14. What is meant by data representation?
15. Name four chemistry related softwares?
16. Mention the toxicity of strong acids
17. What is a chemical database?
18. Explain basic concepts of IPR?
19. What are the features of modern personal computer?
20. What are acid base indicators ?
21. What is TLC?
22. Which are the factors affecting solubility of precipitates. Section C (Short essay type)

Answer any 8 from the following. Each question carries 4 marks.

23. What is meant by revision of scientific theories and laws?
24. Explain documentation of experiments.
25. Explain the applications of cheminformatics.
26. Explain copy right and patents.
27. Explain enquiry vs discovery approach?
28. Discuss about the carcinogenic chemicals used in the laboratory.
29. What is the scope of chemical science?
30. Write a short note on the theory of an acid base indicator
31. Explain the principleof gravimetric titration with an example.

Section D.

Answer any 2 from the following. Each question carries 15 marks

32. (a)Explain the various types of file formats .(5 marks)
(b)databases used in cheminformatics ? (5 marks)

(c)Write the SMILES of Methane, Benzene and cyclohexane. .(5 marks)

33. (a) Discuss about chemical safety.
(b) Discuss about the theory of titration.
(c) Write a note on the knowledge of hazard warning informations.

34.(a) Write a short note on the evolution of modern chemistry.
(b) Write a note on induction-deduction methods in knowledge transfer process.

35.(a) Explain the applications of common ion effect and solubility product in analysis of cations. (10 marks)
(b)Write a short note on method to avoid accidents in chemical laboratory. (5marks)

B.Sc. Chemistry Programme
Semester-3 Course-II Course Code – CH1341 Credit-3
Inorganic Chemistry- II 54 hrs

Lecture-Tutorial-Lab: 3-0-2 hours per week; eighteen 5-day weeks per semester. Contact hours per semester: 56 hrs lecture and 36 hrs related lab instruction.

Aim of the Course

The course is emphasized to provide fundamental to detailed knowledge in chemical bonding and compounds of non-transition elements. The course is designed to provide the students the fundamental knowledge of the nanomaterials. The course also describes about the various applications of nuclear chemistry.

Objectives:The objective of this course is to provide a necessary foundation for inorganic chemistry. This course build a thorough knowledge in chemical bonding and compounds of non-transition elements and gives an elementary idea about nanomaterials. It aims to lay a strong foundation in the area of nuclear chemistry.

Course out line

Module-1 Chemical Bonding –I *9hrs*

Concept of resonance, formal charges. VSEPR theory and its applications - structure of molecules with bond pairs only, molecules with both bond pairs and lone pairs . -Valence bond theory-Conditions for overlapping-Types of overlapping (positive, negative and Zero overlapping), - hybridization - methane, ethylene, benzene, acetylene,allenes, sp^3d and sp^3d^2– Limitations of VBT

MO theory, LCAO, homonuclear diatomic molecules- C_2, B_2, N_2, O_2 and ions like O_2^+- heteronuclear diatomic molecules (HF, NO, and CO) – Bond order - comparison of VB and MO theories

Module II : Chemical Bonding –II *9hrs*

Ionic bond-ionic lattice energy of ionic compounds- Bond-Lande equation, BornHaber cycle, solvation energy and solubility of ionic solids-covalent character of ionic bond, Fajan's rules

Polarity of Covalent bond- dipole moment- percentage ionic character- dipole moment and molecular structure

Metallic bonding- free energy theory, VB theory and band theory (Qualitative treatment only)- Secondary forces – hydrogen bond, inter and intramolecular hydrogen bond, intermolecular interaction –-

ion –dipole van der Waals forces such as dispersion forces, dipole-dipole, ion-induced dipole, dipoleinduced dipole

Module III Compounds of non-transition elements I (9 hrs)

Manufacture and uses of the following Glass – different types of glasses, Silicates, Zeolites and Silicones. Borax - boron hydrides, boron nitrides, borazole and carboranes. Oxides and oxyacids of phosphorus. Refractory carbides, nitrides, salt-like carbides, borides, and silicides.

Module IV Compounds of non-transition elements II (9 hrs)

Oxides and oxyacids of halogens (structure only) – Inter halogen compounds and pseudo halogens – Compounds of noble gases (Xenon and Radon)– Uses of noble gases.

Inorganic polymers Phosphorus, boron and silicon based polymers – Structure and industrial applications.

Module V: Nuclear Chemistry (9hrs)

Natural radioactivity, modes of decay, decay constant(Derivation not expected), half life, average life, Disintegration series. Geiger –Nuttal rule, artificial transmutation and artificial radioactivity- nuclear stability, n/p ratio, packing fraction, mass defect and binding energy, Nuclear models –Shell model and liquid drop model. nuclear fission-atom bomb and nuclear fusion-hydrogen bomb-applications of radioactivity- ^{14}C dating, rock dating neutron activation analysis and isotope as tracers. Study of reaction mechanism (ester hydrolysis)-application of radioactive isotopes in medicine - Radio diagnosis and radiotherapy. (Including numerical problems)

Module VI : Chemistry of Nanomaterials (9hrs)

Evolution of Nanoscience – Historical aspects- Preparations containing nano gold in traditional medicine. Lycurgus cup- Faraday's divided metal etc. Nanosystems in nature. Preparation of nanoparticles: Top-down approaches and Bottom to top approach Sol–gel synthesis, Colloidal precipitation, Co–precipitation, Combustion technique, Sonochemistry, Hydrothermal technique, High energy ball milling etc. Carbon nanotubes and fullerenes. Properties of nanoparticles: optical, magnetic, mechanical, thermal and catalytic properties with examples.

Reference:

1. "Basic Inorganic Chemistry" ; F. A. Cotton, G. Wilkinson and P. L. Gaus, Willey
2. "Concise Inorganic Chemistry" : J. D. Lee, ELBS
3. "Theoretical Inorganic Chemistry" : M. C. Day and Selbin
4. "Inorganic Chemistry- Principles and Structure and Reactivity" : J. E. Huheey
5. "Inorganic Chemistry" : Shriver and Atkins
6. "Coordination Chemistry" :Bosolo and Johnson
7. "Coordination Chemistry" : S. F. A. Kettle
8. "Inorganic Chemistry" : J. E. Hueey

9 . Essentials of Nuclear Chemistry : H S Arniker 10.

Puri, Sharma and Kalia "Inorganic Chemistry"

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12.T.F.Gieryn, Cultural boundaries of science Univ. Chicago Press 1999.

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14. S. Glasstone, Source Book on Atomic Energy, 3rd Edition, East-West Press Pvt. Ltd., New Delhi, 1967.

15.The Golem : What everyone should know about science. H.Collins and T.Pinch. Cambridge Univ Press 1993

16."Nano, The Essentials", T. Pradeep, Mc Graw- Hill Education

Model Question Paper of B.Sc. Chemistry Programme
2017 admissions onwards
Semester -III Core Course-II Course Code – CH1341 Credit-3INORGANIC CHEMISTRY IITime: Three Hours
Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. What is the bond order of O_2^+.
2. What is fullerenes?
3. What are nano sensors?
4. Name the hydrogen bonding in salicylaldehyde.
5. What is inorganic benzene?
6. Write an example for inter halogen compound.
7. Example for phosphorus based polymer.
8. Name a naturally occurring radioactive element.
9. Write an example of carboranes?
10. What is zeolite.

SECTION B

(Answer any 8 questions. Each question carries 2 Marks)

11. Compare the properties of Borazole with benzene
12. Explain the method of preparation of gold nano particles
13. Applications of nano particles in medicine and electronics
14. Write a note on Fajans rule
15. Calculate the bond order of N_2, B_2, C_2 and O_2
16. What are the limitations of VBT?
17. Explain the structure of diborane
18. What is lattice energy?
19. State Geiger –Nuttal rule.
20. What are carboranes ?
21. Write a note on Born-Haber cycle
22. What is nuclear fission ?

SECTION C

(Answer any 6 questions. Each question carries 4 Marks)

23. Draw the MO diagram for NO and C_2 molecule
24. Give a comparative account of VB and MO theories using relevant examples.
25. What is meant by dipole moment? How it is helpful in explaining the structure of molecules.
26. Write a note on the preparation of nano particles using sol-gel method.
27. Explain the optical, magnetic, thermal and catalytic properties of nanoparticles with examples.
28. Write the hybridisation and structures of Xenon compounds.
29. Explain artificial transmutation with example.
30. Explain mass defect.
31. Write a note on the manufacture of glasses.

SECTION D

(Answer any 2 questions. Each question carries 15 Marks)

32.(a) Explain VSEPR theory with example (5 marks)

(b) Write a note on solvation energy and solubility of ionic solids (5 marks)

(c) Write a note on secondary bond forces (5 marks)

33. (a) Explain the optical, magnetic, thermal and catalytic properties of nanoparticles with examples (b) Write a note on radio carbon dating.

34. (a) Write a note on the manufacture of glass.

(b)Explain the preparation and bonding of noble gases.

35. (a) Write a note on carbon nanotubes and fullerenes

(b) Explain inorganic polymers

(c) Write a note on band theory

SEMESTER – IV (Core Course – 3) Credit – 3 Course Code – CH1441

Organic chemistry Paper – I Total : 54 hours

Lecture - Tutorial – Lab: 3-0-2

Aim of the Course: The syllabus includes introduction to classificaion, nomenclature, mechanism of reactions, aromaticity and the chemistry of aliphatic and aromatic substituted compounds. The course also describes the stereochemistry of organic compounds.

Objective of the Course: It imparts the behaviour of aliphatic and aromatic compounds and introduces the concept of reaction mechanism. Make the students to understand the mechanism of reactions of organic compounds, stereo chemical aspects, photochemical reactions and aromaticity.

Module I: Introduction to organic chemistry (3 hours)

Uniqueness of carbon – classification of organic compounds – Functional groups (mention only) Review of basic rules of IUPAC nomenclature and IUPAC naming of organic compounds.
Types of reagents: Electrophiles and Nucleophiles.
Types and subtypes of organic reactions: Substitution, addition. Elimination and rearrangement (definition and simp le examples only).

Module II :Introductin to organic reaction mechanism: (9 hours)

Definition of reaction mechanism.
Drawing of electron movements with arrows – curved arrow notation. Half headed and double headed arrows. Nature of bond fissions :Homolysis and heterolysis.
Electron displacement effects: Inductive effect, electromeric effect, mesomeric effect, resonance, hyperconjugative and steric effects.
Acidity and basicity of organic compounds based on inductive and resonance with reference to acid characters of alcohols, phenols and carboxylic acids and basic character of aliphatic and aromatic amines.
Applications of hyperconjugative effect – stability of alkenes, alkylbenzenes, free radicals and carbocations.

Reaction intermediates: Carbocations, carbanions, free radicals and carbenes (definition, hybridization, structure, classification, formation, stability and important reactions) – rearrangement of carbocations – nitrenes(mention only).

Introduction to pericyclic reaction – Electrocyclic, cycloaddition and sigmatropic reactions.

Module III : Reaction Mechanism II (9 hours)

Aliphatic nucleophilic substitutions, mechanism of SN1 and SN2 reactions – Effect of structure, substrate, solvent, nucleophile and leaving goups. Stereochemistry – Walden Inversion.
Elimination reaction: Hoffmann and Saytzeff rule – cis and trans eliminations – mechanisms of E1 and E2 reactions. Substitution vs Elimination.

Addition reactions – mechanism of addition of bromine and hydrogen halides to double bonds – Markownikoff's rule and peroxide effect. Cis-hydroxylation.
Elimination – Addition mechanism – Benzyne intermediate.

Methods of determination of reaction mechanism – product analysis, intermediates, isotopic effect, kinetic and stereochemical studies.

Module IV: Stereochemistry I (6 hours)

Representation of organic molecules: Fischer, Flying wedge, Sawhorse and Newman projection formulae.
Conformational isomerism – conformation – Dihedral angle – Torsional strain – conformational analysis of etha ne and n-butane including energy diagrams – Baeyer's strain theory – Sache-Mohr theory of strainless rings – conformation of cyclohexane (chair, boat and skew boat forms) – axial and equatorial bonds – ring flipping – conformers of mono and dialkyl substituted cyclohexanes.

Module V: Stereochemistry II (9 hours)

Optical Isomerism : Chirality and elements of symmetry – DL notation – Enantiomers – optical isomerism in glyceraldehydes, lactic acid and tartaric acid – Diastereoisomers – mesocompounds – Cahn-Ingold-Prelog rules – R-S notations for optical isomers with one and two asymmetric carbon atoms.- erythro and threo representations. Racemic mixture – resolution – methods of resolution.
Enatiomeric excess – Introduction to asymmetric synthesis

Optical activity in compounds not containing symmetric carbon atoms – biphenyls and allenes.
Geometrical isomerism – cis-trans, syn-anti and E-Z notations – geometrical isomerism in maleic and fumaric acids and unsymmetrical ketoximes – methods of distinguishing geometrical isomers using melting point, dipolemoment, dehydration and cyclisation.

Module VI: Organic photochemical reactions and Dyes (9 hours)

Introduction – photochemical vs thermal reactions
Photochemical reactions of olefins: Photosensitization and photodimerisation
Photochemistry of carbonyl compounds: Norrish I, Norrish II cleavages. Photo reduction (Benzophenone to benzopinacol)

Dyes – Theory of colour and constitution – classification according to structure and method of application. Preparation and uses of methyl orange, congored, malachite green, crystal violet, phenolphthalein, fluorescein, alizarin and indigo.

Module VII :Arenes and Aromaticity (9hours)

Heat of hydrogenation and heat of combustion of benzene – structure of benzene, naphthalene and anthracene – Concept of aromaticity – Huckel's rule – Application to benzenoid and nonbenzenoid compounds.

Reactions – Mechanism of electrophilic substitution in benzene – halogenation, nitration, sulphonation and Friedel Craft's alkylation and acylation – energy profile diagram.

Ring activating and deactivating groups with examples – orientation effect in monosubstituted benzene - –OH, $-NH_2$, NO_2, $-CH_3$ and halogens.

Aromatic nucleophilic substitution – bimolecular displacement mechanism – Elimination-Addition mechanism. Reactivity and orientation in Aromatic Nucleophilic substitution.

Reactivity of naphthalene towards alkylation, nitration and sulphonation. Carcinogenic polynucleararenes

References

(1) A.Bahl and B.S.Bahl, Advanced Organic Chemistry, S.Chand& Company, New Delhi.
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(3) K.S.Tewari, N.K.Vishnoi and S.N.Mehrotra, A textbook of Organic Chemisty, Vikas Publishing House (Pvt) Ltd., New Delhi..
(4) S.C.Sharma and M.K.Jain, Modern Organic Chemistry, Vishal Publishing Company, New Delhi.. (5)P.L.Soni, Organic Chemistry
(6) D.Nasipuri, Stereochemistry of Organic Compounds: Principles and Applications, New Age International Publizhers, New Delhi.
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(8) R.T.Morrison, R.N.Boyd. Organic Chemistry, Pearson Education, New Delhi.
(9) P.Y.Bruice, Essential Organic Chemisty, Pearson Education, New Delhi.
(10) Peter Sykes, A Guide Book to Mechanism in Organic Chemistry, Pearson Education, New Delhi.
(11) J.Clayden, N.Greeves and S.Warren, Organic Chemistry, Oxford University Press, New York.
(12) G.M. Louden, Organic Chemistry, Oxford University Press, New York.
(13) E.L.Eliel, Stereochemistry of Carbon compounds, Tata McGraw Hill Publishing House, New Delhi.
(14) Jagadamba Singh and Jaya Singh, Photochemistry and Pericyclic rections, New Age International, New Delhi.
(15) J.March, Advanced Organic Chemistry, John Wiley & Sons., NY.
(16) S.M.Mukerji and S.P.Singh, Reaction Mechanism in Organic Chemistry, McMillan Publishers.
(17) I L Finar, "Organic Chemistry" Vol – 1, 5th Edition, Pearson Education, NewDelhi

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
SEMESTER IV Core Course III Course Code CH1441Credit-3
ORGANIC CHEMISTRY I

Time:3hours Max.Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. What is the product formed when a bond undergoes homolytic fission?
2. Give one example for each (i) substitution reaction and (ii) elimination reaction.
3. Write an example for electrocyclic reaction.
4. Name two reagents used for cis-hydroxylation.
5. What the products obtained when naphthalene undergoes sulphonation at different temperatures?
6. Identify the orienting effect of the following functional groups $-CH_3$, $-NO_2$, -CHO and –OH.
7. What are chromophores?
8. What are conforms?
9. What is geometrical isomerism?
10. Explain the term chirality. (1 X 10 =10 Marks)

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. What are electrophiles and nucleophiles? Give examples
12. Write the structure of the following compounds (i) 3,3,4-trimethyl-4-heptene (ii) 2- ethyl-3-methyl hexanal.
13. Phenol is acidic while ethanol is not. Why?
14. Arrange the following in the decreasing order of stability. Justify your answer.
    $(CH_3)_2CH^+$, CH_3^+, $(C_6H_5)_2CH^+$, $C_6H_5CH_2^+$
15. Give an example and state Hofmann rule.
16. What is Walden Inversion?
17. What is Kharasch effect? Illustrate with an example.
18. When toluene is nitrated the major products are ortho and para substituted products. Why?

19. Define Huckel's rule.
20. Explain photosensitization with an example.
21. What is enantiomeric excess?
22. Explain with examples the importance of dipole moment measurements in distinguishing geometrical isomerism.

(2 X 8 = 16 Marks)

SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. What is inductive effect? How is it affect the acidity and basicity of organic acids and bases?
24. Explain the mechanism of E1 and E2 eliminations.
25. o-chloro toluene when treated with sodamide in liquid ammonia gives o-toluidine and m-toluidine. Explain this observation with relevant mechanism.
26. Explain Norrish I and Norrish II reactions.
27. Determine the R & S notations of the asymmetric carbon atoms in (+)-tartaric and (-) tartaric acid
28. Explain the conformational analysis of n-butane.
29. Give a brief account on optical activity due to restricted rotation.
30. Explain any two methods of determination of reaction mechanism.
31. What are non-benzenoid aromatics compounds. Explain their aromaticity with examples

(4 X 6 = 24marks)

SECTION – D

(*Answer any2 question. Each question carries 15 marks*)

32. (a) Explain SN1 and SN2 mechanisms.
(b)Write the influence of structure of the substrate and polarity of the solvent on nucleophilic substitution reactions. (c) Explain Baeyer's strain theory.
33. (a) Explain the mechanism of (i) nitration (ii) halogenation of benzene.
(b) Discuss the orientation of influence of $-NO_2$ and –OH group in aromatic electrophilic Substitution.
(c) Discuss the classification of dyes on the basis of structure.
34. (a) What is resolution? Explain different methods of resolution.
(b) What are carbenes? How are they generated? Comment on the structure of carbene.
(c) Draw conformers of dimethyl cyclohexane and discuss their comparative stability.
35. (a) Write the synthesis and uses of the following dyes (i) Malachite green (ii) Methyl Orange.
(b) Explain the geometrical isomerism of maleic and fumaric acid.
(c) Explain the elimination-addition mechanism in halo benzens.

(15 X 2 = 30marks)

B.Sc. Chemistry Programme
Semester – V (Course V)
Course Code – CH1541 Credit - 3
Physical Chemistry – I 54 hours

Aim of the course: This course is an introduction to different states of matter and provides a firm foundation for understanding the physical principles that govern chemical systems. The course also describes the principles of chemical thermodynamics and group theory.

Objectives: Students, upon completion of this course, will gain exposure and practice in the areas of physical chemistry which include gas and liquid properties, thermodynamics, and group theory. The laws of thermodynamics form the appropriate organizational tool to understand the chemistry of bulk systems.

Module I – Gaseous state (9 hrs)

Ideal gas equation, Behaviour of real gases, Deviation from ideal behaviour, Compressibility factor, Boyle temperature - van der Waal's equation of state – derivation and importance, Virial equation of state.

Critical phenomena: Isotherms of CO_2, continuity of states, Critical constants and their experimental determination, relation between critical constants and van der Waals constants.

Types of molecular velocities and their inter relations. Maxwell Boltzmann distribution of molecular velocities, Statement of equation and explanation (No derivation), Effect of temperature on distribution of molecular velocities - Derivation of most probable and average velocities from the equation.

Collision properties. Collision diameter, Collision number, Collision frequency and mean free path. Relation between collision parameters and viscosity and thermal conductivity of gases (no derivation).

Module II – Solid state (9 hrs)

Isotropy and anisotropy, Space lattice and unit cell, Elements of symmetry of crystals, Bravais lattices, Crystal systems, Laws of rational indices, Miller indices, Representation of lattice planes of cubic crystals, Determination of Avogadro number from crystallographic data, X-ray diffraction studies of crystals, Bragg's equation – derivation and applications, Rotating crystal and powder method, Structure of NaCl and KCl Rutile, Zinc blend, Wurtzite - Imperfections in crystals, point defects – Schottky and Frenkel defects, Non-stoichiometric defects – Line defects – edge dislocation – screw dislocation.

Module III – Liquid state and Dilute solutions (9 hrs)

Vacancy theory of liquid state : Properties of liquids: Surface tension and its measurement by capillary rise and stalagmometer method, factors affecting Surface tension, Viscosity, Poisuelle's equation, Determination of viscosity by Ostwald's viscometer, Refractive index and its determination by Abbe refractometer.

Dilute solutions: Molarity, Molality, Normality and Mole fraction. Colligative properties, Thermodynamic derivation of $\Delta T_b = K_b \times m$ and $\Delta T_f = K_f \times m$, Osmotic pressure, van't Hoff equation and molecular mass, Isotonic solutions, Reverse osmosis - Determination of molecular mass of solutes by Beckmann's method, Rast's method and cooling curve method. Abnormal molecular mass, van't Hoff factor, Determination of degree of dissociation and association.

Module IV – Thermodynamics I (9hrs)

Types of Processes, Zeroth law of thermodynamics Definition of internal energy and enthalpy. Heat capacities at constant volume (Cv) and at constant pressure (Cp), relationship between Cp and Cv. Mathematical statement of first law. Reversible process and maximum work. Calculation of work, heat, internal energy change and enthalpy change fo r the expansion of an ideal gas under reversible isothermal and adiabatic condition. The Joule-Thomson effect – derivation of the expression for Joule-Thomson coefficient. Sign and magnitude of Joule-Thomson coefficient, inversion temperature.

Thermochemistry – standard states. Enthalpies of formation, combustion and neutralization. Integral and differential enthalpies of solution. Hess's law and its applications. Kirchoff's equation – Flame and explosion temperatures.

Module V – Thermodynamics II (9 hrs)

Need for IInd law of thermodynamics. Different statements of IInd law, Thermodynamic scale of temperature. Carnot cycle and its efficiency, Carnot theorem. Concept of entropy- Definition and physical significance. Entropy as a function of volume and temperature, Entropy as a function of pressure and temperature. Entropy as a criterion of spontaneity and equilibrium. Gibbs and Helmholtz free energies and their significances - criteria of equilibrium and spontaneity.

Gibbs-Helmholtz equation, dependence of Gibbs free energy changes on temperature, volume and pressure. Maxwell's relations. Partial molar quantities. Chemical potential-Gibbs-Duhem equation. Clapeyron – Clausius equation. Concept of fugacity, determination of fugacity by graphical method.

Module VI – Group theory – 9 hours

Group theory: Elements of symmetry – Proper and improper axis of symmetry, plane of symmetry, centre of symmetry and identity element. Combination of symmetry elements, Determination of point groups of simple molecules like Acetylene,H_2O, NH_3, BF_3, $[Ni(CN)_4]^{2-}$ and C_6H_6.Symmetry operations. Order of a group. Combination of symmetry operations. Group theoretical rules. Construction of Group multiplication table of C_2V. (5 hours)

Liquid crystals:

Origin of liquid crystals, mesogens self-organisation, Types –smectic, nematic and cholesteric liquid crystals, characterization of liquid crystals, Swarm theory of liquid crystals, uses of liquid crystals, characterization of LCmaterials by DSC, PLM and x-ray. (4 hours)

(At least 100 problems are to be worked out from all units together. 30% of the questions for Examination shall contain problems.)

References

1. P W Atkins, "Physical Chemistry", Oxford University Press
2. R J Silby and R AAlberty, "Physical Chemistry", John Wiley & Sons
3. G W Castellan, "Physical Chemistry", Narosa Publishing House
4. F Daniels and R AAlberty, "Physical Chemistry", Wiley Eastern
5. E A Moelwyn Hughes, " Physical Chemistry", Pergamon Press
6. Puri, Sharma and Pathania, "Principles of Physical Chemistry", Millennium Edition, Vishal Publishing Co
7. R.StephenBerry,StuartA.Rice,JohnRoss,"Physical Chemistry,2nd edition,Oxford".
8. Gurdeep Raj, "Advanced Physical Chemistry", Goel Publishing House
9. S Glasstone, "Thermodynamics for Chemists", Affiliated East West Publishers
10. L V Azaroff, " Introduction to Solids", McGraw Hill
11. N B Hannay, " Solid State Chemistry", Prentice Hall
12. Anthony R West, " Solid State Chemistry and its Applications", Wiley Eastern
13. V Ramakrishnan and M S Gopinathan, "Group Theory in Chemistry",Vishal Publishing Co.
14. A. SalahuddinKunju and G. Krishnan "Group Theory and its Applications in Chemistry" 15. A.S.Negi and S.C.Anand, A text book of Physical Chemistry, New Age International publishers.

University of Kerala
Model Question Paper of B.Sc. Chemistry Programme
(2017 admissions onwards)

Semester V- Core Course-5 Course Code 1541 Credit-4
Physical Chemistry –I

Time: 3 Hrs Total marks: 80

Section A. Answer all the questions. Each question carries 1 mark

1. Write down the van der Waal's equation for n moles of a gas.
2. In which type of liquid crystals, the colour of the material is sensitive to temperature changes?
3. What are isotonic solutions?
4. Write down the conditions at which real gases tend to approach ideal behaviour.
5. Define the term fluidity.
6. What is inversion temperature?
7. Write down the efficiency of Carnot engine.
8. The average speed of a certain gas at $27^{o}C$ is $400ms^{-1.}$ Calculate the temperature at which the speed will be $800ms^{-1}$.
9. What is meant by unit cell in crystallography?
10. What is the physical significance of entropy? (1 x 10 = 10 marks)

Section B

Each question carries2 marks (Short answer). Answer any 8 questions

11. What are colligative properties?
12. Write the point group to which NH_3 belongs and mention the symmetry elements present in NH_3.
13. Explain van't Hoff factor
14. Explain first law of thermodynamics.
15. Derive the expression for Joule Thomson coefficient
16. Explain any two statements of second law of thermodynamics.
17. Maximum work is obtained from a reversible process. Substantiate.
18. What are the proper and improper axes of symmetry?
19. Draw the group multiplication table of C_{2v}point group 20.Define the terms collision frequency and collision number.
21. Explain virial equation of state.
22. Explain elements of symmetry of crystals. (2×8 = 16)

Section C

Each question carry 4 marks (Short essay) Answer any 6 questions

23. Derive root most probable velocity and average velocity from Maxwell- Boltzmann equation.
24. An aqueous solution containing 0.25 g of a solute dissolved in 20 g of water froze at – 0.42 ^{o}C. Calculate the molar mass of the solute. Molar heat of fusion of ice at $0^{o}C$ is 6.025 KJ and R = 8.314 $JK^{-1}mol^{-1}$
25. Deduce the relationship between Cp and Cv by thermodynamics.
26. Explain different types of semi-conductors and their uses.
27. What is the law of corresponding states? How is it derived from van der Waals equation.
28. Explain Gibbs - Helmholtz equation and its significance
29. What is chemical potential and derive Gibbs Duhem equation?

30. Explain Hess's law and its applications
31. Derive the relation between depression of freezing point and lowering of lowering of vapour pressure.

(4 x 6 = 24 marks)

Section D

Each question carries 15 marks (essay), Answer any two questions

32. a) Derive Bragg's equation. (5 marks)
    b) The edge length of the unit cell of NaCl crystal lattice is 564 pm by X-ray diffraction. Compute the interionic distance between sodium and chloride ions. (5 marks)
    c)Explain point defects in a crystal. (5 marks)

33. a) What is meant by reversible process? Derive an expression for work done in the reversible isothermal expansion of an ideal gas. (5 marks) b) Calculate the work done in expanding one mole of an ideal gas from a volume of 2 to 20 dm^3 at 27 ^0C (5 marks) c) Derive the relation between Cp and Cv. (5 marks)

34. a) Calculate Tc, Pc and Vc for C2H2. Given a = 4.390 atm litre mol^{-2}, b=0.05136 litre mol^{-1}. (5 marks)
    b) Do all gases obey gas laws? Discuss some experimental results to explain deviation and point out the causes which accounts for this behaviour. (10 marks)

35. a) Derive thermodynamically the relation between the elevation of boiling point of a solvent and molal concentration of an electrolyte dissolved in the solvent. (5 marks) b) The surface tension of water at 293 K is 72.75 dyne cm^{-1}. How high will a column of water rise in a capillary tube with a radius of 0.005 cm. (5 marks) c) Illustrate the operation improper rotation. (5 marks)

(15x2=30)

B.Sc. Chemistry Programme

Semester 5 Course – V Course Code –CH1542 Credit 4

Inorganic Chemistry – III (72 hrs)

Lecture-Tutorial-Lab: 4-0-3 hours per week; eighteen 5-day weeks per semester. Contact hours per semester: 72 hrs lecture and 54 hrs related lab instruction.

Aim of the course: The main objective of this course is to help students to learn the important multidisciplinary areas of bioinorganic chemistry and organometallic chemistry. The main theme of this course is the importance of fundamental concepts needed to understand transition metal chemistry, including transition meta l ions in biological systems and about the inner transition elements and the principles of coordination chemistry. The course also describes about the general principles of isolation and purification of elements and instrumental methods of analysis.

Objectives: Students, upon completion of this course, will gain exposure and practice in the areas of inorganic chemistry which include coordination chemistry, transition and inner transition elements. Students will have a thorough understanding of the classification of several organometallic reactions and will be able to identify the role of organometallic compounds in organic synthesis. Instrumental methods of analysis and general principles of isolation of elements help the students to understand about the experimental techniques used in chemistry and how the elements are isolated from their ores.

Course out line

Module I Transition and inner transition elements (18 hrs)

(a) Transition elements : Electronic configuration and general characteristics – oxidation state, ionization enthalpy (variation of I,II and III ionization enthalpy across 3d series), enthalpy of atomisation, melting and boiling point, density, variation of std. electrode potentials ($E^{o}_{M^{2+}/M}$& $E^{o}_{M^{3+}/M^{2+}}$), stability of higher oxidation states, colour, magnetic property, catalytic property and formation of complexes. Comparison of 3d, 4d and 5d transition series –Preparation, properties and uses of $K_2Cr_2O_7$, $KMnO_4$ and $TiCl_4$. Important application of transition metals

(b) Lanthanides and actinides : Lanthanides - electronic configuration and general properties, reactions – Occurrence and isolation of lanthanides from monazite – Lanthanide contraction – consequences of lanthanide contraction– Magnetic properties and complexation behaviour.

Actinides – Oxidation states, ionic radii, colour, complex formation, actinide contraction, comparison with lanthanides.

Module II Coordination Chemistry (18 hrs)

Nomenclature (latest version) – ligands and their classifications. EAN rule – Chelates – Stability of complexes – Factors affecting stability of complexes – Isomerism – Structural and stereoisomerism – Geometrical and optical isomerism – Bonding in complexes – V.B. Theory, CFT applied to Oh, Td and SPcomplexes. factors affecting crystal field, –– Spectrochemical series – CFSE, Magnetic properties and colour of metal complexes .Effect of crystal field splitting –Jahn -Teller effect, Tetragonal distortion of an octahedral complex- –– Application of coordination compounds in quantitative and qualitative analysis. Reactions of metal complexes-labile &inert complexes, ligand substitution reactions- S_N1 & S_N2 reactions-

Module III Organometallic Compounds(12hrs)

Organometallic Compounds : Definition – Nomenclature and classification – sigma complex – Pi complex – those containing both sigma and Pi bonds – 18 electron rule – Metal carbonyls – mononuclear and polynuclear (give examples of carbonyls of Fe, Co, Ni) – preparation and properties of carbonyls(Fe, Ni, Mn, Cr) Vibrational frequency of CO bond in metal carbonyls – Bonding in organometallic compounds like ferrocene, dibenzene chromium, Ziese's salt (Without MOT)– Dinitrogen complexes – Application of organometallic compounds.

Module IV Bioinorganic Chemistry 6 hrs

Bioinorganic Chemistry: Role of metal ions in biological systems – Biochemistry of iron, haemoglobin and myoglobin (elementary idea of the structure and mechanisms of their actions). Electron transport proteins: Cytochromes, Fe- Sulphur proteins, Storage and transport of iron .Photosynthesis – Sodium-Potassium pump - Biochemistry of magnesium and calcium (brief study only)

Module V General Principles of Isolation of Elements 9hrs

Methods of concentration of an ore-Gravity separation, Froth floatation, Magnetic separation, Leaching, electrostatic separation, Automated ore sorting and dewatering,Preliminary processes - calcination and roasting.

Methods of preparing metal from concentrated ore- Electro metallurgy- Metallurgy of Aluminium, Sodium-Pyro Metallurgy- - Metallurgy of Iron, Zinc, Aluminothermy, Auto reduction-Hydro Metallurgy- Metallurgy of Silver, Gold

Purification of crude metal- Distillaion, Liquation , Zone refining, Vapour phase refining (Mondsproess and van Arkel processes), Electro refining, Chromatography technique

Module VI: Instrumental Methods of Analysis 9hrs

Atomic absorption spectroscopy- flame emission spectroscopy- applications – colorimetry-spectrophotometry- laws of spectrophotometry- Beer- Lambert's law- applications of spectrophotometry-thermal methods- introduction to TG, DTA and DSC- instrumentations and applications. Tools for measuring nanostructures: XRD, Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy(STM), Scanning Electron Microscopy(SEM), Transmission Electron Microscopy(TEM) *References:*

1. Advanced Inorganic Chemistry : Cotton and Wilkinson
2. Inorganic Chemistry : J.E. Huheey
3. Inorganic Chemistry : Shriver and Atkins
4. Concise inorganic Chemistry :J.D.Lee
5. Coordination Chemistry :Bosolo and Johnson
6. Coordination Chemistry : S. F. A. Kettle
7. Bio inorganic Chemistry : M.N. Hughes
8. "Fundamentals of Inorganic Chemistry" : E. S. Gilreath
9. "Instrumental Methods of Analysis" : Willard, Merrit
10. A. K. Srivasthava and P. C. Jain, "Chemical Analysis"
11. Puri, Sharma and Kalia "Inorganic Chemistry"

University of Kerala

Model Question Paper of B.Sc. Chemistry Programme

2017 admissions onwards

Semester V Course VI Course Code CH1542 Credit-4

Inorganic Chemistry III

Time: Three Hours Maximum Marks : 80

Section A

Answer all questions, each question carries 1 mark (answer in a word\sentence)

1. Which is more basic; $La(OH)_3$or $Lu(OH)_3$?
2. Give the general outer electronic configuration of a transition element.
3. Which is the catalyst used in the oxidation of SO2 to SO3 in contact process?
4. Name the element obtained by the bombardment of ^{238}U with an a – particle.
5. What is the coordination number of Ag in $[Ag(CN)_2]$?
6. Give the IUPAC name of $Na_3[Co(CO_3)_3]$ 7 What is the unit of magnetic moment?
8. Give the example for a tridentate ligand.
9. Write the structure of ferrocene.
10. Give the formula of a metal carbonyl which does not obey 18-electron rule. (1 x 10 = 10)

Section B

Answer any 8 questions, each question carries 2 marks (short answer questions)

11.Explain zone refining.

12.Name the metal ion, other than magnesium, involved in photosynthesis.

13. Give an example of phosphorus based polymer.
14. What is 'inorganic graphite?
15. What is the oxidation number of P in H3PO4?
16. Give the formula of a methanide.
17. Transition metals are less reactive than the alkali and alkaline earth metals - Justify.
18. Which is more stable: Cu^{2+} or Cu^{+}in aqueous solution. ? Substantiate your answer.
19. Which has got greater tendency to form complexes; lanthanides or actinides ? Give reasons. 20.Write the difference between calcinations and roasting 21.What is an ambidentateligand ? Give example.

22.Explain geometrical isomerism in metal complexes with suitable example.

(2x8=16)

Section C

Answer any 6 questions, each question carries 4 marks (short essay type)

23.What is Ziese'ssalt ? Give its structure.

24. State and explain 18-electron rule.

25. How haemoglobin differ from myoglobin.

26. What are carboranes ?

27. Purification of crude metals by Mondsproess and van Arkel processes

28. What happens when orthophosphoric acid is heated ?

29. What is lanthanide contraction ? Explain its consequences .

30. What are the factors that affect stability of metal complexes ?31.Give an account of the applications of coordination compounds in quantitative and qualitative analysis.

Section D

(Answer any 2 questions, Each question carries 15 marks) (essay type)

32.a.Describe the ion exchange method for the separation of lanthanides from monazite. (5 marks)

b. Describe the splitting of d-orbitals in tetrahedral and octahedral fields according to crystal field theory.(5 marks)

c.Comment on the magnetic properties of lanthanides .(5 marks)

33.a.Give an account of the preparation, properties, structure and bonding of noble gas compounds. (10 marks)

b.Discuss the nature of bonding in metal carbonyls. (5marks)

34.a.How silicones are prepared ? Discuss their structure and uses.

b.Give an account of sodium-potassium pump in biological systems.

c.Explain the principle of TG with example.

35.a.Starting from pyrolusite, how KMnO4 is prepared ?

b.Explain the principle and working of AFM.

Semester- V Core Course -VII Credit-4 Course Code – CH1543

Organic Chemistry- II

72 Hrs Lecture- Tutorial- Lab : 4-0-2

Aim of the Course: The course deals with organic compounds like alcohols, aldehydes, ketones, ethers, acids and their properties. The course also describes the principles of spectroscopy and spectral applications to organic molecules and also introduces the fundamentals of green chemistry and supramolecular chemistry.
Objective of the Course: The students will get an interesting idea about the preparation and properties, mechanism of reactions of many organic conversions and of organic compounds. They will also get sufficient knowledge to interpret spectrum of organic compounds and the novel areas of organic chemistry – the supramolecular and green chemistry.

Organic chemistry Paper II

Module I: Alcohols, Phenols and Ethers (12 hours)

Alcohols: Preparation: From alkenes (hydration. Hydroboration-oxidation, oxy-mercurationdemercuaration) and carbonyl compounds (reduction and with Grignard reagent)

Chemical properties: Reactions involving cleavage of O-H bonds (acidity and esterification), oxidation (with PCC, Collins reagent, Jones reagent and $K_2Cr_2O_7$) and catalytic dehydrogenation – distinction between primary, secondary and tertiary alcohols – Ascent and descent in alcohol series. Biofuel – ethanol and biodiesel.

Dihydric alcohols: Oxidative cleavage – Lead tetra acetate, periodic acid – Pinacol-pinacolone rearrangement.

Phenols: Preparation from halobenzens, cumene and sulphonic acid. Chemical properties: Acidity of phenol - effect of substituents on acidity. Comparison of acidity with alcohol – bromination, nitration, sulphonation, Reimer-Tiemann reaction (mechanism expected), Kolbe reaction, Liebermann's nitroso reaction and Lederer-Mannasse reaction. Distinction between alcohols and phenols.

Ethers: Preparation by Williamson's synthesis. Reactions of ethers : Cleavage by HI and Claisen rearrangement (Mechanism expected) – Ziesel's method of estimation of methoxy group. Crown ethers: Nomenclature and importance of crown ethers.

Epoxides: Preparation from alkenes – acid and base catalysed ring opening reactions.

Module II : Aldehydes and Ketones (12 hours)

Preparation: Oxidation of primary and secondary alcohols using PCC, reduction of esters using DIBAL-H, Rosenmund reduction, Gattermann-Koch formylation and Friedel-Craft's acylation.

Chemical properties: Nucleophilic addition (HCN, $NaHSO_3$, RMgX and ROH)
Addition-elimination reaction (with ammonia and ammonia derivatives)
Reduction (Metal hydrides (mechanism expected), MPV reduction, Clemmenson and Wolff-Kishner reduction)

Oxidation: with $KMnO_4$, Tollen's reagent, Fehling solution, Br_2 water, Oppenaur oxidation, Baeyer-Villiger oxidation.
Acidity of α-hydrogen: Aldol, Claisen-Schmidt, Benzoin, Perkin and Knovenagel condensations (Mechanisms expected).
Haloform reaction – Iodoform test – Cannizaroreaction(mechanism expected) and Beckmann rearrangement(mechanism expected)

Module III: Carboxylic acids, Sulphonic acid and their Derivatives (12 hours)

Preparation: Hydrolysis of nitrile, carboxylation of Grignard reagent and oxidation of alkyl benzenes.

Chemical properties: Acidity – effect of substituents on the acidity of aliphatic and aromatic carboxylic acids – HVZ reaction – Decarboxylation – Kolbe electrolysis (Mechanism expected). Ascent and descent series in aliphatic carboxylic acids.

Preparation, properties and uses of anthranilic acid, cinnamic acid, citric acid, lactic acid, oxalic acid, adipic acid and phthalic acid.

Formation of acid derivatives – acid chlorides, amides, acid anhydrides and esters – comparison of reactivity of acid derivatives. Preparation of coumarin – Fries rearrangement (Mechanism expected)

Preparation and reactions of benzene sulphonic acid, toluene sulphonic acid and benzene sulphonyl chloride – Importance of tosyl group – synthesis and application of saccharin.

Module IV: Organic Nitrogen Compounds (12hours)

Nitrocompounds: Nitro-acitautomerism – Nef's reaction – reduction of nitrobenzene in various media – nitro compounds as explosives.

Amines: Classification – Preparation: From alkyl halides, nitro compounds, nitriles, isonitriles and amides – Hoffmann's bromamide reaction, Schmidt reaction, Gabriel phthalimide synthesis.

Chemical properties: Basicity (effect of substituents on the basicity of aliphatic and aromatic amines), Carbyl amine reaction, conversiton of amines to alkene (Hoffmann elimination with mechanism), acylation and reaction with nitrous acid. Electrophilic substitution reactions of aniline: halogenation, nitration and sulphonation. Benzidine rearrangement (mechanism expected).
Separation of mixture of amines – methods to distinguish primary, secondary and tertiary amines.

Preparation and synthetic applications of diazonium chloride and diazomethane.

Module V: Organic Spectroscopy I (12 hours)

UV – Visible spectroscopy – types of electronic transitions, effect of conjugation, concept of chromophore, auxochrome, bathochromic, hypochromic shifts, hyperchromic and hypochromic effects. UV-Visible spectra of enes. Calculation of λ_{max} of dienes and α,β-unsaturated ketones.

IR spectroscopy – Molecular vibrations - Functional group and finger print region – group frequencies – effect of hydrogen bonding on –OH stretching frequency – factors influencing carbonyl stretching frequency. Comparison of carbonyl stretching frequency in compounds containing carbonyl group.

Interpretation of IR spectra of simple organic molecules such as salicylaldehyde, benzamide, acetophenone, nitro benzoic acid and phenyl acetate.

Theory of Mass spectrometry – mass spectrum, base peak and molecular ion peak, types of fragmentation, McLafferty rearrangement, isotopic effect.

Module VI Organic Spectroscopy II (6 hours)

NMR spectroscopy – principle of proton NMR – shielding and deshielding effect, chemical shift, factors influencing chemical shift, spin-spin splitting, coupling constant, interpretation of PMR spectrum of simple molecules like $CHBr_2CH_2Br$, ethylbromide, pure ethanol and impure ethanol (acidic impurities) acetaldehyde and toluene. Structural elucidation of simple organic molecules using IR and NMR spectroscopic techniques.

Module VII: New Frontiers in Organic Chemistry (6 hours)

Supramolecular chemistry : Introduction – molecular recognition – host-guest interactions – types of non-covalent interactions .

Green chemistry : Introduction – atom economy – principles of greenchemistry.

Newer methods of synthesis : Ultrasound, microwaves and phase transfer catalysis. References

(1) A.Bahl and B.S.Bahl, Advanced Organic Chemistry, S.Chand& Company, New Delhi.
(2) L.G.Wade Jr, Organic Chemistry, Pearson Education, New Delhi.
(3) K.S.Tewari, N.K.Vishnoi and S.N.Mehrotra, A textbook of Organic Chemisty, Vikas Publishing House (Pvt) Ltd., New Delhi..
(4) S.C.Sharma and M.K.Jain, Modern Organic Chemistry, Vishal Publishing Company, New Delhi..
(5) P.L.Soni, Organic Chemistry
(6) I L Finar, "Organic Chemistry" Vol – 1, 5th Edition, Pearson Education, New Delhi.
(7) R.T.Morrison, R.N.Boyd. Organic Chemistry, Pearson Education, New Delhi.
(8) P.Y.Bruice, Essential Organic Chemisty, Pearson Education, New Delhi.
(9) J.Clayden, N.Greeves and S.Warren, Organic Chemistry, Oxford University Press, New York.
(10) G.M. Louden, Organic Chemistry, Oxford University Press, New York.
(11) V.K.Ahluwaliya, Organic Reaction Mechanisms, Narosa Publishing House, New Delhi.
(12). Y.R.Sharma, Elementary Organic Spectroscopy, Pearson Education, New Delhi
(13) R.M.Silverstein and F.X.Webster, Spectrometric Identification of Organic Compounds, John Wiely and Sons, New York.
(14) P.S.Kalsi, Application of Spectroscopic Techniques in Organic Chemistry, New Age International, New Delhi.
(15) William Kemp, Organic Spectroscopy, Macmillan, New York.

(16) D.L.Pavia, G.M.Lampman and G.S.Kriz, Introduction to Spectroscopy, Thomson Brooks Cole.
(17) Helena Dodzuik, Introduction to supramolecular chemistry, Springer.
(18) L.M. Lehn, Supramolecular Chemistry, VCH.
(19) M.M.Sreevastava and Rashmi Sanghi, Green Chemistry for environment, Narosa Publishing House.
(20) V.K.Ahluwalia, Green Chemistry, Enviornmentally Benign Reaction, Ane Book Pvt. Ltd.

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
SEMESTER V Core Course VII Credit 4 Course Code CH1543
ORGANIC CHEMISTRY II

Time:3hours Max.Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. What is Williamson's synthesis?
2. Which reagent is used for the oxidative cleavage of 1,2-diols?
3. Give a test to distinguish aliphatic aldehydes from aromatic aldehydes.
4. What is atom economy.
5. What is HVZ reaction?
6. What happens when aniline is treated with bromine?
7. Identify the types of electronic transitions in CH_3CHO.
8. What is base peak?.
9. What is PTC?
10. Write the frequency range useful for the identification of organic compounds.

(10 X 1 =10 Marks)

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. Why phenol is more acidic than methanol?
12. How can you convert isopropanol to tert.butyl alcohol?
13. What is iodoform test?
14. What is MPV reduction?
15. How coumarin is prepared?
16. How will you convert acetic acid to propionic acid?
17. Explain Nef's reaction.
18. Write the mechanism of Benzidine rearrangement?
19. What is finger print region? Give its importance.
20. Differentiate bathochromic and hypochromic shifts.
21. What is TMS? Why it is selected as a reference compound in H-nmr spectroscopy?
22. What is DIBAL? What is its use?

(8 X 2 = 16 Marks)

SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. Explain Zeisels method of estimating methoxy group?
24. How can you distinguish primary, secondary and tertiary alcohol?
25. Write the importance of LiAlH4 and NaBH4 in carbonyl chemistry.
26. Comment on Clemmensen and Wolff-Kishner reduction.
27. How cinnamic acid is prepared? Explain its important properties.
28. Discuss Hoffmann elimination?
29. Explain microwave synthesis with examples.
30. (i) How can you distinguish inter and intra molecular hydrogen bonding using IR spectroscopy?
    (ii) Predict the regions where salicylaldehyde give IR absoptions.
31. Explain spin-spin coupling with an example.

(6 X 4 = 24marks)

SECTION – D

(*Answer any2 question. Each question carries 15 marks*) 32. (a) Write the mechanism of the following reactions:(a)Aldol condensation and (b) Benzoin Condensation.

(b) Discuss the mechanism of (i) Reimer-Tiemann reaction and (ii) Claisen Condensation.

(c) Comment on the following (i) Biodiesel and (ii) Crown ethers.

33. (a) Explain the synthesis and applications of saccharin.

(b) How diazonium chloride is prepared? How is it useful to synthesis the following compounds phenol, iodobenzene, azocompounds,

(c) How can you effect the following conversions (i) aniline to para-bromo aniline (ii) Benzamide to aniline.

34. (a) Discuss the Woodward-Fieser for calculating λ_{max} of dienes.

(b) Explain the principle of nmr spectroscopy.

(c) A compound with molecular formula C_8H_8O shows the following absorptions:

(i) IR Spectrum: 3050, 2950, 1700, 1620, 1550, 690 cm^{-1}.

(ii) pmr spectrum: δ 7-8ppm (multiplet, 5H), 2.5ppm (singlet, 3H).

Identify the structure of the compounds.

35. (a) How primary, secondary and tertiary amines are separated?

(b) Discuss the preparation and important reactions of benzene sulphonic acid.

(c) Discuss the different types of non covalent interactions in molecules.

(15 X 2 = 30marks)

B.Sc. Chemistry Programme

Semester – VI Course VIII Course Code – CH1641 Credit-4 Physical Chemistry – II Total: 72 hours

Aim of the course: To learn statistical mechanics which explains the chemical and physical properties and dynamics in the thermodynamic limit from a knowledge of the microscopic properties of the constituent atoms and molecules of a bulk system. The concepts of quantum mechanics and spectroscopy which provide a complete description of chemistry at the microscopic level, form the basis for the course.

Objectives: Students will explain and apply the concepts of thermodynamics, quantum mechanics, and spectroscopy to chemical, physical, and biochemical systems. Students will be able to derive essential mathematical relationships in thermodynamics, quantum mechanics, and spectroscopy. Students will evaluate physical and chemical systems by non spectroscopic techniques.

Module I – Thermodynamics III & Statistical thermodynamics 12 hrs

Nernst heat theorem, proof and its consequences. Statement of IIIrdlaw-Plank's statement, Lewis Randall statement. Concept of perfect crystal, evaluation of absolute entropies of solid, liquid and gas. Exception to IIIrd law with reference

to examples- CO, NO, N_2O and H_2O Phase space, system, assembly and ensemble-types of ensembles and uses. Thermodynamic probability, Boltzmann distribution law (no derivation). Partition function, entropy and probability. Thermodynamic functions in terms of partition functions - internal energy, enthalpy, pressure, work function and free energy function.

Module II – Colloids and Adsorption 12 hrs

Colloidal state: Classification of colloids, Purification of colloids – ultra filtration and electrodialysis, Kinetic, optical and electrical properties of colloids. Ultra microscope, Electrical double layer and zeta potential. Coagulation of colloids, Hardy-Schulz rule, Gold number. Gels: Elastic and non-elastic gels, Imbibition and syneresis, Micelles and critical micelle concentration, sedimentation and streaming potential, Application of colloids – Cottrell precipitator, purification of water and delta formation.

Adsorption: Physical and chemical adsorption, Freundlich adsorption isotherm, Derivation of Langmuir adsorption isotherm, Statement and explanation of BET and Gibbs isotherms, determination of surface area of adsorbents by BET equation. Applications of adsorption.

Module III – Quantum mechanics - 12 hrs

Radiation phenomena- blackbody radiation, photoelectric effect, Compton effect and atomic spectra. Plank's quantum theory and explanation of the radiation phenomena. Schrodinger wave equation – significance of Ψ, well behaved functions, Concept of operators and some operators of interest (properties of operators not required), Postulates of quantum mechanics Application of quantum mechanics to simple systems - particle in 1 D box, normalization of wave function, Particle in 3 D box. Concept of degeneracy. Application to hydrogen atom (no derivation) Schrodinger wave equation in Cartesian and spherical polar co-ordinates, Quantum numbers.

Module IV – Spectroscopy – 12 hrs

Regions of electromagnetic spectrum. Different units of energy (erg, joule, calorie, cm^{-1}, Hz, A^0 and eV) and their inter conversions. Interaction of radiations with matter. Various types of molecular spectra. Born-Oppenheimer approximation.

Rotational spectroscopy: microwave spectra of diatomic molecules, energy expression, selection rule, rotational energy levels, determination of bond length.

Vibrational spectroscopy: Harmonic oscillator. IR spectra of diatomic molecules. Energy expression. Selection rules, frequency of separation, calculation of force constant, anharmonic oscillators. Morse equation. Fundamental and overtone transitions, combination bands, degree of freedom of polyatomic molecules.

Raman spectroscopy: Stoke's and antistoke's lines and their intensity difference, rotational Raman spectrum. Selection rule. Frequency of separation, vibrational Raman spectrum, Mutual exclusion principle.

Module V – Spectroscopy – II 12 hrs

Electronic spectroscopy: Frank-Condon principle. Singlet and triplet states. Electronic spectra and diatomic molecules. Dissociation energy, electronic spectra of polyatomic molecules (qualitative idea only).

NMR spectroscopy: Principle of NMR, nuclear spin. Interaction of nuclear spin with external magnet. Precession. Relaxation, Chemical shift. Low resolution spectra. Delta and tau scales. Spin-spin coupling and high resolution spectra, application of NMR in MRI.

Electron spin resonance spectroscopy: principle. Types of substances with unpaired electrons, interaction of electron magnet with external magnet. Energy level spliting. Lande splitting factor, presentation of ESR spectrum. The normal and derivative spectra. Hyperfine splitting. Simple examples like methyl and benzene radicals.

Introduction to Mossbauer Spectroscopy

Module VI – Non-spectroscopic methods 12 hrs

Non-spectroscopic methods: Dipole moment, Debye equation and Clausius-Mosotti equation, measurement of dipole moment by temperature method, Dipole moment and molecular structure, Diamagnetism and paramagnetism, Magnetic susceptibility and unpaired electrons, measurement of magnetic susceptibility, Molar refraction and molecular structure, Atomic refraction, Optical exaltation, Parachor and atomic equivalent of para chor.

(At least 100 problems are to be worked out from all units together. 30% of the questions for Examination shall contain problems.)

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1. P W Atkins, “Physical Chemistry”, Oxford University Press
2. R J Silby and R AAlberty, “Physical Chemistry”, John Wiley & Sons
3. G W Castllan, “Physical Chemistry”, Narosa Publishing House
4. Puri, Sharma and Pathania, “Principles of Physical Chemistry”, Millennium Edition, Vishal Publishing Co.
5. Gurdeep Raj, “Advanced Physical Chemistry”, Goel Publishing House.
6. S Glasstone, “Thermodynamics for Chemists”, Affiliated East West Publishers
7. M C Guptha, “Elements of Statistical Thermodynamics”, New Age International (P) Ltd.
8. L K Nash, “Elements of Statistical Thermodynamics”, Addison Wesley
9. A W Adamson, “The Physics and Chemistry of Surfaces”, Interscience
10. N K Adam, “ The Physics and Chemistry of Surfaces”, Oxford University Press
11. M W Hanna, “Quantum Mechanics in Chemistry”, Benjamin
12. I N Levine, “Quantum Chemistry”, Prentice Hall
13. C N Banwell, “Fundamentals of Molecular Spectroscopy”, Tata McGraw Hill
14. Manas Chanda, “ Atomic structure and Chemical bonding in Molecular Spectroscopy”, Tata McGraw Hill
15. Physical Chemistry, R. Stephen Berry, Stuart A Rice & John Rose 2nd Edn Oxford 16. A.S.Negi and S.C.Anand, A text book of Physical Chemistry, New Age International publishers.

University of Kerala
Model Question Paper of B.Sc. Chemistry Programme
2017 admission onwards
Semester VI Core Course-VIII Course Code CH1641 Credit-4
Physical Chemistry II

Time: 3 Hrs Total marks: 80

Section A.

Answer all the questions. Each question carries 1 mark

1. Which of the following will give pure rotational spectrum? H_2, N_2, CO_2, HCl.
2. Write the mathematical definition of Laplacian operator.
3. Which branch of spectroscopy is used for the identification of free radicals?
4. What is the significance of polarizability of a molecule?
5. What is responsible for the stability of a lyophilic sol?
6. State The Heisenberg uncertainty principle.
7. Give the expression for Freundlich adsorption isotherm.

8. Give the expansion of STM.
9. Give the selection rule for rotational spectroscopy.
10. What is the unit of dipole moment?

Section B,

(2 marks each), [Short answer]. Answer any 8 questions

11. What is meant by Critical Micelle Concentration (CMC)?
12. What is sedimentation?
13. What is the significance of wave function of a particle?
14. Give any two applications of ESR spectroscopy.
15. What do you mean by the term 'parachor'?
16. What is meant by normal modes of vibrations?
17. What is zeta potential ?
18. Calculate the number of fundamental modes of vibrations of CO2 and SO2 molecules.
19. How does stokes and anti stokes lines originate in Raman spectrum.
20. Explain chemical shift.
21. Explain blackbody radiation
22. What is hyperfine splitting in esr?

Section C

Each question carries 4 marks(Short essay), Answer any 6 questions

23. What is an ensemble, explain the different types of ensembles.
24. Discuss the postulates of quantum mechanics.
25. Explain the underlying principle of NMR spectroscopy.
26. What is meant by Optical Exaltation? Calculate the optical exaltation of2,6-dimethylhepta-2,5-dien-4-one.
27. Compare physisorption and chemisorptions
28. What are the consequences of unharmonicity in vibrational spectroscopy?
29. What is Debye equation ? Explain its significance.
30. Explain mutual exclusion rule with examples.
31. The fundamental vibrational frequency of carbon monoxide molecule is 2170. cm^{-1} Calculate the force constant of the molecule.

Section D,

15 marks each (Long essay) Answer any two question

32. a) Derive and explain Langmuir adsorption isotherm. (5 marksx3 = 15)
    b) What is meant by partition functions? Derive expressions for internal energy and enthalpy.
    c)The acceptable solutions to Schrodinger wave equation must have some special properties. What are these? Elaborate.
33. a) What is Hardy-Schulze rule and what are the principles involved in the mechanism of coagulation? (5 marksx3 = 15)
    b) Show that for a rigid diatomic rotor, the moment of inertia is given by $I = \mu r^2$
    c)The pure rotational spectrum of a gaseous molecule CN consists of a series of equally spaced lines

separated by 3.7978cm^{-1}. Calculate the internuclear distance of the molecule. The molar masses are; ^{12}C=12.011 and^{14}N=14.007 g mol^{-1}.

34. a) How can NMR spectrum distinguish between the isomers: p-xylene and ethyl benzene?

(5 marks x3 = 15)

b) Explain the shielding and deshielding mechanism in NMR.

c)Give the hyperfine structure of ESR spectrum of hydrogen atom.Calculate the ESR frequency of an unpaired electron in a magnetic field of 0.33T. Given g_e = 2 and μ_B = 9.273x10-24 JT^{-1}.

35. a) Discuss the function of a protective colloid. (5 marks x3 = 15)

b) What is meant by electrodialysis?

c)Explain BET theory.

B.Sc. Chemistry Programme

SEMESTER VI Core Course IX Credit – 4 Course Code CH1642

Organic Chemistry Paper – IIITotal
: 54 hours

Lecture - Tutorial – Lab: 3-0-2

Aim of the Course:

The syllabus deals with organic compounds carbohydrates, amino acids, proteins, nucleic acids, oils, fats, detergents, vitamins, terpenes, alkaloids, and polymers and their properties

Objective of the Course: The students will get an interesting idea about the preparation and properties mechanism of reactions of many organic conversions and of organic compound.

Module I: Carbohydrates

Classification and nomenclature of monosaccharides, configuration of monosaccharides. Reactions of glucose and fructose – structure of glucose and fructose – anomers and mutarotation (mechanism expected) - cyclic structure – pyranose and furanose forms – determination of ring size – Haworth projection formula – chair conformations.

Epimers and epimerization – Interconversion of aldoses and ketoses – chain lengthening and shortening of aldoses.

Disaccharides – reactions and structure of sucrose (structural elucidation not required)

Polysaccharides – Structure of starch and cellulose (structural elucidation not required) – Industrial applications of cellulose.

Module II: Heterocyclic compounds and Drugs (9 hours)

Heterocyclic compounds – classification – nomenclature – aromaticity.

Preparation (special reference to Paal-Knorsyntheisis and Hantzsch synthesis) and properties of furan, pyrrole, thiophene and pyridine. Basicity of pyridine and pyrrole.

Synthesis and reactions of quinoline, isoquinoline and indole with special reference to Skraup, Bischler-Napieralski and Fischer-Indole synthesis. Structural elucidation of quinoline.

Structure of purine and pyrimidine bases.

Chemotherapy – Drugs – introduction – classification – Synthesis of sulphanilamide, sulphathiazole and sulphapyridine. mode of action of sulphadrugs and amphicillin.. Elementary idea of the structure and application of chloroquine, paracetamol and aspirin.

Module III: Amino acids, proteins and nucleic acids (9hours)

Amino acids – classification, structure and stereochemistry of amino acids, essential and non essential amino acids – zwitter ion, isoelectric point.
Synthesis of amino acids – Strecker synthesis, amidomalonate synthesis, Erlenmeyer azlactone synthesis.

Peptides: Structure and synthesis (Carbobenzoxy, Sheehan and solid phase synthesis)

Proteins – classification of proteins –structure of proteins –denaturation and colour reactions.

Nucleic acids: Classification and structure of DNA and RNA. Replication of DNA. Transcription and Translation - Genetic code.

Module IV: Natural products (9 hours)

Terpenes – Classification - Isoprene rule - Essential oil – Source, structure, (no structural elucidation) and uses of citral and geraniol, limonene and menthol. Structure of natural rubber – vulcanization and its advantages.

Alkaloids – Extraction and structural elucidation of conine and nicotine. Importance of quinine, morphine and codeine.

Vitamins : Classification, structure, functions and deficiency diseases (structure of vitamin A, B1 and C only - but no structural elucidation).

Lipids – biological functions – oils and fats – common fatty acids – hydrogenation – rancidity - saponification value, iodine value, acid value.

Module V: Soaps, Detergents and Polymers (9 hours)

Soaps and detergents: Soap – synthetic detergents – cleaning action of soap and detergents.

Polymers: General idea of monomers, polymers and polymerisation – Degree of polymerisation – polydispersity - number and weight average molecular mass.

Classification of polymers, Homopolymers and copolymers, Addition and condensation polymers, thermoplatstics and thermosets – mechanism of addition polymerization (Cationic, anionic and free radical) – Tacticity – role of ZieglerNatta catalyst in directing the tacticity in polypropylene (mechanism not required).

Addition polymerisation. Preparation and uses of (i) polyethylene (ii) PVC (iii) Teflon
Condensation polymerisation:(i) phenol-formaldehyde resin (ii) epoxy resin (iii)nylon-66
(iv) polyethylene terephthalate. Synthetic rubbers – SBR and nitrile rubbers. Biodegradable polymers Additives to polymers – Plasticisers, stabilizers and fillers

Module VI: Organometallics, Active methylene compounds and Reagents in Organic synthesis.(9 hours)

Organomagnesium compounds: Grignard reagent: Preparation – Reaction with compounds containing acidic hydrogen, carbonyl compounds, cyanides and CO_2.

Organo lithium compounds: Preparation – Reaction with compounds containing acidic hydrogen, alkyl halides, carbonyl compounds, cyanides and CO_2.

Organo zinc compounds: Preparation of dialkyl zinc – Reaction with active hydrogen compounds, acid halides and alkyl halides – Reformatsky reaction (mechanism expected)

Li dialkylcuprates – Preparation and reaction with aliphatic/aromatic/vinyl halides.

Active methylene compounds – examples – Preparation of ethyl acetoacetate by Claisen condensation (mechanism expected) – tautomerism – Synthetic applications of acetoacetic ester.

Reagents in organic synthesis: Study of the following reagents with respect to functional group transformations –

(1) $LiAlH_4$ – reduction of =CO, -COOR and $-CONH_2$.
(2) $NaBH_4$ andDiborane – reduction of =CO
(3) SeO_2 - hydroxylation of allylic and benzylic positions, oxidation of CH_2 alpha to =CO to =CO
(4) NBS : Allylic and benzylic bromination.

References:

(1) A.Bahl and B.S.Bahl, Advanced Organic Chemistry, S.Chand& Company, New Delhi.
(2) L.G.Wade Jr, Organic Chemistry, Pearson Education, New Delhi.
(3) K.S.Tewari, N.K.Vishnoi and S.N.Mehrotra, A textbook of Organic Chemisty, Vikas Publishing House (Pvt) Ltd., New Delhi..
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(5) P.L.Soni, Organic Chemistry.
(6) I L Finar, "Organic Chemistry" Vol – 1&2, 5th Edition, Pearson Education, New Delhi.
(7) R.T.Morrison, R.N.Boyd. Organic Chemistry, Pearson Education, New Delhi.
(8) P.Y.Bruice, Essential Organic Chemisty, Pearson Education, New Delhi.
(9) J.Clayden, N.Greeves and S.Warren, Organic Chemistry, Oxford University Press, New York.
(10) G.M. Louden, Organic Chemistry, Oxford University Press, New York.
(11) Gowariker V.R., Viswanathan N.V. and JayaderSreedhar, Polymer Science, Wiley Eastern Ltd, New Delhi.
(12) Billmeyer F.W., Text book of Polymer Science, John Wiley and Sons.
(13) S.M.Mukerji and S.P.Singh, Reaction Mechanism in Organic Chemistry, McMillan Publishers.
(14) S.P.Bhutani, Chemistry of Biomolecules, Ane Book Pvt Ltd.
(15) O.P.Agarwal, Chemistry of Natural Products, Goel Publications.
(16) T.L.Gilchrist, Heterocyclic Chemistry, Pearson Education, New Delhi.
(17) V.K.Ahluwaliya, Organic Reaction Mechanisms, Narosa Publishing House, New Delhi.

University of Kerala
MODEL QUESTION PAPER SEMESTER VI
First Degree Programme in Chemistry
Semester VI Core Course – IX Course Code CH1642 Credit 4
ORGANIC CHEMISTRY III
2017 admission onwards

Time:3hours Max.Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. Draw the structure of D-Arabinose and D-Ribose?
2. What are epimers?
3. Write the IUPAC name of (i) Furan and (ii) quinoline.
4. Write the structure of chloroquine.
5. What is isoelectric point?
6. What is natural rubber chemically?
7. Write any two biological functions of lipids.
8. What is soap?
9. Write the monomers of the following polymers (i) PTFE (ii) PP.
10. What is Frankland reagent? (10 X 1 =10 Marks)

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. Explain inversion of cane sugar.
12. Write any two industrial applications of cellulose.
13. Compare the aromaticity of furan and thiophene.
14. Write the structure of pyramidine bases present in nucleic acids.
15. Define the terms (i) saponification value and (ii) iodine value.
16. What is isoprene rule?
17. What are essential and non-essential amino acids?
18. What is denaturation of protein?
19. Differentiate oils and fats.
20. Define the terms M_n and M_w.
21. What is NBS? What is its use?
22. What are active methylene compounds? Give examples.

(8 X 2 = 16 Marks)

SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. How can you interconvert glucose and fructose?
24. What is mutarotation? Explain its mechanism.
25. Explain the synthesis of amino acid by (i) Strecker and amidomalonate synthesis.
26. What are vitamins? How are they classified? Write the structure of Vitamin A and C.
27. What is tacticity? Explain it by taking poly propylene as an example.
28. What is Bakelite? How is it prepared? Give its important applications.
29. Write a short note on the structure of DNA.
30. Discuss the mechanism of Reformatsky reaction.
31. Elucidate the structure of conine.

(6 X 4 = 24marks) SECTION – D

(*Answer any2 question. Each question carries 15 marks*)

32. (a) Discuss the cycic structure of glucose

(b) Briefly explain the structure of starch and cellulose.

(c) (i) Why glucose and fructose form same osazone?

(ii) How fructose reacts with the following reagents? (1) Na/Hg and H_2O (2) CH_3OH and dry HCl (3) Fehling's solution.

33. (a) Explain the Fischer-Indole synthesis.

(b) What are sulphadrugs? Give examples. Explain the mode of action of sulpha drugs.

(c) What are terpenes? How are they classified? Write the structure of limonene and menthol.

34. Write brief note on the following : (a) Replication of DNA

(b) Merrifield synthesis

(c) Structure of protein

35. (a) Explain the synthetic applications of ethyl acetoacetate.

(b) How Grignard reagent is prepared? Explain its importance in the synthesis of primary, secondary, tertiary alcohols and carboxylic acid. (c) Explain the mechanism of cationic and anionic polymerization.

(15 X 2 = 30marks)

B.Sc. Chemistry Programme

Semester VI Core Course –X Course Code – CH1643 Credit 4

PHYSICAL CHEMISTRY- PAPER III [72 hours]

Aim of the course: To provide an insight into the thermodynamic and kinetic aspects of chemical reactions and phase equilibrium. To give an insight to the various electrochemical systems.

Objectives: The main objective of the course is to study the basics of electrochemistry and its importance to modern industry and technology. The course introduces various types of reactions and the different factors that determine the rate of chemical changes. The course also includes the study of the phase diagrams of one, two and three component systems and elementary ideas of photochemistry.

Module I: Chemical Kinetics &Catalysis 12 hrs

Order of reaction, Derivation of integrated rate equation of zero, first, second and nth order reaction, determination of order of reactions:- Graphical and analytical methods using integrated rate equations, Fractional life- method, Differential rate equation method, Isolation method. Qualitative idea of Complex reactions:- (a) opposing reactions (b) first order consecutive reactions (c) parallel reactions. Qualitative idea of chain reactions. Influence of temperature on rate of reaction: Arrhenius equation, Determination of Arrhenius parameter, Energy of activation and its significance. Collision theory, Derivation of the rate equation for a second order reaction based on collision theory, unimolecular reactions- Lindemann mechanism, steady state approximation.

Catalysis:- Theories of catalysis, Intermediate compound formation theory, steady state method, Enzyme catalysis, Michaelis-Menten law.

Module II: Chemical and Ionic Equilibria 12 hrs

Equilibrium constant and free energy, Thermodynamic derivation of law of mass action, relation between Kp,Kc and Kx.

Le-Chatelier's Principle – Application in Haber process and dissociation of PCl_5.

Reaction isotherm, Temperature dependence of equilibrium constant, Pressure dependence of equilibrium constant, Application of Clausius-clapeyron equation in physical equilibria.

Ionic equilibrium : Ionic product of water, Effects of solvents on ionic strength, levelling effect, Pka and Pkb values, solubility product and common ion effect and their applications, pH and its determination by indica tor methods, buffer solution, buffer action, Henderson's equation, buffer capacity - hydrolysis of salts of all types, degree of hydrolysis and hydrolytic constant, determination of degree of hydrolysis, relation between hydrolytic constant and ionic product of water

Module III: Phase Equilibria 12 hrs

Phase Equilibria:-Terminology, the phase rule, thermodynamic derivation of phase rule and its application to (a) water system (b) sulphur system (c) solid-liquid equilibria involving simple eutectic system such as Pb-Ag system, KI-water system, freezing mixtures, thermal analysis and desilverisation of lead (d) solid-liquid equilibria involving compound formation with congruent and incongruent melting points:- $FeCl_3$- H_2O system and Na_2SO_4-H_2O system (e) solid–gas system- decomposition of $CaCO_3$, dehydration of $CuSO_4.5H_2O$, deliquescence and efflorescence.

Module IV: Binary Liquid Systems 12 hrs

Liquid-Liquid system:- Completely miscible, ideal and non-ideal mixtures, Raoult's law, vapour pressure- composition and temperature-composition curves, fractional distillation, deviation from Raoult's law, Azeotropic mixtures, partially miscible liquid system, critical solution temperature, Conjugate layers, example for upper, lower and upper cum lower CST, Introduction to three component system, distribution law, its thermodynamic derivation, limitations of distribution law, application of distribution law to the study of association and dissociation of molecules, solvent extraction. (9hrs) Photochemistry: .

Grothus-Draper, Beer- Lambert and Stark- Einstein laws, Quantum yield, Reason for very low and very high quantum yields, Rate equation for decomposition of hydrogen iodide, Qualitative treatment of H_2-Cl_2 reaction and H_2-Br_2 reaction, Fluorescence and phosphorescence, chemiluminescence and photosensitization, Explanation and examples . (3hrs)

Unit V: Electromotive Force 15 hrs

Electrochemical cells(brief explanation) Reference electrodes-standard hydrogen electrode, calomel electrode, Types of electrodes-Metallic electrodes, anion reversible electrodes and redox electrodes, Electrode reactions and cell reactions, Derivation of Nernst equation for electrode potential and cell potential, Gibb's Helmholtz equation and EMF of a cell, calculation of ΔG, ΔH and ΔS from EMF data. Concentration cells with and without transference, electrode and electrolyte concentration cells, derivation of equation for the EMF of concentration cells with and without transference, Liquid Junction Potential,. Introduction to over voltage and polarization. Applications of potential measurement:- Determination of ionic product of water, hydrolysis constant and solubility product, pH value using quinhydrone and glass electrode, potentiometric titrations of acid-base and redox reaction. (12hrs)

Fuel cells :- Hydrogen-Oxygen fuel cell, Hydrocarbon – Oxygen fuel cell

Primary-Mercury cell, Dry cell and secondary cells –Lead acid cell, Li-ion cell Corrosion,

Prevention of corrosion . (3hrs)

Module VI: Electrical Conductance 9 hrs

Inter ionic attraction theory, Debye-Huckel-Onsager equation (Qualitative treatment only) activity and activity coefficient of electrolytes, Kohlrausch's law and its applications , Wein effect, Debye-Falkenhagen effect, Walden's rule. Ionic mobilities:- Transference number and its determination by Hittorff's and moving boundary methods, abnormal transference numbers, Applications of conductivity measurements:- Determination of degree of dissociation of weak electrolytes, degree of hydrolysis, solubility of sparingly soluble salts, conductometric titrations involving strong acid - strong base, strong acid-weak base, weak acid- strong base, weak acid-weak base and precipitation.

At least 100 problems are to be worked out from all units together. 30% of the questions for Examination shall contain problems.

References:

1. Advanced Physical Chemistry ,Gurdeep Raj, Goel publishing house
2. Elements of Physical Chemistry ,Glasstone and Lewis,Macmillan
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4. A Text book of Physical Chemistry ,K.L.K.Kapoor,Vol 1,3 & 4, Macmillan

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7. Physical Chemistry , G.M .Barrow, 6th edn, The McGRAW-HILL Companies ,INC
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University of Kerala

Model Question Paper of B.Sc. Chemistry Programme

2017 admissions onwards

Semester VI Core Course X: Course Code CH1643 Credit 4

Physical Chemistry – III

Time: 3 Hrs Total marks: 80

Section A

Answer all the questions Each question carries 1 mark

1. Give the Arrhenius equation.
2. Write the integrated rate equation for a first order reaction.
3. Give the relation between hydrolytic constant, dissociation constant and ionic product of water of a salt of strong acid and weak base.
4. The solubility of AgCl in water at 250C is 0.00179 g/L. calculate its solubility product at 25 ^{0}C.
5. Write Debye- Huckel- Onsagar equation.
6. Write the reduced phase rule equation.
7. Give an example for a system having upper cum lower CST.
8. Give the Nernst equation for the potential of a copper electrode.
9. What is meant by quantum yield of a photochemical reaction?
10. Represent the electrochemical cell formed when Zn electrode is coupled with Ag electrode.

Section B

Each question carries 2 marks (Short answer) .Answer any 8 questions

11. Define buffer solution and buffer index .
12. Define the term activation energy. Why different reactions proceed at different rates? 13.Give one example each for a consecutive and a parallel reaction
14. What is meant by common ion effect? Explain with an example.
15. Describe with example (i) Triple point (ii) Eutectic point
16. Explain the term congruent melting point with an example
17. Write a note on conductometric titration of acetic acid against sodium hydroxide?
18. What is Debye Falkenhagen effect?
19. How will you construct a calomel electrode?
20. What is meant by liquid junction potential? How can it be almost eliminated?
21. What are azeotropes ? Explain with an example.
22. What is critical solution temperature? How does it vary by the addition of an electrolyte?

Section C

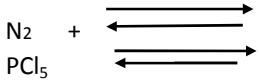
Each question carries 4 marks (Short essay). Answer any 6 questions

23. The rate constant of a second order reaction is 5.70 x 10^{-5} dm^3mol^{-1} S^{-1} at 25^0C and 1.64 x 10^{-4} dm^3mol^{-1} S^1 at 40^0C. Calculate the activation energy and the Arrhenius preexponential factor.
24. What would be the pH of a solution obtained by mixing 5 g of acetic acid and 7.5 g of sodium acetate and making the volume equal to 500 ml? Dissociation constant of acetic acid at 250C is 1.75 x 10-5.
25. Explain the principle of freezing mixture by taking KI – H2O system as an example.
26. State and explain Nernst distribution law. What are the limitations of the law?
27. What are fuel cells? Describe H2 – O2 fuel cell and its cell reactions.
28. Derive Clausius- Clapeyron equation and mention its applications . 29.Explain the terms (i) Fluorescence (ii) Phosphorescence
30. What are the laws of photochemistry , explain ?
31. Explain the phase diagram of Pb-Ag system.

Section D

Each question carries 15 marks (essay) Answer any two question

32. a) using Le Chatliers Principle, describe the effect of temp, P and concentration for the following systems in equilibria:



$N_2 + 3H_2 \rightleftharpoons 2NH_3$

$PCl_5 \rightleftharpoons PCl_3 + Cl_2$ (5 marks x 3 = 15) b) Give the applications Nernst distribution law.

c) Elaborate on azeotropic mixtures.

33. a) How will you determine the transport number of ions using Hittorf method? (10 marks)
    b) Give the construction and working of SHE. (5 marks)
34. a) Derive van't Hoff equation for temperature dependence of equilibrium constant. (10 marks)
    b) The equilibrium constant for a reaction is 1× 105. Calculate the standard free energy change for the reaction in kilojoules at 25? C . (5 marks)
35. a)What is meant by CST. Explain different types of CST with examples (5 marks)
    b) Discuss various types of concentration cells. (10 marks)

For all Lab courses scheme of ESE is decided by the board examiners in each year

First Degree B.Sc Programme in Chemistry Lab course Semester II,

PART B. LABORATORY

COMPUTER LABORATORY

[No ESA for this component]

Computer Lab based instruction on the use of computer and internet in learning. Use of educational softwares, information mining from internet and using INFLIBNET/NICNET, NPTEL and VIRTUAL LABS OF MHRD. Word processing and document preparation. Use of Spread sheets in Data handling and presentation. Introduction to chemical structure drawing, visualization of molecules using chemistry softwares.

First Degree B.Sc Programme in Chemistry
SEMSTER I, III & IV Core Course-II Course Code CH1442
(Lab Course I) Core Course-IV
Three hours examination in semester IV. (Credit 2)

I. Qualitative Analysis (Micro Analysis)

a. Studies of the reactions of the following radicals with a view to their identification and confirmation: Pb^{2+}, Cu^{2+}, Bi^{2+}, Cd^{2+}, Sn^{2+}, Sb^{2+}, Fe^{2+}, Fe^{3+},

Al^{3}+, $Cr^{3+,}$ Zn^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, K^{+}, NH^{4+}, CO_3^{2-}, S^{2-}, NO_2^{-}, NO_3^{-}, F^{-}, Cl^{-}, Br^{-}, I^{-}, BO_3^{-} ,

acetate, oxalate, CrO_4^{--}, $PO_4^{-}$and SO_4^{2-}.

b. Systematic qualitative analysis by microscale methods of a mixture containing two acidic and two basic radicals from the above list (not more than one interfering radical). *II. Inorganic Preparations*

The following preparations are to be done:-

a. Potash alum
b. Hexamine cobalt
c. Chloride
d. Tetramine copper
e. Sulphate
f. Mohr's salt
g. Microcosmic salt
h. Sodium cobalti nitrate
i. Sodium nitro pruside
j. Manganese phthalocyanin
k. Potassium trioxalatochromate and
l. Potassium trioxalatoferrate

Semester V & VI Core Course- VIII Course Code CH1544 Inorganic Volumetric Analysis (Lab Course Number II)
and Core Course-IX physical Chemistry Experiments Course code 1545(Lab Course Number III)
(Credit 3) Six hours examination in semester VI

Inorganic Volumetric analysis- one burette titration only

(a) *Acidimetry and alkalimetry*

Preparation of carbonate free sodium hydroxide. Use of constant boiling hydrochloric acid Titrations using (1) Strong acid – strong base (2) Strong base – weak acid (3) Strong acid – weak base, determination of Na_2CO_3 and $NaHCO_3$ in a mixture by indicator method and NH_3 in an ammonium salt by direct and indirect methods.

(b) Permanganometry

The following determinations are to be done using standard permanganate solution (1) Ferrous iron (2) Oxalic acid (3) Hydrogen peroxide (4) Calcium (5) Nitrite and (6) MnO_2 in pyrolusite.

(c) Dichrometry

Determination of Ferrous iron using internal (& external indicator) and Ferric iron after reduction with SnCl2.

(*d) Cerimetry*

Standardisation of ceric ammonium sulphate with Mohr's salt. Determination of oxalic acid using ceric ammonium sulphate. *(e) Iodometry*

Standardisation of thiosulphate using KIO3, electrolytic copper and potassium dichromate. Determination of a copper salt.

(f) Precipitation titration

Determination of chloride in neutral medium. *(g) Complexometry (using EDTA)*

Standardisation of EDTA solution with ZnSO4 – determination of Zn, Mg, Ni and Ca – determination of permanent and temporary hardness of water.

Physical Chemistry Practicals

The following experiments are to be done :

Determination of

1. Partition coefficient of iodine between CCl_4 and H_2O or Partition coefficient of ammonia between $CHCl_3$ and H_2O 2. Transition temperature of a salt hydrate. Molar mass of a solute using transition point depression of a salt hydrate.
3. Depression in freezing point of a solid solvent by cooling curve method. Molar mass of a solute.
4. Critical solution temperature of phenol – water system.
5. Viscosity of binary mixtures and then concentration of an unknown mixture.
6. Surface tension of binary mixtures and then concentration of an unknown mixture.
7. Refractive indices of KCl solutions of different concentrations and then concentration of an unknown KCl solution.
8. Conductometric titration of NaOH Vs HCl.
9. Potentiometric titration of Fe^{2+} vs $Cr_2O_7^{2-}$
10. Potentiometric titration of $KMnO_4$ Vs KI
11. Determination of water equivalent of a calorimeter and heat of neutralisation of strong acid – strong base.
12. Kinetics of hydrolysis of an ester
13. Influence of KCl impurity on miscibility temperature of phenol – water system and then the determination of concentration of a given KCl solution.

2.COMPUTER SOFTWARE

Use of softwares and programmes in the physical chemistry experiments

1.Computer software like Scilab, Excel, etc to solve some of the plotting or calculation problems.
2.Determination of equivalence point of potentiometric and conductometric titrations using spreadsheet program.
3. Data analysis of kinetic experiments using spreadsheet program (determination of rate constant)
4.Plot scatter diagram.
5. Basic idea of software like Chemsketch or Chemdraw (any freely available structure drawing softwares)
6. Draw the structure of molecules using above mentioned software.
(Take prints and paste in the physical chemistry record)

B.Sc. Chemistry Programme Laboratory Course

Semester VI Organic Chemistry Experiments Core Course-XIII Credit-3 Course Code CHI644 (Lab Course IV), and Course Code CHI645 Gravimetry Core Course-XIII (Lab Course V) Six hours examination in semester VI

I. Organic Chemistry Practicals (micro scale) 1.Tests for

elements : Nitrogen, halogens and sulphur

2. Determination of physical constants
3. Studies of the reactions of common functional groups using known organic compounds.
4. Qualitative analysis with a view to characterization of the functional groups. The following compounds may be given for the analysis : chlorobenzene, benzyl chloride, phenol, o – m – p – cresols, naphthols, resorcinol, benzaldehyde, acetophenone, benzophenone, benzoic, phthalic, cinnamic and salicylic acids, ethyl benzoate, methyl salicylate, benzamide, urea, aniline, o – m, p – toluidines, dimethylaniline, nitrobenzene, o – nitro toluene p – nitro toluene, m – dinitrobenzene, naphthalene, anthracene, glucose and sucrose.
   Organic preparations involving halogenation, nitration, oxidation, reduction, acetylation benzoylation, hydrolysis and diazotisation (TLC of the reactant and Product) . Isolation of an organic compound from a natural source eg. Hippuric acid from cow's urine.
5. Chromatography
   a. Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars
   b. Separation of a mixture of dyes by column chromatography.
6. Organic estimation
   a. Molar mass determination of an acid and base by titration method
   b. Determination of the phenol/aniline by bromate – bromide method
   c. Determination of the equivalent mass of an ester

II Gravimetry

The following determinations are to be done using silica crucible (1) Ba as $BaSO_4$ (2) Sulphate as $BaSO_4$ (3) Iron as Fe_2O_3 (4) Calcium as $CaCO_3$ (5) Aluminium as Al_2O_3 and Magnesium as $Mg_2P_2O_7$

The following determinations are to be done using sintered crucible

(1) Magnesium as oxinate (2) Nickel using dimethyl glyoxime (3) Copper as copper thiocyanate and (4) Silver as silver chloride

Colorimetry (Using photo electric colorimeter)

Determination of Iron using thiocyanate and ammonia using Nessler's reagent.

REFERENCE

1. A.I.Vogel, "A text book of Qualitative Analysis including semi micro methods" Longmans.
2. V.V.Ramanujam, "Semi micro Qualitative Analysis"
3. E.S.Gilreath "Qualitative Analysis using semi micro method" Mc Graw Hill
4. A.I.Vogel, "A text book of Qualitative Inorganic Analysis" Longmass
5. A.I.Vogel, "Elementary Practical Organic Chemistry" Longmass
6. Day and Raman, "Laboratory Mannual of Organic Chemistry". Viswanathan
7. Mann and Saunders, "Practical Chemistry"
8. A.Findlay, "Practical Physical Chemistry"
9. R.C.Das and E.Behara, "Experimental Physical Chemistry", Tata Mc Graw Hill
10. N.K.,Vishnu, "Advanced practical organic chemistry" Vikas publishing house, New Delhi

The practical examinations of Lab course II (volumetric analysis), Lab course III (physical chemistry experiments) and Lab course IV (organic analysis) , Lab course V (gravimetric analysis are conducted at the end of VI semester with a duration of two days (6hours duration on each day).

First Degree Programme
Semester V and VI
Chemistry Project and Factory visit
Course Code – CH1646
No. of credit – 4 . Total ESE marks-100- (No CE marks)
Project

Aim of the course

To develop an aptitude for research in chemistry, to learn research methodology and literature search

Objective of the course

To inculcate proficiency to identify appropriate research topic and presentation

Specifications

Topics of chemical interest can be selected for the project. Project is to be done by a group not exceeding 5 students. Every student should submit typed (A4 paper, 12 Font, 1.5 Space, 20- 30 pages), spirally bind project report duly attested by the supervising teacher and the Head of the Department on

the day of practical examination before a board of two Examiners for ESE. The viva-voce based on the project is conducted individually. Project topic once chosen shall not be repeated by any later batches of students. List of projects submitted year wise is to be maintained in a register and submitted before the examiners if requested.

The project report may contain the following sections:

1. Preliminary (Title page, declaration, certificate of the supervising teacher, content etc.)
2. Introduction with relevant literature review and objective
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion / Summary 7. References.

Study tour and Factory/ research institute visit

Students are directed to visit one research institute/ chemical factory preferably with in the state of Kerala. Scientifically prepared hand written study tour report along with photographs of candidate at the places of visit must be submitted by each student for ESE on the day of the examination of project evaluation.

The board of examiners can decide the scheme of evaluation of project , study tour report and viva voce

Open Course for Other Majors-
Semester-5 Credit-2 Course-CH1551.1
2017 admission onwards
Essentials of Chemistry

Module 1:Atomic structure and Periodic Classification of Elements (9hrs) Structure of atom- Fundamental particles, atomic mass, atomic number, isotopes. Bohr theory of atom. Orbitals- Quantum numbers, aufbau principle, Hund's rule; Pauli's exclusion principle. Electronic configuration of atoms - half and completely filled orbitals. Modern periodic table: Periods, Groups, Periodicity- valency, atomic radius, electronegativity, Ionisation potential, Electron affinity.

Module 2 :Nuclear Chemistry (9 hrs)

Natural radioactivity, Nature and types of radiations, Properties. Group displacement law. Radio active decay series. Decay rate. Half life period, Average life period, Unit of radioactivity. Radiation dose, artificial radioactivity, nuclear structure. Nuclear fission and Nuclear fusion. Rock dating- Radio carbon dating. (*elementary idea only*)

Module 3 :Polymer Chemistry (9 hrs)

Classification of polymer: Origin, structure, synthesis, Molecular forces. Commercially important polymers: Application of polyethylene, polystyrene, polyhaloolefines, Nylon-6, Nylon-66, Melamine, Terylene, Bakelite, Natural and synthetic rubber, vulcanization, inorganic polymer: (*Examples Only*).

Module 4 :Chemistry in Biological Process (9hrs)

Vitamins: Vitamin-A, Vitamin-B2, Vitamin-C, Vitamin-D, Vitamin-E and Vitamin-K- Name, Source, Function and deficiency diseases. Enzymes- Classifications, characteristics, role, examples. Hormones - Sex hormones- Androgens, oestrogens, progesterone, Example, function. Cortical hormones- A few examples

with function. Nucleic acid- RNA, DNA: Introduction- role in life process (*No structure or chemical reactions needed*)

Module 5 : Chemistry in action (9hrs)

Dyes: classification based on constitution, application, examples, uses. Drugs: Antipyretic, analgesic, antiseptic, disinfectants, tranquilisers, antibiotics structure, name and uses only. Soaps and detergents: Hard and soft soaps, anionic, cationic and non-ionic detergents, cleansing action of soaps, Explosives: TNT, TNG, RDX, Gun cotton: name, structure and action. (*No structure or chemical reactions needed*)

Module 6 :Environmental Chemistry (9hrs)

Air Pollution: Types of pollutant in air- carbon monoxide, carbon dioxide, Nitrogen oxides, Sulphur dioxides, hydrogen sulphide, Cl_2, CFC, particulate matter, metals, fly ash, asbestos, hydrocarbons- source and influence. Acid rain, Green house effect, ozone layer and its depletion. Water Pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents. Hard and soft water, Removal of hardness, disadvantage of hard water. Soil pollution : Due to pesticides, herbicide, fungicide, long term use of fertilizers, plastic waste.

References

1. M. C. Day and J. Selbin,“ Theoretical Inorganic Chemistry”.
2. H. S. Arniker,“ Essentials of Nuclear Chemistry:
3. B.K. Sharma “Environmental Pollution”.
4. Solomons- John- Wiley, “Fundamentals of Organic Chemistry”.
5. F.A. Carey, Mc. GrawHill ,“Organic Chemistry” Inc. 226
6. I.L Finar,“Organic Chemistry”, Vol. 1 Longman
7. Tewari, Mehrotra- Vikas&Vishnoi,“A Text book for Organic Chemistry:
8. M.K. JainJain,“ Principles of Organic Chemistry”.
9. A.K. Dey,“Environmental Chemistry”.

University of Kerala
Model Question Paper
2017 admission onwards
Open Course for other Majors Course CH1551.1
Essentials of Chemistry

Time: 3 Hrs Total marks: 80

Section A.

Answer all the questions. Each question carries 1 mark

1. Who discovered radioactivity?
2. Name any unit of radioactivity. 3.What is the expansion of DNA?
4. Write an example of a sex hormone.
5. Name an enzyme.
6. State Afbau principle.
7. Draw Px orbital.

8. Give an example of inorganic polymer.
9. Name any compound which causes acid rain.
10. What is the monomer of nylon-6,6?

(1x10 = 10 marks)

Section B

(2 marks each), Short answerAnswer any 8 questions

11. Name the pollutants in air?
12. What are the factors affecting the purity of water?
13. Explain Hund's rule of maximum multiplicity with an example.
14. Define electron affinity, explain with an example.
15. Distinguish between half life period and average life period.
16. Explain artificial radioactivity.
17. Write the structure and applications of polyhalo olefins.
18. What is vulcanization of rubber?
19. What are corticosteroidal hormones? Explain with example.
20. Distinguish between DNA and RNA.
21. How are dyes classified?
22. Explain cleansing action of soap

(2×8 = 16 marks)

Section C

(Each question carry 4 marks), (Short essay)Answer any 6 questions

23. Explain the source and hazards of fly ash and asbestos.
24. Explain briefly soil pollution.
25. What are periods and groups in the periodic table? What is periodicity?
26. Explain Bohr model of atom.
27. Distinguish between nuclear fission and nuclear fusion with examples.
28. What are Nylon 66, Melamine and Terylene?
29. What are the functions and deficiency diseases of Vitamin C, Vitamin D and Vitamin E.
30. Write a note on explosives.
31. Distinguish between addition and condensation polymerization.

(4×6 = 24 marks)

Section D

(15 marks each), (essay), Answer any two question

32. a) What are quantum numbers? Explain.
    b) State Pauli Exclusion Principle. Expalin their significance.
    c)Explain stability of half-filled and completely- filled orbitals. (5x3 = 15 marks)

33. a) Write a note on Group Displacement law and radioactive decay series.
    b) What is carbon dating? In an archaeological piece of wood 14C activity is 10 % of the activity found in a fresh wood. Calculate the age of the archaeological piece (half life of 14C is 5760 years.).
    c)Write a note on vitamin deficiency disease. (5x3 = 15 marks)

34. a) What are the different methods for the analysis of oils and fats?
b) What is meant by DNA? Name the sugar unit present in DNA.
c)Write anote on vat dyes. (5x3 = 15 marks)

35. a) Explain the cleansing action of soap.
b) What is antibiotic? Give the names of the first antibiotic and the scientist who discovered it.
c)Give an account of the green house effect. (5x3 = 15 marks)

Open Course For Other Majors-
Semester-5 Credit-2 Course Code-CH1551.2
2017admission onwards

Fundamentals of Chemistry & Its Application to Everyday Life

Module 1 Evolution of Chemistry *9 hrs*

Evolution of Chemistry - ancient speculations on the nature of matter, early form of chemistryalchemy, Robert Boyle and the origins of modern chemistry in the latter 1600s - origin of modern chemistry - Antoine Lavoisier and the revolution in chemistry - Role of Chemistry as a central science connecting
Physics, Biology and other branches of science. Basic ideas of interdisciplinary areas involving Chemistry

Module 2 Atomic structure Atom- model of Dalton- Thomson – Rutherford and Bohr. Nature of electron proton and neutron – atomic number – mass number- isotopes -state the relative charges and approximate relative masses of a proton, a neutron and an electron - describe, with the aid of diagrams, the structure of simple atoms as containing protons and neutrons (nucleons) in the nucleus and electrons arranged in shells (energy levels) (no knowledge of s, p, d and f orbitals);

Module 3–Periodic table *9 hrs*

The Periodic Table - Periodic trends, Group properties - describe the relationship between group number and the ionic charge of an element- similarities among the elements in the same group - metallic to non-metallic character from left to right across a period of the Period Table- Properties of elements in Group I and XVII using the Periodic Table

Module 4 Structure and properties of materials *9 hrs*

Elements, compounds and mixtures – elementary idea of ionic bond and covalent bond- compare the structure of simple molecular substances, e.g. methane; water, carbon dioxide, iodine, with those of giant molecular substances, e.g. poly(ethene); sand (silicon dioxide); diamond; graphite in order to deduce their properties compare the bonding structures of diamond – graphite, electrical conductivity.

Module 5 Chemicals used in everyday life. *9 hrs*

Household materials – Major chemical ingredients (*No structural formula and preparation needed*), method of action and possible hazards/toxicity of : Match Box- Household bleach – Soap- detergent— cooking gas – tooth paste – shampoo-hair dye- nail polish- whitener-moth balls –fire crackers.

Module 6 Chemicals in food and beverages *9 hrs*

Important chemical ingredients/ taste makers used in packed food - soft drinks - and its health hazards. Chemicals in food production - fertilizers used in natural sources - Fertilizers urea, NPK and Super phosphates - uses and hazards. Adulterants in milk, ghee, oil, coffee powder, tea, asafoetida, chilli powder, pulses and turmeric powder - identification. artificial sweeteners - food preservatives.

University of Kerala
Model Question Paper
2017 admission onwards
Open Course for other Majors Course
Semester V Course Code CH1551.2 Credit 2
Fundamentals of Chemistry & Its Application to Everyday Life Time: Three Hours Maximum Marks : 80

Section A
(answer in a word / sentence) Answer all questions

1. What is superphosphate?
2. Who is the Father of Modern Chemistry?
3. How many atoms are present in a molecule of ozone?
4. Define isotopes.
5. What is a diamond made up of?
6. Which element has the electron configuration 2,1.
7. Name a liquid element.
8. What is the shape of water molecule?
9. How many valence electrons are there in carbon?
10. Name the main compound present in cooking gas.

Section B
Each question carries 2 marks (Short answer type).Answer any eight questions .

11. Name any two Toxic Chemicals in Cosmetics
12. Obtain the electron configuration for (a) N; (b) F.
13. Explain Hund's rule of maximum multiplicity with an example.
14. Define electron affinity, explain with an example.
15. Which of the following elements Li, Be, B, C, N, O, F and Ne are metals?
16. Explain Bohr model of atom.
17. Why is the electronegativity value of most noble gases equal to zero?
18. What are the Health Effects of Drinking Soda?

19. Which do you expect to have more metallic character, Lead (Pb) or Tin (Sn)

20. What is a Match Head of match stick made of?

21. Explain why graphite conducts electricity whereas diamond doesn't.

22. Is the reactivity of group I metals increasing or decreasing down the group? Explain why? 2×8 = 16

Section C

Each question carries 4 marks(Short essay type)*Answer any six questions*

23. Explain the colour of firecrackers.

24. What is the difference between covalent and ionic bonding?

25. What are periods and groups in the periodic table? What is periodicity?

26. What are adulterants.

27. How is Thomson's model of the atom different from Dalton's model of atom?

28. What's the difference between an oxidation number and an ionic charge?

29. Explain the health hazards associated with drinking soft drinks?

30. How can metallic character change across a period?

31. Describe clearly the link between increasing effective nuclear charge across a period and the changes in van der Waals radius.

4×6 = 24

Section D

Each question carries 15 marks (essay type) Answer any two questions.

32. a.Explain about the pH changes of aqueous solutions of elements in the third period as the period is crossed.
b. Explain how these changes are directly related to the changes in effective nuclear charge across the period.
c. Describe the metallic character of elements in a period.

33. a.Explain the role of some chemicals in household items.(7.5 marks)
b.Write a short note on food adultration. (7.5 marks)

34. a.Write a short note on the uses and hazards of fertilisers. (10 marks)
b.Draw the structure of carbon and sodium containing nucleons. (5 marks)

35. a.compare the structure of substances, methane, water, carbon dioxide and iodine, with ethane and silicon (10 marks)
b.compare the bonding structures of diamond – graphite. (5 marks)

Open Course for Other Majors
Semester-V Credit-2 Course Code -CH1551.3
2017 admission onwards
Environmental Chemistry

Module -I Environmental Components: 9 hrs

Structure and composition of the, Atmosphere, hydrosphere, biosphere and Lithosphere – composition of atmosphere

Module -II Water pollution: 9 hrs

Sources, its effect and control; Sampling and measurement of water quality and their analysis, water quality standards, BOD and COD Hard water – soft water Eutrophication and restoration of lakes.

Module -III Air Pollution: 9 hrs

Types and sources of air pollution, Common Air Pollutants - Effects of air pollution; Smog – ozone layer depletion – green house effect – acid rain

Module -IVSoil Pollution: 9 hrs

Sources, types, effects and control of: Land pollution, Marine pollution, Thermal Pollution and Radioactive pollution. Waste separation, storage and disposal ; Waste Reduction, Recycling and Recovery of materials. Plastics and their misuses.

Module -V Major environmental disasters 9 hrs

Major environmental disasters - - mercury poisoning in Minamata, Japan ,Itaiitai disease due to cadmium poisoning in Japan - Love Canal toxic waste site, Seveso disaster chemical plant explosion - Bhopal disaster - Chernobyl incident,

Module -VI Major environmental laws: 9 hrs

Environment (Protection Act) – The Air (Prevention and control of pollution) Act – The water (Prevention and control of pollution) Act – The wild life protection Act – Forest conservation Act – The Ozone Depleting Substances (Regulation and Control) Rules – The Plastic Waste (Management and Handling) Rules - Rio declaration- Montreal protocol, Kyoto protocol Introduction to Green chemistry (elementary ideas only)

Reference

1. S. K. Banerji, “Environmental Chemistry”.
2. K. De “Environmental Chemistry - An introduction”
3. B. K. Sharma “Air Pollution”.
4. V. K. Ahluwalia “Environmental Chemistry”
5. G.W. vanLoon and S. J. Duffy “Environmental Chemistry: A global perspective”
6. S.K.Mohanty, Environment and Pollution Laws, Universal Law Publishing Co. Pvt Ltd

University of Kerala
Model Question Paper
2017admission onwards
Open Course for other Majors Course Code CH1551.3 Credit -2
Environmental Chemistry

Time: 3 hours Maximum marks: 80

Section A
Answerall questions (Eachanswercarries 1 mark)

1. What you meant by Triple R in waste management ?.
2. What type of pollution causes acid rain?
3. What are the misuses of plastics?
4. What are the three major man made sources of air pollution?
5. What kind of materials are discharged into the seas?
6. What increases the amount of carbon dioxide in the atmosphere?
7. Explain the action of zeolites on hard water.
8. What are freons?
9. Define pollution
10. What is fly ash

(10x1=10)Sectio

n B

(short answer type) (Answer any 8 questions, Each answer carries 2 mark)

11. How is pollution related to acid rain?
12. How does ocean pollution affect sea animals?
13. What are the main concepts of Green Chemistry
14. Write short note on Radioactive pollution
15. Discuss the major composition of earth's atmosphere 16.Write about the cause and consequence of Chernobyl incident
17. What is BOD and COD?
18. What causes radioactive pollution?
19. Distinguish between Hard water and soft water.
20. What is the goal of Forest Conservation Act?
21. What is the Greenhouse effect and what is its cause? 22.What are the types of air pollutants ?

(2×8 = 16)

SectionC

(Short essay type) each question carries 4marks. Answer any 6

23. Write short note on volatile organic compounds.
24. How can thermal pollution be prevented?
25. How do you control Radioactive pollution?
26. What is smog? How does smog arise?

27. What is Eutrophication

28. Write a note on Rio-Declaration.

29. Explain the various layers of the Atmosphere

29. What is Air Pollution? How can air pollution be minimized?

30. Briefly explain about the components of atmosphere.

6×4 = 24

Section D.

Answer any 2 from the following. Each question carries 15 marks

32. (a) Explain Hardness of water and the different types. (5 marks) (b) Discuss about the various sources of water pollution. (5 marks)

(c) What are the control measures for water pollution ? . (5 marks)

33. (a) Write short note on causes and problems of ozone layer depletion? (b) Explain the various types of smog.

(c) Discuss the Ozone Depleting Substances (Regulation and Control) Rules

34. (a) Explain thermal pollution

(b) Discuss about plastics and their misuses

(c) Discuss about Chernobyl disasters

35. (a) Discuss about green chemistry

(b) Explain Montreal protocol and Kyoto protocol

(c) The water (Prevention and control of pollution) Act

15 × 2= 30

B.Sc. Chemistry programme Elective Course

Semester-6 Credit-2 Elective Course, Course Code – CH1651 .1

Supramolecular, Nano Particles and Green Chemistry---54 hrs

Module I Green Chemistry-1 ---9hrs

Role of Chemical Industries in polluting the environment-Limitations of conventional waste managementpollution prevention-birth of green chemistryintroduction to the principles of green chemistry-atom economy calculation(simple reactions)-production of Ibuprofen-less hazardous chemical syntheses, designing safer chemicals-Bhopal gas tragedy- new greener syntheses, safer solvents and auxiliaries ionic liquids-super critical fluids CO2 and H2O, advantages of SCFs

Module II Green Chemistry-2 ---9hrs

Design for energy efficiency-principle of microwave oven, microwave assisted organic syntheses, simple examples- renewable feedstock- biodiesel, preparation, advantages, catalysis, green catalysts- inherently safer chemistry for accident prevention. Green chemistry practices in research, educational and commercial laboratories- lab safety signs- introduction to micro scale experiments.

Module III Chemistry of Nano Materials Part I 9 Hrs

Classifications of nanostructured materials, nano particles; quantum dots, nanowires, ultra - thinfilmsmultilayered materials. Synthesis of nanometre scale particles of colloidal semiconductors such as TiO2, CdS, ZnO, BaTiO3, by wet chemical methods, hydrothermal methods, and pyrolytic or high temperature methods. Carbon nanotubes fullerenes and graphene. Synthesis and purification of carbon nanotubes, Singlewalled carbon nanotubes and multiwalled carbon nanotubes, Structure-property relationships.

Module IV Chemistry of Nano materials Part II 9 hrs

Preparation of self-assembled monolayers, core shell nanoparticles and quantum dots. Properties of nanoparticles: optical, magnetic, mechanical, thermal and catalytic properties, characterisation of nano particles by AFM, STM and SEM. Applications of nanomaterials: Potential uses of nanomaterials in electronics, robotics, computers, sensors, mobile electronic devices, vehicles and transportation. Medical applications of nanomaterials.

Module V :Molecular recognition 9hrs

The concepts of molecular recognition, host, guest and receptor systems. Forces involved in molecular recognition. Hydrogen bonding, ionic bonding, p-stacking, vander Waal's and hydrophobic interactions.

Module VI Supramolecular chemistry: 9hrs

Introduction to molecular receptors-design principles: Tweezers, Cryptands and Carcerands, Cyclophanes, Cyclodextrins and Calixarenes- Typical examples Molecular recognition and catalysis- catalysis by cation receptors, anion receptors and cyclophanes.
Molecular recognition in DNA and protein structure

References

1. Anastas. P.T.; Warner, J.C.,"Green Chemistry; Theory and Practice", Oxford University Press; Oxford , U.K.,1998.
2. Lancaster,M,"Green Chemistry; An Introductory Text",Royal Society of Chemistry; Cambridge,UK, 2003
3. Rashmi Sanghi and M.M Srivasthava, "Green Chemistry Environment Friendly Alternatives", Narosa Publishing House,2006
4. T.Pradeep, "NANO: The Essentials", 'McGraw-Hill Education'. 5. D. Nasipuri "Stereochemistry of Organic Compounds", Wiley
6. J M Lehn, "Supramolecular Chemistry", V C H.
7. H Vogtle, "Supramolecular Chemistry", W iley.
8. P S Kalsi, J P Kalsi,"Bioorganic, Bioinorganic and supramolecular Chemistry", New Age International

University of Kerala
Model Question Paper
2017 onwards
B.Sc Chemistry Programme
Elective Course Semester VI Course Code CH1651.1 Credit 2
Supramolecular, Nano Particles and Green Chemistry

Time: Three Hours Maximum marks : 80

Section A.
Answer all questions. Each question carries 1 mark.

1. Define atom economy.
2. Write an example of green catalyst.
3. Between an addition and elimination reaction which is having a better atom economy?
4. Name a colloidal semiconductor.
5. Expand SAMS.
6. What is graphene?
7. Name the different allotropes of carbon.

8 . Name any two molecular receptors.
9. What are cryptands?
10. Define π stacking.

Section B.

Answer any eight questions. Each question carries 2 marks.

11. Write a note on Bhopal Tragedy.
12. Define Carbon efficiency.
13. Explain the limitations of conventional waste management.
14. Give any four lab safety signs with its meaning.
15. Write about the wet method of preparing colloidal semiconductors.
16. What are the magnetic properties of nanoparticles.
17. Briefly describe the catalytic properties of nano materials.
18. Explain the different types of SWCNTs.
19. What are the non-covalent bonds involved in molecular recognition?
20. Define host and guest in supramolecular chemistry.
21. Write a note on Cyclodextrins.
22. What are molecular tweezers?

Section C.

Answer any six questions. Each question carries 4 marks.

23. What are secondary electrons?
24. Write a note on safer solvents and auxiliaries.
25. Explain ionic liquids.
26. Write a note on biodiesel.
27. Describe the synthesis of quantum dots and mention its optical properties.
28. Explain the preperation of SAMs.
29 Discuss the potential applications of nanomaterials in computers, sensors, and Medical applications.
30. Discuss the various aspects of molecular recognition involved in the structure of DNA.
31 Write notes on cation and anion receptors.

Section D

Answer any two questions. Each question carries 15 marks.

32.(a)Explain the twelve principles of green chemistry.(10marks)
(b) Explain microwave assisted organic syntheses with an example.(5marks)
33. (a) Explain the principle and working of SEM
(b) Write a note on synthesis and purification of carbon nanotubes.
34. Write short notes on (a) calixarenes (b) Cyclodextrins (c) cyclophanes.
35. Write short notes on(a) molecular recognition(b) preparation biodiesel(c)non bonded interactions.

B.Sc Chemistry ProgrammeELECTIVE
COURSE

Semester-6 Credit-2 Course Code – CH1651.2

Computational, Combinatorial and Physical Organic Chemistry 54 hrs

Module I Introduction to Computational Chemistry *9 hrs*

Web resources in chemistry learning Introduction to structure drawing, spread sheet and chemistry related softwares. Approximate methods in Quantum mechanics- Many electron atoms: Self consistent field method. Chemical bonding: Perturbation theory and variational principle. MO theory of hydrogen molecule ion. VB theory of hydrogen. Concept of resonance.

Module II Computational Methods *9 hrs*

Brief description of computational methods: ab initio, semi empirical, DFT and molecular mechanics. RHF, ROHF &UHF methods Basis sets, STO &GTO. Z-matrix of simple molecules H_2O, CO_2& NH_3. Common computational and visualization softwares

Module III: Combinatorial Chemistry Introduction *9 hrs*

Early development, what is combinatorial synthesis, library synthesis on resin beads, solid phase chemistry, Merrifield peptide synthesis, support for solid phase synthesis, parallel synthesis and mix and split library synthesis.

Module IV Combinatorial Synthesis *9hrs*

Libraries on multipins, libraries on wicks, libraries on laminar solid phases (no detail study).Solution phase library synthesis- eg.-, Hantzsch synthesis of aminothiazole, peptide and nonpeptide libraries(eg. only), Applications of combinatorial chemistry in drug discovery.

Module V : Introduction to Physical organic chemistry *9 hrs* Classification of mechanism with suitable examples. Bond breaking mode – Heterolytic, Homolytic and Pericyclic Nature of reaction – Substitution, Elimination, Addition, Pericyclic and Rearrangement reactions. Nature of reagent – Nucleophilic, Electrophilic and Free radical. Thermodynamic and Kinetic control of reaction. The Hammond postulate (qualitative treatment). The thermodynamic functions – ΔH, ΔS and ΔG and their determination from Arrhenius equation. Role of above thermodynamic functions in mechanistic probe of reactions. Methods of determining mechanism, Identification of products, Detection of intermediates, Catalytic study, Isotopic labeling, Stereochemical evidence, Kinetic evidence.

Module VI Correlation of structure with reactivity *9 hrs*

The effect of substrate structure – Differences in mechanism for primary, secondary and tertiary systems. The effect of a and ß substitution – the +I and –I effects (Inductive effects of electron releasing and electron withdrawing groups at a and ß positions). Substitution of mono and bicyclic (at a and ß positions) aromatic rings (Resonance effects). Hyperconjugate effects. Neighbouring group effect nonclassical bridge head - Steric effects – B-strain, Strain in aliphatic cyclic systems. Steric inhibition of resonance – ortho effect and a-effect, The Hammett equations.

References :

1. Guy H. Grant and W.Graham Richards, “Computational Chemistry”, OCP(29) 2. Christopher J. Cramer, John Wiley,“Essentials of Computational Chemistry”,

3. Frank Jenson, “Computational Chemistry”.
4. Ira N. Levine,“ Quantum Chemistry”.
5. David Young, “Computational Chemistry A Practical Guide for Applying Techniques to Real World Problems”, Wiley Interscience.
6. N K Turret, “Combinatorial Chemistry”, (Oxford Publication)
7. Jerry March "Advanced Organic chemistry”, 3rd edition, Wiely International (Indian edn New Delhi) Chapter 6 and 10
8. P S Kalsi,“ Text of organic Chemistry”, Mac million India ltd 1999 Ch 2
9. M K Jain and S C Sharma,“ Modern Organic Chemistry” , Vishal Publishing Co, 2004, Chapter 3,4, 15

UNIVERSITY OF KERALA

B.Sc Chemistry Programme, Semester VI

2017 admission onwards

MODEL QUESTION Elective Course- Course Code CH1651 .2 Credit 2 Computational, Combinatorial and Physical Organic Chemistry Time: Three Hours

Max. Marks : 80

Section A

Answer all questions. Each question carries 1 mark.

1.Write Arrhenius expression and explain the terms.

2. What is RHF?
3. What are nucleophilic reagents? Give examples.
4. Name any two structure drawing softwares.
5. Write Hammett equation.
6. Give one example solution phase library synthesis.
7. Write any two examples for poly amide resin.
8. Propene is more stable than ethane. Why?
9. What is combinatorial synthesis?
10. Write any two examples for heterolytic bond breaking reaction. 1 X 10 = 10 Marks Section B

Answer *any eight* questions from the following. Each question carries 2 marks.

11. What are the web resources in learning Chemistry?
12. What is a basis set ?
13. What are the major mechanisms of organic reactions ?
14. Distinguish between STO & GTO.
15. Explain the advantages of combinatorial synthesis.
16. What is meant by electrocyclic reaction. Give one example.
17. What are the applications of combinatorial synthesis.18.What are multipins used in combinatorial synthesis
19. Explain kinetic requirements of reaction.
20. Explain Hammond postulate.
21. Explain +I and – I effects.
22. Explain isotopic labeling in the study of organic reactions. 2× 8 = 16 Section C

Answer *any six* questions from the following. Each question carries 4 marks. 23. Draw the Z matrix of H2O & NH3

24.Why SEM is called parametrisation method

25. How can a eight – member dipeptide library is synthesized ?
26. Explain non-peptide libraries.
27. How are the intermediates detected?
28. Explain substitution reactions of naphthalene.
29. Explain the effect of leaving group in aliphatic substitution reactions.
30. What is self consistent field method.
31. Explain mix and split library synthesis. 6 X 4 = 24 Marks

Section D

Answer *any two* questions from the following. Each question carries 15 marks

32. (a)Explain MO theory of hydrogen molecule ion. (b)Explain VB theory of hydrogen .
10 + 5 = 15 Marks
33. (a)Explain neighboring group participation with examples. (b)Explain sterric effects and B-strain. 7.5 + 7.5 = 15 Marks
34. (a) How does the structure of substrate affect the aliphatic nucleophilic substitution? (b) Comment on the effect of substituent on nucleophilic substitution reaction.
7.5 + 7.5 = 15 Marks
35. (a) Write a brief description of methods(a) ab initio(b)DFT (c) molecular mechanics.

5+ 5+ 5 = 15 Marks

B.Sc Chemistry Programme

ELECTIVE-COURSE

2017admission onwards

Semester-6 Credit-2 Elective Course Code - CH1651.3

POLYMER CHEMISTRY 54hrs

Module I:- Introduction *9hrs*

Brief history of macromolecular science, general characteristics of polymers in comparison with common organic compounds. Nomenclatures. Distinction between plastics, elastomers and fibres. Natural polymers- cellulose, silk, gums and resin . Types of polymers- thermoplastics and thermosettings, functionality concept. Concept of cross linked polymers. Types of polymerization- addition, condensation, ionic, co-ordination. Addition – polymerisation – mechanism, initiation , propagation and termination processes, initiators, inhibitors. Mechanism of ionic polymerization

Module II : Methods of polymerization *9hrs*

Methods of polymerization-bulk, suspension, emulsion, solution necessity of copolymers and copolymerization, blocks and graft copolymers. Detailed study of the following thermosetting polymers with respect to synthesis, chemistry, properties and applications. (a) phenol- formaldehyde resins (b) amino resins_ urea- formaldehyde and melamine-formaldehyde resins (c) polyurethanes (d) epoxy resins- grades of epoxy resins, curing process and its importance with mechanism (e) poly carbonates, silicones

Module III: : Elastomers-I *9hrs*

Polyisoprene, polybutadiene, neoprene. Detailed study of the following thermoplastic polymers with respect to synthesis, chemistry, properties and applications. Polyolefins ,polyethylenes_HDPE, LDP,LLDP, polyvinyl chloride-grades of PVC, Teflon, Polystyrene-homopolymers, copolymers such as SBR, ABS, SAN.

Module IV : Elastomers 2 *9hrs*

Vinyl polymers- polyvinyl acetate and its modifications like PVA, PVB and polyacetals. Polyamides - nylon -6, nylon-66 and other nylons. Poly ethers and poly esters, terephthalates. Cellulosics such as esters, ethers, acetates, butyrates, nitrate, CMC; regenerated cellulose.

Module V: Experimental methods-1 *9hrs*

Molecular weight and molecular weight distribution – number , weight and viscosity average molecular weights of polymers, methods of determining molecular weight, practical significance of

molecular weight distribution, size of polymers. Introductory concepts of kinetics of polymerization and Carother's relation. Glassy state, glass transition temperature, TGA, factors affecting GTT, crystallinity in polymers.

Module VI : Experimental Methods –II *9hrs*

Viscosity, solubility, optical properties, electrical properties, thermal properties, mechanical properties of polymers. Degradation of polymers by thermal , oxidative ,mechanical and chemical methods. Polymer processing- compression moulding, casting, extrusion , fibre spinning, injection moulding, thermoforming, vulcanization of elastomers, polymer industry in India.

References

1. Bllmeyer, "Textbook of polymer science", John Wiley and Sons
2. D.D. Deshpande, "Physical chemistry of macromolecules", Vishal publications, New Delhi, 1985
3. V.R. Gowariker, N.V. Viswanathan and J.Sreethan, "Polymer Science", Wiley Eastern Ltd, 1986

B.Sc Chemistry Programme
Model Question Paper
Elective Course Semester VI Course Code CH1651.3
2017 admission onwards
Polymer Chemistry

Time: Three Hours Maximum Marks: 80

Section A
Each question carries 1 mark (Answer in one word\sentence)
Answer all questions

1. What are elastomers?
2. How is melamine-formaldehyde resin prepared?
3. Write a note on Nylon 66.
4. Mention the monomer unit of neoprene.
5. Define copolymers.
6. Explain extrusion.
7. Define fibre spinning.
8. Explain emulsion polymerisation
9. Give two examples of natural polymers10. What is SBR and SAN?

Section B
Answer any eight questions. Each question carries 2 marks.

11. Write a note on Condensation polymerisation.
12. Explain the synthesis of HDPE.
13. Write a note on Polyurethanes.
14. Explain number, weight and viscosity average molecular weight.
15. Define graft copolymers.
16. Explain the preparation of PVC.
17. What are epoxy resins?

18. Explain the vulcanisation of ealstomers.
19. Write the mechanism of ionic polymerisation.
20. Explain the chemical methods of degradation of polymers.
21. Explain polymer processing.
22. Distinguish between thermoplastics and thermosetting plastics.

Section C

Answer any six questions. Each question carries 4 marks.

23. Write a short note on silicones?
24. What are the methods of determining molar mass?
25. Write notes on (1) compression (2) moulding (3) casting
26. Discuss the synthesis and application of Teflon
27. Describe the role of initiators and inhibitors in addition polymerisation
28. Distinguish between plastics, elastomers and fibres
29. Describe the TGA of polymers.
30. Discuss the various aspects of molecular recognition involved in the structure ofDNA.
31. Explain kinetics of polymerization and Carothers relation

Section D.

Answer any two questions. Each question carries 15 marks.

32. Discuss the methods of (a) Determining molecular weight (b)Practical significance of molecular weight distribution
33. Write a note on (a) vinyl polymers and (b) discuss about the methods of synthesis of PVA, PVB and Polyacetals.
34. (a) Explain crystallinity in polymers (b) Explain thermal, electrical and mechanical properties of polymers.

35. Write notes on (a) compression (b) moulding (c) casting

B.Sc Chemistry ProgrammeElective Course

2017 admission onwards

Semester-VI Course Code –CH1651.4Credit-2

Total: 54Hrs

BIOCHEMISTRY Module - I Blood 9 Hrs

Constituents of blood cells and plasma, plasma proteins, albumin and globular - lipoproteins, functions (Details not expected), Coagulation - 'Coagulation factors, Hemoglobin - functions, Structure of hemoglobin, abnormal hemoglobin.

Module II Respiration 9 Hrs

Chemical and physiological events, affecting diffusion of O2 and CO2 during respiration, Transport of Oxygen in Blood O2 dissociation curve, Interrelationship between O2 and CO2 transport.

Module III Kidney Function 9 Hrs

Body water balance, buffers in blood, Formation of Urine, Kidney function, Renal Threshold, Constituents of Urine, diseases associated with Kidney function

Module IV Nutrition 9 Hrs

Measurement of Energy Value of food , Calorific value, caloric requirement, Kilocalorie. Basal metabolic rate (BMR):- Significance, Condition, factors , measurement

Module V Digestion and Absorption of Food 9 Hrs

Outline study of digestion and absorption of Carbohydrates, proteins, fats and enzymes involved , composition and functions of bile - Bile pigments, Bile acids, Bile salts.

Module VI Biochemical Techniques 9 Hrs

Chromatography - Ion exchange, adsorption paper, TLC, GLC, affinity, Gel filtration Electrophoresis - paper, gel, ultracentrifugation.

REFERENCES

1.Gyton,"Text Book of Medical Physiology".

2. Ganog,"Text Book of Medical Physiology ".

3. David Randall, "Physiology".

4. Dr. A.C. Deb, "Fundamentals of Biochemistry".

5. Swaminathan, "Advanced Text Book on Food & Nutrition".

6. B. Srilakshmi, "Nutrition Science".

University of Kerala

B.Sc Chemistry Programme

Model Question Paper

Elective Course Semester VI Course Code CH1651 .4

Biochemistry

2017 admission onwards

Time: 3 hours Maximum marks: 80

Section A.

Answer all questions (maximum two sentences each question carries 1 mark)

1. What is the normal pH of arterial blood?
2. What is the cause of sickle cell anemia?
3. Give an example for plasma protein.
4. What are anticoagulants?
5. Define BMR?
6. What is the renal threshold value of glucose?
7. What is NPN?
8. What is the calorific value of fat?
9. Name the bile pigments.
10. What is GLC?

(10x1=10 marks)

Section B

Answer any eight, each question carries 2 marks

11. Define renal threshold and its significance?
12. What are the normal constituents of urine?
13. What are the different types of hemoglobin?
14. Write a short note on protein digesting enzymes.
15. Draw the structure of heme
16. What are the constituents of blood?
17. What are the functions of plasma protein?
18. What is difference between plasma and serum?

19. What is adsorption chromatograpy?
20. What is the composition of bile?
21. Write about abnormal hemoglobin.
22. Discuss about ion exchange chromatography.

(8 x 2 = 16 marks)

Section C

Answer any six each question each question carries 4 marks

23. Explain Oxygen dissociation curve and factors affecting its shift.
24. Describe gel electrophoresis.
25. Explain thin layer chromatography.
26. Explain briefly the buffers in blood.
27. Give an account of diseases affecting kidney function.
28. Discuss about ultracentrifugation.
29. Discuss the physiological events involved in the transport of oxygen and carbon dioxide.
30. Describe briefly about the various blood cells.
31. Briefly explain about lipoproteins and their functions.

(6 x 4 = 24 marks)

Section D

Answer any two (essay) Each question carries 15 marks 32.

Discuss about (i) Coagulation factors (ii) Anticoagulants (iii) Mechanism of blood clotting. 33. Discuss about the principle procedure and applications of (i) SDS PAGE (ii) Affinity chromatography (iii) Gel filtration chromatography

34. Describe (i) Body water balance (ii) Functions of kidney (iii) Formation of urine.
35. Discuss about the digestion and absorption of (i) Carbohydrate (ii) Protein (iii) Fat

(15 x 2 =30 marks)

UNIVERSITY OF KERALA

First Degree Programme in Chemistry

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

CHEMISTRY COMPLEMENTARY COURSES

SCHEME AND SYLLABI

2017 ADMISSION ONWARDS

General Instructions to Complementary courses

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

B Sc Chemistry ComplementaryComplementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Semester	Hours per week		Number Of Credits	Course code*	Instructional Hours
	Theory	Lab			
1	2	2	2	CH1131 .1	2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .1	2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .1	3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .1 CH1432 .1	3×18 =54 2×18 = 36

- Course code of physics majors is used as an example

GENERAL ASPECTS OF EVALUATION

CONTINUOUS EVALUATION FOR LECTURE COURSES

The Continuous evaluation will have 20 marks and will be done continuously during the semester. CE components are

(i) Attendance for lecture and laboratory sessions (to be noted separately where both lecture and laboratory hours have been specified within a course);

(ii) Assignment /seminar and

(iii) Test

. The weightage is shown in Table I.1. There will be two class tests for which, the better of the two grades obtained will form part of CE. Seminar for each course to be organized by the course teacher and assessed along with a group of teachers in the Department. The topic selection by the student for assignments/seminar will be with the approval of the course teacher.

No	Component	Marks
1	Attendance	5
2	Assignment / Seminar	5
3	Tests	10
	Total	20

QUESTION PAPER PATTERN FOR CONTINIOUS EVALUATION TEST

1. The theory examination has a duration of 1.5 hours
2. Each question paper has three parts: A, B , C
3. Part A contains ten questions. Each question carries1mark. The questions may be in the forms – one word/one sentence.
4. Part B contains twelve questions. Out of these twelve questions, the students have to answer 7 questions. Each question carries 2 marks. Each answer should contain four points. (Short Answer type).
5. Part C contains nine questions of which the candidate has to answer 4 questions. Each question carries 4 marks. The answer must contain 8 points (Short Essay type). Question paper should contain 20% hard, 60% medium and 20% easy questions

QuestionPaperPatternforTest		
QuestionNo	*Typeof Question*	*Marks*
Part A: 1-10	All / one word/one sentence	1X10=10
Part B: 11-22	7out of 12; Short Answer	7 X2=14
Part C: 23-31	4 out of 9; Short Essay	4 X4= 16
TOTAL		40 marks

CONTINUOUS EVALUATION FOR LABORATORY COURSES

The Continuous evaluation will have 20 marks. The ESE of laboratory courses will be done only in the IV semester. But the corresponding CE are calculated from all the semesters in which there is attendance for laboratory sessions?

No	Component	Marks
1	Attendance	5
2	Lab test	5
3	Record	5
4	Punctuality	5
	Total	20

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I. 2. 1. EVALUATION OF THE RECORD

On completion of each experiment, a report should be presented to the course teacher as soon as the experiment is over. It should be recorded in a bound note -book and not on sheets of paper. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, and tables of data collected, equations, calculations, graphs, and other diagrams etc. as necessary and final results. Careless experimentation and tendency to cause accidents due to ignoring safety precautions will be considered as demerits.

CE for Laboratory Record		
No	Sub Component	Marks

1	Punctual submission and Neat presentation	All four sub-components present & satisfactory 5 Only three : 4 Only two : 3 Only one : 2
2	Record of more than 90% experiments in the syllabus	
3	Calculations and absence of errors/mistakes	
4	Accuracy of the result	

During ESE external examiner has to verify the Lab report of experiments certified by the tutor and HOD. The scheme of examination for lab exams may be framed by the Board of examiners.

END SEMESTER QUESTION PAPER PATTERN & GUIDELINE FOR QUESTION PAPER SETTERS

1. The theory examination has a duration of 3 hours
2. Each question paper has four parts: A, B, C and D
3. Part A contains ten questions. Each question carries1mark. The questions may be in the forms – one word/one sentence.
4. Part B contains twelve questions. Out of these twelve questions, the students have to answer eight questions. Each question carries 2 marks. Each answer should contain four points. (Short Answer type).
5. Part C contains nine questions of which the candidate has to answer six questions. Each question carries 4 marks. The answer must contain 8 points (Short Essay type).
6. Part D contains four questions of which the candidate has to answer two. Each question carries 15marks.Essay type question. Each question carries two or three subdivisions (10+5) or (5+5+5) pattern.
7. The total weightage for the entire questions to be answered is 80 marks.
8. Question paper should contain 20% hard,60% medium and 20% easy questions.
9. Question paper setter shall submit a detailed scheme of evaluation along with question paper.

QuestionPaperPatternforTest		
QuestionNo	*TypeofQuestion*	*Marks*
Part A: 1-10	10 one word/one sentence	1x10=10
Part B: 11-22	8 out of 12; Short Answer	2x8=16
Part C: 23-31	6 out of 9; Short Essay	4x6=24
Part D: 32-35	2 out of 4; Essay	2x15=30
		Total = 80-80 marks

SYLLABUS OF COMPLEMENTARY COURSE

(For students of Physics Majors)

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course*	Title of Course	Instructional Hours
1	2	2	2	CH1131 .1		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .1		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .1		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .1 CH1432 .1		3×18 =54 2×18 = 36

I B.Sc Complementary

THEORETICAL CHEMISTRY

(For students of Physics majors)

(Common for Physics and Geology students)

SEMESTER I Complementary Course N o. – 1 Course Code- CH1131 .1 Credit-2

Total Hour : 36 L–T-P- 2-0-2

Module I –Atomic Structure 9hrs

Atomic spectrum of Hydrogen – different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (no derivation mention only) concept of orbitals, the four quantum numbers and their significances. Orbital wise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, stability of filled and half filled orbitals

Module II - Chemical bonding 9hrs.

Energetic of bond formation – Types of Chemical bonds – Energetics of ionic bond formation – Lattice energy – Born Haber Cycle - Fajan's rules.

Polarity of covalent bond its relation with electronegativity – electro negativity scales – Paulings and Mullikan's approaches, factors influencing polarity , dipole moment – its relation to geometry. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility.

Hybridisation and structure of molecules – SP, SP^2, SP^3, dSP^2, dSP^3, SP^3d^2, and SP^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia VSEPR theory, geometry of molecules with bond pairs of electrons only, geometry of molecules containing bond pairs and lone pairs of electrons, limitations. A brief review of molecular orbital approach, LCAO method – bond order, bond distance and stability of O_2,O_2^{2+},O_2^{2-},NO,NO+,CO and HF.

Module–III:Radioactivity
9hrs.

Radio active equilibrium (qualitative idea only) detection of radio activity by Wilson's cloud chamber and Geiger Muller Scintillation counter – units of radio activity – curie and rutherford – Radio carbon dating , Rock dating, Neutron activation analysis Applications in agriculture and medicine. A brief study of the biological effects of radiation such as pathological and genetic damage, Dosimetry – Units – rad, gray and roentgen. Fricke dosimeter and ceric sulphate dosimeter. Nuclear Chemistry – stability of Nucleus – n/p ratio, artificial transmutation and radio activity, mass defect, binding energy, atomic fission and fusion.

Module IV: Analytical principles9 Hrs

Analytical methods in Chemistry – principles of volumetric analysis, primary standard, standard solution, normality and molarity, theory of acid - base titration, permanganometric and dichrometric titration, theory of acid – base and redox indicators.

Inorganic qualitative analysis, common ion effect- solubility product- precipitation of cations- chromatography- principle and applications of paper and thin layer chromatography.

References

1. Atomic structure and chemical bonding withintroduction to molecular spectroscopy- Manas Chandra.
2. Inorganic chemistry- Puri, Sharma and Kalia
3. Fundamental concepts of inorganic chemistry- E S Gilreath
4. Inorganic chemistry-Madan
5. Basic inorganic chemistry-F A Cotton, G Wilkinson and P L Guas
6. Elements of nuclear chemistry- Arnicker
7. Text book of qualitative analysis- A I Vogel
8. Text book of quantitative inorganic analysis- A I Vogel

9. Quantitative analysis: Laboratory manual- Day and Underwood

First semester B.Sc Degree Examination Model question paper

Complimentary course for PhysicsCH1131.1: THEORETICALCHEMISTRY

(2017 admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. Write the electronic configuration of Chromium?
2. Name the principle according to which an orbital can accommodate only two electrons?
3. What is the shape of IF_7 molecule?
4. Write the hybridization of Boron in BF_3?
5. What is the bond order of O_2^+ ?
6. Emission of ------ from a radioactive element does not bring any change in charge or mass.
7. What is the base of radiocarbon dating.
8. What is the result of the beta emission of group 15 element?
9. A useful indicator for the titration of acetic acid versus sodium hydroxide is --------.
10. Calculate the normality of 10% NaOH solution.

SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. State Hund's rule.
12. Give the general equation for the frequency of the lines in the Balmer series for hydrogen?
13. Write the Schrodinger wave equation and explain the terms?
14. NH_3 and CH_4 have SP^3 hybridization. Shapes of these molecules are different. Why?
15. Distinguish between intermolecular and intramolecular hydrogen bonding?
16. The bond energy of NO^+ is larger than that of NO. Why?
17. Define Soddy's group displacement law?
18. The half life period of Ra^{226} is 1620 years. Calculate the value of K for its decomposition in $years^{-1}$?

19. What are beta rays? Which element is formed when beta particle is emitted from Cl-38?
20. Phenolphthalein is not suitable for the titration of strong acid X weak base. Why?
21. How would you prepare 100ml of 0.05M Mohr's slat solution?
22. What are primary standards? Give two examples. SECTION C

(Answer any six questions. Each question carries 4 mark)

23. Why is Bohr model of atom considered inadequate?
24. Explain hydrogen spectrum?
25. Explain why CO_2 and CCl_4 molecules are non polar but $CHCl_3$ molecule is polar?
26. Explain the shape of SF_6 molecule.
27. Water exists as liquid at room temperature while H_2S is a gas at the same temperature. Account for the reason.
28. Explain neutron activation analysis and its application?
29. Write a note on (i) Geiger-Muller counter and (ii) Wilson cloud Chamber.
30. Explain the principle and application of paper chromatography?
31. Explain the theory of redox indicators.

SECTION D

(Answer any two questions. Each question carries 15 mark)

32. (i) What are quantum numbers? Give the significance of each? (5 marks)

    (ii) Write the postulates of Bohr model of atom? (5 marks)

    (iii)Define Aufbau principle with example and explain the stability of half-filled and fully filled orbital? (5 marks)

33. (i) write a short note on Born- Haber cycle?

(ii) Draw and explain the MO diagram for O_2 molecule.

(iii) Describe the different approaches of electronegativity?

34. (i) Derive an equation for the decay constant of a radioactive material.

    (ii) If at the end of 67.5 years only 3.125% of a radioactive material remains without decay.

    What is the half life of the decay?

    (iii) Give an example each for proton, neutron and deuteron induced reactions.

35. (i) what are acid base indicators?

    (ii) explain the use of indicators in acid base titrations.

    (iii) Discuss the titration curves for the titration of strong acid – strong base and weak acid –strong base?

SYLLABUS OF COMPLEMENTARY COURSE
(For students of Physics majors)
(Common for Physics and Geology students)

Physical chemistry-I

SEMESTER II Complementary Course No.- 2 Course Code-CH1231 .1Credit – 2

Total Hours - 36 L-T-P 2-0-2

ModuleI –Thermodynamics 9hrs

First law of thermodynamics, mathematical form, intrinsic energy, enthalpy, reversible, process and maximum work, work of expansion of an ideal gas in reversible isothermal process. Heat capacity of gases at constant volume and constant pressure, derivation of CP – CV = R. Second law of thermodynamics, entropy and free energies, significance of Δ G, Δ H and available work – criteria of equilibrium, and spontaneity on the basis of entropy and free energy – Gibbs-Helmholtz equation.

Module II Thermochemistry:9hrs

Enthalpies of formation, combustion, neutralization, solution and hydration. Relation between heat of reaction at constant volume and constant pressure, variation of heat of reaction with temperature. Kirchoff's equation, Hess's law and application – bond dissociation energies and bond energies of different types of bonds, their calculation and enthalpies of reaction.

Module III –Chemical Equilibrium 9 hrs

Reversible reactions – KP, KC, and KX and their inter relationships – Free energy change and chemical equilibrium (thermodynamic derivation) – van't Hoff reaction isotherm and isochore - influence of pressure and temperature on the following reactions.

(i) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (ii) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ (iii) $2SO_2 + O_2 \rightleftharpoons 2SO_3$ Le Chatelier's principle and the discussion of the above reactions on its basis.

Module IV–Ionic Equilibrium9hrs

Concepts of Acids and Bases, ionization of weak electrolytes. Influence of solvent on acid strength – leveling effect - pH and its determination of potentiometric method. Buffer solutions and calculations of their pH. Henderson equation. Hydrolysis of salt – degree of

hydrolysis and hydrolytic constant, derivation of relation between Kw and Kh for salts of strong acid – weak base, weak acid - strong base and weak acid – weak base.

References

1. Principles of physical chemistry-Puri, Sharma and Pathania
2. Advanced physical chemistry-Gurudeep Raj
3. Thermodynamics for chemists- S Glastone
4. Elements of physical chemistry- Glastone and Lewis
5. A text book of physical chemistry-K L K Kapoor
6. Physical chemistry-P C Rakhit

Second semester B.Sc Degree Examination Model question paper

Complimentary course for Physics Majors

Semester II Complementary Course No.- 2 Course Code-CH1231 .1Credit – 2

PHYSICAL CHEMISTRY- I

(2017 Admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. What is a reversible process?
2. Write the first law of thermodynamics.
3. What is an isochoric process?
4. What is standard enthalpy of formation?
5. Write one example for an exothermic reaction.
6. What is enthalpy of hydration?
7. What is rate constant?
8. What is the significance of ΔG?
9. What is common ion effect?
10. What is the P^H of 0.01M HCl?

SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. One mole of an ideal gas at 25oc is allowed to expand isothermally and reversibly form a volume of 10 liters to 20 liters. Calculate the work done by the gas?
12. State the first law of thermodynamics. What are its limitations?
13. Write the relation between ΔG, ΔH and ΔS. What is the condition for spontaneity of a process?

14. Calculate the enthalpy of hydrogenation, C_2H_4 (g) + H_2(g) ___ C_2H_6 (g).Given that bond energy of H-H= 433kJ, C=C =615kJ and C-C= 347kJ and C-H = 413kJ.
15. Define Enthalpy of formation.
16. What is bond dissociation energy?
17. State Le Chatlier principle.
18. What is isochoric process?
19. What are the characteristics of equilibrium constant?
20. Define Lewis acid and base.
21. What is meant by levelling effect?
22. What is ionic product of water?

SECTION C

(Answer any six questions. Each question carries 4 mark)

23. What do you understand by heat capacity of a system? Show from thermodynamic considerations that Cp - Cv = R.
24. Derive Gibb's Helmohtz equation.
25. In a certain process 675 J of heat is absorbed by a system while 290 J of work is done on the system. What is the change in internal energy for the system?
26. State and explain Hesse's law.
27. Derive relation between heat of reaction at constant volume and constant pressure.
28. Calculate the equilibrium constant for a reaction at 25^0C. ΔG^0=20kcal.
29. Predict the effect of pressure on the dissociation of PCl_5.
30. What is meant by Buffer solution? Give an example of acidic and basic buffer solution? Explain its mechanism?
31. Write Henderson equation. What is its significance? SECTION D

(Answer any two questions. Each question carries 15 mark)

32. (i) Derive an expression for work done in the reversible isothermal isothermal expansion of an ideal gas. (ii) Define
    (a) Work function
    (b) Gibbs free energy function
    (c) Entropy
    (d) Internal energy
33. (i) State Kirchhoff's equation. Indicate how it can be used to evaluate ΔH of a reaction from heat capacity data of reactants and products.

(ii) Calculate the heat of formation of CO_2. Given that CO (g)+H_2O (l) $\rightleftharpoons$ CO_2 (g)+ H_2(g); ΔH=0.7 kcal. Heat of formation of H_2O (l) and CO (g) are -68.3 and -26.4 kcalmol^{-1} respectively.

34. (i) Derive van't Hoff equation.

    (ii) Derive relation between Kp and Kc.

    (iii)The equilibrium constant of a reaction doubles on raising the temperature from 25^{0}C to 35^{0}C. Calculate ΔH^0 of the reaction?

35. (i) Define pH of a solution. Calculate the pH of 0.2M acetic acid in 0.5M sodium acetate at 298K. Dissociation constant of acetic acid at 298K is 1.8 x10^{-5}?

    (ii) Write a note on salt hydrolysis?

SYLLABUS OF COMPLEMENTARY COUSRSE (For students of Physics Majors)

PHYSICAL CHEMISTRY- II

SEMESTER III Course-3 Credit-3Course Code – CH1331.1

L-T-P 3-0-2 54 Hrs

Module 1: Gaseous State 9hrs

Maxwell's distribution of molecular velocities (No derivation) average, most probable and rms velocities, collision number and collision frequency, mean free path, deviation of gases from ideal behaviour – Boyle temperature, derivation of vander waals constants and critical constants – Law of corresponding states – reduced equation of state, Joule Thomson effect, liquefaction of gases – Linde's and claude's processes

Module II – Crystalline State 9hrs

Isotropy and anisotropy – symmetry elements in crystals – the seven crystal systems. Miller indices, Bravais lattices, primitive, bcc and hcc of cubic crystals – Representation of lattice planes of simple cubic crystal - Density from cubic lattice dimension – calculation of Avogadro number - Bragg equation, diffraction of Xrays by crystals – single crystal and powder method. Detailed study of structures of NaCI and KCl crystals.

Module III - Electro Chemistry 9hrs

Transport number – definition, determination by Hittorfs method and moving boundary method, application of conductance measurements. Conductometric titrations involving strong acid – strong base, strong acid – weak base, weak acid – strong base and weak acid – weak base.

EMF – Galvanic cells, measurement of emf, cell and electrode potential, IUPAC sign convention, Reference electrodes, SHE and calomel electrode, standard electrode potential,

Nernst equation, anion and cation reversible electrodes, redox electrode with examples, quinhydrone electrode, glass electrode concentration cell without transference, potentiometric titration, Fuel cells – H2 – O2 and hydrocarbon – O2 type.

Module IV – Catalysis and Photo Chemistry 9hrs

General Characteristics of catalytic reactions. Different types of catalysis – examples – theories of catalysis (Outline of intermediate compound formation theory and adsorption theory). Enzyme catalysis – Michaelis-Menten mechanism.

Photo Chemistry:- Laws of Photo Chemistry, Grothus – Drapter law, Beer Lambert's law, Einstein's laws, quantum yield, H2 – Cl2 reaction, H2 – Br2 reaction – Fluorescence and phosphorescence, chemiluminescence and photo sensitization.

Module – V: Chemical Kinetics 9 Hrs

Rates of reaction, various factors influencing rates of reactions – order and molecularity – Zero, first, second and third order reaction, derivation of integrated rate equation, fractional life time, units of rate constants, influence of temperature on reaction rates. Arrhenius equation, calculation of Arrhenius parameters – collision theory of reaction rates.

Module VI-Group theory 9 Hrs

Group theory- elements of symmetry- proper and improper axis of symmetry- plane of symmetry-center of symmetry- identity elements, combination of symmetry elements-point group- C_{2v}, C_{3v} and D_{3h}- group multiplication table of C_{2v}- determination of point group of simple molecules like water, NH_3, BF_3

References

1. Principles of physical chemistry-Puri, Sharma and Pathania
2. Advanced physical chemistry-Gurudeep Raj
3. Physical chemistry- PW Atkins
4. Physical chemistry-F Daniel and R A Alberty
5. Physical chemistry-E A Moelwyn
6. Introduction to solids- L V Azaroff
7. Solid state chemistry- N B Hannay
8. Group theory in chemistry-V Ramakrishnan and M S Gopinathan
9. Group theory and its applications in chemistry- A Salahuddin kunju and G krishnan

Third Semester B.Sc Degree Examination Model Question Paper

Complimentary course for Physics

CH1331 .1: PHYSICAL CHEMISTRY- II

(2017 Admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1.What is the ratio of observed molar volume to ideal molar volume is?

2. Define Boyle temperature?
3. How many unit cell are possible in cubic crystal?
4. Why amorphous solids are said to be isotropic?
5. In a Galvanic cell electron flows from …… to ……
6. What is the potential of SHE.
7. What is the quantum yield of H_2-Cl_2 reaction?
8. Define chemiluminescence
9. What is the order of the reaction with rate constant $2x10^{-2}$ $molL^{-1}s^{-1}$
10. NH_3 belongs to which point group?

SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. Define critical temperature and explain its significance?
12. What is virial equation of states?
13. Explain the term Space lattice and Unit cell.
14. Both NaCl and KCl have fcc structures but KCl behaves towards X-rays like simple cubic lattice. Why?
15. What is liquid junction potential? How can it be eliminated?
16. What are reference electrodes? Give their significance?
17. State Einstein's law of photochemical equivalence?
18. What is meant by chemiluminescence?
19. What is meant by autocatalysis?
20. Define order and molecularity of a reaction?

21. A substance decomposes following first order kinetics. The half life period of a reaction is 35 minutes. What is the rate constant of the reaction?

22. What is meant by point group?

SECTION C

(Answer any six questions. Each question carries 4 mark)

23. What is the law of corresponding states? How is it derived from the vander waal's equation?

24. Calculate the constants a and b, if Tc=31^{0}C, Pc=72.8atm and R=0.082lit atm/K?

25. What are the Miller indices? How are they determined?

26. EMF of a standard Daniel Cell is 1.01832 V at 298K. Temperature coefficient of the cell is 5x10^{-5}V/K. Calculate ΔG, ΔH, and ΔS of the cell reaction?

27. Write a brief note on Calomel electrode?

28. State and explain Beer-Lambert's law? What are its limitations?

29. Explain pseudo order reactions with suitable examples?

30. Give the group multiplication table for C_{2V}

31. Explain the different symmetry elements?

SECTION D

(Answer any two questions. Each question carries 15 mark)

32. (i) Explain Linde's and Claude's method of liquefaction of gases?

    (ii)Do all gases obey gas laws? Discuss some experimental results to explain the deviation and point out the causes which account for this behavior?

    (iii) explain the terms: collision frequency and collision diameter.

33. (i) Derive Bragg's equation for the diffraction of of X-rays by crystal lattice? How is this equation used in elucidating the crystal structure?

    (ii) In fcc lattice of NaCl the distance between Na^+ and Cl^- ions is 281 pm and the density of NaCl is 2.165g/cm^3. Compute Avogadro's no. from the given data. The molar mass of NaCl is 58.5g/mol.

    (iii) Assign the point groups of the molecule BF_3 and H_2O

34. (i) Write a brief note on fuel cells? (ii) State and explain Nernst equation (iii) Explain the principle of potentiometric titrations?

35. (i) What is catalysis? What are the general characteristics of catalyst? (ii) Derive an expression for rate constant of a first order reaction? (iii) Explain the influence of temperature on reaction rates?

SYLLABUS OF COMPLEMENTARY COUSRSE

(For students of Physics Majors)

Spectroscopy and Material Chemistry

SEMESTER IV Course-4 Credit-3 Course Code – CH1431 .1

L-T-P 3-0-2 Total 54hrs

Module I - Spectroscopy-I 9hrs

Regions of electromagnetic spectrum – different units to represent energy such as erg, joule, calorie, cm^{-1}, Hz and eV, their interconversions – interaction of radiation with matter, different types of energy levels of molecules – rotation, vibration and electronic levels. Rotation spectroscopy Microwave spectrum of diatomic molecules – expressions for rotational energy, selection rule – frequency separation and determination of bond length – vibrational spectrum – harmonic oscillator, equation for frequency of vibration, expression for vibrational energy,

selection rule, frequency separation, calculations of force constant, Electronic spectroscopy –types of transition and regions where they absorb.

Module II- SPECTROSCOPY- II 9 hrs

Raman spectroscopy – stokes and anti stokes lines, quantum theory of Raman spectrum – advantages and disadvantages of Raman spectrum, rotational Raman spectrum, selection rules and frequency separation. Vibrational Raman spectrum – Complementary with IR spectrum, mutual exclusion principle, NMR spectroscopy, principle of NMR spectroscopy, nuclear spin, interaction with external magnet, energy spacing, transition between nuclear energy levels in hydrogen nucleus, low resolutionspectrum, chemical shift, spin – spin

coupling – fine structure spectrum, application to simple molecule

Module III Coordination Chemistry 9 Hrs

Types of ligands, Werner's coordination theory, Valence bond theory of bonding in octahedral and tetrahedral complexes, Drawbacks of valence bond theory crystal field theory of octahedral and tetrahedral complexes, examples – high and low spin complexes, magnetic properties ,application in qualitative and quantitative analysis. 9 hrs

Module IV – Metallurgy 9 Hrs

General principles of occurrence and extraction of metals – purification, roasting, calcination and smelting, reduction to metal, different method with examples, refining of metals- electrolytic and zone refining. Van – Arkel method. Metallurgy of titanium, cobalt, nickel, thorium and uranium.

Module V :Chemistry of Nano Materials 9hrs

Evolution of Nano science – Historical aspects – preparations containing nano gold in traditional medicine, Lycurgus cup – Faraday's divided metal etc.

Nanosystems in nature.

Preparation of Nano particles – Top – down approach and bottom – top approach, sol – gel synthesis, colloidal precipitations, Co- precipitation, combustion technique. Properties of nano particles: optical, magnetic and mechanical properties.

Tools for measuring nano structure – XRD, Atomic force Microscopy (AFM), Scanning Tunneling

Microscopy (STM), and Scanning Electron Microscopy (SEM) Transmission Electron Microscopy (TEM). Applications of nano materials in electronics, robotics, computers, sensors, mobile electronic devices, Medical applications (use Au, Ag,ZnO and ZnO2 as examples)

Module VI- Advanced Materials 9hrs

Magnetic materials-classification-applications- conducting polymers- polyacetylene-ployanilines- synthesis- applications- photoconducting polymers-examples-super conducting materials - Liquid crystals – mesomorphic state, types of liquid crystals applications and examples. .

References

1. Fundamental of molecular spectroscopy- C N Banwell
2. Atomic structure and chemical bonding in molecular spectroscopy- Manas Chandra
3. Physical chemistry-R Stephen Berry, Sturt A Rice and John Rose
4. Inorganic chemistry-J E HuheeCoordination chemistry- Bosolo and Johnson
5. Coordination chemistry- S F A Kettle
6. Inorganic chemistry- Puri, Sharma and Kalia
7. NANO: the essentials –T Pradeep
8. Introduction to Solid State Physics- Charles Kittel

Fourth semester B.Sc Degree Examination Model question paper

Complimentary course for Physics

CH1431 .1: Spectroscopy and Material Chemistry
(2017 Admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. Which of the following give pure rotational spectrum: H_2, N_2, CO_2, HCl?
2. What is Rayleigh scattering?
3. What is the selection rule for vibrational transition?
4. What is the condition for a molecule to be NMR active?
5. What is Wilkinson's catalyst?
6. What is nano shells?
7. Write an example for a chelate.
8. What are the ores of titanium?
9. Name the nano meterials used in semiconductors?
10. What are ferromagnetic materials?

SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. What is Born Oppenheimer approximation?
12. The force constant of HF molecule is 970Nm-1. Calculate the fundamental vibrational frequency as well as the zero-point energy?
13. What is Raman Effect? What is the cause of Raman effect?
14. Explain the terms shielding and deshielding with regard to NMR spectroscopy.
15. What is chemical shift?
16. Explain the effect of solvent in UV spectroscopy.
17. What is the difference between a double salt and a complex compound?
18. $[Fe(CN)_6]^{3-}$ paramagnetic. Why?
19. Explain Van Arkel method of refining of metals.
20. What is froth flotation?
21. What is STM and its basic principle?
22. Explain the synthesis of polyaniline from aniline. SECTION C

(Answer any Six questions. Each question carries 4 mark)

23.Why are anti-stokes lines intense than the stokes lines in the Raman spectrum?

24. Taking the example of HCl show how rotation of the molecule causes dipole moment fluctuations?
25. State and illustrate the Frank-Condon principle.

26. Define the terms: Bathochromic shift, Hypsochromic shift, hyperchromic shift, hypochromic shift.
27. Discuss Werner's theory of coordination compounds.
28. Explain the formation of low spin and high spin complexes with the help of crystal field theory.
29. Outline the principles involving electrolytic refining.
30. Explain the properties of nano particles.
31. Give a short note on superconducting materials. SECTION D

(Answer any twot questions. Each question carries 15 mark)

32. (i) Derive an expression for allowed energies of rotational levels ina diatomic molecule.
    (ii) Show that for a rigid diatomic rotor the moment of inertia is given by $I = \mu r^2$.
    (iii) Discuss the quantum theory of Raman spectroscopy 33.(i) Explain the underlying principle in an NMR spectrum.
    (ii)What are the different kinds of protons indicated in an NMR spectrum. How do they produce their characteristics signals?
    (iii)How can the NMR method be used to distinguish between the structures of 1propanol and 2-propanol?
34. (i) Give an account of crystal field theory?
    (ii) What are applications of coordination compounds in qualitative analysis? (iii) Give an account of hydrometallurgy.
35. (i) Explain the applications of nanomaterials in electronic and robotics.
    (ii) Explain working principle of SEM and TEM.
    (iii)Give a note on types of liquid crystals.

SYLLABUS FOR LABORATORY COURSES FOR B.Sc COMPLEMENTARY CHEMISTRYCourse V
Course CodeCH1432 .1 Credit 2 For Physics & Geology MajorsSemesters 1, 2, 3 & 4

Reactions and identification of cations : Hg^{+}, Pb^{2+}, Ag^{+}, Hg^{2+}, Bi^{3+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+}, Sn^{4+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Cd^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+} and NH_4^{+}

The cations must be provided in solutions. A student must analyse at least ten mixtures containing two cations each.

Volumetric analysis- one burette method only

A. Acidimetry and Alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. (Estimation of a strong base and a weak base using standardized HCl)
Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

[d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.]

(e. Estimation of a strong acid using standardized NaOH))

B. Permanganometry

a. Standardisation of KMnO4 by oxalic acid sodium oxalate and Mohr's salt

b. Estimation of oxalic acid / sodium oxalate.

c. Estimation of Mohr's Salt. d. Estimation of calcium.

C. Dichrometry

e. Preparation of Std. K2Cr2O7 and estimation of ferrous iron by external and internal indicators.

f. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodometry and Iodimetry

g. Standardization of sodium thiosulphate using std. potassium dichromate. h. Estimation of copper in a solution

i. Estimation of iodine

E. Complexometric titrations

j. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution

k. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Physical Chemistry Experiments

1. Conductometric titrations- HCl Vs NaOH

2. Potentiometric titrations- Ferrous iron Vs Dichromate

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} semesters

SYLLABUS OF COMPLEMENTARY COURSE
(For students of Geology Majors)
(Common for Physics and Geology
students)I B.Sc Complementary
THEORETICAL CHEMISTRY
SEMESTER I Complementary Course – 1 Course Code- CH1131 .2 Credit-2

Total Hour : 36 L–T-P- 2-0-2

Module I –Atomic Structure 9hrs

Atomic spectrum of Hydrogen – different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (no derivation mention only) concept of orbitals, the four quantum numbers and their significances. Orbital wise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, stability of filled and half filled orbitals

Module II - Chemical bonding 9hrs.

Energetic of bond formation – Types of Chemical bonds – Energetics of ionic bond formation – Lattice energy – Born Haber Cycle - Fajan's rules.

Polarity of covalent bond its relation with electronegativity – electro negativity scales – Paulings and Mullikan's approaches, factors influencing polarity , dipole moment – its relation to geometry. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility.

Hybridisation and structure of molecules – SP, SP^2, SP^3, dSP^2, dSP^3, SP^3d^2, and SP^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia VSEPR theory, geometry of molecules with bond pairs of electrons only, geometry of molecules containing bond pairs and lone pairs of electrons, limitations. A brief review of molecular orbital approach, LCAO method – bond order, bond distance and stability of O2,$O2^{2+}$,$O2^{2-}$,NO,NO+,CO and HF.

Module–III:Radioactivity
9hrs.

Radio active equilibrium (qualitative idea only) detection of radio activity by Wilson's cloud chamber and Geiger Muller Scintillation counter – units of radio activity – curie and rutherford – Radio Carbon dating , Rock dating, Neutron activation analysis Applications in agriculture and medicine. A brief study of the biological effects of radiation such as pathological and genetic damage, Dosimetry – Units – rad, gray and roentgen. Fricke dosimeter and ceric sulphate dosimeter. Nuclear Chemistry – stability of Nucleus – n/p ratio, artificial transmutation and radio activity, mass defect, binding energy, atomic fission and fusion.

Module IV: Analytical principles9 Hrs

Analytical methods in Chemistry – principles of volumetric analysis, primary standard, standard solution, normality and molarity, theory of acid - base titration, permanganometric and dichrometric titration, theory of acid – base and redox indicators.

Inorganic qualitative analysis, common ion effect- solubility product- precipitation of cations- chromatography- principle and applications of paper and thin layer chromatography.

References

1. Atomic structure and chemical bonding withintroduction to molecular spectroscopy- Manas Chandra.
2. Inorganic chemistry- Puri, Sharma and Kalia
3. Fundamental concepts of inorganic chemistry- E S Gilreath
4. Inorganic chemistry-Madan
5. Basic inorganic chemistry-F A Cotton, G Wilkinson and P L Guas
6. Elements of nuclear chemistry- Arnicker
7. Text book of qualitative analysis- A I Vogel
8. Text book of quantitative inorganic analysis- A I Vogel
9. Quantitative analysis: Laboratory manual- Day and Underwood

First semester B.Sc Degree Examination Model question paper

Complimentary course for Geology CH1131.2: THEORETICALCHEMISTRY

(2017 admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. Write the electronic configuration of Chromium?
2. Name the principle according to which an orbital can accommodate only two electrons?
3. What is the shape of IF_7 molecule?
4. Write the hybridization of Boron in BF_3?
5. What is the bond order of O_2^+ ?
6. Emission of ------ from a radioactive element does not bring any change in charge or mass.
7. What is the base of radiocarbon dating.
8. What is the result of the beta emission of group 15 element?
9. A useful indicator for the titration of acetic acid versus sodium hydroxide is --------.

10. Calculate the normality of 10% NaOH solution. SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. State Hund's rule.
12. Give the general equation for the frequency of the lines in the Balmer series for hydrogen?
13. Write the Schrodinger wave equation and explain the terms?
14. NH_3 and CH_4 have SP^3 hybridization. Shapes of these molecules are different. Why?
15. Distinguish between intermolecular and intramolecular hydrogen bonding?
16. The bond energy of NO^+ is larger than that of NO. Why?
17. Define Soddy's group displacement law?
18. The half life period of Ra^{226} is 1620 years. Calculate the value of K for its decomposition in $years^{-1}$?
19. What are beta rays? Which element is formed when beta particle is emitted from Cl-38?
20. Phenolphthalein is not suitable for the titration of strong acid X weak base. Why?
21. How would you prepare 100ml of 0.05M Mohr's slat solution?
22. What are primary standards? Give two examples. SECTION C

(Answer any six questions. Each question carries 4 mark)

23. Why is Bohr model of atom considered inadequate?
24. Explain hydrogen spectrum?
25. Explain why CO_2 and CCl_4 molecules are non polar but $CHCl_3$ molecule is polar?
26. Explain the shape of SF_6 molecule.
27. Water exists as liquid at room temperature while H_2S is a gas at the same temperature. Account for the reason.
28. Explain neutron activation analysis and its application?
29. Write a note on (i) Geiger-Muller counter and (ii) Wilson cloud Chamber.
30. Explain the principle and application of paper chromatography?
31. Explain the theory of redox indicators.

SECTION D

(Answer any two questions. Each question carries 15 mark)

32. (i) What are quantum numbers? Give the significance of each? (5 marks)

    (ii) Write the postulates of Bohr model of atom? (5 marks)

(iii)Define Aufbau principle with example and explain the stability of half-filled and fully filled orbital? (5 marks)

33. (i) write a short note on Born- Haber cycle?

(ii) Draw and explain the MO diagram for O_2 molecule.

(iii) Describe the different approaches of electronegativity?

34.(i) Derive an equation for the decay constant of a radioactive material.

(ii) If at the end of 67.5 years only 3.125% of a radioactive material remains without decay.

What is the half life of the decay?

(iii) Give an example each for proton, neutron and deuteron induced reactions.

35.(i) what are acid base indicators?

(ii) explain the use of indicators in acid base titrations.

(iii)Discuss the titration curves for the titration of strong acid – strong base and weak acid –strong base?

SYLLABUS OF COMPLEMENTARY COURSE
(For students of Geology majors)
(Common for Physics and Geology students)
Physical chemistry-I

SEMESTER II Complementary Course No.- 2 Course Code-CH1231 .2Credit – 2

Total Hours - 36 L-T-P 2-0-2

ModuleI –Thermodynamics 9hrs

First law of thermodynamics, mathematical form, intrinsic energy, enthalpy, reversible, process and maximum work, work of expansion of an ideal gas in reversible isothermal process. Heat capacity of gases at constant volume and constant pressure, derivation of CP – CV = R. Second law of thermodynamics, entropy and free energies,significance of Δ G, Δ H and available work – criteria of equilibrium, and spontaneity on the basis of entropy and free energy – Gibbs-Helmholtz equation.

Module II Thermochemistry 9hrs

Enthalpies of formation, combustion, neutralization, solution and hydration. Relation between heat of reaction at constant volume and constant pressure, variation of heat of reaction with temperature. Kirchoff's equation, Hess's law and application – bond dissociation energies and bond energies of different types of bonds, their calculation and enthalpies of reaction.

Module III –Chemical Equilibrium 9 hrs

Reversible reactions – KP, KC, and KX and their inter relationships – Free energy change and chemical equilibrium (thermodynamic derivation) – van't Hoff reaction isotherm and isochore - influence of pressure and temperature on the following reactions.

(i) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (ii) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ (iii) $2SO_2 + O_2 \rightleftharpoons 2SO_3$ Le Chatelier's principle and the discussion of the above reactions on its basis.

ModuleIV–Ionic Equilibrium 9hrs

Concepts of Acids and Bases, ionization of weak electrolytes. Influence of solvent on acid strength – leveling effect - pH and its determination of potentiometric method. Buffer solutions and calculations of their pH. Henderson equation. Hydrolysis of salt – degree of hydrolysis and hydrolytic constant, derivation of relation between Kw and Kh for salts of strong acid – weak base, weak acid - strong base and weak acid – weak base.

References

1. Principles of physical chemistry-Puri,Sharma and Pathania
2. Advanced physical chemistry-Gurudeep Raj
3. Thermodynamics for chemists- S Glastone
4. Elements of physical chemistry- Glastoneand Lewis
5. A text book of physical chemistry-K L K Kapoor
6. Physical chemistry-P C Rakhit

B.Sc Degree Examination Model question paper

Complimentary course for Geology Majors

Semester II CH1231.2: PHYSICAL CHEMISTRY- I

(2017 Admission onwards)

Time: Three Hours Maximum Marks: 80

SECTION A

(Answer all questions. Each question carries 1 mark)

1. What is a reversible process?
2. Write the first law of thermodynamics.
3. What is an isochoric process?
4. What is standard enthalpy of formation?
5. Write one example for an exothermic reaction.
6. What is enthalpy of hydration?
7. What is rate constant?

8. What is the significance of ΔG?
9. What is common ion effect?
10. What is the P^H of 0.01M HCl?

SECTION B

(Answer any eight questions. Each question carries 2 mark)

11. One mole of an ideal gas at 25oc is allowed to expand isothermally and reversibly form a volume of 10 liters to 20 liters. Calculate the work done by the gas?
12. State the first law of thermodynamics. What are its limitations?
13. Write the relation between ΔG, ΔH and ΔS. What is the condition for spontaneity of a process?
14. Calculate the enthalpy of hydrogenation, C_2H_4 (g) + H_2(g) C_2H_6 (g).Given that bond energy of H-H= 433kJ, C=C =615kJ and C-C= 347kJ and C-H = 413kJ.
15. Define Enthalpy of formation.
16. What is bond dissociation energy?
17. State Le Chatlier principle.
18. What is isochoric process?
19. What are the characteristics of equilibrium constant?
20. Define Lewis acid and base.
21. What is meant by levelling effect?
22. What is ionic product of water?

SECTION C

(Answer any six questions. Each question carries 4 mark)

23. What do you understand by heat capacity of a system? Show from thermodynamic considerations that Cp - Cv = R.
24. Derive Gibb's Helmohtz equation.
25. In a certain process 675 J of heat is absorbed by a system while 290 J of work is done on the system. What is the change in internal energy for the system?
26. State and explain Hesse's law.
27. Derive relation between heat of reaction at constant volume and constant pressure.
28. Calculate the equilibrium constant for a reaction at 25^0C. ΔG^0=20kcal.
29. Predict the effect of pressure on the dissociation of PCl_5.

30. What is meant by Buffer solution? Give an example of acidic and basic buffer solution? Explain its mechanism?

31. Write Henderson equation. What is its significance? SECTION D

(Answer any two questions. Each question carries 15 mark)

32. (i) Derive an expression for work done in the reversible isothermal expansion of an ideal gas.

    (ii) Define

    (a) Work function

    (b) Gibbs free energy function

    (c) Entropy

    (d) Internal energy

33. (i) State Kirchhoff's equation. Indicate how it can be used to evaluate ΔH of a reaction from heat capacity data of reactants and products.

    (ii) Calculate the heat of formation of CO_2. Given that CO (g)+H_2O (l) $\Longleftrightarrow$ CO_2 (g)+ H_2(g); ΔH=0.7 kcal. Heat of formation of H_2O (l) and CO (g) are -68.3 and -26.4 $kcalmol^{-1}$ respectively.

34. (i) Derive van't Hoff equation.

    (ii) Derive relation between Kp and Kc.

    (iii)The equilibrium constant of a reaction doubles on raising the temperature from 25 ^{0} C to 35^{0}C. Calculate ΔH^0 of the reaction?

35. (i) Define pH of a solution. Calculate the pH of 0.2M acetic acid in 0.5M sodium acetate at 298K. Dissociation constant of acetic acid at 298K is 1.8 $x10^{-5}$?

    (ii) Write a note on salt hydrolysis?

Complementary Chemistry

(For Geology Majors)

Physical , Analytical and Inorganic ChemistrySemester III Course-3
Credit-3Course Code – CH1331 .2

L-T-P 3-0-2 Total 54 hrs

Module I – Gascous State

Maxwell's distribution of molecular velocities (no derivation), average, most probable and RMS velocities collision number and collision frequency, mean free path, deviation of gases from ideal behaviour – Boyle temperature, derivation of Vander Waal's constants and critical constants, law of corresponding states – reduced equation of state, Joule Thomson coefficient, liquefaction of gases –Linde's and Claudes process. 9 Hrs

Module II – Crystalline State

Isotropy and anisotropy – symmetry elements in crystals – the seven crystal systems – Miller indices, Bravais lattices, primitive, bcc and fcc lattices of cubic crystals – Bragg equation - diffraction of X rays by crystals – single crystal and powder method. Detailed study of structure of NaCl and KCl crystals. Liquid crystals – mesomorphic state, types of liquidcrystals, application and examples. 9 hrs

Module III – Chemical Cycles and Group Properties

Carbon, Sulphur, Nitrogen, phosphorous and hydrologic cycle.

Group properties (reactions) of anions in common minerals – Carbonate, Sulphate, Phosphate, Sulphides and fluorides.

Classification of oxides – Acidic, Basic, Amphoteric and neutral 9 hrs

Module IV: Surface Chemistry and Colloids (9 Hrs)

Adsorption – types of adsorption of gases by solids, factors influencing adsorption,Freundlich adsorption isotherm – Langmuir adsorption isotherm (derivation not required).

Colloids:True solution, colloidal solution and suspension. Classification of colloids: Lyophilic, lyophobic, macromolecular, multimolecular and associated colloids with examples. Purification of colloids by electrodialysis and ultrafiltration. Properties of colloids: Brownian movement – Tyndall effect – Electrophoresis. Origin of charge and stability of colloids – Coagulation - Hardy Schulze rule – Protective colloids - Gold number. Emulsions. Applications of colloids: Application of colloids Cottrell precipitator – purification of water, coagulation, reverse osmosis, electro dialysis, delta formation, medicines, cleaning action of detergents and soaps.

Module V Inorganic Polymers9hrs

General properties of inorganic polymer, phosphazenes – preparation of linear and cyclo phosphazene with examples, properties, and application, silicones – General methods of preparation and properties examples. Application of Silicones, Silicone rubber, silicone resins. 9 hrs

Module VI Soil and Water Chemistry 9 hrs

Soil – Composition, mineral matter in soil process of soil formation, weathering –

physical (mention), chemical (detail) + biological (mention)

Saline and alkaline soil (brief explanation) Rocks – different types (Igneous, sedimentary and Meta morphic.) Analysis of lime stone qualitative treatment only.

Water Analysis Water quality parameters COD, BOD, main quality characteristics of water (alkalinity, hardness, total solids and oxidation)

Water treatment including chemical (Precipitation, aeration, osonisation,chlorination) and physical methods of sterilization.

References

1) Physical Chemistry-Rakshit
2) Principles of Physical Chemistry- Puri,Sharma, Pathania
3) Instrumental methods of Chemical Amalysis- B.K.Sharma
4) Vogel's Text book of Quantitative Chemical Analysis –VI Edition
5) Atomic structure with introduction to Molecular Spectroscopy – Manas Chanda
6) Physical Chemistry- N.M.Kapoor
7) Soil and Noise pollution- B.K.Sharma
8. Industrial Chemistry – B.K.Sharma.

Model Question Paper Chemistry (complementary) for Geology majors (2017 admission onwards)

Semester III Course Code: CH1331 .2 Course – III

Physical, Analytical and Inorganic Chemistry

Time: Three Hours Maximum marks: 80

Section A. Answer all questions. Mark 1.

1. Write the general formula of silica.
2. How oxides are classified?
3. Explain the term mean free path.
4. Name two classification of colloids based on solvent?
5. Explain Bravais lattices
6. Write the expression for RMS velocity.
7. What is inorganic rubber?
8. Define Brownian movement.
9. Define glass transition temperature.
10. Mention any two chemical methods of water sterilization.

Section B. Answer any eight questions. Each question carries 2 marks.

11. Distinguish between most probable velocity and average velocity.
12. State law of corresponding states.
13. Differentiate between isotropy and anisotropy.
14. Find the Miller indices of a crystal plane with intercepts 2a,2b and 3c.
15. Explain COD and BOD.
16. How will you analyse limestone qualitatively?
17. What is CMC
18. Draw Langmuir adsorption isotherm
19. What is the difference between colloid and suspension?
20. Define Boyle temperature.
21. What is Bragg's equation?
22. What is Joule- Thomson coefficient?

Section C. Answer any six questions. Each question carries 4 marks.

23. What are the causes for the deviation of real gases from ideality? How is it solved?
24. Explain symmetry elements in crystals.
25. Give an account of weathering with emphasis to chemical weathering.
26. What are inorganic polymers? How do they differ from organic polymers?
27. Give any one method for the preparation of silicones. What are the important applications of silicones?
28. Explain Hardy Schulze rule with the help of an example.
29. Give an account of carbon cycle.
30. Explain Linde's process of liquefaction of gases.

Section D. Answer any two questions. Each question carries 15 marks.

31. (a) Explain liquid crystals with examples for each type (b) Give a detailed account on the structure of NaCl.

32. Write a note on (a) Nitrogen cycle (b) different types of rocks and (c) main quality characteristics of water.
33. Give an account of the preparation, properties and important applications of (a) silicates (b) phosphazenes.
34. (a) Write a note on different types of adsorption of gases by solids.
    (b) Describe the applications of colloids.
35. (a) Write a short note on the various purification methods of water.
    (b) Calculate the average velocity and root mean square velocityof a molecule in a sample of oxygen at 0 °C?

Semester IV – Geology Majors

Physical and Analytical Chemistry -II Course-4

Credit -3Course Code – CH1431 .2

L-T-P 3-0-2 Total 54 Hrs

Module I Metallurgy

Metallurgy of Titanium, Iron, cobalt, Nickel, Thorium, Uranium. Extraction of lanthanides. 9 Hrs

Module II Petro Chemicals

Introduction to crude oil, exploratory methods, constitution of crude oil, natural gas - constituents. Distillation of crude oil, separation of natural gas and different fractions. Meaning of terms such as ignition point, flash point, octane number. Types of hydrocarbon fuels and their characteristics. Cracking – catalytic cracking, hydro cracking, isomerisation, reforming, sulphur, hydrogen, petroleum, coke and nitrogen compounds from petroleum. 9Hrs

Module III Chemical Kinetics

Rates of reactions, various factors influencing rates of reactions – order and molecularity - Zero, first, second and third order reactions – derivation of integrated rate equation, fractional life time – units of rate constants, influence of temperature on reaction rates – Arrhenius equation, calculation of Arrhenices parameters – Collision theory of rates. 9 hrs

Module IV Catalysis and Photo Chemistry 9hrs

Theories of catalysis, outline of intermediate compound formation theory and adsorption theory.

Photo Chemistry:Laws of photo Chemistry .Grotthus Draper Law, Einstein's law, Beer lambert law, Photo Chemical equivalence and quantum yield, explanation for high and low quantum yields, H2-Cl2 reaction, H2-Br2 reaction, Photosensitisation and Chemiluminescence.

Module V - Electro Chemistry 9hrs

Transport number – definition, determination by Hittorfs method and moving boundary method, application of conductance measurements. Conductometric titrations involving strong acid – strong base, strong acid – weak base, weak acid – strong base and weak acid – weak base.

EMF – Galvanic cells, measurement of emf, cell and electrode potential, IUPAC sign convention, Reference electrodes, SHE and calomel electrode, standard electrode potential, Nernst equation, anion and cation reversible electrodes, redox electrode with examples, quinhydrone electrode, glass electrode concentration cell without transference, potentiometric titration, Fuel cells – H2 – O2 and hydrocarbon – O2 type.

ModuleVI Instrumental Methods of Analysis9 hrs

Spectral methods – Atomic Absorption Spectroscopy (AAS) principle, measurement, advantages, disadvantages, and applications. Flame Emission Spectroscopy (FES) principle, measurement,(single beam method) applications.

Thermal methods: Thermo gravimetric analysis (TG) principle and method, Factors affecting thermogravimetric analysis, Application, Differential Thermal Analysis (DTA) principle, method, factors affecting DTA Applications.

References

1. Physical Chemistry-Rakshit
2. Principles of Physical Chemistry- Puri,Sharma, Pathania
3. Instrumental methods of Chemical Amalysis- B.K.Sharma
4. Vogel's Text book of Quantitative Chemical Analysis –VI Edition
5. Atomic structure with introduction to Molecular Spectroscopy – Manas Chanda

6. Physical Chemistry- N.M.Kapoor

7. Soil and Noise pollution- B.K.Sharma

8.IndustrialChemistry–B.K.Sharma.

Model Question Paper Chemistry (complementary) for Geology majors (2017 admission onwards)

Semester IV Course Code: CH1431.2 Course IV

Physical and Analytical Chemistry II

Time: Three Hours Maximum marks: 80

Section A. Answer all questions. Mark 1.

1. Write Arrhenius equation.
2. State Beer Lambert law.
3. Explain catalytic cracking.
4. Give an example of a negative catalyst with the chemical reaction which it catalyses.
5. The rate law for a reaction is $r = k [A] [B]^2$. Write the order of the reaction.
6. Define octane numbe r.
7. Name two important ores of Uranium.
8. Draw the shape of graph for the titration of a strong acid Vs strong base.
9. What you meant by flash point?
10. Conductance of an electrolyte depends on ……. and …….

Section B. Answer any eight questions. Each question carries 2 marks.

11. What is the influence of temperature on reaction rate?
12. A substance decomposes following first order kinetics. The half life period of the reaction is 35 minutes. What is its rate constant?
13. State Einstein's law of photochemical equivalence.
14. Define quantum yield of a photochemical reaction.
15. Explain van't Hoff reaction isotherm.
16. Illustrate SHE.
17. Write the principle of AAS.
18. How do you differentiate a TG curve from a DTA curve?
19. What is smelting.
20. Distinguish between order and molecularity?
21. What is Grotthus- Draper law?
22. Explain chemiluminescence.

Section C. Answer any six questions. Each question carries 4 marks.

23. Give the Arrhenius equation. How will you determine the Arrhenius parameters?
24. Explain photosensitization reaction with an example.
25. Explain the method used to determine transport number of an electrolite.
26. What is the principle of flame emission spectroscopy? Mention its important applications.
27. What are the general methods for refining of metals?

28. Give an account of different types of hydrocarbon fuels and their characteristics.
29. Distinguish between isotherm and isochore.
30. Explain quantum yield in terms of H_2-Cl_2 reaction.

Section D. Answer any two questions. Each question carries 15 marks.

31. (a) Derive the expression for the rate constant of a first order reaction. (b) How will you express the units of rate constant for reactions of order 1, 2 and 3?
32. Write a note on (a) Extraction of lanthanides (b) Types of hydrocarbon fuels and their characteristics (c) Photosensitisation.

33. Give a detailed account on the principle and applications of (a) TG and (b) DTA.
34. (a) Discuss the principle, measurement and applications of Flame Emission Spectroscopy (FES)
    (b) Explain Collision theory of rates.
35. (a)Explain the method used to determine transport number of an electrolyte.
    (b) A solution of silver nitrate containing 12.14 g of silver in 50 ml of solution was electrolysed between platinum electrodes. After electrolysis, 50 ml of the anode solution was found to contain 11.55 g of silver, while 1.25 g of metallic silver was deposited on the cathode. Calculate the transport number of Ag+ and – NO3 ions.

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY Course CodeCH1432 .2 Credit 2 For Physics & Geology Majors

Semesters 1, 2, 3 & 4

Reactions and identification of cations : Hg^{+}, Pb^{2+}, Ag^{+}, Hg^{2+}, Bi^{3+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+}, Sn^{4+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Cd^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+} and NH_4^{+}

The cations must be provided in solutions. A student must analyse at least ten mixtures containing two cations each.

Volumetric analysis

A. Acidimetry and Alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl)

Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH.

B. Permanganometry

a. Standardisation of KMnO4 by oxalic acid sodium oxalate and Mohr's salt b. Estimation of oxalic acid / sodium oxalate

c. Estimation of Mohr's Salt.

d. Estimation of calcium

C. Dichrometry

e. Preparation of Std. K2Cr2O7 and estimation of ferrous iron by external and internal indicators.

f.Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodometry and Iodimetry

g. Standardization of sodium thiosulphate using std. potassium dichromate. h. Estimation of copper in a solution

i. Estimation of iodine

E. Complexometric titrations

j. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution

k. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals.

2. Estimation of barium chloride solution.

Physical Chemistry Experiments

1. Conductometric titrations- HCl Vs NaOH

2. Potentiometric titrations- Ferrous iron Vs Dichromate

This laboratory based course reinforces the qualitative and quantitative chemical analysis that

the student has learned in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} semesters

Complementary Chemistry offered to Botany Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry ComplementaryComplementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .3		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .3		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .3		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .3 CH1432 .3		3×18 =54 2×18 = 36

SYLLABUS FOR COMPLEMENTARY COURSE COURSE

Theoretical Chemistry (Common for Botany/Zoology/Microbiology)

(For Students of Botany Majors)

SEMESTER 1 Complementary Course 1 Course Code-CH1131 .3 Credit-2

L-T-P 2-0-2 36 Hours

Module I – Atomic Structure (9 hrs)

Atomic spectrum of hydrogen - different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (mention only, no derivation), concept of orbitals, the four quantum numbers and their significances. Orbitalwise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, Stability of filled and half filled orbitals.

Module II – Chemical Bonding (9 hrs)

Energetics of bond formation – Born-Haber cycle. Hybridisation and structure of molecules – sp, sp^2, sp^3, dsp^2, dsp^3, sp^3d^2 and sp^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia. VSEPR theory with regular and irregular geometry –. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility. Partial covalent character of the ionic bond – Fajan's Rules. A brief review of molecular orbital approach

– LCAO method – bond order, bond distance and stability of O2, $O2^{2+}$, $O2^{2-}$, NO, NO^+

Module III – Analytical Principles (9 hrs)

Principles of volumetric analysis – primary standard – standard solutions normality and molarity, theory of acid-base titrations, permagnometric and dichrometric titrations, iodometry and complexometric titrations. Theory of acid-base indicator – redox indicators. Beer- Lambert law- Principles of colorimetry – Estimation of Iron and phosphate.

Module IV – Environmental Chemistry (9 hrs)

Nature of environmental threats and role of chemistry. Green house effect, ozone layer and its depletion.. Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis.-Dissolved oxygen-BOD,COD

References

1. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
2. Concise Inorganic Chemistry – J.D. Lee
3. Environmental Chemistry A. K. De

4. Modern Inorganic Chemistry A.D. Madan
5. A. I. Vogel, “Text book of Qualitative Analysis”
6. A. I. Vogel, “Text book of Quantitative Inorganic Analysis”.
7. S. K. Banerji, “Environmental Chemistry”.
8. A. K. De “Environmental Chemistry - An introduction”
9. B. K. Sharma “Air Pollution”.
10. V. K. Ahluwalia “Environmental Chemistry”
11. G.W. vanLoon and S. J. Duffy “Environmental Chemistry: A global perspective”

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
SEMESTER I Complementary CourseBotany majors. Course Code -CH1131 .3 THEORETICAL CHEMISTRY

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the electronic configuration of Copper (atomic umber 29) 2. The quantum numbers n = 2 and l = 1 corresponds to which orbital?
3. What are the shapes of molecules with sp and sp3 hybridization?
4. Calculate the bond order of H2 molecule.
5. Give the structure of XeO3.
6. What is Lattice Energy?
7. What is meant by primary standards?
8. Define Molality.
9. What is the optimum value of DO for good water quality?
10. What is meant by BOD?

Section-B

Short answer type. Answer any 8 questions. Each question carries two marks

11. What is Bohr Bury’s rule?
12. Write down the Schrodinger Equation and explain the terms involved.
13. Explain the failures of Bohr’s theory?
14. What are the limitations of VSEPR Theory?
15. What are polar and non polar covalent bonds?
16. Mention the rules for adding electrons to molecular orbitals?
17. What are dichrometric titrations?

18. How would you prepare 100ml of 0.05M Mohr's salt solution?
19. Methyl orange is not a suitable indicator for the titration of weak acid with strong base. Why?
20. Which are green house gases? Mention their sources.
21. What is reverse osmosis? How it is useful in the purification of waste water?
22. What are chief factors responsible for water pollution?

Section-C

Short essay. Answer any 6 questions from the following. Each question carries four marks.

23. If the energy difference between two electronic states of hydrogen atom is 214.68 $KJmol^{-1}$. What will be the frequency of light emitted when the electrons jump from the higher to the lower level?
24. Explain the stability of half filled and completely filled orbitals.
25. Give an account of permanganometric titrations.
26. Discuss the theory of Acid – Base indicators.
27. Explain the energetic of ionic bond formation.
28. Define hybridization. Mention the types of hybridization involved in SF6, PCl5, BF3.
29. Explain Born-Haber Cycle considering the formation of NaCl as an example.
30. Write a note on agricultural pollution.
31. Explain briefly the different methods for the treatment of industrial waste water.

Section-D

Essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32. (a) Discuss Bohr Theory, highlighting its merits and demerits. (b)What are quantum numbers? Give its significance.
    (c) Explain various rules regarding electronic configuration.
33. (a) Discuss the titration curves for the titration of strong acid with strong base and weak acid with strong base.
    (b) Explain the theory of redox indicators.
    (c) explain Beer's Law, Lambert's Law and Beer – Lambert Law.
34. (a) Write a note on Hydrogen bonding and its consequences.
    (b) How electronic configuration of molecules related to molecular behavior? Explain.
    (c) Explain Fajan's Rule.
35. (a) Discuss the formation and importance of ozone layer.
    (b) What is meant by pollution and pollutants? Explain the classification of air pollutants. (c) What are the sources of important air pollutants.

Complementary Chemistry for BOTANY Majors
SEMESTER II Course code-CH1231 .3 Credit-2
Inorganic and bioinorganic chemistry(Common for Botany/Zoology/Microbiology)
L-T-P 2-0-2 (36 hrs)

Module I :Organometallics (9 hrs)

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications. Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses. Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture. Environmental aspects of Organometallic compounds.

Module II Nuclear Chemistry (9 hrs)

Natural radioactivity, modes of decay, Geiger–Nuttal rule, artificial transmutation and artificial radioactivity- nuclear stability, n/p ratio, mass defect and binding energy, nuclear fission and nuclear fusion, -applications of radioactivity- ^{14}C dating, rock dating , neutron activation analysis and isotope as tracers

Module III - Coordination Chemistry (9 hrs)

Nomenclature, Coordination number and geometry - chelates – isomerism – structural and stereo isomerism valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – colour and magnetic properties of transition metal complexes. Application of metal complexes in qualitative and quantitative analysis.

Module IV – Bio inorganic compounds (9 hrs)

Metalloporphyrins – cytochromes – chlorophyll photosynthesis and respiration – haemoglobin and myoglobin, mechanism of O2 – CO2 transportation, nitrogen fixation, carbon fixation and carbon cycle. Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems.

References

1. Co-ordination Chemistry – Bosolo and Johns
2. Chemistry of Organometallics – Rochoco.
3. Concise Inorganic Chemistry – J.D. Lee
4. Puri, Sharma and Kalia “Inorganic Chemistry”
5. Modern Inorganic Chemistry A.D. Madan

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
SEMESTER II Complementary CourseBotany majors. Course Code CH1231.3
INORGANIC AND BIOINORGANIC CHEMISTRY

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the structure of Zeise's salt.
2. Write any one of the preparation methods of organolithium compounds.
3. What is ferrocene? How is it synthesized?
4. What are alpha particles?
5. Define the term radioactivity.
6. Write the IUPAC name of K3[Co(NO2)4Cl2]
7. What are low spin complexes?
8. What do you mean by chelate?
9. What are metalloporphyrins?
10. Give an example of anaerobic respiration.

Section-B

Short answer type . Answer any 8 questions from the following. Each question carries two marks

11. What is reformatsky reaction?
12. What is cisplatin? Give its significance.
13. How are organomercurials prepared?
14. Explain Geiger Nuttal Rule.
15. What are half life period and average life period?
16. Define mass defect and binding energy.
17. Write the postulates of Werner's Coordination Theory.
18. What are poly dentate ligands? Give an example.
19. Explain the colours of transition metal complexes.
20. Differentiate respiration and photosynthesis.
21. What are trace elements?

22.What is the role of chlorophil in photosynthesis?

Section-C

Short essay. Answer any 6 questions from the following. Each question carries four marks.

23.Write a note on organotin compounds.
24.Write a brief note on the applications of organometallic compounds in agriculture and horticulture.
25.One microgram of phosphorus- 32 was injected into a living system for biological tracer studies. The half life period of P-32 is 14.3 days. How long will it take for the radioactivity to fall to 10% of the initial value?
26.Explain the relation between nuclear stability and n/p ratio.
27.Write the biological effects of radiation.
28.Suggest the structure of [NiCl4] on the basis of Valence Bond Theory.
29.Explain the magnetic properties of octahedral complexes with suitable examples.
30.Discuss briefly the biochemistry of iron toxicity and nutrition.
31.Metal ions play a variety of roles in biological systems. Explain.

Section-D

Essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32.(a) Explain the synthesis and applications or Grignard reagent. (5 marks)
(b) What are Frankland reagents? Give its significance. (5 marks)
(c) Explain about organosilicon compounds in medicine. (5 marks)

33.(a) Explain carbon dating and rock dating. (5 marks)
(b) Give the principle of neutron activation analysis. (5 marks)
(c) Explain the terms nuclear fission and fusion with suitable examples. (5 marks)

34.(a) Write a note on Crystal Field Theory. (5 marks)
(b) Explain the applications of complexes in qualitative analysis. (5 marks) (c) Write a brief note on isomerism in coordination complexes. (5 marks)

35.(a) Give brief outline of carbon cycle. (5 marks)
(b) Explain nitrogen Fixation. (5 marks)
(c) Write a short note on hemoglobin. (5 marks)

SYLLABUS OF COMPLEMENTARY COURSE

Physical Chemistry

(For Students of Botany Majors)

SEMESTER III Course-3 Credit-3 Course Code – CH1331 .3

L-T-P 3-0-2 Total: 54 Hours

Module I. Chemical kinetics 9 Hrs

Chemical kinetics, catalysis, rate of reactions, various factors influencing rate, order, molecularity, zero, first, second, third order reactions (derivation of first order only) fractional life time, units of rate constants, influence of temperature on reaction rates, Arrehinius equation, Calculation of Arrhenius parameters, Collision theory, catalysis, different types of catalysis, intermediate compound formation theory and adsorption theory.

Module II -Ionic equilibrium 9 Hrs

Arrhenius, Lowry- Bronstead and lewis concept of acids and bases, Kw and pH, pH of strong and weak acids, Ka and Kb, mechanism of buffer action, pH of buffer, He nde rson e quati on, Hydrolysis of salt, Degree of hydrolysis and hydrolysis constant .

Module III. Solutions 9 Hrs

Completely miscible liquid pairs, vapour pressure - composition curve, boiling point-composition curve- ideal and non ideal solutions, fractional distillations, azeotropes. Partially miscible liquids - CST, phenol- water, nicotine-water system, Effect of impurities on miscibility and CST, immiscible liquid pairs, steam distillation- Distribution law and its limitations, applications of solvent extractions.

Module IV UV and NMR spectroscopy 9Hrs

UV-Visible Spectroscopy- absorption, types of electronic transitions, effect of conjugation, concept of chromophore, auxochrome, bathochrome, hypochromic shifts, hyperchromic and hypochromic effects. UV-Visible spectra of enes. Calculation of λmax. Applications of UV spectroscopy - conjugation, functional group and geometrical isomerism. Principle of NMR, nuclear spin, chemical shift, spin-spin coupling, τ and δ, PMR of simple organic molecules $CHBr_2CH_2Br$, CH_3CH_2Br and CH_3CH_2OH. Principle of MRI .

Module V Dilute solutions: 9hrs

Molarity, molality and molefraction - Colligative property – relative lowering of vapour pressure – elevation in boiling point – depression in freezing point – osmotic pressure – experimental determination of osmotic pressure – Isotonic solution – reverse osmosis - abnormal molecular mass - van't Hoff factor.

Module VI colloids- 9hrs

Colloidal state: Types of colloids, preparation of colloids-Purification of colloids – ultra filtration and electrodialysis, Kinetic, optical and electrical properties of colloids. Ultra microscope, Electrical double layer and zeta potential. Coagulation of colloids, Hardy-Schulz rule. Micelles and critical micelle concentration, sedimentation Application of colloids – Cottrell precipitator, purification of water and delta formation.

References

1. Organic Chemistry of Natural Products, Chatwal,Gurdeep.R, Himalaya Publications
2. Principles of physical chemistry, Puri Shrama Pathania, Vishal
3. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
4. Elementary organic spectroscopy, Y.R Sharma, S chand & Company
5. Principles of Physical Chemistry, B.R.Puri, R.L.Sharma & Pathania, Vishal Publishing
6. Essentials of Physical Chemistry, B.S. Bahl., G.D. Tuli & Arun Bahl , S.Chand & Co., New Delhi.
7. Simplified Course in Physical Chemistry, R.L. Madan, G.D. Tuli , S.Chand & Co.
8. Chromatography, .B.K .Sharma, GOEL Publishing house, Meerut

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
SEMESTER III Complementary Course. Course Code CH1331 .3
(For Students of Botany Majors)

PHYSICAL CHEMISTRY

Time:3hours Maximum Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. What are the units of rate constants for first and second order reactions?
2. Give one example of a reaction in which order and molecularity have different values.
3. Define pH.
4. State Hardy-Schulze rule.
5. Distinguish between lypophilic colloids and lypophobic colloids.
6. Define chemical shift.
7. Explain chromophore with an example.

8. What is meant by a buffer solution? Give one example each for acid buffer and basic buffer solution.
9. What is meant by the term ideal solution?
10. Define Van't Hoff factor.

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. What are the factors which affect the rate of a chemical reaction?
12. Write down the expression that gives the dependence of the rate constantof a chemical reaction on the absolute temperature and explain the terms involved. 13.Explain briefly Lewis concept of acids and bases with two examples
14. What is zeta potential? How does it arise?
15. What is critical micelle concentration? Discuss the structure of micelles in polar and nonpolar media
16. Tetra Methy Silane (TMS) is chosen as a reference compound in NMR studies. Give reasons
17. What are the different types of electronic transitions?
18. Differentiate between molarity and molality.
19. A solution containing 7g of a non volatile solute in 250g of water boils at 373.26 K. Find the molecular mass of the solute.(Kb for water is 0.52K/m)
20. Explain the terms Degree of hydrolysis and hydrolysis constant.
21. Explain reverse osmosis.
22. Calculate the mole fraction of alcohol, C_2H_5OH and water in a solution made by dissolving 9.2g of alcohol in 18g of water.

(8 X 2 = 16 Marks)

SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. What is energy of activation? What happens to the energy of activation in presence of a catalyst.

24. Explain Half life period of a reaction. A first order reaction has a specific reaction rate of $2.31x10^{-3}$ s^{-1}. Calculate the half life period of the reaction.

25. Calculate the pH of a buffer solution containing 0.2 mole of NH_4Cl and 0.1mole of NH_4OH per litre. Kb for NH4OH = $1.85x10^{-5}$.

26. Derive the relation between K_h, K_w and K_a.

27. Give an account of applications of colloids

28. Explain ultra filtration and electrodialysis techniques used for the purification of colloids

29. Which of the following will show spin- spin coupling in their NMR spectra? If coupling is observed, give the spin multiplicity : (a) $ClCH_2CH_2Cl$ (b) CH_3COCH_3 (c) CH_3CHO (d) $ClCH_2CH_2I$

30. What is osmotic pressure? How will you determine the molecular mass of a substance with this method?

31. Explain the principle of Fractional Distillation

(6 X 4 = 24marks)

SECTION – D

(*Answer any 2 question. Each question carries 15 marks*)

32. (a)Differentiate between Molecularity and order of a reaction with examples (5 marks)
    (b) Discuss the Kinetic, optical and electrical properties of colloids (5 marks)
    (c) Explain the protective action of colloids(5 marks)

33. (a) Which of the following has the highest osmotic pressure: 0.1M sucrose, 0.1M acetic acid, 0.1M KCl and 0.1M Na_2SO_4 all in water? Why?
    (b) Why do you get abnormal molecular masses of the substances by using colligative properties of the solution.
    (c) Discuss in detail about the determination of molecular mass of a non volatile compound from elevation in boiling point and depression in freezing point

34. (a) Discuss the factors responsible for deviation from Raoult's law by taking suitable examples. (b) Define critical solution temperature. Explain systems having upper and lower CST using examples
    (c) Explain the applications of UV spectroscopy

35. (a)Discuss the advantages of Bronsted-Lowery concept over Arrhenius concept and also the limitations of the Bronsted-Lowery concept.
    (b) The salt of strong acid and strong base does not undergo hydrolysis. Explain.

(c) Explain the underlying principle in an NMR spectrum and interpret the low resolution NMR spectrum of ethanol molecule.

(15 X 2 = 30marks)

SYLLABUS OF COMPLEMENTARY COURSE
Organic Chemistry (For Students of Botany Majors)
SEMESTER IV Course-4 Credit -3 Course Code CH1431 .3

L-T-P 3-0-2 Total 54 Hours

Module I - Chromatography (9 Hrs)

Outline study of adsorption and partition chromatography, paper , thin layer, ion exchange ,gas chromatography- principle-instrumentation and applications and HPLC - Rf and Rt value – Introduction to zone electrophoresis and capillary electrophoresis.

Module II Amino acids, Proteins (9 hrs)

Amino acids: - Classification, structure and stereochemistry of amino acids, essential and non essential amino acids, zwitter ion, isoelectric point, General methods of preparation and reactions of a - amino acids.

Peptides: structure and synthesis (Carbobenzoxy method, Sheehan method only). Proteins:- Structure of proteins, denaturation and colour reactions.

Nucleic acids: - Classification and structure of DNA and RNA. Replication of DNA, Genetic Codes.Translation- Transcription

Module III Sterochemistry (9 hrs)

Optical Isomerism : Chirality and elements of symmetry – DL notation – Enantiomers – optical isomerism in glyceraldehydes, lactic acid and tartaric acid – Diastereoisomers – mesocompounds – Cahn-Ingold-Prelog rules – R-S notations for optical isomers with one and two asymmetric carbon atoms.- erythro and threo representations. Racemic mixture – resolution – methods of resolution

Module IV Oils, Fats, Detergents, Alkaloids, Vitamins and Terpenes (9 hrs.)

Oils and Fats: - Occurrence and extraction. Common fatty acids, soap, saponification value, iodine value, acid value, Alkaloids: - Extraction and structural elucidation of conine, nicotine and importance of quinine, morphine and codeine. Terpenes: - Essential oils, isolation of citral and geraniol (No structural elucidation) Isoprene and special isoprene rule. Vitamins: - Classification, structure functions and deficiency diseases (structures of vitamin A, B1 and C but no structural elucidation).

Module V Dyes (9hrs)

Theory of colour and constitution, classification of dyes, Natural dyes, indigo- Synthesis of methyl orange, congo red, malachite green, phenolphthalein, Schiffs reagent.

Module VI Drugs (9Hrs)

Classification of drugs- analgesic, antipyretic, antibiotic, hypnotics, suphadrugs, antacids, antimalarials, Synthesis of aspirin, sulphaguanidine, chloramphenicol, Drugs of plant origin anticancer compounds from plants.

References

1. Organic Chemistry of Natural Products, Chatwal,Gurdeep.R, Himalaya Publications
2. Principles of physical chemistry, Puri Shrama Pathania, Vishal
3. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
4. Elementary organic spectroscopy, Y.R Sharma, S chand & Company
5. Principles of Physical Chemistry, B.R.Puri, R.L.Sharma & Pathania, Vishal Publishing
6. Essentials of Physical Chemistry, B.S. Bahl., G.D. Tuli & Arun Bahl , S.Chand & Co., New Delhi.
7. Simplified Course in Physical Chemistry, R.L. Madan, G.D. Tuli , S.Chand & Co.
8. Chromatography, .B.K .Sharma, GOEL Publishing house, Meerut
9. Text Book of Pharmaceutical Chemistry, . Atherden L.M, Bentley and Driver, Oxford. University Press

University of Kerala

Model Question Paper of BSc Botany Programme

2017 Admission onwards

SEMESTER IV Complementary Chemistry Course Code CH1431 .3

ORGANIC CHEMISTRY

Time:3hours Max.Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. What is meant by Rf value?
2. Define Racemic mixture.
3. Represent the configurations of D and L glyceraldehyde.
4. Give two example of essential aminoacids.
5. Describe a colour test for proteins.
6. Define Iodine value.
7. What are antipyretics?
8. State Special isoprene rule?

9. What is mordant dye? Give one example.
10. Give the deficiency disease of Vitamin C. (10 X 1 =10Marks)

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. Give the principle of adsorption chromatography.
12. What is meant by denaturation of proteins.
13. Discuss the importance of Morphine.
14. Which of the following are optically active ? Why?
    (i)2-chloropropane (ii)2-chlorobutane (iii)3-chloropentane
15. Give four differences between enantiomers and diastereoisomers.
16. Write a note on the different types of RNA and its functions.
17. How are alkaloids extracted from natural sources?
18. Give the classification of Vitamins.
19. What are antacids. Explain.
20. Give the structure of Vitamin A.
21. Name three anticancer compounds from plant.
22. Explain saponification.

(2 X 8 = 16 Marks)SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. Discuss the optical isomerism of tartaric acid.
24. Write a note on DNA replication .
25. Give the synthesis of Tryptophan.
26. What is meant by Isoelectric point of aminoacids.
27. Determine the R & S notations of meso tartaric acid and L- glyceraldehyde.
28. Give a brief account on Thin Layer Chromatography.
29. Write a note on the methods of isolation of terpenoids. 30.Give the synthesis of Methyl Orange

31.Explain the cleansing action of soap.

(4x6 = 24marks)

SECTION – D

(*Answer any 2 question. Each question carries 15 marks*)

32. (a) Explain Ion exchange Chromatography. (5 marks)
    (b)Give the structure elucidation of Conine. (5 marks)
    (c) Describe the structure of DNA. (5 marks)
33. (a) Discuss briefly the structure of Protein.
(b) Explain Sheehan's method.
(c) Discuss the classification of dyes on the basis of application.

34. (a) What is resolution? Explain different methods of resolution.
(b) What are meso compounds ? Are they optical activite ? Explain with a suitable example.
(c) Discuss the isolation, structure and uses of geraniol.
35. (a) Give the synthesis of the following drugs (i) Aspirin (ii) sulphaguanidine (b) Define Oils and fats and discuss the different methods of extraction .
(c) Write a note on detergents.
(15 X 2 = 30marks)

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY

Course V Course Code CH1432 .3 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science, Biochemistry and Microbiology majors.

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1. Acetanilide from aniline
2. Meta dinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

A. Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

b. Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH

B. Permanganometry

a. Standardization of KMnO4 by oxalic acid/sodium oxalate and Mohr's salt b. Estimation of oxalic acid/sodium oxalate

c. Estimation of Mohr's salt d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. K2Cr2O7 and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodimetry and Iodometry

a. Standardisation of sodium thiosulphate using std potassium dichromate b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Chromatography

a.Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars

b.Separation of a mixture of dyes by column chromatography.

Gravimetric Analysis

1. Estimation of water of hydration in barium chloride crystals
2. Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} semesters

Complementary Chemistry offered to Zoology Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry ComplementaryComplementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .4		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .4		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .4		3×18 = 54 2×18 = 36

4	3	2	3 4	CH1431 .4 CH1432 .4		3×18 =54 2×18 = 36

SYLLABUS OF COMPLEMENTARY COURSE

Theoretical Chemistry-I(Common for Botany/Zoology/Microbiology)

(For Students of Zoology Majors)

SEMESTER 1 Complementary Course No. - 1 Course Code-CH1131 .4 Credit-2

L-T-P 2-0-2 36 Hours

Module I – Atomic Structure (9 hours)

Atomic spectrum of hydrogen - different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (mention only, no derivation), concept of orbitals, the four quantum numbers and their significances. Orbital wise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, Stability of filled and half filled orbitals.

Module II – Chemical Bonding (9 hours)

Energetics of bond formation – Born-Haber cycle. Hybridisation and structure of molecules – sp, sp^2, sp^3, dsp^2, dsp^3, sp^3d^2 and sp^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia. VSEPR theory with regular and irregular geometry –. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility. Partial covalent character of the ionic bond – Fajan's Rules. A brief review of molecular orbital approach

– LCAO method – bond order, bond distance and stability of O2, $O2^{2+}$, $O2^{2-}$, NO, NO^+,

Module III – Analytical Principles (9 hours)

Principles of volumetric analysis – primary standard – standard solutions normality and molarity, theory of acid-base titrations, permagnometric and dichrometric titrations, iodometry and complexometric titrations. Theory of acid-base indicator – redox indicators. Beer- Lambert law- Principles of colorimetry - estimation of Iron and phosphate

Module IV – Environmental Chemistry (9 Hrs)

Nature of environmental threats and role of chemistry. Green house effect, ozone layer and its depletion. Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis.Dissolved oxygen-BOD,COD

References

12. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
13. Concise Inorganic Chemistry – J.D. Lee
14. Environmental Chemistry A. K. De
15. Modern Inorganic Chemistry A.D. Madan
16. A. I. Vogel, "Text book of Qualitative Analysis"
17. A. I. Vogel, "Text book of Quantitative Inorganic Analysis".

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
Complementary CourseZoology majors.
SEMESTER I Course Code CH1131 .4 THEORETICAL CHEMISTRY

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the electronic configuration of Copper (atomic umber 29) 2. The quantum numbers n = 2 and l = 1 corresponds to which orbital?
3. What are the shapes of molecules with sp and sp3 hybridization?
4. Calculate the bond order of H2 molecule.
5. Give the structure of XeO3.
6. What is Lattice Energy?
7. What is meant by primary standards?
8. Define Molality.
9. What is the optimum value of DO for good water quality?
10. What is meant by BOD?

Section-B

Short answer type (not to exceed one paragraph). Answer any 8 questions from the following. Each question carries two marks

11. What is Bohr Bury's rule?
12. Write down the Schrodinger Equation and explain the terms involved.
13. Explain the failures of Bohr's theory?
14. What are the limitations of VSEPR Theory?
15. What are polar and non polar covalent bonds?

16. Mention the rules for adding electrons to molecular orbitals?
17. What are dichrometric titrations?
18. How would you prepare 100ml of 0.05M Mohr's salt solution?
19. Methyl orange is not a suitable indicator for the titration of weak acid with strong base. Why?
20. Which are green house gases? Mention their sources.
21. What is reverse osmosis? How it is useful in the purification of waste water?
22. What are chief factors responsible for water pollution?

Section-C

Short essay (not exceed 120 words). Answer any 6 questions from the following. Each question carries four marks.

23. If the energy difference between two electronic states of hydrogen atom is 214.68 KJmol1. What will be the frequency of light emitted when the electrons jump from the higher to the lower level?
24. Explain the stability of half filled and completely filled orbitals.
25. Give an account of permanganometric titrations.
26. Discuss the theory of Acid – Base indicators.
27. Explain the energetic of ionic bond formation.
28. Define hybridization. Mention the types of hybridization involved in SF6, PCl5, BF3.
29. Explain Born-Haber Cycle considering the formation of NaCl as an example.
30. Write a note on agricultural pollution.
31. Explain briefly the different methods for the treatment of industrial waste water.

Section-D

Long essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32. (a) Discuss Bohr Theory, highlighting its merits and demerits. (b)What are quantum numbers? Give its significance.
    (c) Explain various rules regarding electronic configuration.
33. (a) Discuss the titration curves for the titration of strong acid with strong base and weak acid with strong base.
(b) Explain the theory of redox indicators.
(c) explain Beer's Law, Lambert's Law and Beer – Lambert Law.
34. (a) Write a note on Hydrogen bonding and its consequences.
(b) How electronic configuration of molecules related to molecular behavior? Explain.
(c) Explain Fajan's Rule.
35. (a) Discuss the formation and importance of ozone layer.

(b) What is meant by pollution and pollutants? Explain the classification of air pollutants.
(c) What are the sources of important air pollutants.

Complementary Chemistry for Zoology Majors
Inorganic Chemistry-I(Common for Botany/Zoology/Microbiology Majors)
SEMESTER II Course code-CH1231 .4 Credit-2
(For Students of Zoology Majors)

L-T- P 2-0-2

36 hours

Module I Organometallics (9 hours)

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications. Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses. Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture. Environmental aspects of Organometallic compounds.

Module II : Nuclear Chemistry (9hours)

Natural radioactivity, modes of decay, Geiger –Nuttal rule, artificial transmutation and artificial radioactivity- nuclear stability, n/p ratio, mass defect and binding energy, nuclear fission and nuclear fusion, -applications of radioactivity- ^{14}C dating, rock dating , neutron activation analysis and isotope as tracers

Module III - Coordination Chemistry (9 hours)

Nomenclature, Coordination number and geometry - chelates – isomerism – structural and stereo isomerism valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – colour and magnetic properties complexes. Application of metal complexes in qualitative and quantitative analysis.

Module IV – Bio inorganic compounds (9 hours)

Metalloporphyrins – cytochromes – chlorophyll photosynthesis and respiration – haemoglobin and myoglobin, mechanism of O2 – CO2 transportation, nitrogen fixation, carbon fixation and carbon cycle. Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems.

References

6. Co-ordination Chemistry – Bosolo and Johns
7. Chemistry of Organometallics – Rochoco.
8. Concise Inorganic Chemistry – J.D. Lee

9. Puri, Sharma and Kalia “Inorganic Chemistry”
10. Modern Inorganic Chemistry A.D. Madan

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
Complementary CourseZoology majors.
SEMESTER II Course Code CH1231.4
INORGANIC AND BIOINORGANIC CHEMISTRY - I(Common for Botany/Zoology/Microbiology)

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the structure of Zeise’s salt.
2. Write any one of the preparation methods of organolithium compounds.
3. What is ferrocene? How is it synthesized?
4. What are alpha particles?
5. Define the term radioactivity.
6. Write the IUPAC name of K3[Co(NO2)4Cl2]
7. What are low spin complexes?
8. What do you mean by chelate?
9. What are metalloporphyrins?
10. Give an example of anaerobic respiration.

Section-B

Short answer type (not to exceed one paragraph). Answer any 8 questions from the following. Each question carries two marks

11. What is reformatsky reaction?
12. What is cisplatin? Give its significance.
13. How are organomercurials prepared?
14. Explain Geiger Nuttal Rule.
15. What are half life period and average life period?
16. Define mass defect and binding energy.
17. Write the postulates of Werner’s Coordination Theory.
18. What are poly dentate ligands? Give an example.
19. Explain the colours of transition metal complexes.

20.Differentiate respiration and photosynthesis.
21.What are trace elements?
22.What is the role of chlorophil in photosynthesis?

Section-C

Short essay (not exceed 120 words). Answer any 6 questions from the following. Each question carries four marks.

23.Write a note on organotin compounds.
24.Write a brief note on the applications of organometallic compounds in agriculture and horticulture.
25.One microgram of phosphorus- 32 was injected into a living system for biological tracer studies. The half life period of P-32 is 14.3 days. How long will it take for the radioactivity to fall to 10% of the initial value?
26.Explain the relation between nuclear stability and n/p ratio.
27.Write the biological effects of radiation.
28.Suggest the structure of $[NiCl_4]$ on the basis of Valence Bond Theory.
29.Explain the magnetic properties of octahedral complexes with suitable examples.
30.Discuss briefly the biochemistry of iron toxicity and nutrition.
31.Metal ions play a variety of roles in biological systems. Explain.

Section-D

Long essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32.(a) Explain the synthesis and applications or Grignard reagent.
(b) What are Frankland reagents? Give its significance.
(c) Explain about organosilicon compounds in medicine.

33.(a) Explain carbon dating and rock dating.
(b) Give the principle of neutron activation analysis.
(c) Explain the terms nuclear fission and fusion with suitable examples.

34.(a) Write a note on Crystal Field Theory.
(b) Explain the applications of complexes in qualitative analysis.
(c) Write a brief note on isomerism in coordination complexes.

35.(a) Give brief outline of carbon cycle.
(b) Explain nitrogen Fixation.
(c) Write a short note on hemoglobin.

ORGANIC CHEMISTRY

Complementary Chemistry for ZOOLOGY MAJORS

SEMESTER III Course-3 Credit-3 Course Code – CH1331 .4

L-T-P 3-0-

2Total - 54 hoursModule I – Mechanisms in organic substitution reactions (9 hours)

Electron displacement in organic compounds – Inductive, electromeric and mesomeric effects, influence of inductive effect on acidic and basic properties of organic compounds, hyperconjugation and steric effect. Reaction mechanism - Bond fission, rate determining step, nucleophilic substitution of alkyl halides SN1 & SN2 reactions. Effect of structure on reactivity as illustrated by methyl, ethyl, isopropyl and tertiary butyl groups. Electrophilic addition to ethene and propene –Markownikoff's rule, free radical addition, peroxide effect.

Module II – Stereochemistry (9hours)

Optical isomerism, chirality, recemisation and resolution, relative and absolute configuration, asymmetric synthesis, optical isomerism due to restricted rotation. Geometrical isomerism, E and Z nomenclature. Aldoximes and ketoximes.

Rotational isomerism. Rotation about carbon – carbon single bond, conformation of ethane, propane, butane, cyclohexane, axial and equatorial bonds.

Module III – Carbohydrates (9 hours)

Classification, configuration, glyceraldehyde, erythrose, threose, ribose, 2-deoxy ribose, arabinose, glucose, fructose and mannose. Preparation and properties of glucose and fructose - Pyranoside structures of glucose and fructose, furanoside structure of fructose (structure elucidation not expected). Mutarotation and epimerization. Conversion of glucose into fructose and viceversa.

Module IV – Amino acid and Proteins (9 hours)

Classification and properties – synthesis of glycine, alanine and tryptophan – polypeptides and proteins, peptide linkage, peptide synthesis, polypeptides, primary,secondary, tertiary and quarternary structure of proteins, test for proteins, Enzymes – Characteristics, catalytic action, theory of enzyme catalysis – Michaelis – Menton theory – Co-enzymes.

Module V– Nucleic acids and Lipids (9 hours)

RNA, DNA – their biological role, hydrolysis of nucleoproteins, elementary idea regarding the structure of nucleic acids.

Lipids – Classification oils, fats and waxes, iodine value and saponification value, properties of oils and fats – phospholipids

Module VI – Polymers (9 hours)

Classification with example – natural and synthetic polymers – condensation and addition polymerization. Elastic fibres, thermoplastics and thermosetting plastics. Terpenes – classification, isoprene rule, essential oils, elementary study of citral and geraniol (structure elucidation not required) Rubber - structure – Vulcanisation of rubber – synthetic rubber – neoprene, butyl rubber, Buna S, Buna N

Referances
1. Organic Chemistry Vol I and II – I.L. Finar
2. Biophysical Chemistry – Principles and Techniques – A. Upadhyay. K.Upadhyay& N. Nath 3. Reaction Mechanism in Organic Chemistry – Mukherjee and Singh – Macmillan
4. Physical Chemistry – Rakshit
5. Essentials of Physical Chemistry – Bahl, Tuli & Arun Bahl
6.Principles of Organic Chemistry – M. K. Jain, S. Nagin &Co .

University of Kerala
Model Question Paper of BSc Zoology Major
2017 Admission onwards
SEMESTER IV Complementary Chemistry Course Code CH1431 .4
ORGANIC CHEMISTRY

Time:3hours Max.Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. Which is more acidic acetic acid or trichloro acetic acid? Why?
2. Explain Markonikoff's rule with example
3. Represent the configurations of D and L glyceraldehyde
4. Draw the ring structures of glucose and fructose
5. Define mutarotation
6. Give two example of essential aminoacids .
7. Describe a colour test for proteins
8. Define saponification value
9. Give the name and structure of the base present in RNA but not in DNA.
10. What is vulcanization of rubber?

(1 X 10 =10Marks)

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. Describe hyperconjugative effect with suitable examples
12. Discuss the optical isomerism of tartaric acid.
13. Which of the following are optically active ? Why?
    (i)2-chloropropane (ii)2-chlorobutane (iii)3-chloropentane
14.Give four differences between enantiomers and diastereoisomers.

15. What is meant by denaturation of proteins?
16. Distinguish between mutarotation and epimerization.
17. Classify the carbohydrates on the basis of behavior towards hydrolysis.
18. What are lipids? How will you classify them? 19.Give a test to distinguish RNA and DNA
20. How is terpenes classified?.
21. What is polymerization? Give an example of linear polymers?
22. Draw the structure of geraniol

(2 X 8 = 16 Marks)

SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. Explain SN1 and SN2 reactions? Give examples
24. Give an account of inductive effect and show how it is applied to predict the strength of organic acids?
25. Give an account of asymmetric synthesis.
26. Determine the R & S notations of meso tartaric acid and L- glyceraldehyde.
27. What are essential oils? Explain ts function with examples.
28. How is glucose is converted into fructose and vice- versa?
29. What is meant by Isoelectric point of aminoacids. 30.Classify polymers based on molecular forces

31.Explain the cleansing action of soap.

(4x6 = 24marks)

SECTION – D

(*Answer any2 question. Each question carries 15 marks*)

32. (a) Explain the effect of structure on reactivity.
    (b) Explain electrophilic addition reactions with examples
    (c) What are meso compounds ? Are they optical activite ? Explain with a suitable example.

33. (a) Write notes on different conformations of ethane and cyclohexane
    (b) Give an account of the configurations of monoaccharides (c) Discuss briefly the structure of Protein.

34. (a) Discuss general physical and chemical properties of oils and fats
    (b)Describe the functions of RNA and DNA
    (c)Explain the structure of DNA

35. (a) Give an account of synthetic rubbers

(b) Discuss the classification of polymers on the basis of structure (c) Write a note on detergents.

(15 X 2 = 30marks)

PHYSICAL CHEMISTRY

Complementary Chemistry for ZOOLOGY MAJORS

SEMESTER IV Course-4 Credit-3 Course Code CH1431 .4 L-T-P 3-0-2

Total 54 hours

Module I. Chemical kinetics 9 hours

Chemical kinetics, catalysis, rate of reactions, various factors influencing rate, order, molecularity, zero, first, second, third order reactions (derivation of first order only) fractional life time, units of rate constants, influence of temperature on reaction rates, Arrhenius equation, Calculation of Arrhenius parameters, Collision theory, catalysis, different types of catalysis, intermediate compound formation theory and adsorption theory.

Module II. Ionic equilibrium 9 hours

Arrhenius, Lowry- Bronstead and Lewis concept of acids and bases, Kw and pH, pH of strong and weak acids, Ka and Kb, mechanism of buffer action, Henderson equation - pH of buffer, Hydrolysis of salt, Degree of hydrolysis and hydrolysis constant .

Module III Colloids 9 hours

Colloidal state: Types of colloids, preparation of colloids-Purification of colloids – ultra filtration and electrodialysis, Kinetic, optical and electrical properties of colloids. Ultra microscope, Electrical double layer and zeta potential. Coagulation of colloids, Hardy-Schulz rule. Micelles and critical micelle concentration, sedimentation Application of colloids – Cottrell precipitator, purification of water and delta formation.

Module IV Spectroscopy 9 hours

UV-Visible Spectroscopy- absorption, types of electronic transitions, effect of conjugation, concept of chromophore, auxochrome, bathochrome, hypochromic shifts, hyperchromic and hypochromic effects. UV-Visible spectra of enes. Calculation of λmax. simple applications of UV spectroscopy, conjugation, functional group and geometrical isomerism

Principle of NMR, nuclear spin, chemical shift, spin-spin coupling, τ and δ, PMR of simple organic molecules, principle of MRI .

Module V- Instrumental methods of Chemical Analysis 9 hours

Principle – instrumentation and applications of Atomic absorption spectroscopy- flame emission spectroscopy- Thermal methods - thermogravimetry (TG) - Differential thermal analysis (DTA) - Gas Chromatography- HPLC – Introduction to zone electrophoresis and capillary electrophoresis.

Module VI Solutions 9 hours

Liquid-Liquid system:- Completely miscible, ideal and non-ideal mixtures, Raoult's law, vapour pressure- composition and temperature-composition curves, fractional distillation, deviation from Raoult's law, Azeotropic mixtures, partially miscible liquid system, critical solution temperature, Conjugate layers, example for upper, lower and upper cum lower CST, Theory of steam distillation

Referances

1. Organic Chemistry of Natural Products, Chatwal,Gurdeep.R, Himalaya Publications
2. Principles of physical chemistry, Puri Shrama Pathania, Vishal
3. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
4. Elementary organic spectroscopy, Y.R Sharma, S chand & Company
5. Principles of Physical Chemistry, B.R.Puri, R.L.Sharma & Pathania, Vishal Publishing
6. Essentials of Physical Chemistry, B.S. Bahl., G.D. Tuli & Arun Bahl , S.Chand & Co., New Delhi.
7. Simplified Course in Physical Chemistry, R.L. Madan, G.D. Tuli , S.Chand & Co. 8.Chromatography, B.K .Sharma, GOEL Publishing house, Meerut

University of Kerala
Model Question Paper for Zoology Major
2017 Admission onwards
SEMESTER IV Complementary Course.IV Course Code CH1431 .4
PHYSICAL CHEMISTRY

Time:3hours Max.Marks : 80

SECTION – A

(Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark)

1. What are the units of rate constants for first and second order reactions?
2. Give one example of a reaction in which order and molecularity have different values.
3. Define P^H.
4. State Hardy-Schulze rule.
5. Distinguish between lypophilic colloids and lypophobic colloids.
6. Define chemical shift
7. Explain chromophore with an example.

8. What is meant by a buffer solution? Give one example each for acid buffer and basic buffer solution.
9. What is meant by the term ideal solution?
10. Write a short note on zone electrophoresis

SECTION - B

(*Short answer type. Answer any 8 questions from the following. Each question carries two marks.)*

11. What are the factors which affect the rate of a chemical reaction?
12. Write down the expression that gives the dependence of the rate constantof a chemical reaction on the absolute temperature and explain the terms involved. 13.Explain briefly Lewis concept of acids and bases with two examples
14. What is zeta potential? How does it arise?
15. What is critical micelle concentration? Discuss the structure of micelles in polar and nonpolar media
16. Tetra Methy Silane (TMS) is chosen as a reference compound in NMR studies. Give reasons
17. What are the different types of electronic transitions?
18. Explain the working of Hollow Cathod Lamp
19. What is the difference between GC and HPLC?
20. Explain the terms Degree of hydrolysis and hydrolysis constant.
21. What are the conditions at which the solutions deviate from ideal behaviour?
22. Calculate the mole fraction of alcohol, C_2H_5OH and water in a solution made by dissolving 9.2g of alcohol in 18g of water.

(8 X 2 = 16 Marks)

SECTION - C

(*Short essay type. Answer any 6 questions from the following. Each question carries four marks.)*

23. What is energy of activation? What happens to the energy of activation in presence of a catalyst.
24. Explain Half life period of a reaction. A first order reaction has a specific reaction rate of $2.31x10^{-3}$ s^{-1}. Calculate the half life period of the reaction.
25. Calculate the pH of a buffer solution containing 0.2 mole of NH_4Cl and 0.1mole of NH_4 OH per litre. Kb for NH4OH = $1.85x10^{-5}$.
26. Derive the relation between K_h, K_w and K_a.
27. Give an account of applications of colloids
28. Explain ultra filtration and electrodialysis techniques used for the purification of colloids

29. Which of the following will show spin- spin coupling in their NMR spectra? If coupling is observed, give the spin multiplicity : (a) $ClCH_2CH_2Cl$ (b) CH_3COCH_3 (c) CH_3CHO (d) $ClCH_2CH_2I$

30. Briefly explain TGA taking suitable example

31. Explain the principle of Fractional Distillation

(6 X 4 = 24marks)

SECTION – D

(*Answer any2 question. Each question carries 15 marks*)

32.(a)Differentiate between Molecularity and order of a reaction with examples

(b) Discuss the Kinetic, optical and electrical properties of colloids

(c) Explain the protective action of colloids

33.(a) Discuss the principle and applications of AAS

(b) Distinguish between AAS and FES

(c) Explain the applications of TGA and DTA

34.(a) Discuss the factors responsible for deviation from Raoult's law by taking suitable examples.

(b) Define critical solution temperature. Explain systems having upper and lower CST using examples

(c) Explain the applications of UV spectroscopy

35.(a)Discuss the advantages of Bronsted-Lowery concept over Arrhenius concept and also the limitations of the Bronsted-Lowery concept.

(b) The salt ofstrong acid and strong base does not undergo hydrolysis. Explain.

(c) Explain the underlying principle in an NMR spectrum and interpret the low resolution NMR

spectrum of ethanol molecule. (15 X 2 = 30marks)

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY Course V

Course Code CH1432 .4 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science Biochemistry and Microbiology majors

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given

Organic preparations

1.Acetanilide from aniline

2.Metadinitrobenzene from nitro benzene

3.Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

I.Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. Estimation of a strong base and a weak base using standardized HCl

Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. HCl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH

II.Permanganometry

d. Standardization of KMnO4 by oxalic acid/sodium oxalate and Mohr's salt e. Estimation of oxalic acid/sodium oxalate

f. Estimation of Mohr's salt

g.Estimation of calcium

III.Dichrometry

h. Preparation of Std. K2Cr2O7 and estimation of ferrous iron by external and internal indicators.

i.Estimation of ferric iron by reduction with stannous chloride (internal indicator).

IV.Iodimetry and Iodometry

j. Standardisation of sodium thiosulphate using std potassium dichromate k. Estimation of copper in a solution

l. Estimation of iodine.

V.Complexometric titrations

m. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

n. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Chromatography

a.Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars

b.Separation of a mixture of dyes by column chromatography.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals

2.Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} semesters

Complementary Chemistry offered to Homescience and Biochemistry Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry ComplementaryComplementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .5		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .5		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .5		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .5 CH1432 .5		3×18 =54 2×18 = 36

Syllabus for complementary courses

(Common for Homescience & Biochemistry)

(for Homescience Majors)

Semester-1 Complementary Course No. - 1 Course Code CH1131.5

Credit-2

Inorganic and Analytical Chemistry L-T-P 2-0-2 36 hrs

Module I –Atomic structure 9 hrs

Atomic spectra of hydrogen,-different series, Rydberg equation. Bohr theory-postulates –statement of Bohr energy equation –derivation of spectral frequency from Bohr equation-Schrodinger wave equation(mention only), concepts of orbitals, the four quantum numbers and their significance- Orbital wise electron configuration, energy sequence rule, Pauli's principle, Hund's rule, stability of filled and half filled orbitals.

Module II- Analytical Principles 9 hrs

Principles of volumetric analysis, primary standards, Standard solutions, normality and molarity, numerical problems, theory of acid base titrations, permanganometric and dichrometric titrations, theory of acid base and redox indicators.(Numerical problems are to be worked out) .

Module III- Radioactivity and Nuclear Chemistry 9 hrs

Radio active decay series, Radioactive equilibrium, Average life, Half life detection of radio activity-Geiger Muller Counter, Wilson cloud chamber, Units of radioactivity-Curie and Rutherford. Applications of radio activity- in medicine and agriculture, biological effects of radiation, pathological and genetic damage, Units of radiations, Nuclear Chemistry-stability of nucleus, n/p ratio, artificial transmutation and radioactivity, mass defect, binding energy, neutron activation analysis

Module IV- Organometallics and biomolecules 9 hrs

Organometallic compounds –Definition and classification, Biological and environmental aspects of organometallics-organometallics in medicine ,Organo mercury, boron, silicon and arsenic compounds. Biomolecules –Metallo porphyrins, Haemoglobin and Myoglobin. References

1. Concise Inorganic Chemistry J. D. Lee

2. Inorganic Chemistry Puri and Sharma

3. Chemistry of Organometallics Rochow

4. Organic Chemistry Vol 2 I.L. Finar

5. Chemistry of natural products Vol. 1 Gurdeep Chatwal

6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

7. Modern Inorganic Chemistry R D Madan

Model Question paper for S1 Complementary Chemistry Course - II Semester

1 CH1231 .5 (For Students of Homescience and Biochemistry majors)

Organic Chemistry

Time : Three Hours Total marks : 80

Section – A

(Very short answer questions)

Answer all questions. Each question carries 1 mark (1×10=10)

1. Give the relationship between wavelength, frequency and velocity of electromagnetic radiation?
2. What is the Rydberg equation for calculating the wave number of radiation?
3. Give Schrodinger equation which describes the behaviour of electron in an atom?
4. Indicator used for the titration between strong base and weak acid?
5. Give two examples of primary standard?
6. What is meant by transmutation?
7. Name two units of radioactivity?
8. What is meant by half life period?
9. Give two examples of Organomercuric comounds in medicine ?
10. What are organometallic comounds?

Section – B

(Short Answer Questions)

Answer any eight. Each question carries 2 marks (2×8=16)

11. Explain the Hund's rule with a suitable example?
12. Draw the shapes of d-orbitals?
13. What is meant by normality and molarity?
14. Why HCl is not used in Permanganomertic titration?
15. Calculate the weight of Na_2Co_3 required to prepare250ml N/10 solution?
16. What is binding energy?
17. What is meant by radio carbon dating??
18. Name four radioactive elements used in medicine?
19. What are organo boron compounds? Give one example?
20. What are anti tumour drugs??
21. What are biomolecules? Give two examples?
22. What are silatranes?

Section – C

(Short Essay Questions)

Answer any six. Each question carries 4 marks (4×6=24)

23. i)Explain the wave nature of material objects? ii) What is uncertainty principle?
24. Explain the concepts of orbitals?
25. Explain the theory of acid base titrations?
26. Write a note on dichromatic titration?
27. Write the stability of nucleus with respect to n/p ratio ?

28. What is meant by biological effect of radiation?
29. How will you detect radioactivity by Wilson cloud Chamber?
30. What are the functions of Haemoglobin?
31. Write a note on Organoarsenic compounds in medicine?

Section – D

(Long Essay Questions)

Answer any two. Each question carries 15 marks (15×2=30)

32. Derive the Bohr frequency equation?(10marks)
    b) Explain quantum numbers.
33. a)Write notes on Acid base indicators? (10mark) b)Explain the Permanganometric titration? (5mark)
34. a)What are the applications of radioactivity in medicine and agriculture? (10mark)
    b).What is meant by neutron activation analysis? (5mark)
35. a) Write in detail the classification of Organometallic compounds with examples? (10Mark)
    b) Explain the biological aspects of myoglobin? (5marks)?

Syllabus(Complementary course Chemistry)

(For Students of Homescience Majors)

(Common for Homescience &Biochemistry)SEMESTER 2 Course No. 2

Course Code . CH1231 .5 Credit 2 Organic Chemistry

L-T-P 2-0-2 36 hrsModule I: Carbohydrates 9hrs

Classification, configuration of glyceraldehydes, erythrose, threose, ribose,2- deoxy ribose, arabinose, glucose, fructose and mannose. Reactions of glucose and fructose Pyranoside structures of glucose and fructose Furanoside structure of fructose (structure elucidation not expected), muta rotation, epimerization, conversion of glucose into fructose and vice versa

Module II Vitamins 9hrs

Classification, source, isolation, physiological function and deficiency diseases caused by Vitamin A1(retinol), A2(axerophthol), Vitamin B-B1 (thiamine), B2(riboflavin and folic acid), B5(niacin), B6(Pyridoxine), B12 (Cyano cobalamine) Vitamin C (ascorbic acid),–Vitamin,D2 (ergocalciferol), Vitamin E (Tochopherols), Vitamin H(biotin) and Vitamin K

Module III :Aminoacids and Proteins 9hrs

Classification,synthesis of glycine, alanine, phenyl alanine and aspartic acid, zwitter ion, isoelectric point,, reactions of aminoacids, peptide linkage, peptide synthesis, polypeptides, primary, secondary, tertiary and quarternary structure of proteins, classification, biological importance and tests for proteins.

Module IV: Enzymes and Hormones 9hrs

Enzymes- Characteristics, classification, factors influencing enzyme action, mechanism of enzyme action, Michaelis –Menton theory, enzyme inhibitors.

Hormones- Introduction, isolation, functions and abnormalities due to oxytocin, thyroxin, adrenalin, glutathione, progesterone, estrogens, cortisone, corticosterone, adrenalin References

1. Concise Inorganic Chemistry — J. D. Lee
2. Inorganic Chemistry — Puri and Sharma
3. Chemistry of Organometallics — Rochow
4. Organic Chemistry Vol 2 — I.L. Finar
5. Chemistry of natural products Vol. 1 — Gurdeep Chatwal
6 The Text Book of Organic Chemistry — P.L Soni, H.M. Chowla
7. Modern Inorganic Chemistry — R D Madan

Model Question paper for S2 Complementary Chemistry Course - II Semester 2
CH1231 .5 (For Students of Homescience and Biochemistry majors)
Organic Chemistry

Time : Three Hours Total marks : 80

Section – A
(Very short answer questions)
Answer all. Each question carries 1 mark. (1×10=10)

1. Write the name of a neutral aminoacid?
2. Give the name of an essential aminoacid?
3. What is peptide linkage?
4. Give the name of a monosaccharide?
5. Write one reaction of glucose?
6. What is a carbohydrates?
7. Give the other name of oxytocin?
8. Give the name of two enzymes?
9. Give two functions of enzymes?
10. Which vitamin is called antihaemorrhagic vitamin?

Section – B

(Short Answer Questions)

Answer any eight. Each question carries 2 marks (2×8=16)

11. What are peptides?
12. What is Zwitter ion?
13. What is the building block of proteins?
14. Give a test for protein?
15. What are enzyme inhibitors?
16. What is a substrate?
17. What is optimum temperature for enzyme action?
18. What are hormones?
19. Draw the structure of vitamin A?
20. What is epimerization?
21. What is Mannose?
22. What is mutarotation?

Section – C

(Short Essay Questions)

Answer any six. Each question carries 4 marks (4×6=24)

23. What is the reaction of amino acid with nitrous acid?
24. Explain the isoelectric point of an aminoacid?
25. Give the method of synthesis of glycine?
26. What are the factors affecting enzyme action?
27. Give the functions and deficiency diseases of vitaminC ?
28. What is Michaeli's Menton theory of enzyme action?
29. Write a note on Furanoside structure of fructose?
30. How will you convert a glucose into a fructose?
31. Write configuration of glyceraldehydes and erythrose?

Section – D

(Long Essay Questions)

Answer any two. Each question carries 15 marks (2×15=30)

32. a) Explain the structure of protein. (10 marks)
    b) Write a note on the synthesis of aspartic acid (5 marks)
33. a) Write notes on the different types of vitamins. (10 marks)
    b) Explain the deficiency disease caused by vitamin B and D. (5 marks)
34. Discuss about

a) The different types of hormones. (10 marks)
b) Enzyme inhibitors. (5 marks)

35. Write in detail
a) The classification of Carbohydrates. (10 marks)
b) Ergocalciferol (5 marks)

Syllabus (Complementary course Chemistry)
(For Students of Home Science majors)
SEMESTER 3 Course-3 Credit-3 Course Code – CH1331 .5L-T-P 3-0-2
Organic Chemistry II Total - 54 hrs

Module 1: Colloids 9hrs

Introduction, dispersed phase, dispersion medium, classification, multi molecular, macromolecular and associated colloids. Preparation - condensation and dispersion methods, purification -dialysis and ultra filtration, properties of colloidal solution-optical, kinetic and electrical properties, coagulation, Hardy-Schultz rule, protective colloid, applications of colloidal systems, emulsions, emulsifiers and cleansing action of soap.

Module 2: Adsorption and Chromatography 9hrs

Adsorption-Adsorbent, adsorbate, desorption, types of adsorption, physical and chemical adsorption, kinds of adsorption, interactions, adsorption of gases and solutions on solids, importance of adsorption phenomena(applications)- adsorption in catalysis, Chromatography-Column, TLC, paper and gas chromatography.

Module 3: Colour and constitution, Dyes 9hrs

Colours, complimentary colours, chromophore-auxochrome theory, modern theory of colours, classification of dyes, preparation and uses of para red and methyl orange, phenolphthalein and fluorescein , Alizarin, malachite green

Module 4: Terpenes 9hrs

Introduction, isolation, occurrence, isoprene rule, classification, physical and chemical properties and uses of citral, geraniol, menthol and camphor. An elementary idea of the structure of natural rubber, synthetic rubber, Buna-N, Buna-S, Neoprene and Thiokol.

Module 5: Alkaloids 9hrs

Occurrence, general methods of isolation, functional group analysis, functional nature of oxygen containing groups -OH,-COOH,-CHO, >C= O groups, nature of nitrogen, Hoffmann exhaustive methylation, structure and physiological actions of coniine, nicotine, quinine, morphine and codeine (structure elucidation is not expected)

Module 6: Polymers 9hrs

Natural and synthetic polymers, preparation and uses of vinyl polymers-PE, PVC, PVA, PS, PVF, PMMA, PTFE, Synthetic fibres-Nylon, Nylon 66,Terylene, Di methyl teraphthalat, polymers in medicine and surgery

References

1. Chemistry of natural products Vol. 1 — Gurdeep Chatwal
2. The Text Book of Organic Chemistry — P.L Soni, H.M. Chowla
3. Organic Chemistry Vol 1 & 2 — I.L. Finar
4. The Text Book of Organic Chemistry — Arun Bahl & B S Bahl
5. Polymer Chemistry — B.K Sharma
6. Inorganic Polymer Chemistry — G S Misra

Model question paper for S_3
Complementary Chemistry for Home Science
Semester III Course Code CH 1331.5 Course III

Total Mark:80

Time: 3 hours

Section A

Answer all questions (Marks -1 for each)

1. What are gels.
2. What is meant by Brownian movement.
3. An alkaloid present in hemlock herb.
4. Enthalpy of adsorption is negative .true or false 5 Name an adsorbent in paper chromatography.
6. What are complimentary colours?
7. Explain chromophore with an example.
8. Draw the structure of citral.
9. How many isoprene units are in sesquiterpenes ?
10. Write any two uses of PVC.

Section B

Answer any 8 questions (Marks-2 for each)

11. Write a note on electrical double layer and zeta potential.
12. Distinguish between coagulation and peptisation.

13 Write a note on Gibb's adsorption isotherm.

14. Write any two applications of adsorption.

15. How will you prepare phenolphthalein?

16.What is mordant dye? Give an example

17.What is Buna rubber?

18. Write the reaction of citral with silver oxide.

19.Draw the structure if morphine.

20. How is the functional nature of OH analysed in alkaloids ?

21. What is Bakelite?

22. Give the structure of Nylon 66.

Section C

Answer any 6 questions (Marks -4 for each)

23.What are micelles. Define critical micelle concentration.

24. What is gold no.explain protective colloid ?

25. What do you understand by physical and chemical adsorption?

26. Explain the isomerism shown by citral and geraniol

27. What is Hoffmann exhaustive methylation

28. Write the structure and physiological actions of nicotine

29. What are terpenes. Discuss isoprene and special isoprene rule.

30. How is polystyrene synthesized?

31. Write a note on polymers in medicine and surgery.

Section D

Answer any 2 questions (Marks -15 for each)

32. a)Explain adsorption chromatography b) Write a note on partition chromatography ?

33.Give preparation and uses of 1)PVC 2)PMMA 3)Terylene 4)PTFE 5)PVF?

34. Discuss the various theory of a) colour b) constitution.

35. a) What are emulsifiers? Explain the cleansing action of soap. b) Explain the Hardy- ` ` Schultz rule?

Syllabus (Complementary course Chemistry)
(For Students of Home Science majors)
SEMESTER 4 Course-4 Credit-3Course Code – CH1431 .5Organic and Medicinal Chemistry

L-T-P 3-0-2 **Total- 54 hrs**

Module-1: **Medicinal Chemistry** 9hrs

Chemo therapy-Drugs- Classification, Elementary study of analgesics, antipyretics, antibiotics, antimalarials, sulphadrugs, mode of action of drugs, synthesis of aspirin and paracetamol

Module-2: Food additives 9hrs

Preservatives –Calcium propionate, sodium benzoate and sodiumbisulphite antioxidants-Structure and functions of Butylated hydroxy anisole(BHA), Butylat hydroxy toluene(BHT),Vitamine A,E and C. Artificial sweeteners –Structure and applications of saccharin, aspartame and cyclamate. Emulsifiers-chitin

Module-3: Heterocyclics 9hrs

Introduction, Classification and nomenclature. Isolation, preparation, physical properties, acidic and basic character, addition , substitution, oxidation and resonance structures of of pyrrole, furan, thiophene and pyridine.

Module-4: **Insecticides and pesticides** 9hrs

Insecticides - classification and preparation of compounds like DDT, DDE and BHC. Methoxy chlor, malathion, parathion and carbamates(mention only).

An elementary study of antiseptics, disinfectants, pesticides, rodenticides, herbicides and fungicides.

Module-5:Environmental Chemistry -I 9hrs

Air and soil pollution-Introduction, different types of air and soil pollution, air pollutants SO_2, SO_3, NO,.NO_2 and smog. Acid rains, CO_2, CO, green house effect, O_3, importance of ozone layer, causes and effects of ozone layer depletion. Aerosol, photochemical oxidants, PAN, hydrocarbons, particulates, dust, smoke, asbestos, lead mercury, cadmium. Control of air pollution

Module-6:Environmental Chemistry - II 9hrs

Water pollution-Factors affecting the purity of water, sewage water, Industrial waste, agricultural pollution such pesticides, fertilizers, detergents; treatment of industrial waste, water using activated charcoal, synthetic resins, reverse osmosis and electro dialysis.

References

1.An Introduction to Medicinal Chemistry Graham L Patrick Indian Edn

2.Food Chemistry L. H. Mayer

3. The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

4. Organic Chemistry Vol 1 & 2 I.L. Finar

5. The Text Book of Organic Chemistry Arun Bahl & B S Bahl

6. K. Banerji, “Environmental Chemistry”.

7. A. K. De “Environmental Chemistry - An introduction”

8. B. K. Sharma “Air Pollution”

9.G.W. vanLoon and S. J. Duffy “Environmental Chemistry: A global perspective

Model question paper for S_4

Complementary Chemistry for Home Science majors
Semester 1V Course Code CH 1331.5 Course IV

Total Mark:80

Time: 3 hours

Section A

Answer all questions (Marks -1 for each)

1. What are antimalarials? Give one example?
2. Name a sulpha drug?
3. Write two examples for food preservatives?
4. Draw the structure of aspartame?
5 What are Heterocyclics? And give any one hector cyclic compounds?
6. Give the reaction showing the acidic character of furan?
7. What is DDT, DDE?
8. What is an acid rain?
9. What is a smog ?
10. What are detergents?

Section B

Answer any 8 questions (Marks-2 for each)

11. Name two antibiotics?
12. What is BHT? What are its fuctions?
13 How thiophene is isolated?
14. What is an aerosol? Give an example?
15. What are herbicides and fungicides?
16. How will you control of air pollution?
17. What are photochemical oxidants?
18. What is reverse osmosis?
19. What is meant by green house effect. And name two green house gases?
20. Write two chemicals used for sterilization?
21. What are the uses of methoxychlor?
22. What is chitin?

Section C

Answer any 6 questions (Marks -4 for each)

23.What are the mode of action of drugs?.

24. Give the synthesis of aspirin ?

25. Explain the preparation and properties of furan?

26. What are the different types of pollutants in air?

27. Explain the electro dialysis?

28. How will you synthesis paracetamol?

29. Write of Butylated hydroxy anisole(BHA)?

30. Draw the resonance structure of pyridine?

31. Write a note on disinfectants and rodenticides?

Answer any 2 questions (Marks -15 for each)

32. a) Give an outline of a) air pollution b) soil polution?

33.Write the importance of a)ozone layer b) causes and effects of ozone layer depletion?

34. Write the structure and applications of saccharine, aspartane and cyclamate?

35. a) What are the factors affecting the purity of water. b) Explain the treatment of industrial waste?

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY Course V
Course Code CH1432 .5 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science, Biochemistry and Microbiology majors.

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1.Acetanilide from aniline

2.Metadinitrobenzene from nitro benzene
3.Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

I.Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. i)Estimation of a strong base and a weak base using standardized HCl

ii)Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH

II.Permanganometry

a.Standardization of $KMnO_4$ by oxalic acid/sodium oxalate and Mohr's salt b.Estimation of oxalic acid/sodium oxalate

c.Estimation of Mohr's salt

d.Estimation of calcium

II.Dichrometry

a.Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b.Estimation of ferric iron by reduction with stannous chloride (internal indicator).

III.Iodimetry and Iodometry

a.Standardisation of sodium thiosulphate using std potassium dichromate

b.Estimation of copper in a solution

c.Estimation of iodine

IV.Complexometric titrations

a.Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution. b.Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Chromatography

a.Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars

b.Separation of a mixture of dyes by column chromatography.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals

2.Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} semesters

Complementary Chemistry offered to Biochemistry Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry Complementary

Complementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .6		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .6		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .6		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .6 CH1432 .6		3×18 =54 2×18 = 36

Syllabus for complementary courses

(for Bio Chemistry Majors)

Semester-1 Complementary Course No. - 1 Course Code-CH1131 .6Credit-2

Inorganic and Analytical Chemistry 36 hrs

L-T-P 2-0-2

Module I –Atomic structure 9 hrs

Atomic spectra of hydrogen,-different series, Rydberg equation. Bohr theory-postulates –statement of Bohr energy equation –derivation of spectral frequency from Bohr equation-Schrodinger wave equation(mention only), concepts of orbitals, the four quantum numbers and their significance- Orbital wise electron configuration, energy sequence rule, Pauli's principle, Hund's rule, stability of filled and half filled orbitals.

Module II- Analytical Principles 9 hrs

Principles of volumetric analysis, primary standards, Standard solutions, normality and molarity, numerical problems, theory of acid base titrations, permanganometric and dichrometric titrations, theory of acid base and redox indicators.(Numerical problems are to be worked out) .

Module III- Radioactivity and Nuclear Chemistry 9 hrs

Radio active decay series, Radioactive equilibrium, Average life, Half life detection of radio activity-Geiger Muller Counter, Wilson cloud chamber, Units of radioactivity-Curie and Rutherford. Applications of radio activity- in medicine and agriculture, biological effects of radiation, pathological and genetic damage, Units of radiations, Nuclear Chemistry-stability of nucleus, n/p ratio, artificial transmutation and radioactivity, mass defect, binding energy, neutron activation analysis

Module IV- Organometallics and biomolecules 9 hrs

Organometallic compounds –Definition and classification, Biological and environmental aspects of organometallics-organometallics in medicine ,Organo mercury, boron, silicon and arsenic compounds. Biomolecules –Metallo porphyrins, Haemoglobin and Myoglobin. References

1. Concise Inorganic Chemistry J. D. Lee

2. Inorganic Chemistry Puri and Sharma

3. Chemistry of Organometallics Rochow

4. Organic Chemistry Vol 2 I.L. Finar

5. Chemistry of natural products Vol. 1 Gurdeep Chatwal

6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla

7. Modern Inorganic Chemistry R D Madan

Model Question paper for S1 Complementary Chemistry Course - II
Semester
1 CH1231 .5 (For Students of Biochemistry majors)
Organic Chemistry

Time : Three Hours Total marks : 80

Section – A
(Very short answer questions)

Answer all questions. Each question carries 1 mark (1×10=10)

1. Give the relationship between wavelength, frequency and velocity of electromagnetic radiation?
2. What is the Rydberg equation for calculating the wave number of radiation?
3. Give Schrodinger equation which describes the behaviour of electron in an atom?
4. Indicator used for the titration between strong base and weak acid?
5. Give two examples of primary standard?
6. What is meant by transmutation?
7. Name two units of radioactivity?
8. What is meant by half life period?
9. Give two examples of Organomercuric comounds in medicine ?
10. What are organometallic comounds?

Section – B
(Short Answer Questions)

Answer any eight. Each question carries 2 marks (2×8=16)

11. Explain the Hund's rule with a suitable example?
12. Draw the shapes of d-orbitals?
13. What is meant by normality and molarity?
14. Why HCl is not used in Permanganomertic titration?
15. Calculate the weight of Na_2Co_3 required to prepare250ml N/10 solution?
16. What is binding energy?
17. What is meant by radio carbon dating??
18. Name four radioactive elements used in medicine?
19. What are organo boron compounds? Give one example?
20. What are anti tumour drugs??
21. What are biomolecules? Give two examples?
22. What are silatranes?

Section – C
(Short Essay Questions)

Answer any six. Each question carries 4 marks (4×6=24)

23. i)Explain the wave nature of material objects? ii) What is uncertainty principle?
24. Explain the concepts of orbitals?

25. Explain the theory of acid base titrations?
26. Write a note on dichromatic titration?
27. Write the stability of nucleus with respect to n/p ratio ?
28. What is meant by biological effect of radiation?
29. How will you detect radioactivity by Wilson cloud Chamber?
30. What are the functions of Haemoglobin?
31. Write a note on Organoarsenic compounds in medicine?

Section – D

(Long Essay Questions)

Answer any two. Each question carries 15 marks (15×2=30)

32. Derive the Bohr frequency equation?(10marks)
    b) Explain quantum numbers.
33. a)Write notes on Acid base indicators? (10mark) b)Explain the Permanganometric titration? (5mark)
34. a)What are the applications of radioactivity in medicine and agriculture? (10mark)
    b).What is meant by neutron activation analysis? (5mark)
35. a) Write in detail the classification of Organometallic compounds with examples? (10Mark)
    b) Explain the biological aspects of myoglobin? (5marks)?

Syllabus for complementary courses

(for Bio Chemistry Majors)

(Common for Homescience &Biochemistry) Semester-II Complementary Course No. - 1 Course Code-CH1231 .6Credit-2 L-T-P 2-0-2

Module I: Carbohydrates 9hrs

Classification, configuration of glyceraldehydes, erythrose, threose, ribose,2- deoxy ribose, arabinose, glucose, fructose and mannose. Reactions of glucose and fructose Pyranoside structures of glucose and fructose Furanoside structure of fructose (structure elucidation not expected), muta rotation, epimerization, conversion of glucose into fructose and vice versa

Module II Vitamins 9hrs

Classification, source, isolation, physiological function and deficiency diseases caused by Vitamin A1(retinol), A2(axerophthol), Vitamin B-B1 (thiamine), B2(riboflavin and folic acid), B5(niacin), B6(Pyridoxine), B12 (Cyano cobalamine) Vitamin C (ascorbic acid),–Vitamin,D2 (ergocalciferol), Vitamin E (Tochopherols), Vitamin H(biotin) and Vitamin K

Module III :Aminoacids and Proteins 9hrs

Classification,synthesis of glycine, alanine, phenyl alanine and aspartic acid, zwitter ion, isoelectric point,, reactions of aminoacids, peptide linkage, peptide synthesis, polypeptides, primary, secondary, tertiary and quarternary structure of proteins, classification, biological importance and tests for proteins.

Module IV: Enzymes and Hormones 9hrs

Enzymes- Characteristics, classification, factors influencing enzyme action, mechanism of enzyme action, Michaelis –Menton theory, enzyme inhibitors.

Hormones- Introduction, isolation, functions and abnormalities due to oxytocin, thyroxin, adrenalin, glutathione, progesterone, estrogens, cortisone, corticosterone, adrenalin References

1. Concise Inorganic Chemistry J. D. Lee
2. Inorganic Chemistry Puri and Sharma
3. Chemistry of Organometallics Rochow
4. Organic Chemistry Vol 2 I.L. Finar
5. Chemistry of natural products Vol. 1 Gurdeep Chatwal
6 The Text Book of Organic Chemistry P.L Soni, H.M. Chowla
7. Modern Inorganic Chemistry R D Madan

UNIVERSITY OF KERALA

Model Question paper for Complementary Chemistry Course - II Semester 2

CH1231 .6 (For Students of biochemistry majors)

Organic Chemistry

Time : Three Hours Total marks : 80

Section – A(Very short answer questions)

Answer all. Each question carries 1 mark. (1×10=10)

1. Write the name of a neutral aminoacid?
2. Give the name of an essential aminoacid?
3. What is peptide linkage?
4. Give the name of a monosaccharide?
5. Write one reaction of glucose?
6. What is a carbohydrates?
7. Give the other name of oxytocin?
8. Give the name of two enzymes?
9. Give two functions of enzymes?

10. Which vitamin is called antihaemorrhagic vitamin?

Section – B
(Short Answer Questions)

Answer any eight. Each question carries 2 marks (2×8=16)

11. What are peptides?
12. What is Zwitter ion?
13. What is the building block of proteins?
14. Give a test for protein?
15. What are enzyme inhibitors?
16. What is a substrate?
17. What is optimum temperature for enzyme action?
18. What are hormones?
19. Draw the structure of vitamin A?
20. What is epimerization?
21. What is Mannose?
22. What is mutarotation?

Section – C
(Short Essay Questions)

Answer any six. Each question carries 4 marks (4×6=24)

23. What is the reaction of amino acid with nitrous acid?
24. Explain the isoelectric point of an aminoacid?
25. Give the method of synthesis of glycine?
26. What are the factors affecting enzyme action?
27. Give the functions and deficiency diseases of vitamin C ?
28. What is Michaeli's Menton theory of enzyme action?
29. Write a note on Furanoside structure of fructose?
30. How will you convert a glucose into a fructose?
31. Write configuration of glyceraldehydes and erythrose?

Section – D
(Long Essay Questions)

Answer any two. Each question carries 15 marks (2×15=30)

32. a) Explain the structure of protein. (10 marks)
    b) Write a note on the synthesis of aspartic acid (5 marks)
33. a) Write notes on the different types of vitamins. (10 marks)
    b) Explain the deficiency disease caused by vitamin B and D. (5 marks)
34. Discuss about
    a) The different types of hormones. (10 marks)
    b) Enzyme inhibitors. (5 marks)

35. Write in detail
    a) The classification of Carbohydrates. (10 marks)
    b) Ergocalciferol (5 marks)

Syllabus for complementary course
(for Biochemistry Majors)
Semester-3 Course-3 Credit-3Course Code – CH1331 .6Inorganic and Organic Chemistry and Spectroscopy Total - 54hrsL-T-P 3-0-2Module I: Chemical Bonding
9hrs

Energies of bond formation Born-Haber cycle, hybridization and structure of molecules-sp, sp^2,sp^3,dsp^2,dsp^3,sp^3d^2 hybridisation with examples, explanation of bond angle in water and ammonia, VSEPR Theory with regular and irregular geometry , polarity of covalent bond, its relation with electronegativity, electronegativity scale-Paulings and Mullickens approaches, factors influencing polarity, dipole moment, its relation to geometry, hydrogen bond, intra and intermolecular hydrogen bond, its consequence on BP, volatility and solubility, partial covalent character of ionic bond, Fajan's rule

Module II: Coordination Chemistry 9hrs

Nomenclature, coordination number, geometry, chelates, isomerism, structural and stereoisomerism, Valence Bond theory of bonding in octahedral and tetrahedral complexes, high spin and low spin complexes, drawbacks of Valence Bond theory, magnetic properties and application in qualitative and quantitative analysis

Module III :Mechanism in Organic Substitution Reactions 9hrs

Electron displacement in organic molecules, inductive, electromeric and mesomeric effects, hyper conjugation and steric effect , bond fission, rate determining step nucleophilic substitution of alkyl halides, SN1, SN2 reactions, effect of structure on reactivity as illustrated by methyl, ethyl, isopropyl and tertiary groups, aromatic electrophilic substitution

reactions, directive influence Module IV: Stereochemistry
9hrs

Optical isomerism, chirality, racemisation and resolution, relative and absolute configuration, asymmetric synthesis, optical isomerism, E and Z nomenclature, aldoxims and ketoxims, rotational isomerism, rotation about carbon – carbon single bond, conformation of ethane, propane, butane, cyclohexane, axial and equatorial bonds

Module V : Spectroscopy – I 9hrs

Regions of electromagnetic spectrum interaction radiation with matter, different types of energy levels in molecules, rotation , vibration and electronic levels, various types of molecular spectra, microwave spectroscopy, spectra of diatomic molecules, expression for rotational energy, selection rules, frequency separation, equation for frequency of vibration, expression for vibrational energy, selection rule, calculation of force constant

Module VI: Hetrocyclics and Alkaloids 9hrs

An outline study of the preparation and propertifs of Furan, Pyrrole, Thiophene, Pyridine, Hoffmans exhaustive methylation, Alkaloids, general method of isolation, general properties, physiological action of alkaloids, conine, morphine and nicotine(no structural elucidation expected) References :

1. Basic Inorganic Chemistry : F. A. Cotton G. Wilkinson and P. L. Gaus, Wlley
2. Concise Inorganic Chemistry : J. D. Lee, ELBS
3. Inorganic Chemistry : J. E. Huheey
4. Coordination Chemistry : Bosolo and Johns
5. Organic Chemistry : Peter Sykes
6. Organic Chemistry : F. A. Carey, Mc Graw Hill
7. Organic Chemistry : Morrison & Boyd
8. Reaction Mechanism of Organic Chemistry : S. M. Mukherji and S. P. Singh, Mc Millan

9.Spectrscopy Y R Sharma.

10.Advanced Organic Chemistry :Jerry March

Model Question Paper for Complementary Chemistry for Biochemistry Majors Semester III Course Code CH 1331.5

Total Mark:80

Time: 3 hours

Section A

Answer all questions (Marks -1 for each)

1.What is meant by hybridization?

2. What is the structure of SP_2molecule.
3. What is the geometry of SF_6 ?
4. What is the non-linear hybridisation in octahedral complexes?
5. What are chelates?
6. What is inductive effect?
7. Which is the most stable conformation of ethane?
8. Write the selection rule for vibrational spectrum ?
9. Write an expression for force constant ?
10. Write any two properties of alkaloids? **Section B**

Answer any 8 questions (Marks-2 for each)

11. Explain VSEPR theory?
12. What is meant by structural isomerism?

13 What is meant by hyperconjugation?

14. Write a note on steric effect?
15. Explain the conformation of ethane?
16. What are axial and equatorial bonds?
17. What are ketoximes?
18. What are the various types of molecular spectra?
19. Discuss the various types of energy level in molecule?
20. What are the physiological action of alkaloids? ?
21. Write the properties of nicotin?
22. Write the structure of Thiophene?

Section C

Answer any 6 questions (Marks -4 for each)

23.Explain Pauling's electronegativity scale?

24. Explain using valance bond theory, the bonding in tetra hedral complexes ?
25. What are high spin and low spin complexes?
26. Write in detail about hydrogen bonding?
27. What is Hoffmann's exhaustive methylation?
28. Give the expression for the frequency of vibration in vibrational spectroscopy and explain the terms?
29. Explain asymmetric synthesis with an example?
30. Write a note on the isolation of alkaloids?
31. How will you determine bond length in a molecule using microwave spectra?

Section D

Answer any 2 questions (Marks -15 for each)

32. Explain a) Born- Haber cycle (b) Derive an expression for vibrational energy?
33. a)Explain the magnetic properties of co-ordination compounds b) Explain the methods of resolution?
34. a)What are the difference between SN_1 andSN_2 reaction. b) Effect of the structure of bond reactivity on methyl, ethyl, isopropyl and tertiary groups?
35. a)What are alkaloids b)Explain the preparation and properties of Furan, Pyrrole, Pyridine.

c) Write a note on the Physiological action of morphine, conine?

Syllabus for complementary course
(for Biochemistry students)
Semester-4 Course-4 Credit-3Course Code –CH1431
.6Organic Chemistry and Spectroscopy-II

L-T-P 3-0-2 Total 54hrs

Module I: Chromatography 9hrs

Adsorption and partition chromatography, column, paper and thin layer chromatography, Rf value, applications, gas chromatography, applications, ion- exchange chromatography, applications

Module II :Nucleic acids and Lipids 9hrs

Nucleic acids: RNA and DNA, their biological role, hydrolysis of nucleoproteins, elementary idea regarding the structure of nucleic acids, Lipids: Classification, oils, fats and waxes, iodine value, saponification value, properties of oils and fats, phospholipids

Module III :Polymers and Terpenes 9hrs

Polymers- Classification with examples- natural and synthetic condensation and addition polymerization, elastic fibre, thermoplastics and thermosetting plastics, Rubber structure, lectrophores of rubber, neoprene, butyl rubber, Buna-S, Buna-N, synthetic polymers, Nylon-6, Nylon-66, Bakelite, elementary idea of the structure of natural rubber, Terpenes- classification, isoprene rule, essential oils, elementary study of citral and geraniol(structural elucidation not required)

Module IV :Biophysical Analysis 9hrs

Osmosis osmotic pressure, isotonic solution, determination of molar mass by osmotic pressure method, reverse osmosis, adsorption – types of adsorption, applications factors influencing adsorption, Langmuir theory of adsorption

Module V: Colloids 9hrs

Properties of colloids , Tyndal effect, ultra microscope, Brownian movement, lectrophoresis, electroosmosis, sedimentation and streaming potential stability of colloids, Zeta potential, Hardy- Schultz protective colloids, gold number, emulsion, gels, application of colloids, delta formation, medicines, sewage disposal, emulsification and cleansing action of detergents and soaps.

Module VI :Spectroscopy II 9hrs

Raman spectroscopy, stokes and antistokes lines, quantum theory of Raman spectrum, advantages and disadvantages of Raman spectrum, rotational Raman, vibrational Raman spectrum, complementary with IR spectrum, mutual exclusion principle, NMR spectroscopy, principle of NMR spectroscopy, nuclear spin, interaction with external magnetic field, chemical schift, spin-spin coupling, applications

References :

1. Basic Inorganic Chemistry : F. A. Cotton G. Wilkinson and P. L. Gaus, Wlley

2. Organic Chemistry, Vol. I &II I. L. Finar, Longman
3. Advanced Organic Chemistry : Jerry March
4. Polymer Chemistry B.K Sharma
5. Bio Physical Chemistry Principles and techniques Avinash Upadhyay.Kakoli Upadhyay.Nirmalendu Nath
6. Spectroscopy B K Sharma
7. Spectroscopy Y R Sharma

Model Questions Semester IV (for Bio chemistry Majors) Course Code CH1431 .6 Course – IV

Organic Chemistry and Spectroscopy II

Time : Three Hours Maximum marks: 80 marks

Section A

Answer all.(answer in one word \ sentence)

1.What is Rf value?
2.The chromatographic method where the components are separated in stacks is called
3.Which sugar is present in RNA?
4.Write the expression of Langmuir's adsorption isotherm 5.Write the expansion of DNA.
6. Name one lipid.
7. Name the components obtained on hydrolysin nucleoprotein.
8. Name the two main types of polymers.
9. W h a t i s Nylon 66 ?
10. Which is the monomer of natural rubber?

Section B

Answer any 8. Each question carries 2 marks (short answer type)

11. What are Stokes and anti Stokes lines?
12. Write in brief "Ion exchange chromatography."
13. What is paper chromatography.
14. What is iodine value ?
15. Explain saponification value.
16. What are terpenes ?
17. Explain the stereochemistry of double bond in natural rubber..
18. What are isotonic solutions ?
19. What is Tyndall effect ?

20. What is Hardy-Schultz rule?
21. Explain mutual exclusion rule ?
22. What is chemical shift? 1×8 = 8

Section C

Answer any 6. Each question carries 4 marks (short e ssay)

23. Write a note on partition chromatography.
24. Explain biological roles of RNA and DNA.
25. Distinguish between addition and condensation polymerization.
26. Distinguish between thermoplastics and thermosetting plastics.
27. Which are the different types of adsorption and the factors influencing adsorption.
28. Define elecrophoresis and electro osmosis.
29. Explain the terms (1) emulsion (2) gel
30. Explain spin-spin coupling in nmr spectroscopy.
31. Draw the high resolution nmr spectrum of ethanol and explain the peaks.

4×6 = 24

Section D

Answer any 2. Each question carries 15 marks (essay)

32. (a)Briefly explain the theory and principle of NMR spectroscopy.
(b) Why Raman spectrum is complementary with IR spectrum.

33. (a) Write a short note on the applications of chromatography. (b) Write a note on the biological role of nucleic acid.

34.(a) How is molar mass determined by osmotic pressure method.
(b) Writ a note on cleansing action of soaps and detergents.

35.(a) Explain in detail the applications of colloids.
(b) Explain isoprene rule with an example. 2x15=30

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY

Course V Course Code CH1432 .6 Credit 2 Semesters 1,2,3 & 4

For students of Botany, Zoology, Home Science Biochemistry and Microbiology majors

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – polynuclear hydrocarbons, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1.Acetanilide from aniline

2.Metadinitrobenzene from nitro benzene

3.Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

I.Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard

b. i)Estimation of a strong base and a weak base using standardized HCl

ii)Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH

II.Permanganometry

a.Standardization of KMnO4 by oxalic acid/sodium oxalate and Mohr's salt

b.Estimation of oxalic acid/sodium oxalate
c.Estimation of Mohr's salt

d.Estimation of calcium

III.Dichrometry

a.Preparation of Std. $K2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b.Estimation of ferric iron by reduction with stannous chloride (internal indicator).

IV.Iodimetry and Iodometry

a.Standardisation of sodium thiosulphate using std potassium dichromate

b.Estimation of copper in a solution

c.Estimation of iodine

V.Complexometric titrations

a.Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution. b.Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

1.Estimation of water of hydration in barium chloride crystals
2.Estimation of barium in barium chloride solution.

Chromatography

a.Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars

b.Separation of a mixture of dyes by column chromatography.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1^{st} ,2^{nd} , 3^{rd} and 4^{th} semesters

Complementary Chemistry offered to Microbiology Majors

Each Complementary Course has 4 theory courses and 4 practical courses. The Hour allotments and Credits for all are given in the table.

Chemistry ComplementaryComplementary Courses -4 Total Credits – 14

One Semester – 18Weeks

Sem	Hours\ Week Theory	Lab	Number Of Credits	Course	Title of Course	Instructional Hours
1	2	2	2	CH1131 .7		2×18 = 36 2×18 = 36
2	2	2	2	CH1231 .7		2×18 = 36 2×18 = 36
3	3	2	3	CH1331 .7		3×18 = 54 2×18 = 36
4	3	2	3 4	CH1431 .7 CH1432 .7		3×18 =54 2×18 = 36

QuestionPaperPatternforTest		
QuestionNo	*Typeof Question*	*Marks*
Part A: 1-2	One word or a sentence	1
Part B: 3-6	2 out of 4; Short Answer	2
Part C: 7-8	1 out of 2; Short Essay	4
Part D: 9-10	1 out of 2; Long Essay	15
		Total = 25

SYLLABUS OF COMPLEMENTARY COURSE

Theoretical Chemistry(Common for Botany/zoology/Microbiology) (For Students of Microbiology Majors)

SEMESTER 1 Complementary Course No. - 1 Course Code-CH1131 .7 Credit-2

L-T-P 2-0-2 36 hours

Module I – Atomic Structure (9 hrs)

Atomic spectrum of hydrogen - different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (mention only, no derivation), concept of orbitals, the four quantum numbers and their significances. Orbitalwise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, Stability of filled and half filled orbitals. Electronic configuration of lanthanides and actinides, Lanthanide contraction

Module II – Chemical Bonding (9 hrs)

Energetics of bond formation – Born-Haber cycle. Hybridisation and structure of molecules – sp, sp^2, sp^3, dsp^2, dsp^3, sp^3d^2 and sp^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia. VSEPR theory with regular and irregular geometry –. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility. Partial covalent character of the ionic bond – Fajan's Rules. A brief review of molecular orbital approach

– LCAO method – bond order, bond distance and stability of O2, $O2^{2+}$, $O2^{2-}$, NO, NO^+, CO and

HF.

Module III – Analytical Principles (9 hrs)

Principles of volumetric analysis – primary standard – standard solutions normality and molarity, theory of acid-base titrations, permagnometric and dichrometric titrations, iodometry and complexometric titrations. Theory of acid-base indicator – redox indicators. Principles of colorimetry – estimation of iron and phosphorous.

Module IV – Environmental Chemistry (9hrs)

Nature of environmental threats and role of chemistry. Green house effect, ozone layer and its depletion. Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis.Dissolved oxygen-BOD,COD analysis.

References:

1. " Atomic structure and chemical bonding with introduction to molecular spectroscopy" – Manas Chanda
2. " Concise Inorganic Chemistry" – J.D. Lee
3. "Inorganic chemistry", Puri, Sharma and Kalia

4. “A text book of Quantitative analysis” A.I.Vogel
5. “Qunatitative analysis: laboratory manual”: Day & Underwood.
6. “Theoretical Principles of Inorganic Chemistry”: Manku.
7.S. K. Banerji, “Environmental Chemistry”.
8.A. K. De “Environmental Chemistry - An introduction”
9.B. K. Sharma “Air Pollution”.
10.V. K. Ahluwalia “Environmental Chemistry”
11.G.W. vanLoon and S. J. Duffy “Environmental Chemistry: A global perspective”

University of Kerala
Model Question Paper of BSc Chemistry Programme
2017 Admission onwards
SEMESTER I Complementary CourseMicrobiology majors. Course Code CH1131.7
THEORETICAL CHEMISTRY

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the electronic configuration of Copper (atomic umber 29) 2.
The quantum numbers n = 2 and l = 1 corresponds to which orbital?
3. What are the shapes of molecules with sp and sp3 hybridization?
4. Calculate the bond order of H_2 molecule.
5. Give the structure of XeO_3.
6. What is Lattice Energy?
7. What is meant by primary standards?
8. Define Molality.
9. What is the optimum value of DO for good water quality?
10. What is meant by BOD?

Section-B

Short answer type (not to exceed one paragraph). Answer any 8 questions from the following. Each question carries two marks

11. What is Bohr Bury's rule?
12. Write down the Schrodinger Equation and explain the terms involved.
13. Explain the failures of Bohr's theory?
14. What are the limitations of VSEPR Theory?
15. What are polar and non polar covalent bonds?
16. Mention the rules for adding electrons to molecular orbitals?
17. What are dichrometric titrations?
18. How would you prepare 100ml of 0.05M Mohr's salt solution?
19. Methyl orange is not a suitable indicator for the titration of weak acid with strong base. Why?

20. Which are green house gases? Mention their sources.
21. What is reverse osmosis? How it is useful in the purification of waste water?
22. What are chief factors responsible for water pollution?

Section-C

Short essay (not exceed 120 words). Answer any 6 questions from the following. Each question carries four marks.

23. If the energy difference between two electronic states of hydrogen atom is 214.68 KJmol1. What will be the frequency of light emitted when the electrons jump from the higher to the lower level?
24. Explain the stability of half filled and completely filled orbitals.
25. Give an account of permanganometric titrations.
26. Discuss the theory of Acid – Base indicators.
27. Explain the energetic of ionic bond formation.
28. Define hybridization. Mention the types of hybridization involved in SF6, PCl5, BF3.
29. Explain Born-Haber Cycle considering the formation of NaCl as an example.
30. Write a note on agricultural pollution.
31. Explain briefly the different methods for the treatment of industrial waste water.

Section-D

Long essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32. (a) Discuss Bohr Theory, highlighting its merits and demerits. (b)What are quantum numbers? Give its significance.
    (c) Explain various rules regarding electronic configuration.
33. (a) Discuss the titration curves for the titration of strong acid with strong base and weak acid with strong base.
    (b) Explain the theory of redox indicators.
    (c) explain Beer's Law, Lambert's Law and Beer – Lambert Law.
34. (a) Write a note on Hydrogen bonding and its consequences.
    (b) How electronic configuration of molecules related to molecular behavior? Explain.
    (c) Explain Fajan's Rule.
35. (a) Discuss the formation and importance of ozone layer.
    (b) What is meant by pollution and pollutants? Explain the classification of air pollutants.
    (c) What are the sources of important air pollutants.

SYLLABUS OF COMPLEMENTARY COURSE Inorganic & Bioinorganic chemistry (Common for Botany/Zoology/Microbiology) (For Students of Microbiology Majors)SEMESTER II Course Code-CH1231 .7 Credit-2

L-T-P 2-0-2 36 hours

Module I –Organometallics (9 hrs)

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications. Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses. Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture. Environmental aspects of Organometallic compounds.

ModuleII – Nuclear Chemistry (9hrs)

Natural radioactivity, modes of decay, Geiger –Nuttal rule, artificial transmutation and artificial radioactivity- nuclear stability, n/p ratio, mass defect and binding energy, nuclear fission and nuclear fusion, -applications of radioactivity- ^{14}C dating, rock dating , neutron activation analysis and isotope as tracers

ModuleIII-Coordination Chemistry (9hrs)

Nomenclature, Coordination number and geometry of chelates – isomerism – structural and stereo isomerism - valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – magnetic properties.

Application of coordination complexes in qualitative and quantitative analysis.

Module IV – Bio inorganic compounds (9 hrs)

Metalloporphyrins – cytochromes – chlorophyll photosynthesis and respiration – haemoglobin and myoglobin, mechanism of O_2 – CO_2 transportation, nitrogen fixation, carbon fixation and carbon cycle. Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems.

References

1. Co-ordination Chemistry – Bosolo and Johns
2. Chemistry of Organometallics – Rochoco.
3. Concise Inorganic Chemistry – J.D. Lee
4. Puri, Sharma and Kalia “Inorganic Chemistry” 5.Modern Inorganic Chemistry A.D. Madan University of Kerala

Model Question Paper of BSc Chemistry Programme

2017 Admission onwards

SEMESTER II Complementary CourseMicrobiology majors. Course Code CH1231.7

INORGANIC AND BIOINORGANIC CHEMISTRY

Time: Three Hours Maximum Marks: 80

Section A

Answer all questions. Answer in one word to maximum two sentences. Each question carries one mark.

1. Give the structure of Zeise's salt.
2. Write any one of the preparation methods of organolithium compounds.
3. What is ferrocene? How is it synthesized?
4. What are alpha particles?
5. Define the term radioactivity.
6. Write the IUPAC name of K3[Co(NO2)4Cl2]
7. What are low spin complexes?
8. What do you mean by chelate?
9. What are metalloporphyrins?
10. Give an example of anaerobic respiration.

Section-B

Short answer type (not to exceed one paragraph). Answer any 8 questions from the following. Each question carries two marks

11. What is reformatsky reaction?
12. What is cisplatin? Give its significance.
13. How are organomercurials prepared?
14. Explain Geiger Nuttal Rule.
15. What are half life period and average life period?
16. Define mass defect and binding energy.
17. Write the postulates of Werner's Coordination Theory.
18. What are poly dentate ligands? Give an example.
19. Explain the colours of transition metal complexes.
20. Differentiate respiration and photosynthesis.
21. What are trace elements?
22. What is the role of chlorophil in photosynthesis?

Section-C

Short essay (not exceed 120 words). Answer any 6 questions from the following. Each question carries four marks.

23. Write a note on organotin compounds.

24.Write a brief note on the applications of organometallic compounds in agriculture and horticulture.
25.One microgram of phosphorus- 32 was injected into a living system for biological tracer studies. The half life period of P-32 is 14.3 days. How long will it take for the radioactivity to fall to 10% of the initial value?
26.Explain the relation between nuclear stability and n/p ratio.
27.Write the biological effects of radiation.
28.Suggest the structure of [NiCl4] on the basis of Valence Bond Theory.
29.Explain the magnetic properties of octahedral complexes with suitable examples.
30.Discuss briefly the biochemistry of iron toxicity and nutrition.
31.Metal ions play a variety of roles in biological systems. Explain.

Section-D

Long essay. Answer any 2 questions from the following. Each question carries fifteen marks.

32.(a) Explain the synthesis and applications or Grignard reagent. (5 marks)
(b) What are Frankland reagents? Give its significance. (5 marks)
(c)Explain about organosilicon compounds in medicine. (5 marks)

33.(a) Explain carbon dating and rock dating. (5 marks)
(b) Give the principle of neutron activation analysis. (5 marks)
(c)Explain the terms nuclear fission and fusion with suitable examples. (5 marks)

34.(a) Write a note on Crystal Field Theory. (5 marks)
(b) Explain the applications of complexes in qualitative analysis. (5 marks)
(c)Write a brief note on isomerism in coordination complexes. (5 marks)

35.(a) Give brief outline of carbon cycle. (5 marks)
(b) Explain nitrogen Fixation. (5 marks)
(c)Write a short note on hemoglobin. (5 marks)

Majors)SEMESTER III Course Code-CH1331 .7 Credit-3T-P 3-0-2
Total - 54 hrs

Module I – Mechanisms in organic substitution reactions (9 hrs)

Electron displacement in organic compounds – Inductive, electromeric and mesomeric effects, influence of inductive effect on acidic and basic properties of organic compounds, hyperconjugation and steric effect.

Reaction mechanism - Bond fission, rate determining step, nucleophilic substitution of Alkylhalides, SN1& SN2 reactions. Effect of structure on reactivity as illustrated by Methyl, ethyl, isopropyl and tertiary butyl groups. Electrophilic addition to ethene and propene – Markownikoff's rule, free radical addition, peroxide effect.

Module II – Stereochemistry (9 hrs)

Optical isomerism, chirality, recemisation and resolution, relative and absolute configuration, asymmetric synthesis, optical isomerism due to restricted rotation. Geometrical isomerism, E and Z nomenclature. Aldoximes and ketoximes.

Rotational isomerism. Rotation about carbon – carbon single bond, conformation of ethane, propane, butane cyclohexane, axial and equatorial bonds.

Module III – Carbohydrates (9 hours)

Classification, configuration, glyceraldehyde, erythrose, threose, ribose, 2-deoxy ribose, arabinose, glucose, fructose and mannose. Preparation and properties of glucose and fructose Pyranoside structures of glucose and fructose, furanoside structure of fructose (structure elucidation not expected). Mutarotation and epimerization. Conversion of glucose into fructose and viceversa.

Module IV – Amino acid and Proteins (9 hrs)

Classification and properties – synthesis of glycine, alanine and tryptophan – polypeptides and proteins, peptide linkage, peptide synthesis, polypeptides, primary,secondary, tertiary and quarternary structure of proteins, test for proteins, Enzymes – Characteristics, catalytic action, theory of enzyme catalysis – Michaelis – Menton theory – Co-enzymes.

Module V : Heterocyclic compounds (9hours)

Heterocyclic systems – 5 membered, 6 membered and condensed systems. Structure of pyrrole, Furan and Thiophene. Electrophilic substitution in pyrrole, Furan and Thiophene. Reactivity and orientation – Structure and properties of pyridine. Electorphilic and nucleophilic substitution reactions in pyridine – Basicity and reduction. Structure of purine and pyramidine bases present in nucleic acids.

Module VI– Nucleic acids and Lipids (9 hrs)

RNA, DNA – their biological role, hydrolysis of nucleoproteins, elementary idea regarding the structure of nucleic acids.

Lipids – Classification oils, fats and waxes, iodine value and saponification value, properties of oils and fats – phospholipids.

References:

1 . Principles of Organic Chemistry – M. K. Jain, S. Nagin & Co
2. The Text Book of Organic Chemistry – P.L.Soni

3. The Text Book of Organic Chemistry – Arun Bahl & B.S. Bahl
4. Reaction Mechanism in Organic Chemistry – Mukherjee and Singh – Macmillan
5. Organic Chemistry Vol I and II – I.L. Finar
6. K.S.Tewari, N.K.Vishnoi and S.N.Mehrotra, A textbook of Organic Chemisty, Vikas Publishing House (Pvt) Ltd., New Delhi.

MODEL QUESTION PAPER

SEMESTER III

Complementary Course for Microbiology Majors

COURSE CODE CH1331.7ORGANIC CHEMISTRY

Time: 3 hours Maximum marks: 80

SECTION A

(Answer allquestions. Each question carries 1 Mark)

1)What is heterolytic bond fission?
2) Explain the term rate determining step.
3) Draw the most stable conformer of methyl cyclohexane.
4) Write the epimer of D-Glucose.
5) What are polysaccharides?
6) What are zwitter ions?
7) Relationship between the base sequence in DNA and the amino acid sequence in protein is known as ……..
8) Write the structure of tryptophan.
9) What are heterocyclics? Give examples.
10) Name the purine bases present in DNA. (10x1=10 marks)

SECTION B

(Answer any 8 question. Each question carries 2 Marks)

11) Explain hyper conjugation with an example.
12) Explain Markownikoff's rule with example.
13) What is asymmetric synthesis? Illustrate.
14) Explain racemisation.
15) How will you convert glucose to fructose?
16) Why pyrrole undergoes electrophilic substitution at 3-position.
17) Explain saponification value.
18) What is zwitter ion?
19) Draw the structure of D-Arabinose, D-Ribose, L-Glyceraldehyde and L-Erythrose.
20) Whar are phospholipids?
21) Name the products of hydrolysis of nucleoproteins.
22) Compare the basicity of pyridine and pyrrole.

(8x2=16 marks)

SECTION C

(Answer any 6 question. Each question carries 4 Marks)

23) What is inductive effect? How it influences the acidity of organic acids?
24) Explain the E & Z notation of geometrical isomers with examples.
25) Explain mutarotation and epimerization.
26) Explain the following denaturation and colour reactions of protein.
27) How pyridine is prepared? Explain it important nucleophilic substitution reactions.
28) What are lipids? Give examples. Enumerate their functions.
29) (i) What is peroxide effect? (ii) Draw the different conformers of n-butane.
30) What are enzymes? Give their general characteristics.
31) What is iodine value? Write its importance.

(6x4=24marks)

SECTION D

(Answer any 2question. Each question carries 15 Marks)

32) (a) Discuss the mechanism and influence of structure on SN2 reactions.
    (b) Discuss the mechanism of addition of HBr to propene in presence of organic peroxide and in the absence of organic peroxides.
    (c) Assign the R and S configuration of D- & L- Lactic acid.
33) (a) What is resolution? Explain any two methods.
    (b) Write short notes on (i) the configuration of aldoxime and ketoxime and (ii) Optical isomerism due to restricted rotation.
    (c) Discuss the ring structure of glucose.
34) (a) Explain two methods of synthesizing peptides.
    (b) Discuss primary and secondary structure of proteins.
    (c) Discuss the electrophilic substitution in pyrrole.
35) (a) Describe the classification of oils.
    (b) Discuss the structure of DNA.
    (c) How glucose reacts with the following (i) Br_2 water (ii) Phenylhydrazine (iii) CH_3OH and dry Conc.HCl.

(2x15=30 marks)

SYLLABUS OF COMPLEMENTARY COURSE

Physical chemistry-(For Students of Microbiology Majors)

SEMESTER IV Course Code-CH1331 .7 Credit-3

T-P 3-0-2 Total - 54 hrs

Module I. Chemical kinetics & Enzyme catalysis 9 Hrs

Chemical kinetics, rate of reactions, various factors influencing rate, order, molecularity, zero, first, second, third order reactions - derivation of first order kinetics - fractional life time, units of rate constants, influence of temperature on reaction rates, Arrhenius equation, Calculation of Arrhenius parameters

Enzyme Catalysis: Classification of enzymes.General properties of Enzymes. Mechanism of enzyme action- Enzyme substrate interaction, Activation energy, Rate of reaction and Michaelis constant. MichaelisMenton equation.

Module II - Ionic equilibrium 9 hrs

Arrhenius, Lowry- Bronstead and Lewis concept of acids and bases, Kw and pH, pH of strong and weak acids, Ka and Kb, mechanism of buffer action, pH of buffer, Hydrolysis of salt, Degree of hydrolysis and hydrolysis constant.

Module III - colloids 9hrs

Colloidal state: Types of colloids, preparation of colloids-Purification of colloids – ultra filtration and electrodialysis, Kinetic, optical and electrical properties of colloids. Ultra microscope, Electrical double layer and zeta potential. Coagulation of colloids, Hardy-Schulz rule. Micelles and critical micelle concentration, sedimentation Application of colloids – Cottrell precipitator, purification of water and delta formation

Module IV- Instrumentation Method 9hrs

Ultracentrifuge: Principle and application

Spectroscopic techniques: Principle and applications of UV and Visible spectroscopy – types of electronic transitions, concept of chromophore and auxochrome – red and blue shifts – applications.

NMR spectroscopy – nuclear spin – principle of NMR – chemical shift – spin-spin interation – PMR of simple organic molecules $CHBr_2CH_2Br$, CH_3CH_2Br and CH_3CH_2OH. Principle of MRI .

Chromatographic techniques : Principle and application of TLC and HPLC .

Electropheresis: Principle and application of Zone electrophoresis and capillary electrophoresis.

Module V - Thermodynamics - 9 hrs

Basic concepts – System – surroundings – open, closed and isolated systems – Isothermal – isochoric and isobaric process – work – heat – energy – internal energy – Heat capacity at constant volume (Cv) and at constant pressure (Cp) – relation between Cp and Cv – First law– The second law – Enthalpy-Entropy-and Free energy-Criteria for reversible and irreversible process Gibbs –Helmholtz equation, concepts of spontaneous and non spontaneous processes.

Module VI Dilutie solutions: 9hrs

Molarity, molality and molefraction - Colligative property – relative lowering of vapour pressure – elevation in boiling point – depression in freezing point – osmotic pressure – experimental determination of osmotic pressure – Isotonic solution – reverse osmosis - abnormal molecular mass - van't Hoff factor.

References:

1) Physical Chemistry-Rakshit

2) Principles of Physical Chemistry- Puri,Sharma, Pathania

3) Instrumental methods of Chemical Analysis- B.K.Sharma

4) Essentials Of Physical Chemistry - Arun Bahl & B.S. Bahl

5). Y.R.Sharma, Elementary Organic Spectroscopy, Pearson Education, New Delhi

6) Physical Chemistry- N.M.Kapoor

MODEL QUESTION PAPER SEMESTER IV

Complementary Course for Microbiology Majors

COURSE CODE CH1431.7 PHYSICAL CHEMISTRY

Time: 3 hours Maximum marks: 80

SECTION A

(Answer all questions. Each question carries 1 Mark)

1)What is unit of second order rate constant?

2) Give an example for enzyme catalysed reaction.

3) What are Arrhenius acids and bases?

4) Calculate the pH of a decimolar HCl.

5) What is sol?

6) What are lyophobic colloids?

7) What are chromophores?

8) How many peaks will you get for 1,2-dibromoethane in its H-NMR spectrum?

9) Define the term isobaric process.

10) What is cryoscopic constant? (10x1=10 marks)

SECTION B

(Answer any 8 question. Each question carries 2 Marks)

11) Prove half life of a first order reaction is independent of initial concentration.

12) Differentiate order and molecularity. 13)Explain the term conjugate pair.

14) Explain the terms Ka, Kb and Kw

15)State and explain Hardy-Schule rule?

16) What is CMC?

17) What is chemical shift?

18) State first law of thermodynamics. Write its mathematical form.

19) Explain the different systems in thermodynamics.

20) What is R_f value? Write any two factor influencing R_f value.

21) A 5.13% solution of cane sugar (M=342) is isotonic with 0.9% solution of unknown solute. Calculate the molar mass of the solute 22)Define the term (i) molarity and (ii) molality.

(8x2=16 marks)

SECTION C

(Answer any 6 question. Each question carries 4 Marks)

23) For the decomposition of a compound, k = 2.46 x $10^{-5}s^{-1}$ at 273K and 1.63 x 10^{-3} s^{-1} at 303K. Calculate the energy of activation of the reaction.

24) What is buffer? Give examples. Explain buffer action with an example.

25) Describe any two methods of purifying colloids.

26) Explain red and blue shifts in UV-Vis spectroscopy.

27) Write the principle and application of zone electrophoresis.

28) Derive the relationship between Cp and Cv.

29) Derive an expression for the isothermal reversible expansion work of an ideal gas.

30) What is van't Hoff factor? What is its application?

31) Describe the experimental determination of osmotic pressure.

(6x4=24marks)

SECTION D

(Answer any 2question. Each question carries 15 Marks)

32) (a) Derive the expression for the rate constant in a first order reaction.
(b) Discuss the different factors influencing the rate of reaction.
(c) (i) Explain the general properties of enzymes.
(ii) Briefly discuss the Michaelis-Menton mechanism of enzyme catalysis.

33) (a) Obtain expression for the hydrolysis constant and degree of hydrolysis for the salt of a strong acid and weak base.
(b) Discuss the kinetic and optical properties of colloids.
(c) Write the important applications of colloids.

34) (a) Explain the principle of NMR spectroscopy
(b) Explain spin-spin interaction taking CHBr2-CH2Br as an example. (c) Explain the principle of HPLC.

35) (a) Free energy change is a measure of spontaneity of reactions. Substantiate the statement.
(b) What are collogative properties? Mention different types of colligative properties. The lowering of freezing point of benzene was 2.33K when 0.412g of a solute of unknown molar was dissolved in 9.31g of benzene. Calculate the molar mass of the solute. Molal depression constant of benzene is 5.1K/m. (c) Explain the following (i) Reverse osmosis (ii) Applications of UV-Vis spectroscopy.

(2x15=30 marks)

SYLLABUS FOR LABORATORY COURSES FOR COMPLEMENTARY CHEMISTRY Course V
Course Code CH1432 .7 Credit 2 Semesters 1,2,3 & 4For students of Botany, Zoology, Home Science, Biochemistry and Microbiology majors.

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – glucose, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1. Acetanilide from aniline
2. Metadinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

A.Acidimetry and alkalimetry

a. Preparation and standardization of decinormal HCl using sodium carbonate as primary standard
b. Estimation of a strong base and a weak base using standardized HCl)

Estimation of sodium hydroxide using (i)Std. oxalic acid and (ii) Std. Hcl

c. Determination of sodium hydroxide, and sodium hydroxide and sodium carbonate in a mixture (indicator method)

d. Preparation and standardization of decinormal NaOH using oxalic acid as primary standard.

e. Estimation of a strong acid using standardized NaOH

B. Permanganometry

a. Standardization of $KMnO_4$ by oxalic acid/sodium oxalate and Mohr's salt b. Estimation of oxalic acid/sodium oxalate

c. Estimation of Mohr's salt d. Estimation of calcium

C. Dichrometry

a. Preparation of Std. $K_2Cr_2O_7$ and estimation of ferrous iron by external and internal indicators.

b. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

D. Iodimetry and Iodometry

a. Standardisation of sodium thiosulphate using std potassium dichromate b. Estimation of copper in a solution

c. Estimation of iodine

E. Complexometric titrations

a. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.

b. Estimation of any one metallic ion from Ca^{2+}, Mg^{2+}, Zn^{2+} or Ni^{2+}

A student has to carry out at least twelve experiments in this class.

Chromatography

a.Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars

b.Separation of a mixture of dyes by column chromatography.

Gravimetric Analysis

1. Estimation of water of hydration in barium chloride crystals

2. Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1st ,2nd , 3rd and 4th semesters.

The scheme of practical examination may be framed by the Board of Examiners.

UNIVERSITY OF KERALA

THIRUVANANTHAPURAM

COURSE STRUCTURE AND SYLLABUS

FOR

FIRST DEGREE PROGRAMME

IN

BOTANY

UNDER

CHOICE BASED CREDIT- SEMESTER SYSTEM

(w.e.f. 2014 admission)

OBJECTIVES OF THE PROGRAMME

- To impart knowledge of Science is the basic objective of education.
- To develop scientific attitude is the major objective to make the students open minded, critical, curious.
- To develop skill in practical work, experiments and laboratory materials and equipments along with the collection and interpretation of scientific data to contribute the science.
- To understand scientific terms, concepts, facts, phenomenon and their relationships.
- To make the students aware of natural resources and environment.
- To provide practical experience to the students as a part of the course to develop scientific ability to work in the field of research and other fields of their own interest and to make them fit for society.
- The students are expected to acquire knowledge of plant and related subjects so as to understand natural phenomenon, manipulation of nature and environment in the benefit of human beings.
- To develop ability for the application of the acquired knowledge to improve agriculture and other related fields to make the country self reliant and sufficient.
- Understand and appreciate the role of biology in societal issues, such as the environment and biological resources, biodiversity, ethics and human health and diseases.
- To enrich the students with the latest developments in the field of Information technology, Biotechnology, Bioinformatics and other related fields of research and development
- To create enthusiasm to understand more about the beautiful planet Earth and to give awareness to the public the need to protect the planet from all kinds of exploitation.
- To keep the scientific temper which the student acquired from school level and to develop a research culture

Table 1.General Structure of the First Degree Programme in Botany

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
I	EN1111 1111 EN1121 BO1141 CH/BC1131 ZO1131	English Language I Additional Language I Foundation Course I Core Course I Compl. courseI(CH/BC) Complementary Course II(ZO)	5 4 4 2 2 2	- - - 2 2 2	4 3 2 3 2 2	3hrs ,, ,, ,, ,, ,,	25%	75%	16
II	EN1211 EN1212 1211 BO1221 CH/BC1231 ZO1231	English Language II English Language III Additional Language II Foundation Course II Compl. Course III(CH/BC) Complementary Course IV(ZO)	5 4 4 2 2 2	- - - 2 2 2	4 3 3 3 2 2	„ „ „ „ „ „	**25%**	**75%**	17
III	EN1311 1311 BO1341 CH/BC1331 ZO1331	English Language IV Additional Language III Core Course II Compl. Course V(CH/BC) Complementary Course VI(ZO)	5 5 3 3 3	- - 2 2 2	4 4 3 3 3	„ „ „ „ „	**25%**	**75%**	17
IV	EN1411 1411 BO1441 CH/BC1431 ZO1431 CH/BC1432 ZO1432	English Language V Additional Language IV Core Course III Compl.CourseVII(CH/BC) Complementary courseVIII(ZO) Compl IX (Practical CH/BC) Compl X (Practical ZO)	5 5 3 3 3 - -	-- - 2 2 2 (8)* (8)*	4 4 3 3 3 4 4	„ „ „ „ „ „	**25%**	**75%**	25
V	BO1541 BO1542 BO1543 BO1544 BO1545 BO1551.1 BO1551.2 BO1551.3	Core Course IV Core Course V Core Course VI Core (Practical-1) VII Core (Practical-2)VIII Open Course I Horticulture Mushroom cultivation & Marketing Forestry Project	4 5 4 - - 3 -	3 2 2 (4)* (4)* - 2	4 4 3 3 4 2 - 	„ „ „ „ „ „	**25%**	**75%**	20
VI	BO1641 BO1642 BO1643 BO1644 BO1645 BO1651 BO1646	Core CourseIX Core Course X Core Course XI Core (Practical-3)XII Core (Practical-4)XIII Elective Course II Project	5 4 4 - - 3 	2 2 2 (5)* (8)* - 3	4 4 4 3 4 2 4 	„ „ „ „ „ „	**25%**	**75%**	25
									120

L = Lecture P = Practical ()*Practical hour already distributed in the semester concerned

Table 2. SEMESTER – I

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
I	EN1111	English Language I	5	-	4	3hrs			
	1111	Additional Language I	4	-	3	,,			
	EN1121	Foundation Course I	4	-	2	,,			
	BO1141	Core Course I -Angiosperm Anatomy Reproductive Botany & Palynology	2	2	3	,,	25%	75%	16
	CH/BC1131	Compl. courseI(CH/BC)	2	2	2	,,			
	ZO1131	Complementary Course II(ZO)	2	2	2	,,			

Table 3. SEMESTER – II

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
II	EN1211	English Language II	5	-	4	,,			
	EN1212	English Language III	4	-	3	,,			
	1211	Additional Language II	4	-	3	,,			
	BO1221	Foundation Course II- Methodology & Perspectives in Plant Science	2		3	,,	25%	75%	17
	CH/BC1231	Compl. Course III(CH/BC)	2	2	2	,,			
	ZO1231	Complementary Course IV(ZO)	2	2	2	,,			

Table 4. SEMESTER – III

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
III	EN1311	English Language IV	5	-	4				
	1311	Additional Language III	5	-	4	”			
	BO1341	Core Course II- Microbiology, Phycology, Mycology, Lichenology & Plant Pathology	3	2	3	”	25%	75%	17
	CH/BC1331	Compl. Course V(CH/BC)	3	2	3	”			
	ZO1331	Complementary Course VI(ZO)	3	2	3	”			

Table 5. SEMESTER –IV

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credit
			T	P			Internal	University exam	
IV	EN1411	English Language V	5	--	4				
	1411	Additional Language IV	5	-	4	”			
	BO1441	Core Course III- Bryology, Pteridology, Gymnosperms &Paleobotany	3	2	3	”	25%	75%	25
	CH/BC1431	Compl.CourseVII(CH/BC)	3	2	3	”			
	ZO1431	Complementary CourseVIII(ZO)	3	2 (8)	3	”			
	CH/BC1432	Compl IX (Practical CH/BC)	-	*	4	”			
	ZO1432	Compl X (Practical ZO)	-	(8) *	4	”			

Table 6. SEMESTER - V

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
V	BO1541	Core Course IV - Angiosperm Morphology, Systematic botany, Economic botany, Ethno botany & Pharmacognosy	4	3	4	”	25%	75%	20
	BO1542	Core Course V- Environmental Studies & Phytogeography	5	2	4	”			
	BO1543	Core Course VI- Cell Biology, Genetics & Evolutionary Biology	4	2	3	”			
	BO1544	Core (Practical-1) VII (BO1141, BO1221)	-	(4)*	3	”			
	BO1545	Core (Practical-2)VIII (BO1341 & BO1441)	-	(4)*	4	”			
	BO1551.1 BO1551.2 BO1551.3	Open Course I Horticulture Mushroom cultivation & Marketing Forestry	3	-	2				
		Project	-	2	-				

Table 7. SEMESTER – VI

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
VI	BO1641	Core Course IX Plant physiology &Biochemistry	5	2	4	„			
	BO1642	Core Course X- Molecular Biology, General informatics and Bioinformatics	4	2	4	„ ,	25%	75%	25
	BO1643	Core Course XI- Plant breeding, Horticulture& Research methodology	4	2	4	,			
	BO1644	Core (Practical-3)XII (BO1541 & BO1542)	-	(5)*	3	„			
	BO1645	Core (Practical-4)XIII IV (BO1543, BO1641,BO1642, 1643)	-	(8)*	4	„			
	BO1651	Open Course II- Biotechnology & Nano biotechnology	3	-	2	„			
	BO1646	Project	-	3	4				

Table 8. Distribution of Contact Hours and Credits

(CORE, FOUNDATION & OPEN COURSES, PROJECT/DISSERTATION)

Course Code	Course Title	Semester I			Semester II			Semester III			Semester IV			Semester V			Semester VI			Total	
		Contact hours		credit	Contact hours		credit	Contact hours		credit	Contact hours		credit	Contact hours		credit	Contact hours		credit	Contact hours	Credit
		T	P		T	P		T	P		T	P		T	P		T	P			
BO1141	Angiosperm anatomy Reproductive Botany & Palynology	2	2	3																4	3
BO1221	Methodology & Perspectives in Plant Science				2	2	3													4	3
BO1341	Microbiology, Phycology, Mycology Lichenology & Plant Pathology							3	2	3										5	3
BO1441	Bryology, Pteridology, Gymnosperms &Paleobotany										3	2	3							5	3
BO1541	Angiosperm Morphology Systematic botany, Economic botany Ethno botany & Pharmacognosy													4	3	4				7	4
BO1542	Environmental Studies & Phytogeography													5	2	4				7	4
BO1543	Cell Biology, Genetics & Evolutionary Biology													4	2	3				6	3
BO1544	Practical-I (BO1141, BO1221)		2 *			* 2														4	3
BO1545	Practical-II (BO1341 & BO1441)								* 2			* 2								4	4
BO1551.1 BO1551.2 BO1551.3	Horticulture Mushroom cultivation & Marketing Forestry													3						3	2
BO1641	Plant Physiology &Biochemistry																5	2	4	7	4
BO1642	Molecular Biology, General informatics and Bioinformatics																4	2	4	6	4
BO1643	Plant breeding, Horticulture& Research methodology																4	2	4	6	4
BO1644	Practical-III (BO1541 & BO1542)														5*						3
BO1645	Practical-IV (BO1543, BO1641,BO1642, 1643)																	8 *			4
BO1651	Biotechnology & Nano biotechnology																3			3	2
BO1646	Project report, Tour Diary, Viva-Voce														2			3		5	4
	Total																				**57**

L = Lecture P = Practical *Practical hour already distributed in the semester concerned

Table 9. Scheme of Evaluation of Foundation Course II, Core Courses, Open Courses & Project

Semester	Course Code	Course Title	Marks		Duration of University Exam.
			CE	ESE	
I	BO1141	Angiosperm anatomy Reproductive Botany & Palynology	20	80	3 hrs
II	BO1221	Methodology & Perspectives in Plant Science	20	80	3 hrs
III	BO1341	Microbiology, Phycology, Mycology Lichenology & Plant Pathology	20	80	3 hrs
IV	BO1441	Bryology, Pteridology, Gymnosperms &Paleobotany	20	80	3 hrs
V	BO1541	Angiosperm Morphology Systematic botany, Economic botany Ethno botany & Pharmacognosy	20	80	3 hrs
	BO1542	Environmental Studies & Phytogeography	20	80	3 hrs
	BO1543	Cell biology, Genetics & Evolutionary Biology	20	80	3 hrs
	BO1544	Practical-I (BO1141, BO1221)	20	80	3 hrs
	BO1545	Practical-II (BO1341 & BO1441)	20	80	3 hrs
	BO1551.1 BO1551.2 BO1551.3	Horticulture Mushroom cultivation & Marketting Forestry	20	80	3 hrs
VI	BO1641	Plant Physiology &Biochemistry	20	80	3 hrs
	BO1642	Molecular Biology, General informatics and Bioinformatics	20	80	3 hrs
	BO1643	Plant breeding, Horticulture& Research methodology	20	80	3 hrs
	BO1644	Practical-III (BO1541 & BO1542)	20	80	3 hrs
	BO1645	Practical-IV (BO1543, BO1641,BO1642, 1643)	20	80	3 hrs
	BO1651	Biotechnology & Nano biotechnology	20	80	3 hrs
	BO1646	Project report, Tour Diary, Viva-Voce	20	80	-

END SEMESTER ASSESSMENT (ESA)

The University shall conduct the external examinations for all semesters. There will not be any supplementary exams. The practical examinations for **Core courses** shall be conducted after 4th, 5th and 6th semesters and **Complementary** courses at the end of 4th semester according to the common calendar and questions set up by the University. The Board of Examiners constituted by the University will have the right to make necessary changes in the pattern of practical examination as and when needed.

ELIGIBILITY TO APPEAR FOR PRACTICAL EXAMINATION

Submission of the following

- Certified and bonafide practical record
- Certified herbarium sheets
- Certified field work
- Certified tour report
- Project report/Dissertation (certified and bonafide)

PROJECT

Project work/Dissertation is compulsory. It can be carried out either individually or by a group not exceeding 15 students. The topics shall either be allotted by the supervising teacher or be selected by the student in consultation with the supervising teacher. The project report/dissertation duly attested by the Supervising teacher and Certified by the Head of the Department, has to be submitted on the day of examination of **Practical - III (Core)**. The project shall be evaluated by an external examiner. The project report/ Dissertation (not less than 40 pages) shall be prepared as per the format given below.

1. Title page /Front page (Certified by the **HOD**)
2. Declaration by the candidate
3. Certificate attested by the Supervising teacher
4. Acknowledgement, if any
5. Table of contents
6. Abbreviation, if any
7. Introduction & Review of Literature
8. Material and Methods
9. Results and Discussion (Not less than 10 pages)
10. Summary and Conclusion
11. References

Tables, Graphs, Photographs etc. can be used to present the data. Topics selected once should not be repeated.

STUDY TOUR

• Field trip to a place of plant diversity within or outside Kerala with a minimum duration of 3 days is compulsory. (Field trips are to be conducted for three days either as continuous or one day trips).

• A brief report of the trip has to be submitted

CORE COURSES

Semester	Course Code	Course Title	Contact hrs/week		Credits
			L	P	
I	BO1141	Angiosperm anatomy Reproductive Botany & Palynology	2	2	3
III	BO1341	Microbiology, Phycology, Mycology Lichenology & Plant Pathology	3	2	3
IV	BO1441	Bryology, Pteridology, Gymnosperms &Paleobotany	3	2	3
V	BO1541	Angiosperm Morphology Systematic botany, Economic botany Ethno botany & Pharmacognosy	4	3	4
	BO1542	Environmental Studies & Phytogeography	5	2	4
	BO1543	Cell Biology, Genetics & Evolutionary Biology	4	2	3
	BO1544	Practical-I (BO1141, BO1221)		4	3
	BO1545	Practical-II (BO1341 & BO1441)		4	4
VI	BO1641	Plant Physiology &Biochemistry	5	2	4
	BO1642	Molecular Biology, General informatics and Bioinformatics	4	2	4
	BO1643	Plant breeding, Horticulture & Research methodology	4	2	4
	BO1644	Practical-III (BO1541 & BO1542)		5	3
	BO1645	Practical-IV (BO 1543, BO1642, BO1642 & BO1643)		8	4

SEMESTER-I

ANGIOSPERM ANATOMY, REPRODUCTIVE BOTANY AND PALYNOLOGY

Course code : BO1141

Number of credits : 3

Number of contact hours: Lecture: 36 hrs; Practical: 36 hrs; Total: 72 hrs

Distribution of Hours	Theory	Practical
Angiosperm Anatomy	**22 hrs**	**27 hrs**
Reproductive Botany & Palynology	**14 hrs**	**09 hrs**
Total	**36 hrs**	**36 hrs**

Angiosperm Anatomy

MODULE-I **04hrs**

1. Objective and scope of plant anatomy
2. Cell wall organization - Gross structure - Primary and secondary wall pits – plasmodesmata -microscopic and sub microscopic structures – Extra cell wall material. Non living inclusions of the cell – Reserve food - secretary products, by products.

MODULE-II **09hrs**

3. Tissues – Meristems, Definition, Classification based on origin, position, growth patterns, functions.
4. Apical meristems & theories on apical organization - Apical cell theory, Histogen theory, Tunica -Corpus theory. Organization of root apex in dicots & monocots.
5. Permanent tissues – Definition, classification - simple, complex and secretory.
6. Tissue systems – Epidermal tissue systems-stomata, structure and functions, Ground tissue systems & vascular tissue systems. Different types of vascular arrangements

MODULE-III **09 hrs**

7. Primary structure – Root, stem and leaf [Dicot & Monocot].
8. Secondary growth - Root and stem- cambium (structure and function) annular rings, heart wood and sap wood, tyloses, ring porous wood and diffuse porous wood, periderm formation-phellum, phellogen and phelloderm ; lenticels
9. Anomalous secondary growth – *Boerhaavia*, *Bignonia*, *Dracaena*.

Practical **27 hrs**

1. Non living inclusions - Cystolith, Raphide, Sphaero-raphide, Aleurone grains.
2. Starch grains (Eccentric, concentric, compound)
3. Simple permanent tissue – Parenchyma, Chlorenchyma, Aerenchyma, Collenchyma and Sclerenchyma
4. Primary structure – Dicot stem: *Hydrocotyle, Eupatorium.*
5. Monocot stem: Grass and *Asparagus*.
6. Dicot root: Pea and *Limnanthemum*
7. Monocot root: *Colocasia* or any monocot root.
8. Secondary structure - Stem [Normal type]- *Vernonia*
9. Secondary structure - Root [Normal type]- *Tinospora, Ficus*, *Carica papaya*, or any normal type
10. Epidermal structures –Stomata.
11. Anomalous secondary thickening – *Boerhaavia, Dracaena, Bignonia*

MODULE- IV

Reproductive Botany &Palynology **14 hrs**

1. Introduction to angiosperm embryology with special reference to Indian embryologists.
2. Micro sporogenesis - structure and functions of wall layers.
3. Development of male gametophyte - Dehiscence of anther.
4. Megasporogenesis - Development of female gametophyte - Embryo sac - Development and types - Monosporic – *Polygonum* type, Bisporic - *Allium* type, Tetrasporic – *Adoxa* type.
5. Pollination - Fertilization - Barriers of fertilization - Germination of pollen grains – Double fertilization.
6. Structure of Embryo- Dicot [*Capsella*], Monocot [*Sagittaria*] & Endosperm types.
7. Palynology: Pollen structure, pollen morphology, pollen allergy, Economic and Taxonomic importance

Practical **09 hrs**

Students should be familiar with the structure of anther and embryo,

(Permanent slides can be used)

REFERENCES

1. Coutler E. G. (1969) Plant Anatomy – Part I Cells and Tissues – Edward Arnold, London.
2. Esau K. (1965) - Plant Anatomy – Wiley Eastern, New York.
3. Fahn A. (1985) - Plant Anatomy – Pergamon Press, Oxford.
4. Pandey, B .P. (1997) - Plant Anatomy - S.Chand and co. New Delhi Biology - McGraw Hill Co, New York.
5. Vashista .P. C (1984) - Plant Anatomy – Pradeep Publications – Jalandhar
6. Maheswari P. - Embryology of Angiosperms - Vikas Pub:
7. Nair PKK Palynology of Angiosperms

SEMESTER-II

FOUNDATION COURSE

METHODOLOGY AND PERSPECTIVES IN PLANT SCIENCES

Course code : BO1221

Number of credits : 3

Number of contact hours: 36 hrs (Lecture); 36hrs (Practical) = 72 hours

Distribution of Hours	Theory	Practical
MODULE-I - Scientific Studies	08 hrs	
MODULE- II - Data handling in science	12 hrs	16 hrs
MODULE-III - Microtechnique	06 hrs	08 hrs
MODULE-IV - Biophysics	10 hrs	12 hrs
Total	36 hrs	36 hrs

Aim of the course: To introduce the methodology and perspectives of Science in generalso as to enable the students to systematically pursue his particular discipline in science in relation to other disciplines that come under the rubric of sciences.

Objectives:

• To familiarize the students with the fundamental characteristics of science as a human enterprise

• To see how science works

• To apply scientific methods independently

• To interpret scientific data using basic statistical methods

MODULE-I Scientific Studies **08 hrs**

1. Types of knowledge: practical, theoretical and scientific knowledge

2. Information: What is science; what is not science; laws of science; basis of scientific laws and factual truths.

3. Science as a human activity; scientific temper and empiricism, Science disciplines

4. Revolution in Science and Technology

5. Ethics in Science: Scientific information; depositories of scientific information, Primary, secondary and digital sources; sharing of knowledge; transparency and Honesty; danger of pre conceived ideas.

6. Methods and tools in science: Steps in scientific method. Null hypothesis and alternative hypothesis. Inductive and deductive reasoning.

MODULE- II Data handling in science- 12 hrs

1. Nature and types of data-typical examples, Data collection, Data presentation- Classification and tabulation, diagrammatic (bar, pie diagrams) and graphic presentation.
2. Samples and sampling techniques.
3. Statistical treatment of data: Statistical terms and symbols. Measures of central tendencies (mean, median, mode), Measures of dispersion (range, mean deviation, variance, standard deviation, coefficient of variation), Significance tests (chi-square test).
4. Data analysis – Normal frequency distribution and binomial distribution.

Practical 16 hrs

1. Workout problems on frequency distribution, measures of central tendencies (Mean, Median, Mode)
2. Workout problems on measures of dispersion. (range, mean deviation, variance, standard deviation, coefficient of variation)
3. Workout problems on chi-square test.

MODULE-I11

Microtechnique 06 hrs

1. Introduction - microscopy - simple and compound – phase contrast; dark field illumination and electron microscopes (SEM and TEM).
2. Micrometry, Camera lucida
3. Sectioning - hand and microtome– rotary and sledge
4. Killing and fixation agents – Carnoy's formula, Farmers formula, F .A. A
5. Dehydration - reagents
6. Stains and staining techniques - double staining. General account; Stains: safranin, haematoxylin, acetocarmine.
7. Mounting media - D. P. X and Canada balsam
8. Whole mounts - cytological methods: maceration, smear and squash preparation.

Practical 08 hrs

1. Familiarize stains, fixatives and mounting media
2. General awareness of Micro technique - maceration, smears & squash
3. Demonstration of microtome sectioning and hand sectioning
4. Measurement of specimens using micrometer (Demonstration only).
5. Photomicrography and Camera lucida drawings (Demonstration only).

MODULE-IV

Biophysics **10 hrs**

1. Principles and applications of Colorimeter, Spectrophotometer and Centrifuge.
2. Basic knowledge of the separation methods: - Chromatography, Electrophoresis.
3. Buffers -their functions in biological systems -Uses of buffers in biological research, pH meter.
4. Cryobiology – cryopreservation, freeze drying (lyophilisation) and its applications.

Practical **02 hrs**

1. Preparation of buffer
2. Measurement of pH
3. Separation of plant pigments by paper chromatography/TLC.
4. Construct the absorption spectrum of any sample.

REFERENCE

1. Gieryn T.F. (1999) *Cultural Boundaries of Science* Univer. Chicago Press.
2. Jeffrey A. Lee (2010) The Scientific Endevor. Pearson Delhi
3. Collins H.and T Punch (1993). *The Golem. What everyone should know about Science*. Cambridge Univ. Press
4. Hewitt, Paul G, Suzanne Lyons, John A, Suchocki and Jennifer Yeh (2007)*Conceptual Integrated Science*, Addison-Wesley
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9. Sasidharan A. – An introduction to Biophysics
10. Willard H. H., J .A. Dean, L. L. Merritt and F. A. Settle-Instrumental methods of analysis CBS Publishers and Distributors Delhi
11. Blair E .J. - Introduction to chemical instrumentation Mc-Graw Hill BookCompany
12. T .J .Bailey - Statistical Methods in Biology (3rd Edition) – Cambridge University Press India Pvt Ltd.
13. Casey E. J. - Biophysics – Concepts and Mechanics Van Nostrand Reinhold Company
14. Elizabeth Allman (2004) Mathematical Methods in Biology, Cambridge University Press India Pvt. Ltd
15. Rarnco - Bio-Statistics – Saras Pub:
16. T .K .Saha - Bio-statistics – Theory & Practical - Emkay Pub:
17. Richad Grey –Hand book of microtechnique-Mac Graw Hill Book company
18. Donald A. Johansen-Plant Microtechnique- Mac Graw Hill Book company
19. Prasad and Prasad (1972) Out lines of Botanical Micro technique, Emkay publishers, New Delhi

SEMESTER-III

MICROBIOLOGY, PHYCOLOGY, MYCOLOGY, LICHENOLOGY AND PLANT PATHOLOGY

Course code: BO1341

Number of credits: 3

Number of contact hours: Lecture: 54 hrs; Practical: 36 hrs; Total: 90 hrs

Distribution of Hours	Theory	Practical
Microbiology	**08 hrs**	**07 hrs**
Phycology	**20hrs**	**15 hrs**
Mycology	**20hrs**	**10 hrs**
Plant Pathology	**06 hrs**	**04 hrs**
Total	**54 hrs**	**36 hrs**

MODULE-I

Microbiology **08 hrs**

1. History & scope of microbiology.
2. Bacterial classification: Morphological classification, classification based on staining reaction:
   Ultra structure of bacteria, Reproduction, Economic importance.
3. Mycoplasma & Actinomycetes –General account.
4. Virus- General characteristics, nomenclature, classification, structure, chemical composition,
   properties and reproduction of bacteriophages and T. M. V. Economic importance.
5. Soil microbiology – Soil microorganisms, the rhizosphere
6. Aquatic microbiology - Microbiology of sewage or waste water. Methods of waste water treatment (Brief account only)
7. Food microbiology - Food spoilage and preservation methods. [General account].
8. Agricultural microbiology - Role of microbes in soil fertility, Nitrogen fixation, Biofertilizers

Practical **07 hrs**

1. Gram staining of bacteria.
2. Test for the Coli form bacteria in contaminated water.
3. Isolation of *Rhizobium* from root nodules of leguminous plants. (Demonstration)
4. Examination of different forms of bacteria.(Demonstration)

MODULE II **20 hrs**

Phycology

1. Introduction – Range of thallus structure – Phylogenic trends – Pigments – Reproduction
2. Life cycle – Classification proposed by F .E Fritsch
3. Salient features of the following major groups with reference to the structure, reproduction and life cycle of the types given below **(Excluding the developmental details)** –

a) Cyanophyceae – *Nostoc*
b) Chlorophyceae - *Chlorella*, *Volvox, Oedogonium* and *Chara*
c) Xanthophyceae – *Vaucheria*
d) Bacillariophyceae – *Pinnularia*
e) Phaeophyceae – *Sargassum*
f) Rhodophyceae – *Polysiphonia*

1. Economic importance of algae

a) Commercial products of algae – Agar, Alginates, Carrageenin, Diatomaceous earth
b) Algae - medicinal aspects, algal blooms and red tides

Practical **15 hrs**

1. Make micro preparations of vegetative and reproductive structures of the types mentioned in the syllabus.
2. Identify the algal specimens up to the generic level and make labeled sketches of the specimens observed.

MODULE-III

Mycology **20 hrs**

1. Introduction, structure, reproduction, life cycle, evolutionary trends, Classification based on Ainsworth.
2. Distinguishing characters of different classes of fungi representing the following genera **(Excluding Developmental details)**

a. Myxomycotina -General characters.
b. Zygomycotina - *Rhizopus*
c. Ascomycotina

- Hemiascomycetes - *Saccharomyces*
- Plectomycetes - *Penicillium*
- Pyrenomycetes - *Xylaria*
- Discomycetes – *Peziza*

d. Basidiomycotina

- Teliomycetes - *Puccinia*
- Hymenomycetes - *Agaricus*

e. Deuteromycotina - *Cercospora*.

3. Economic importance of Fungi

Lichenology: General account and economic importance; the structure, reproduction and life cycle of *Usnea*

Practicals **10 hrs**

A detailed study of structure and reproductive structures of types given in the syllabus and submission of record.

Rhizopus, Saccharomyces, Penicillium, Xylaria, Peziza. Puccinia. Agaricus, Cercospora and *Usnea.*

MODULE-IV

Plant Pathology **06 hrs**

1. Classification of plant diseases on the basis of causative organisms and symptoms – Host parasite interaction, phytoalexins.
2. Study of the following diseases with emphasis on symptoms, disease cycle and control measures - Leaf mosaic of Tapioca, Citrus Canker, Blast disease of Paddy, Root wilt of Coconut
3. Brief account of the following fungicides- Bordeaux mixture, Lime sulphur, Tobacco decoction, Neem cake & oil.

Practical **04 hrs**

1. Identify the Diseases mentioned with respect to causal organism and symptoms- Leaf mosaic of Tapioca, Citrus Canker, Blast disease of Paddy.
2. Students should be trained to prepare the fungicide Bordeaux mixture &Tobacco decoction.

REFERENCE

1. Kanika Sharma 2009, Manual of Microbiology, Ane Books Pvt. Ltd.
2. Alain Durieux 2009, Applied Microbiology, Springer International Edition
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4. Heritage. L. 2007, Introductory Microbiology, Cambridge University Press India Pvt Ltd
5. Mamatha Rao 2009, Microbes and Non flowering plants, Impact and applications; Ane Books Pvt. Ltd.
6. Dr. G. Gunasekharan - Labortary Manual of Microbiology – New Age Pub:
7. R .C .Dubey & D .K .Maheswari - A text Book of Microbiology – Chand & Co:
8. Alexopoulos C.J & MIMS C.V 1988. Introductory Mycology, John Wiley & Sons.
9. Jim Deacon 2007, Fungal Biology, 4th edition, Blackwell Publishing, Ane Books Pvt.Ltd.
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11. Vashishta B.R. 1990, Botany for Degree Students, Fungi, S.Chand & Co.
12. Singh V, Pandey PC and Jam D.K 1998, A Text Book of Botany for Under Graduate Students, Rastogi Publications.
13. Chapman V.J & Chapman D.J, The Algae, Macmillan.
14. Fritsch F. B 1945, Structure and Reproduction of Algae Vol.I & II. Cambridge University Press.
15. Smith G.M 1955, Cryptogamic Botany Vol.I, McGraw Hill
16. Vasishta B.R 1990, Botany for Degree Students, Algae, S.Chand & Co.
17. Singh V., Pandey P.C and Jain D.K 1998, A Text book of Botany for Undergraduate Students, Rastogi Publications.
18. Webster J 1970, Introduction to Fungi, Cambridge University Press.

SEMESTER-IV

BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS AND PALAEOBOTANY

Course code : BO1441

Number of Credits :3

Number of Contact Hours: Lecture- 54 Hours; Practicals-36 Hours Total- 90 Hrs

Distribution of Hours	Theory	Practical
Bryology	18 hrs	09 hrs
Pteridology	18 hrs	16 hrs
Gymnosperms	14 hrs	10 hrs
Paleobotany	04 hrs	01 hr
Total	54 hrs	36 hrs

MODULE-1

Bryology **18hrs**

1. Introduction and classification- general account

2 Study of habit, thallus organization, vegetative and sexual reproduction and alternation of generation of the following types (Developmental details are not required)

Riccia, Marchantia, Funaria

3 .Economic importance of Bryophytes

Practical **09 Hrs**

1.*Riccia*- Habit- Internal structure of thallus- V.S.of thallus through archegonia, antheridia and sporophyte

2. *Marchantia*- Habit- thallus with Archegonial receptacle, Male receptacle V.S, Female receptacle V.S. T.S of thallus through gemma, Sporophyte V.S

3.*Funaria*- Habit V.S. of archegonial cluster, V.S of Antheridial cluster, Sporophyte V.S

MODULE -11

Pteridology **18hrs**

1. Introducton: General characters morphological and phylogenetic classification

2. Study of the habitat habit ,internal structure, reproduction and life cycle of the following types (Developmental details not required). *Psilotum*, *Selaginella*, *Pteris* and *Marselia*

3. General topics- Stelar evolution in Pteridophytes . Economic importance of Pteridophytes

Practical **16hrs**

1. *Psilotum* -External features, Stem T.S., Synangium T.S

2. *Selaginella* - Habit , stem and rhizophore , T.S, V.S of strobilus, Megasporophyll and Microsporophylls

3. *Pteris* - Habit , Rachis T.S Sporophyll T.S, Prothallus

4. *Marselia* - Habit, Rhizome and Petiole T.S, Sporocarp T.S , V.S

MODULE-1II

Gymnosperms **14hrs**

1. Introduction –General characters and classification of Gymnosperms

2 .Study of the habit, anatomy, reproduction and life cycle of the following types (Developmental details are not required) *Cycas, Pinus* and *Gnetum*

3. Evolutionary trends in gymnosperms, Economic importance of Gymnosperms

Practical **10hrs**

1.*Cycas*- T.S of leaf,T.S. of coralloid root. Micro and megasporophyll, V S of ovule

2.*Pinus*- T.S. of stem, T.S.of needle, male and female cone , V.S.

3.*Gnetum*-Habit, stem T.S,(young and mature),leaf T.S, male and female strobilus ,V.S of male and female cone ,ovule V.S and seed.

MODULE –IV

Palaeobotany **04hrs**

1. Geological time scale, Fossil formation, types of fossils.

2. Fossil Pteridophytes- *Rhynia,* Lepidodendron, Lepidocarpon. Fossil gymnosperms- *Lygnopteris.*

Practical **01hr**

1 .Fossil Pteridophytes- *Rhynia* stem, *Lepidodendron, Lepidocarpon.*

2. Gymnosperm- *Lygenopteris*

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SEMESTER-V

ANGIOSPERM MORPHOLOGY, SYSTEMATIC BOTANY, ECONOMIC BOTANY, ETHNO BOTANY AND PHARMACOGNOSY

Course code : BO 1541

Number of credits : 4

Number of contact hours : Lecture: 72 hrs; Practical: 54 hrs; Total: 126 hrs

Distribution of Hours	Theory	Practical
Morphology	10 hr	10 hr
Systematic Botany	38 hr	35 hr
Economic Botany	12 hr	06 hr
Ethnobotany &Pharmacognosy	12 hr	03 hr
Total	72 hr	54 hr

MODULE-I

Morphology **10 hrs**

Brief account on the various types of inflorescence including special types (Cyathium, Verticillaster, Hypanthodium, Coenanthium and Thyrsus) with examples; floral morphology- Flower-as a modified shoot, Flower parts, their arrangements, relative position, numeric- plan, cohesion, adhesion, symmetry of flower, aestivation types, placentation types; floral diagram and floral formula

Fruit types: simple, aggregate and multiple. Seeds: albuminous and exalbuminous .

MODULE-II

Systematic Botany **04 hrs**

Definition, scope and significance of Taxonomy, Historical development of the systems of classification:

1. Artificial- Linnaeus sexual system
2. Natural - Bentham and Hooker (detailed account)
3 Phylogenetic- Engler and Prantl (Brief account only)

MODULE-III **04 hrs**

Basic rules of Binomial Nomenclature and International Code of Botanical Nomenclature (ICBN).

Importance of Herbarium, Herbarium techniques and Botanical gardens. A brief account on the

Moder n trends in taxonomy; Chemotaxonomy and Molecular taxonomy

MODULE-IV **30 hr**

A study of the following families with emphasis on the morphological peculiarities and economic importance of its members (based on Bentham & Hooker's system)

(1) Annonaceae
(2) Nymphaeaceae
(3) Malvaceae
(4) Rutaceae
(5) Anacardiaceae
(6) Leguminosae
(7) Myrtaceae
(8) Cucurbitaceae
(9) Apiaceae
(10) Rubiaceae
(11) Asteraceae
(12) Sapotaceae
(13) Apocynaceae
(14) Asclepiadiaceae
(15) Solanaceae
(16) Acanthaceae
(17) Verbenaceae
(18) Lamiaceae
(19) Nyctaginaceae
(20) Euphorbiaceae
(21) Orchidaceae
(22) Scitaminae
(23) Liliaceae
(24) Arecaceae
(25) Poaceae

Practical **45 hrs**

1. Study on various types of inflorescences, Flowers and fruits with vivid record of practical work.
2. Students must be able to identify the angiosperm members included in the syllabus up to the level of families. Draw labeled diagram of the habit, floral parts, L S of flower, T S of ovary, floral diagram, floral formula and describe the salient features of the member in technical terms.
3. Students must submit practical records, Herbarium sheets (25 Nos:) and Field book at the time of practical examination.
4. Field trips are to be conducted for three days either as continuous or one day trips.

MODULE-V **12 hrs**

a) Economic botany

1. Study of the major crops in Kerala with special reference to their Botanical description, morphology of the useful part and economic importance-– Coconut and Paddy.

Cereals and millets - Wheat and Ragi
Pulses - Black gram and Bengal gram
Sugar yielding Plants –Sugar cane
Spices - Pepper and Cardamom
Beverages -Coffee
Fibre yielding plant - Cotton
Dye Yielding plants - Henna and *Bixa orellana*
Resins - Asafoetida
Tuber crops - Tapioca
Oil yielding Plants - Sesame and Ground nut
Latex yielding plant-Rubber
Medicinal plants - *Sida, Zingiber officinalis, Aloe vera and Vinca rosea*
Insecticides - Neem

Practical **06 hrs**

Identify the economic products obtained from the plants mentioned under Economic Botany

b) Ethnobotany **06 hrs**

1. Definition — importance, scope, categories and significance.
2. Study of various methods to collect Ethno botanical data.
3. Plant parts used by tribes in their daily life as food, clothing, shelter, agriculture and medicine.
4. Study of common plants used by tribes. *Aegle marmelos*, *Ficus religiosa*, *Cynadon dactylon, Ocimum sanctum* and *Trichopus zeylanicus*

c) Pharmacognosy **06 hrs**

1. Definition and scope of Pharmacognosy
2. Sources of crude drugs – roots, rhizome, bulb, corm, leaves, stems, flowers, fruits and seeds

Practical **03 hrs**

1. Visit a tribal area and collect information on their traditional method of treatment using crude drugs
2. Observe the plants of ethno botanical importance

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SEMESTER-V

ENVIRONMENTAL STUDIES AND PHYTOGEOGRAPHY

Course code: BO1542

Number of credits: 4

Number of contact hours : Lecture: 90 hrs; Practical: 36 hrs; Total: 126 hrs

Distribution of Hours	Theory	Practical
Environmental Studies	**81 hrs**	**36 hrs**
Phytogeography	**09 hrs**	**00 hrs**
Total	**90 hrs**	**36 hrs**

MODULE- I **14 hrs**

1. Definition- Scope and relevance to society and human environment. Need for public awareness
2. Natural Resources - Renewable and Non renewable - Land & Soil, Water, Energy, Minerals, Food and agriculture , Forests, Plants & Wild life resources
Degradation of natural resources - Land degradation, degradation of water resources, Loss of flora and fauna
Causes – population explosion, over exploitation, deforestation, agriculture mismanagement, desertification, overgrazing, soil erosion, mining, urbanization and industrialization- change in land use, depletion of water resources
3.Conservation of Natural resources
Land and soil- afforestation, regeneration of wasteland
Water - Rain water harvesting, ground water dams
Energy - Promoting use of renewable resources-solar, hydel, tidal and wind; biodiesel, biofuels.
Forests- Reforestation, Community forestry programmes
4. Role of an individual in conservation of natural resources, sustainable life styles.

MODULE II

Ecosystems **22 hr**

1. Ecosystems - Concept, definition, structure and function; components- biotic and abiotic; energy flow
2. Food chains -Food web & ecological Pyramids, biogeochemical cycles - Carbon and Phosphorous cycle
3. Ecological succession-Definition, primary and secondary succession, climax concept, hydrosere and xerosere.
4. Plant adaptations- Morphological, anatomical& physiological adaptations of – Hydrophytes, Xerophytes, Halophytes, Epiphytes, Parasites
5. Introduction- types, characteristic features, structure and functions of the following ecosystems.

1. Forest ecosystem 2. Grassland ecosystem 3. Desert ecosystem 4. Aquatic ecosystems- Ponds, Streams, Rivers, Oceans, Estuaries (brief account only)

MODULE-III

Biodiversity and its conservation **24 hrs**

1. Introduction
2. Definition- genetic, species and ecosystem diversity.
3. Terrestrial (Tropical rain forest) and Aquatic Biomes(mangroves).
4. Hot-spots of biodiversity; India as mega-diversity nation.
5. Threats to biodiversity: land use changes & habitat destruction, poaching of wild life- hunting & export, Overuse of pesticides, invasive species.
6. IUCN, Red data Book; Extinct and Threatened species- endangered & Rare; Endemic species of Western Ghats.
7. Conservation of biodiversity: *In-situ* (National parks and Wild life sanctuaries) and *Ex-situ* conservation (botanical gardens); Biosphere Reserves & World Heritage Sites in India-Ramsar sites.
8. Global initiatives in biodiversity conservation- Stockholm Conference, Montreal Protocol, Convention on Biological diversity Regional initiatives- *Chipko* movement, A brief account on conservation efforts in Kerala- People Biodiversity Register.

MODULE-IV

Environmental pollution & Issues **21 hrs**

1. Definition causes, effects and control measures of – 1. Air pollution 2. Water pollution 3. Soil pollution 4. Marine pollution 5. Noise pollution 6. Thermal pollution 7. Nuclear hazards.
2. Solid Waste Management- waste minimization, Recycling and Reuse, Consuming environment friendly products. E-waste management.
3**.** Environmental Issues **-** Climate change, Global warming, Acid rain, Ozone layer depletion.
4. Environmental Legislations - Environment protection Act (1986); Air [prevention and control of pollution] Act (1981; Amended 1987); Water [prevention and control of pollution] Act (1974; Amended 1988); Wildlife Protection Act (1972); Forest conservation Act (1980). (Scope and relevance only)
5. Environmental Organisations –UNEP, IPCC, WWF, Central Pollution Control Board

MODULE-V

Phytogeography- concept & definition **09 hr**

Vegetation in India – Forests- tropical, temperate, sholas, sub alpine, alpine, mangroves & Grass lands.

Phytogeographical regions of India - Western and eastern Himalayas, Dessert, Western Ghats, Deccan Peninsula, Gangetic Plain, North East India, Coasts & Islands.

Practical **36 hrs**

1. Visit a local polluted site and report major pollutants.
2. Study of ecological and anatomical modifications of Xerophytes, Hydrophytes, Halophytes, Epiphytes and Parasites.
3. Observation and study of different ecosystems mentioned in the syllabus.
4. Phytogeographical regions of India- Photos/ Diagrams

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SEMESTER-V

CELL BIOLOGY, GENETICS AND EVOLUTIONARY BIOLOGY

Course code : BO-1543
Number of credits : 3

Number of contact hours : Lecture: 72 hrs; Practical: 36 hrs; Total: 108 hrs

Distribution of Hours	Theory	Practical
Cell biology	25 hrs	12 hrs
Genetics	36 hrs	24 hrs
Evolutionary biology	11 hrs	00 hrs
Total	72 hrs	36 hrs

MODULE-I
Cell biology **25 hrs**

1. History and progress of cell biology
2. Ultra structure and functions of the cell components and organelles Cell wall; The cell membrane, Endoplasmic reticulum, Ribosomes, Golgi apparatus, Lysosomes, Peroxisomes, Vacuole, Mitochondria, Chloroplast & Nucleus.
3. The chromosomes- Chromosome morphology- Eukaryotic chromosomes and its organization. Chromatin - composition and structure; hetero chromatin and euchromatin; Chemical organization. Nucleoproteins – histones and non –histones. Nucleosome model of DNA organization.
4. Special types of chromosomes- Salivary gland, Lamp brush and B chromosomes
5. Variation in Chromosome number (Numerical aberrations)- anueploidy and Euploidy- haploidy, polyploidy- significance
6. Variation in Chromosome structure (Structural aberrations) - deletion, duplication, inversion and translocation; significance
7. Mitosis and Meiosis. cell cycle : Significance of mitosis and meiosis

Practical **12 hrs**

Make acetocarmine squash preparation of onion root tip and to identify different stages of mitosis.
Make squash preparation of the flower buds of any of the following plants. *Rhoeo,Capsicum* (To identify Meiosis)

MODULE-II
Classical Genetics **36 hrs**

1. Mendelian Genetics- Mendel and his experiments, Mendel's success, Mendelian principles, Mendelian ratios, monohybrid and dihybrid crosses, back cross and test cross

2. Genetics after Mendel- Modified Mendelian ratios; Incomplete dominance –Flower color in Mirabilis ; Interaction of genes- Comb pattern in poultry. 9:3:3:1. Epistasis - Recessive. Coat color in mice. 9:3:4; Dominant epistasis. Fruit colour in summer squash. 12:3:1; Complementary genes. Flower color in Lathyrus 9:7; Duplicate gene with cumulative effect. Fruit shape in summer squash. 9:6:1; Duplicate dominant genes in shepherd's purse. 15:1; Inhibitory factor. Leaf color in Paddy. 13:3

3. Multiple alleles-General account. ABO blood group in man. Rh factor.

4. Quantitative characters- General characters of quantitative inheritance, polygenic inheritance; Skin color in man, ear size in Maize.

5. Linkage and crossing over- Linkage and its importance, linkage and independent assortment. Complete and incomplete linkage. Crossing over – a general account, two point, three point cross. Determination of gene sequence. Interference and coincidence. Mapping of chromosomes.

6. Sex determination- Sex chromosomes, chromosomal basis of sex determination XX- XY, XX-XO mechanism. Sex determination in higher plants (*Melandrium album*) Sex chromosomal abnormalities in man. Klinefelter's syndrome, Turner's syndrome. Sex linked inheritance. Eye color in *Drosophila*, Hemophilia in man.

7. Extra nuclear inheritance General account, maternal influence. Plastid inheritance in *Mirabilis*. Shell coiling in snails, kappa particle in *Paramecium*.

Practical **24 hrs**

Work out problems in

1. Monohybrid cross (Dominance and incomplete dominance)
2. Dihybrid cross (Dominance and incomplete dominance)
3. Gene interactions (All types of gene interactions mentioned in the syllabus)
   a. Recessive epistasis 9: 3: 4.
   b. Dominant epistasis 12: 3: I
   c. Complementary genes 9: 7
   d. Duplicate genes with cumulative effect 9: 6: 1
   e. Inhibitory genes 13: 3
   f. Duplicate dominant gene 15: 1
   g. Comb pattern in poultry 9:3: 3:1
4. Linkage and crossing over
5. Two point and three point crosses
6. Construction of genetic map.

MODULE-III

Evolutionary Biology **11 hrs**

1. Progressive and Retrogressive evolution.
2. Parallel and Convergent evolution.
3. Micro and Macro evolution.
4. Theory of Lamarck, Wiesman and De Vries, Darwinism, Neo- Darwinism
5. Isolation, Mutation, Genetic drift, Speciation
6. Variation and Evolution – Hybridization and Evolution – Polyploidy and evolution– Mutation and evolution.

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SEMESTER-VI

PLANT PHYSIOLOGY AND BIOCHEMISTRY

Course code : BO1641

Number of credits : 4

Number of contact hours: Lecture: 90 hrs; Practical: 36 hrs; Total: 126 hrs

Distribution of Hours	Theory	Practical
Plant Physiology	**60 hrs**	**20 hrs**
Biochemistry	**30 hrs**	**16 hrs**
Total	**90 hrs**	**36 hrs**

MODULE-I **20 hrs**

1. General introduction: physiological processes, their significance and applications.
2. Water relations of plants: Importance of water to plant life.

a. Absorption of water- organs of absorption, root and root hair. Physical aspects of absorption- imbibition, diffusion and osmosis. Plant cell as an osmotic system; water potential and osmotic potential. Plasmolysis and its significance, practical applications. Mechanism of water absorption – active and passive absorption, root pressure. Pathway of water across root cells.

b. Ascent of sap- vital and physical theories.

c. Loss of water from plants: transpiration - cuticular, lenticular and stomatal mechanism - theories – starch sugar hypothesis, potassium - ion theory. Significance of transpiration - guttation, anti-transpirants, factors affecting transpiration.

3. Mineral nutrition: Gross chemical analysis of the plant body, ash analysis, criteria for essentiality of elements, macro and micro elements, role of essential elements and their deficiency symptoms. Culture methods - sand culture, hydroponics and aeroponics. Mechanism of mineral absorption (a) passive absorption- ion exchange and Donnan equilibrium (b) active absorption- carrier concept, Lundegardh hypothesis.

MODULE-II **20 hrs**

4. Photosynthesis: Introduction, significance and general equation; Photosynthetic apparatus, structure and function of chloroplast, quantasomes - solar spectrum and its importance - Fluorescence and phosphorescence; Red drop, Emerson effect; Two pigment systems; raw material for photosynthesis; Mechanism of photosynthesis- Light reaction - cyclic and non cyclic photophosphorylation; Hill reaction - Dark reaction: Calvin cycle; Comparative study of C3, C4,

and CAM plants; Photorespiration Bacterial photosynthesis and chemosynthesis (Brief account only)

5. Factors affecting photosynthesis - Law of limiting factor.

6. Respiration: Introduction, definition and significance and general equation. Respiratory substances, types of respiration- aerobic and anaerobic. Aerobic respiration - glycolysis, Krebs's cycle, terminal oxidation. Anaerobic respiration – fermentation: alcoholic and lactic acid fermentation. Energy relation of respiration - R .Q and its significance - Factors affecting respiration.

MODULE-III **20 hrs**

1. Translocation of solutes: Path way of movement, phloem transport, mechanism of transport - Munch hypothesis, protoplasmic streaming theory - activated diffusion hypothesis, electro osmotic theory.
2. Nitrogen metabolism: Source of nitrogen - Biological nitrogen fixation – symbiotic and asymbiotic. Nitrogen fixation by blue green algae - rotation of crops. Nif genes - Leghaemoglobin.
3. Growth: Phases of growth - vegetative and reproductive growth - growth curve - plant growth regulators - Auxins, Gibberellins, Cytokinins, Ethylene, Abscissic acid - synthetic plant hormones - practical applications. Senescence and abscission. Photoperiodism
4. Vernalization - phytochrome and its significance. Physiology of bud and seed dormancy, germination.
5. Plant movements: Tropic and nastic movements. Circadian rhythm and biological clock.
6. Stress physiology: water stress, salt stress.

Practical **20hrs**

1. Water potential of onion peel / *Rhoeo* peel by plasmolytic method.
2. Imbibition of water by different types of seeds.
3. Effect of temperature on permeability.
4. Papaya petiole osmoscope.
5. Determination of stomatal index.
6. Determination of water absorption and transpiration ratio.
7. Measurement of rate of transpiration using Ganong's potometer or Farmer's potometer.
8. Evolution of oxygen during photosynthesis.
9. Measurement of photosynthesis by Wilmot's bubbler.
10. Evolution of CO_2 during respiration.
11. Ganong's respirometer and measurement of R .Q.
12. Simple respiroscope.
13. Alcoholic fermentation using Kuhn's fermentation vessel.
14. Geotropism using clinostat.
15. Measurement of growth using Arc auxanometer.

Biochemistry

MODULE-IV **15 hrs**

1. Molecules and life.
2. Carbohydrates - Classification, occurrence, structure and functions of monosaccharides (glucose and fructose), oligosaccharides (sucrose and maltose), polysaccharides (starch and cellulose), synthesis of glycosidic bonds – Enzymatic hydrolysis of glycosidic bonds – amylases and invertases.
3. Amino acids- classification based on polarity, structure - Amphoteric property of Amino acids - peptide formation – Amino acid metabolism – reductive amination and transamination
4. Proteins – Structure, classification, properties and function; Role of bonds in stabilizing protein structure - hydrolysis of proteins.

MODULE-V **15 hrs**

5. Lipids- classification – Simple lipids- fats & oils, waxes; Compound lipids- phospholipids, spingolipids and glycolipids; Derived lipids- Cholesterol and terpenes; Fatty acids – Alpha-oxidation and Beta-oxidation; Synthesis of ester bonds.
6. Enzymes - general account - structure, classification and nomenclature (recommended by Commission on Enzymes); Mechanism of enzyme action - inhibition of enzymes - regulation of enzymes - allosteric inhibition - Isoenzymes, coenzymes and cofactors
7. Secondary Plant Products – Introduction – classification and function [General account]

Practical **16 hrs**

1. Qualitative test for carbohydrates - Molisch's test, Benedict's test (for reducing sugar)
2. Iodine test for starch/Seliwanoff's test.
3. Test for proteins - Biuret test

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SEMESTER-VI

MOLECULAR BIOLOGY, GENERAL INFORMATICS & BIOINFORMATICS

Course code : BO1642

Number of credits : 4

Number of contact hours: Lecture: 72 hrs; Practical: 36 hrs; Total: 108 hrs

Distribution of Hours	Theory	Practical
Molecular Biology	**28 hrs**	**12 hrs**
General informatics & Bioinformatics	**44 hrs**	**24 hrs**
Total	**72 hrs**	**36 hrs**

MODULE-I

Molecular Biology **28 hrs**

1.**DNA as genetic material**- experimental evidence- Griffith's experiment on Bacterial transformation, Avery's experiment, Hershey-Chase Experiment.

2.**DNA**- Chemical Composition, Chargaff's rules, molecular structure of DNA-Watson & Crick's Double Helical Model of DNA, Salient features of double helix, Biological Significance of Double Helical Model of DNA; Forms of DNA - A, B and Z forms; Satellite and repetitive DNA

3.**Replication of DNA**- An overview, General principles and features, Semi conservative model-Meselson and Stahl experiment; Leading strand and lagging strand synthesis, okazaki fragments, replication fork and origin of replication; Unidirectional and Bidirectional replication; Enzymology of replication: topoisomerase, helicase, primase, polymerase and ligase; DNA repairing mechanism- photoreactivation.

4. **RNA structure**- Structure, Properties and functions of tRNA, mRNA and rRNA; Genetic code.

5. **Synthesis of protein**: Transcription; RNA modifications- introns, exons, removal of introns, spliceosome; Translation -Central dogma-reverse transcription

6. **Regulation of gene expression in prokaryotes and eukaryotes**- *lac* operon; transcriptional gene regulation in eukaryotes-promoters, enhancers, transcription factors; RNA interference.

7. **Concept of gene**-Units of a gene, cistron, recon, muton; Types of genes- House keeping genes (constitutive genes), Luxury genes (non constitutive genes), overlapping genes.

8.**Transposable genetic elements**- General account, Characteristic, Transposons (jumping genes), Cellular oncogenes (general account only).

Practical **12 hrs**

1.Study of semiconservative replication of DNA through micrographs/schematic representations.

2. Practice problems in molecular biology based on DNA structure and replication

Module- II **22 hrs**

General Informatics

1. **Overview of Information Technology**: Features of the modern personal Computer and peripherals, computer network and internet, overview of operating systems- Windows & Linux, and major application softwares-Excel, Power point, MS word.
2. **Knowledge skill for Higher Education:** Data information and knowledge, knowledge management- Internet as a knowledge repository, academic search techniques, creating your cyber presence, open access initiatives, open access publishing models, basic concepts of IPR, copy rights and patents, plagiarism, introduction to use of IT in teaching and learning, case study of educational software, Academic services-INFLIBNET, NICNET and BRNET.
3. **Social Informatics:** IT and Society- issues and concerns- digital divide, IT and development, new opportunities and new threats, Cyber ethics, Cyber crime, Security, privacy issues, cyber addictions, Information overload, Health issues, guidelines for proper usage of computers, internet and mobile phones. Localization issues-IT and Regional languages-IT for the disabled, the free software debate.

Module-III

Bioinformatics **22 hrs**

1. Introduction: Definition, Origin of concept of Bioinformatics; Brief history, Importance of bioinformatics, Wet lab and Web lab.
2. Basics of Genomics, Proteomics & Comparative genomics
3. Biological databases:
   - Nucleic acid databases (Eg: EMBL, Gen Bank, DDBJ)
   - Protein sequence databases. Eg: PIR, SWISS PROT, UNIPROT
   - Brief account on Model/organism databases, Biodiversity databases
   - Protein structure databank- PDB
4. Sequence analysis and alignment (brief account only), Pair wise sequence alignment, multiple sequence alignment, Sequence Alignment Tools: BLAST, CLUSTAL X
5. Bioinformatics in relation to Biomolecular structure
   - Molecular visualization- use of Ras mol
6. Molecular Phylogeny and Phylogenetic trees- Advantages of Molecular phylogeny and phylogenetic analysis- PHYLIP

Practical **24 hrs**

1. Create, Copy and Save a document with Header, Footer, Page Number, Date and Time using Word processing
2. Insert a table in the above Document
3. Prepare the mark list of students in a class using Excel
4. Prepare five slides each using power point with different design templates

5. Students are expected to work with at least any one of the commercial / scientific packages, to explore the WEB and able to find, recognize, download, install and use software in various areas useful to the research in Biology.

6. Blast Search

7. Molecular visualization using Rasmol

REFERENCE

1. Karp, G. 2010 Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P and Robertis, E.M.P (1991) Cell and molecular biology. Scientific American books.
3. Veer Bala Rastogi (2008), Fundamentals of Molecular Biology Ane Books Pvt. Ltd
4. Darnel, J.Lodish, Hand Baltimore, D. (1991) Cell and molecular biology. Lea and Fibiger, Washington.
5. Durbin (2007) Biological Sequence Analysis. Cambridge University Press India Pvt. Ltd
6. Sandhya mitra,(1998)Elements of molecular biology. Macmillan, India Ltd.
7. Twymann, R.M. (1998) Advanced molecular biology Viva books New Delhi.
8. Selzer PM, Marhofer RJ, Rohwer A (2009) Applied Bioinformatics. Springer- Verlag Berlin Heidelberg, Germany
9. Ingvar Eidhammer, Inge Jonassen,William R Tailor 2009, Protein Bioinformatics, Wiley India Edition
10. Venkatarajan S Mathura and Pandjassarame Kangueane (2009) Bioinformatics- a concept based introduction. Springer-Verlag Berlin Heidelberg, Germany
11. Agrawal S (2009) Bioinformatics for Beginners: Introduction to Bioinformatics. Ane Books India Pvt. Ltd
12. Niel C Jones and Pavela Pevzner (2009) An introduction to Bioinformatics Algorithms. Ane Books India Pvt. Ltd
13. Selzer (2008) Applied Bioinformatics: An Introduction, Ane Books India Pvt. Ltd
14. Kolchanov (2008) Bioinformatics of Genome regulation and Structure. Ane Books India Pvt. Ltd.
15. Rubin (2007) The Avenues in Bioinformatics. Ane Books India Pvt. Ltd.
16. Joseph Seckback and Eitan Rubin (2007) Springer, Kluwer Academic publishers
17. Jin Xiong (2007) Essential Bioinformatics. Cambridge University Press India Pvt. Ltd
18. Higgs (2005), Bioinformatics and Molecular evolution. Ane Books India Pvt. Ltd
19. Ethan Cerami (2005) XML for Bioinformatics. Springer International Edition
20. Moni K and Vijayraj N (2000) Bioinformatics a practical Approach, Coimbatore
21. Mukerjee DP (2000) Fundamentals of Computer Graphics and Multimedia. Prentice Hall of India Pvt. Ltd.

WEB RESOURCES

- ✓ www.fgcu.edu/support/office2000
- ✓ www.openoffice.org *Open office official website*
- ✓ www.microsoft.com/office *MS Office website*
- ✓ www.lgta.org *Office online lessons*
- ✓ www.learntheneth.com *Web Primer*

- ✓ www.computer.org/history/timeline
- ✓ www.computerhistory.org
- ✓ http://computer.howstuffworks.com
- ✓ http://vmoc.museophile.org *Computer history*
- ✓ www.dell.com *Dell Computers*
- ✓ www.intel.com *Intel*
- ✓ www.ibm.com *IBM*
- ✓ www.keralaitmission.org *Kerala Govt. IT Dept.*
- ✓ www.technopark.org
- ✓ www.studentworkzone.com/question.php?ID=139

SEMESTER-VI

HORTICULTURE, PLANT BREEDING & RESEARCH METHODOLOGY

Course code : BO1643

Number of credits : 4

Number of contact hours: Lecture: 72 hrs; Practical: 36 hrs; Total: 108 hrs

Distribution of Hours	Theory	Practical
Horticulture	**35 hrs**	**20 hrs**
Plant breeding	**20 hrs**	**16 hrs**
Research methodology	**17 hrs**	**00 hrs**
Total	**72 hrs**	**36 hrs**

Horticulture

MODULE I **18 hrs**

1. Introduction - Divisions of horticulture- Importance and scope of horticulture.
2. Principles of garden making- types of pots and containers- Potting mixture and potting media – soil, sand, peat, sphagnum moss, vermiculite- Soil types, Soil preparation- Irrigation methods
3. Propagation methods- Cuttings, Layering – Air layering, Ground layering (Tip, Trench and Compound), Budding – T- budding, Grafting – Approach grafting, Bridge grafting, whip and tongue grafting.
4. Garden tools and implements- Lawn mower, hand trowel, nursery spade, spade fork, garden hoe, weeder, tillers
5. Manures and fertilizers- Farmyard manure, compost, vermicompost and biofertilizers; Chemical fertilizers – NPK; Time and application of manures and fertilizers- Foliar sprays

MODULE II **17 hrs**

6. Components of Garden- Landscaping principles; Lawns, Trees, shrubs and shrubberies, climbers and creepers, Flower beds and borders, ornamental hedges, edges, Drives, roads, walks and paths, Carpet beds, topiary, trophy, rockery, Conservatory or green houses
7. Indoor garden, Roof garden (Brief account only)
8. Bonsai
9. Flower Arrangement- Containers and requirements for flower arrangements- Free style, Shallow and Mass arrangement- Japanese- Ikebana. Dry flower arrangement

Practical **20 hrs**

1. Familiarise the garden tools and implements mentioned in the syllabus
2. Students must be trained to do Cutting/ layering/ grafting/ budding.
3. Visit to a Botanical garden under the guidance of the teacher is recommended

MODULE-III **20 hrs**

Plant breeding

1. Introduction, objectives in plant breeding- - Important national and international plant breeding institutes
2. Plant introduction. Agencies of plant introduction in India, Procedure of introduction - Acclimatization - Achievements.
3. Selection - mass selection, pure line selection and clonal selection. Genetic basis of selection and methods.
4. Hybridization: Procedure of hybridisation, inter generic, inter specific, inter varietal hybridisation with examples. Composite and synthetic varieties.
5. Heterosis and inbreeding depression- genetic basis; male sterility
6. Mutation breeding – method – achievements in India.
7. Polyploidy breeding
8. Breeding techniques and achievements with reference to the following crops in India: a. Rice b. Wheat c.Potato d. Coconut

Practical **16 hrs**

1. Techniques of emasculation and hybridization of any bisexual flower.

MODULE-IV **17 hrs**

Research Methodology

1. Introduction; Need for research; Stages of Research – Definition of problem, execution of the problem, interpretation of results
2. Charateristics of Research, Types of research-Qualitative & quantitative.
3. Experimental design, components of experimental designs- Randomized blocks, completely randomized designs.
4. Preparation of a project report : Data analysis and consolidation of photographs, illustrations, tables and graphs, Title, introduction, review of literature, materials and methods, results, discussions, summary, references, acknowledgements; Bibliography – Method of citing and arrangement of references.

REFERENCES

1. Arora J.S 1990, Introductory Ornamental Horticulture, Kalyani Publications
2. Bailey L.H 1901, The Standard Cyclopaedia of Horticulture Volume 1,2 and 3, Macmillan Publications.
3. Bose T.K and Mukerjee D 1987, Gardening in India, Oxford Book House
4. Chauhan V.S, Vegetable Production in India, RamPrasad & Sons
5. Kumar N 1989, lntroduction to Horticulture, Rajalakshmi Publications
6. Manibhushan Rao K 1991, Text Book of Horticulture, Macmillan Publications
7. Shujnrnoto, 1982, The Essentials of Bonsai, David & Charles, Newton
8. Allard RW (1999). Principles of Plant Breeding (2nd Edition), John Wiley and Sons.
9. Acquaah G (2007). Principles of Plant Genetics and Breeding, Blackwell Publishing Ltd. USA.
10. B D Singh Plant breeding
11. N. Gurumani Research Methodology: For Biological Sciences, MJP Publishers, 2006. ISBN, 8180940160
12. C. R. Kothari, Research Methodology New Age International

OPEN COURSES

OPEN COURSE – I

Offered to the students of other disciplines choosing Botany

Semester	Course Code	Title of the Course	Contact hrs/week	Credits
V	BO1551.1	Horticulture	3	2
	BO1551.2	Mushroom Cultivation and Marketing		
	BO1551.3	Forestry		

OPEN COURSE –II

Offered to the students of Botany

Semester	Course Code	Title of the Course	Contact hrs/week	Credits
VI	BO 1651	Biotechnology&Nanobiotechnology	3	2

OPEN COURSE –I (a)

HORTICULTURE

Course code : BO1551.1

Number of credits : 2

Number of contact hours : Lecture: 54 hrs

MODULE I **10 hrs**

1. Introduction
2. Divisions of horticulture
3. Importance and scope of horticulture.
4. Principles of garden making
5. Types of pots and containers
6. Potting mixture and potting media – soil, sand, peat, sphagnum moss.
7. vermiculite
8. Soil types, Soil preparation
9. Irrigation methods
10. Hydroponics

MODULE II **12 hrs**

I Propagation methods

1. Cuttings
2. Layering – Air layering, Ground layering (Tip, Trench and Compound)
3. Budding – T- budding
4. Grafting – Approach grafting, Bridge grafting, whip and tongue grafting.
5. Garden tools and implements
6. Manures and fertilizers
7. Farmyard manure, compost, vermicompost and biofertilizers.
8. Chemical fertilizers – NPK.
9. Time and application of manures and fertilizers.
10. Foliar sprays

MODULE III **12 hrs**

1 Components of Garden
2. Lawns and landscaping Trees, shrubs and shrubberies, climbers and creepers
3. Flower beds and borders, ornamental hedges, edges Drives, roads, walks and paths , Carpet beds, topiary, trophy, rockery
4. Conservatory or green houses, Indoor garden, Roof garden
5. Bonsai

MODULE IV **10 hrs**

1. Flower Arrangement
2. Containers and requirements for flower arrangements Free style, Shallow and Mass arrangement
3. Japanese – Ikebana
4. Bouquet and garland making
5. Dry flower arrangement
6. Harvesting Methods, Storage
7. Marketing of Fruits, vegetables and flowers
8. Preservation and processing of fruits and vegetables

MODULE V **10 hrs**

1. Growth regulators in horticulture
2. Rooting hormones , Growth promoters , Flower induction , Parthenocarpy
3. Plant protection Common diseases of fruits and vegetable crops (Mango, Tomato)
4. Weedicides, Fungicides, Pesticides

Field Study: Visit to a Botanical garden under the guidance of the teacher is encouraged.

REFERENCES

1. Arora J.S 1990, Introductory Ornamental Horticulture, Kalyani Publications
2. Bailey L.H 1901, The Standard Cyclopaedia of Horticulture Volume 1,2 and 3, Macmillan Publications.
3. Bose T.K and Mukerjee D 1987, Gardening in India, Oxford Book House
4. Chauhan V.S, Vegetable Production in India, RamPrasad & Sons
5. Kumar N 1989, lntroduction to Horticulture, Rajalakshmi Publications
6. Manibhushan Rao K 1991, Text Book of Horticulture, Macmillan Publications
7. Shujnrnoto, 1982, The Essentials of Bonsai, David & Charles, Newton 50

OPEN COURSE -I (b)

MUSHROOM CULTIVATION AND MARKETING

Course code : BO1551.2

Number of credits : 2

Number of contact hours : Lecture: 54 hrs

MODULE I **12 hrs**

• History and introduction: Edible mushrooms and Poisonous mushrooms.
• Systematic position, morphology, distribution, structure and life cycle of *Agaricus* and *Pleurotus*.

MODULE II **08hrs**

Nutritional value, medicinal value and advantages- types- milky, straw, button and poisonous mushrooms

MODULE III **12 hrs**

• Cultivation: Paddy straw mushroom – substrate, spawn making. Methods – bed method, polythene bag method, field cultivation.
• Oyster mushroom cultivation –Substrate, spawning, pre-treatment of substrate. Maintenance of mushroom.
• Cultivation of white button mushroom – Spawn, composting, spawning, harvesting.

MODULE IV **12hrs**

• Diseases- Common pests, disease prevention and control measures.
• Processing - Blanching, steeping, sun drying, canning, pickling, freeze drying.
• Storage – short term and long term storage.

MODULE V **10hrs**

• Common Indian mushrooms.
• Production level, economic return, Foreign exchange from Mushroom cultivating countries and international trade.
Field Study: Visit to a mushroom cultivating Laboratory

REFERENCES

1. Pandey B P 1996. A textbook of fungi. Chand and company N Delhi.
2. Kaul T N 2001. Biology and conservation of mushrooms. Oxford and IBH publishing company N.Delhi
3. Gupta P.K. Elements of Biotechnology. 51
4. Harander Singh. 1991. Mushrooms- The Art of Cultivation- Sterling Publishers.
5. Indian Journal of Mushrooms. Published by I.M.G.A. Mushroom Research Laboratory. College Agriculture, Solan

OPEN COURSE -I (c)

FORESTRY

Course code : BO1551.3

Number of credits : 2

Number of contact hours : Lecture: 54 hrs

MODULE I **10 hrs**

General introduction to forests- Natural and Manmade; Tropical, temperate, evergreen semi-evergreen, deciduous; Monoculture, multipurpose, social and industrial. Forest and gene conservation.

MODULE II **16 hrs**

• Silviculture- concept and scope of study of natural and artificial regeneration of forests. Clear felling, uniform shelter, wood selection, coppice and conservation systems. Silviculture of some of the economically important species in India such as *Azadirachta indica, Tectona grandis, Eucalyptus,Mahagoni Dalbergia sisso and Santalum album*, jack wood, Rubber.

• Wood: Homogenous and heterogenous- spring and autumn wood- Porous and non porous wood- Heart and sap wood.

• Relevance of wood anatomical studies in Kerala- Identification of wood- preparation of key and their uses

MODULE III **10 hrs**

• Social and agro forestry. Selection of species and role of multipurpose trees. Food, fodder and energy.

• Social forest- Avenue plantation. Sacred plants- definition, importance of sacred trees like *Ficus religiosa, Emblica officinalis, Aegle marmelous.*

MODULE IV **09 hrs**

• Seed orchards, seed dormancy- Types of dormancy, physical and chemical methods to overcome seed dormancy.

• Forest laws- necessity, General principles, Indian forest act 1927 and their amendment.

MODULE V **09 hrs**

• Forest resources and utilization. Forest products- timber, pulp wood, secondary timbers, non timber forest products (NTFPs).

• Definition and scope (brief outline) - Gums, resins, fibers, oil seeds, nuts, rubber, canes and bamboos, medicinal plants, charcoal. Lac collection and marketing.

Field Study

1. Identification of wood using key: Teak, Jack wood, Mahogany, Rubber, *Azadirachta*, Eucalyptus.

2. Visit to a plywood factory to have knowledge of wood based industry.

REFERENCES

1. Sagreiya, K.P. 1994. Forests and Forestry (Revised by S.S. Negi). National book trust.New Delhi.
6. Tribhawan Mehta, 1981. A handbook of forest utilization. Periodical Expert Book Agency, New Delhi.
7. Kollmann and Cote 1988. Wood science and Technology. Vol.I & II Springer verlag.
8. Sharma P.D. 2004. Ecology and Environment. Rastogi publications, Meerut
9. Singh M.P. and Vinita Vishwakarma.1997.Forest environment and Biodiversity.Daya publishing house, New Delhi.
10. Tiwari K.M. 1983. Social forestry in India.
11. Anil Kumar Dhiman. 2003. Sacred plants and their medicinal uses. Daya publishing house,New Delhi
12. B.S. Chundawat and S.K.Gautham. 1996. Text book of Agroforestry. Oxford and IBH Publishing House ,New Delhi
13. A Hand book of Kerala Timbers- KFRI, Trichur.

SEMESTER-VI

OPEN COURSE-II - ELECTIVE
BIOTECHNOLOGY AND NANO BIOTECHNOLOGY

Course code : BO1651

Number of credits : 2

Number of contact hours : Lecture: 54 hrs

Biotechnology

MODULE- I **12 hours**

1. Introduction – History- major achievements-Biotechnology in India.
2. Plant Tissue culture – Totipotency- definition and importance – dedifferentiation and redifferentiation. Cytodifferentiation.

Culture media, composition, preparation and sterilization.

Callus and suspension culture, meristem culture- Somaclonal variation- Somatic embryogenesis and organogenesis. Synthetic seeds – anther culture and production of haploids – protoplast culture – somatic hybrids – cybrids.

MODULE- II **12 hours**

1. Recombinant DNA technology:

General account of cloning vehicles – plasmid, bacteriophages, cosmids and phagemids. Cutting and joining of DNA molecules – restriction endonucleases, ligases – Gene library.

2. Brief accont of gene transfer techniques – Direct DNA uptake by protoplast –vector method Agrobacterium mediated, physical method- electroporation- shot gun method – microinjection.

MODULE III **12 hours**

1. Methods in Biotechnology.
    a. Isolation and purification of DNA from plant cells.
    b. Agarose gel electrophoresis
    c. PCR, RFLP, DNA sequencing-Sanger's method, Southern blotting, ELISA.
2. Application of biotechnology in
    a. Medicine – edible vaccines from plants, gene therapy.
    b. Agriculture – *nif* genes, GMO foods.
    c. Industry and environment (brief account only)
3. Biosafety and ethical issues, Intellectual Property Rights (IPR)

MODULE IV

Microbial and industrial biotechnology **10 hours**

1. Microbes in biotechnology.
2. Microbial culture methods of culturing, media and composition (LB and PDA)
3.Application of recombinant microbes.
4. Industrial microbiology: Production of alcohol, vinegar, bread, dairy products &single cell protein. (brief account only)

MODULE V

Nanobiotechnology **08 hours**

1. Introduction-background and definition of nanotechnology
2 .Nanosystems in nature
3. Nanoscaled biomolecules (nucleic acids and proteins)
4. Technologies for visualization of biological structures at the nano scale-atomic force microscope
5. Nanoparticles- Quantum dots, Paramagnetic iron Oxide Crystals,Dendrimers, Carbon nanotubes.
6. Application of nanotechnology in life sciences;

Field Study

• Visit to a well equipped biotechnology laboratory to familiar with the use of equipments and glasswares.Petri dishes, conical flasks, culture tubes, Pasteur pipettes, forceps, scalpels, hot air oven, autoclave, platform shaker, pH meter and laminar air flow system.

• Preparation of media, sterilization, inoculation and callus induction (demonstration only).

REFERENCES

1. Sobti RC and Suparna S Pachauri 2009, Essentials of Biotechnology, Ane BooksPvt. Ltd
2. Abhilasha s Muthuriya (2009) Industrial Biotechnology. Ane Books Pvt. Ltd
3. Misra SP (2009) Plant Tissue Culture. Ane Books Pvt. Ltd
4. Victoriano Valpuesta 2004, Fruit and Vegetable Biotechnology, CRC Press. NewYork. Ane Books Pvt. Ltd
5. Smith (2008) Biotechnology (5th Edition), Cambridge University Press India Pvt. Ltd
6. Colin Ratledge (2006) Basic Biotechnology, Cambridge University Press India Pvt. Ltd
7. Balasubramoniun D, CFA Bryce, K Dharmalingam, J Green and Kunthala
8. Jayaraman 2007, Concepts in Biotechnology, Universities Press
9. Janardhanan S and Vincent S 2007, Practical Biotechnology, Universities Press
10. Channarayappa 2008, Molecular Biotechnology, Universities Press
11. Gupta P. K. - Elements of Biotechnology (Rastogi publications).
12. Ignacimuthu S. J. – Applied Plant Biotechnology (Tata Mc Graw Hill)
13. Kumar H .D. - Molecular Biology & Biotechnology (Vikas publishing)
14. Pamela Peters – Biotechnology: A guide to genetic engineering (WC Brown Publishers)
15. Kesavachandran K and KV Peter 2008, Plant Biotechnology, Universities Press
16. Timir Baran Jha and Biswajit Ghosh 2007, Plant Tissue Culture, Universities Press
17. Ramawat K. G. – Plant Biotechnology (S. Chand & company)
18. Razdan M. K. – An introduction to Plant Tissue Culture (Oxford and I B H publishers)

19. Reinert J. and Bajaj Y. P. S – Plant cell, Tissue and Organ Culture (WC Brown publishers).
20. Bharat Bhushan , 2004 Hand book of nanotechnology. Springer- verlag, Berlin
21. Benjamin Lewin, 2004 Gene VIII Pearson Education International

UNIVERSITY OF KERALA

THIRUVANANTHAPURAM

COMPLEMENTARY COURSE

BOTANY

FOR

FIRST DEGREE PROGRAMME IN ZOOLOGY/ HOME SCIENCE

UNDER

CHOICE BASED CREDIT- SEMESTER SYSTEM

(w.e.f. 2014 admission onwards)

SEMESTER-I

MICROTECHNIQUE, ANGIOSPERM ANATOMY AND REPRODUCTIVE BOTANY

SEMESTER-II

PHYCOLOGY, MYCOLOGY, LICHENOLOGY, BRYOLOGY, PTERIDOLOGY,GYMNOSPERMS AND PLANT PATHOLOGY

SEMESTER-III

SYSTEMATIC BOTANY, ECONOMIC BOTANY,ETHNO BOTANY AND PLANT BREEDING

SEMESTER-IV

PLANT PHYSIOLOGY, PLANT ECOLOGY, HORTICULTURE AND PLANT BIOTECHNOLOGY

Course code	Course title	Semester I			Semester II			Semester III			Semester IV			Total	
		Contact hours		Credit	Contact hours		Credit	Contact hours		Credit	Contact hours		Credit	Contact hours	Credit
BO1131	Microtechnique, Angiosperm Anatomy and Reproductive Botany	2		2										4	2
BO1231	Phycology, Mycology, Lichenology, Bryology, Pteridology, Gymnosperms and Plant Pathology				2		2							4	2
BO1331	Systematic botany, Economic botany, Ethno botany and Plant Breeding							3		3				5	3
BO1431	Plant Physiology, Ecology, Plant Biotechnology and Horticulture										3		3	5	3
BO1432	Practical BO1131,BO1231 ,BO1331 &BO1431		2			2			2			2		8	4
															14

SEMESTER-I

MICROTECHNIQUE, ANGIOSPERM ANATOMY AND REPRODUCTIVE BOTANY

Course code: BO1131

Number of credits: 2

Number of contact hours: 72 hrs (Lecture 36 & Practical 36)

Distribution of Hours	Theory	Practical
Microtechnique	06 hrs	00 hrs
Angiosperm anatomy	20 hrs	32 hrs
Reproductive Botany	10 hrs	04 hrs
Total	**36 hrs**	**36 hrs**

MODULE-I

Microtechnique **6 hrs**

1. Killing and fixation agents – Carnoy's formula, F .A. A
2. Stains and staining techniques - double staining. General account; Stains: saffranin, hematoxylin, acetocarmine.

MODULE-II

Angiosperm anatomy **10 hrs**

1. Objective and scopes of plant anatomy
2. Tissues – Meristems, Definition and Classification based on origin, position, growth patterns, functions.
3. Apical meristems & theories on apical organization - Apical cell theory, Histogen theory, Tunica -Corpus theory. Organization of root apex in dicots & monocots.
4. Permanent tissues – Definition, classification - simple, complex and secretory.

5. Tissue systems – Epidermal tissue systems, Ground tissue systems & vascular tissue systems. Different types of vascular arrangements.

MODULE-III **10 hrs**

6. Primary structure – Root, stem and leaf [Dicot & Monocot]. Secondary growth (stelar and extra stelar) Root and stem- cambium (structure and function) annular rings, heart wood and sap wood, tyloses, ring porous wood and diffuse porous wood, periderm formation, phellum, phellogen and phelloderm ; lenticels
7. Anomalous secondary growth –*Boerhaavia*

Practical **32 hrs**

1. Familiarize killing and fixing agents, stains
2.Simple permanent tissue – Parenchyma, Chlorenchyma , Aerenchyma , Collenchyma and Sclerenchyma
3. Primary structure – Dicot stem: *Hydrocotyle*
4. Monocot stem: Grass
5. Dicot root: Pea*, Limnanthemum*
6. Monocot root: *Colocasia*.
7. Secondary structure - Stem [Normal type]- *Vernonia* or any normal type
8. Secondary structure - Root [Normal type]- *Tinospora, Ficus*, *Carica papaya*, or any normal type
9. Anomalous secondary thickening –*Boerhaavia*

MODULE-IV

Reproductive Botany **10 hrs**

1. Micro sporogenesis - structure and functions of wall layers.
2. Development of male gametophyte - Dehiscence of anther.
3. Megasporogenesis - Development of female gametophyte - Embryo sac – Development and types - Monosporic – *Polygonum* type
4. Pollination - Fertilization - Double fertilization. Structure of Embryo- Dicot [*Capsella*]

Practical **4 hrs**

Students should be familiar with the structure of anther and embryo.

(Permanent slides can be used)

REFERENCES

1. Prasad and Prasad (1972) Out lines of Botanical Micro technique, Emkay publishers, New DelhiCoutler E. G. (1969) Plant Anatomy – Part I Cells and Tissues – Edward Arnold,London.
2. Esau K. (1965) - Plant Anatomy – Wiley Eastern, New York.
3. Fahn A. (1985) - Plant Anatomy – Pergamon Press, Oxford.
4. Pandey, B .P. (1997) - Plant Anatomy - S.Chand and co. New Delhi Biology – McGraw Hill Co , New York.
5. Vashista .P. C (1984) - Plant Anatomy – Pradeep Publications – Jalandhar
6. P. Maheswari - Embryology of Angiosperms - Vikas Pub:

SEMESTER-II

PHYCOLOGY, MYCOLOGY, LICHENOLOGY, BRYOLOGY, PTERIDOLOGY,GYMNOSPERMS AND PLANT PATHOLOGY

Course code : BO1231

Number of credits : 2

Number of contact hours : 36 hrs (Lecture); 36 hrs (Practical)

Distribution of Hours	Theory	Practical
Phycology	09 hrs	08 hrs
Mycology	09 hrs	08 hrs
Bryology	06 hrs	06 hrs
Pteridology	06 hrs	06 hrs
Gymnosperms	03 hrs	04 hrs
Plant Pathology	03 hrs	04 hrs
Total	**36 hrs**	**36 hrs**

MODULE-I

Phycology **9hrs**

1.Salient features of the following major groups with reference to the structure, reproduction and life cycle of the types given below (Excluding the developmental details) –

a) Cyanophyceae - *Nostoc*
b) Chlorophyceae - *Chlorella*, *Oedogonium* and *Chara*
c) Phaeophyceae - *Sargassum*
d) Rhodophyceae – *Polysiphonia*

Practical **8 hrs**

1. Make micro preparations of vegetative and reproductive structures of the types mentioned in the syllabus.
2. Identify the algal specimens up to the generic level and make labeled sketches of the specimens observed

MODULE-II

Mycology **9hrs**

1.Characteristic features of the following major groups with reference to the structure, reproduction and life cycle of the types given below (Excluding the developmental details) –

a. Zygomycotina - *Rhizopus*

b. Ascomycotina

i. Plectomycetes - *Penicillium*

ii. Discomycetes - *Peziza*

c. Basidiomycotina

i. Teliomycetes – *Puccinia*

2. Economic importance of Fungi

Lichenology

General account and economic importance; structure, reproduction and life cycle of *Usnea*

Practicals **8 hrs**

A detailed study of structure and reproductive structures of types given in the syllabus and submission of record.

Rhizopus, Penicillium, Peziza. Puccinia. and *Usnea.*

MODULE-IV **6hrs**

Bryology

1. Introduction and Classification

2. Study of the habit, thallus organization, vegetative and sexual reproduction and alternation of generation of the following types (Developmental details are not required).

Riccia, Funaria

3. Economic Importance of Bryophytes.

Practical **6 hrs**

Riccia – Habit - Internal structure of thallus – V. S. of thallus through archegonia, antheridia and sporophyte

Funaria – Habit, V. S. of archegonial cluster, V .S. of antheridial cluster, Sporophyte V.S.

Pteridology **6 hrs**

1. Introduction: General characters morphological and phylogenetic classification.

2. Study of the habitat, habit, internal structure, reproduction and life cycle of the following types (Developmental details not required). *Selaginella and Pteris*

Practical **6 hrs**

Selaginella : Habit , stem and rhizophore T. S , V .S. of strobilus,Megasporophyll and microsporophyll.

Pteris - Habit, Rhizome and petiole T. S., sporophyll T.S

MODULE-V

Gymnosperms **3 hrs**

1. Introduction and classification of gymnosperms.
2. Study of the Habit, Anatomy, Reproduction and life cycle of - *Pinus* (Developmental details are not required*)*

Practical **4 hrs**

Pinus - Branch of indefinite growth, spur shoot, T. S of old stem and needle, male and female cone, V .S. of male and female cone.

Plant Pathology **3 hrs**

1. A brief account on the following plant diseases with reference to the symptoms, causative organism, spread of the disease and effective control measures.

a) Brown spot disease of Paddy
b) Powdery mildew of Rubber
c) Tapioca Mosaic Virus
d) Quick wilt of Pepper

2. Method of preparation and mode of action of the following fungicides- Bordeaux mixture, Tobacco decoction.

Practical **4 hrs**

Students are expected to observe the symptoms and causal organisms of all plant diseases mentioned above.

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SEMESTER-III

SYSTEMATIC BOTANY, ECONOMIC BOTANY, ETHNO BOTANY, PLANT BREEDING

Course code: BO1331

Number of credits: 3

Number of contact hours: 90 hrs (Lecture 54& Practical 36)

Distribution of Hours	Theory	Practical
Systematic Botany	33hrs	32 hrs
Economic botany	08hrs	04 hrs
Ethnobotany	02hrs	00 hrs
Plant Breeding	11hrs	00 hrs
Total	**54 hrs**	**36 hrs**

MODULE- I

Systematic Botany **11 hrs**

1.Floral morphology**:** Parts of a flower, types of inflorescence (Cymose, Racemose, Special type- Cyathium-Brief account only) aestivation and placentation, Floral diagram and Floral formula.

Systematic Botany

2. Definition, scope and significance of Taxonomy.

3. Systems of classification:

a. Artificial

b. Natural - Bentham and Hooker (detailed account)

c. Phylogenetic

4. Basic rules of Binomial Nomenclature. Definition and importance of Herbarium.

MODULE-II **22 hrs**

A study of the following families with emphasis on the morphological peculiarities and economic importance of its members. (Based on Bentham and Hooker's System)

1) Annonaceae
2) Malvaceae
3) Rutaceae
4) Leguminosae
5) Rubiaceae
6) Asteraceae
7) Apocynaceae
8) Solanaceae
9) Verbenaceae
10) Euphorbiaceac
11) Liliaceae
12) Poaceae

Practical / field work **32 hrs**

1. Students must be able to identify the angiosperm members included in the syllabus. Draw labeled diagram of the habit, floral parts, L.S of flower, T.S of ovary, floral diagram, floral formula and describe the salient features of the member in technical terms.
2. Students must submit the practical records at the time of practical examination.

MODULE-III

Economic botany **8 hrs**

Study of the Botanical name, Family, Morphology of useful parts, and utility of the following;

- Cereals and Millets – Paddy and Ragi
- Legumes - Ground nut, Black gram.
- Sugar yielding plants - Sugarcane.
- Spices & condiments - Cumin, Clove, Cardamom and Pepper
- Fibre - Cotton
- Dyes - Henna
- Resins - Asafoetida.
- Tuber crops - Tapioca, Colocasia.
- Tropical Fruits - Banana, Jack Fruit.

- Oil yielding - Sesame oil, Coconut.
- Medicinal plants - *Ocimum , Adhatoda, Sida,* Turmeric.

Practical **4 hrs**

Identify the economic products obtained from the plants mentioned under Economic Botany.

MODULE-1V

Ethnobotany **2 hrs**

1. Study of common plants used by tribes-Neem, *Trichopus zeylanicus*

MODULE-V

Plant Breeding **11 hrs**

1. Introduction, objectives in plant breeding.

2.Plant introduction.Agencies of plant introduction in India, Procedure of introduction - Acclimatization - Achievements.

3. Selection - mass selection, pure line selection and clonal selection.

4.Hybridization:Procedure of hybridization,inter generic,inter specific,inter varietal hybridization with examples. Composite and synthetic varieties.

5. Heterosis and its exploitation in plant breeding.

6. Polyploidy breeding.

7. Breeding for disease resistance.

8. Mutation breeding

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SEMESTER-IV

PLANT PHYSIOLOGY, PLANT ECOLOGY, HORTICULTURE AND PLANT BIOTECHNOLOGY

Course code: BO1431
Number of credits: 3

Number of contact hours: 54 hrs (Lecture); 36 hrs (Practical)

Distribution of Hours	Theory	Practical
Plant Physiology	30hrs	14hrs
Plant Ecology	08hrs	12hrs
Horticulture	06hrs	02hrs
Plant Biotechnology	10hrs	08hrs
Total	**54 hrs**	**36 hrs**

MODULE-I

Plant Physiology **10 hrs**

1. General introduction: physiological processes, their significance and applications.

2. Water relations of plants: Importance of water to plant life.

a. Absorption of water- organs of absorption, root and root hair. Physical aspects of absorption- imbibition, diffusion and osmosis. Plant cell as an osmotic system;water potential and osmotic potential. Plasmolysis and its significance, practical applications. Mechanism of water absorption – active and passive absorption, root pressure. Pathway of water across root cells.

b. Ascent of sap- vital and physical theories.

c. Loss of water from plants: transpiration - cuticular, lenticular and stomatal mechanism - theories – starch sugar hypothesis, potassium - ion theory. Significance of transpiration - guttation, anti - transpirants, factors affecting transpiration.

3. Mineral nutrition: macro and micro elements, role of essential elements and their deficiency symptoms. Mechanism of mineral absorption (a) passive absorption- ion exchange and Donnan equilibrium (b) active absorption- carrier concept.

MODULE-II **10 hrs**

4. Photosynthesis: Introduction, significance and general equation. Photosynthetic apparatus, structure and function of chloroplast, quantasomes - solar spectrum and its importance - Fluorescence and Two pigment systems- raw material for photosynthesis- Mechanism of photosynthesis- Light reaction - cyclic and non cyclic photophosphorylation. Hill reaction - Dark reaction: Calvin cycle. Comparative study of C3, C4, and CAM plants. Photorespiration
5. Factors affecting photosynthesis - Law of limiting factor.

MODULE-III **10 hrs**

6. Respiration: Introduction, definition and significance and general equation. Respiratory substances, types of respiration- aerobic and anaerobic. Aerobic respiration - glycolysis, Krebs's cycle, terminal oxidation. Anaerobic respiration – fermentation: alcoholic and lactic acid fermentation. Energy relation of respiration - R .Q and its significance – Factors affecting respiration.
7. Translocation of solutes: Path way of movement, phloem transport, mechanism of transport - Munch hypothesis, protoplasmic streaming theory - activated diffusion hypothesis, electro osmotic theory.
8. Growth: Phases of growth - vegetative and reproductive growth - growth curve – plant growth regulators - Auxins, Gibberellins, Cytokinins, Ethylene, Abscisic acid – synthetic plant hormones - practical applications. Senescence and abscission. Photoperiodism.

Practical **14 hrs**

1. Water potential of onion peel / *Rhoeo* peel by plasmolytic method
2. Papaya petiole osmoscope.
3. Determination of water absorption and transpiration ratio.
4. Measurement of rate of transpiration using Ganong's potometer or Farmer's potometer.
5. Evolution of oxygen during photosynthesis.
6. Evolution of CO_2 during respiration.
7. Ganong's respirometer and measurement of R .Q.

8. Simple respiroscope.
9. Alcoholic fermentation using Kuhne's fermentation vessel.
10. Geotropism using clinostat.
11. Measurement of growth using Arc auxanometer.

MODULE-IV

Plant Ecology **8 hrs**

1. Definition-Scope and relevance to society and human environment. Need for public awareness
2. Ecosystems-Concept of an ecosystem- structure and function of an ecosystem-
3. Biotic and abiotic components- Energy flow in an ecosystem.
4. Ecological succession-Definition & types.
5. Food chains -Food web & ecological Pyramids.
6. Introduction- types,characteristic features, structure and functions of the following ecosystems.

A 1. Forest ecosystem 2. Grassland ecosystem 3. Desert ecosystem 4 .Aquatic ecosystems- Ponds, Estuaries.

B Morphological, anatomical & physiological adaptations of – Hydrophytes,Xerophytes, Halophytes, Epiphytes, Parasites.

Practical **12 hrs**

1. Study of ecological and anatomical modifications of Xerophytes, Hydrophytes, Halophytes, Epiphytes and Parasites.
2. Observation and study of different ecosystems mentioned in the syllabus.

MODULE-V

Horticulture **6 hrs**

1. Introduction to Horticulure
2. Garden tools and implements - Lawn mower, hand trowel, nursery spade, spade fork, garden hoe, weeder, tillers
3. Methods of vegetative propagation: Cutting, grafting, layering, special methods of propagation, propagation by seeds.
4. Media for propagation of plants — soil, sand, peat, sphagnum moss, vermiculture, soil mixture, nursery beds
3. Manures – organic and inorganic

Practical **2 hrs**

Methods of vegetative propagation: Cutting, grafting, layering, special methods of propagation - propagation by seeds.

Biotechnology **10 hrs**

1.Introduction – History – major achievements – Biotechnology in India

2. Plant Tissue culture - Culture media; composition, preparation and sterilization – Totipotency: definition and importance - Dedifferentiation and redifferentiation – Callus and suspension culture, meristem culture - Somatic embryogenesis, Anther culture and production of haploids.

Practical **8 hrs**

Preparation of media, sterilization, inoculation and callus induction (Demonstration only).

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UNIVERSITY OF KERALA

THIRUVANANTHAPURAM

MSc Degree in Botany (Semester System)

Revised Course structure and Syllabus

(2013 Admissions onwards)

January 2012

PG BOARD OF STUDIES IN BOTANY

UNIVERSITY OF KERALA

MSc Degree in Botany (Semester System)

Revised Course structure

semester	Paper Code	Title of the paper	Hours/ semester	Hours / week		ESA hours	Maximum Marks		
				L	P	3	CA	ESA	Total
I	BO 211	Phycology, Mycology & Plant Pathology	108	6	2	3	25	75	100
	BO212	Bryophyta, Pteridophyta & Gymnosperms	108	6	2	3	25	75	100
	BO213	Microbiology, histology, Microtechnique & histochemistry	108	6	3	3	25	75	100
	BO214	Practical I	126		7	4	25	75	100
	Total for Semester I		**450**	**18**	**7**	**13**	**100**	**300**	**400**
II	BO 221	Taxonomy, Economic Botany & Ethnobotany	108	6	2	3	25	75	100
	BO 222	Environmental Biology,Phytogeography, Conservation Biology & Evolution	108	6	2	3	25	75	100
	BO 223	Cell and Molecular Biology & Genetics	108	6	3	3	25	75	100
	BO224	Practical II	126		7	4	25	75	100
	Total for Semester II		**450**	**18**	**7**	**13**	**100**	**300**	**400**
III	BO 231	Plant Breeding, Horticulture & Reproductive Biology	108	6	1.5	3	25	75	100
	BO232	Biophysics , biochemistry & Plant physiology	108	6	3	3	25	75	100
	BO233	Research Methodology, Biostatistics Plant Biotechnology	108	6	2.5	3	25	75	100
	BO234	Practical III	126		7	4	25	75	100
	Total for Semester III		**450**	**18**	**7**	**13**	**100**	**300**	**400**
IV	BO241	Special Paper –I Bioinformatics	144	8	2	3	25	75	100
	BO242	special Paper –II Elective	144	8	5	3	25	75	100
	BO243	Practical IV	126		7	4	25	75	100
	BO201	Dissertation	36	2				100	100
	BO202	Submissions					25	75	100
	BO203	Comprehensive Viva Voce						100	100
	Total for Semester IV		**450**	**18**	**7**	**10**	**100**	**500**	**600**
		Grand Total					**400**	**1400**	**1800**
L-Lecture, P-practical, ESA-End Semester Assessment, CA-Continuous Assessment(internal)									

SCHEDULE OF WORK LOAD

Semester	Paper code	Subject	Total hours		T Hours/week	P Hours/week
			T	P		
I	BO 211	Phycology	54	27	3	1.5
		Mycology	36	9	2	0.5
		Plant pathology	18	0	1	0
	BO 212	Bryophyta	27	9	1.5	0.5
		Pteridophyta	45	18	2.5	1
		Gymnosperms	36	9	2	0.5
	BO 213	Microbiology	36	9	2	0.5
		Histology	27	9	1.5	0.5
		Microtechnique & histochemistry	45	36	2.5	2
II	BO 221	Taxonomy	72	27	4	1.5
		Economic botany	9	9	.5	.5
		Ethnobotany	9	0	.5	0
		Evolution	18	0	1	0
	BO 222	Environmental Biology	72	36	4	2
		Phytogeography	18	0	1	0
		Conservation Biology	18	0	1	0
	BO 223	Cell & Molecular Biology	54	36	3	2
		Genetics	54	18	3	1
III	BO 231	Plant Breeding	63	9	3.5	0.5
		Horticulture	18	9	1	0.5
		Reproductive biology	27	9	1.5	0.5
	BO 232	Biophysics	27	9	1.5	0.5
		Biochemistry	36	18	2	1
		Plant Physiology	45	27	2.5	1.5
	BO 233	Research Methodology	18	0	1	0
		Biostatistics	27	9	1.5	0.5
		Plant Biotechnology	63	36	3.5	2
IV	BO 241	Special Paper – I Bioinformatics	144	36	8	2
	BO242	Special paper – II Elective	144	90	8	5
		Dissertation	18	0	2	0

Elective Special Papers

BO 242a : Biotechnology

BO 242b : Environmental Biology

BO 242c : Plant Biochemistry and Enzymology

BO 242d : Cytogenetics

The special paper comprises detailed studies in certain areas of a subject. Normally a department shall offer one of the above subjects as special paper. There shall be provision for change of subject for special paper, if necessary, in the ensuing years.

Study Tour

Study tour in the 2nd and 4th semesters of the PG programme is compulsory.

2nd Semester : minimum three one day field trips or 3 to 4 day study tour for flora awareness.

4th Semester : Visit to at least two regional and two national research institutions.

Submissions (4th Semester Practical Examination)

1. Detailed report on visit to research institutions and the type of research works undertaken by these centers
2. A Model research proposal seeking fund to carry out research on a specific problem
3. Power Point presentation of the dissertation carried out by the student before the examiner.

Dissertation/ Project work

Topic of the dissertation may be chosen from any area of botany and may be laboratory based, field based or both or computational, with emphasis on originality of approach. It may be started during 2nd/3rd semester and shall be completed by the end of the 4th semester. It should be duly signed by the research guide and the head of the Department and submitted for evaluation. The dissertation to be submitted should include:

- Introduction
- Objectives of the study
- Materials and methods
- Results and discussion
- Summery and conclusion
- References

Scheme for Practicals	**Duration**	**CA**	**ESA**	**Total Marks**
Practical I (BO 214) includes all the topics under papers BO 211, 212 & 213	4 hrs	25	75	100
Practical II (BO 224) includes all the topics under papers BO 221, 222 & 223	4 hrs	25	75	100
Practical III (BO 234) includes all the topics under papers BO 231, 232 & 233	4 hrs	25	75	100
Practical IV (BO 243) includes all the topics under papers BO 241 & 242	4 hrs	25	75	100

The practical examinations are conducted at the end of the semester II and Semester IV. Practical I and II examinations will be conducted at the end of the Semester II and Practical III and IV examinations will be conducted at the end of the Semester IV.Certified records of practical works done and submissions, if any, should be submitted at the time of each practical examinations.

SCHEME OF EXAMINATION AND MARK DISTRIBUTION

Semester	Paper code	Paper	Hours/ Semester	ESA hours	Maximum marks		
					CA	ESA	Total
I	BO211	Paper 1	108	3	25	75	100
	BO212	Paper 2	108	3	25	75	100
	BO213	Paper 3	108	3	25	75	100
	BO214	Practical I	126	4*	25	75*	100
	Total for Semester I		**450**	**13**	**100**	**300**	**400**
II	BO221	Paper 1	108	3	25	75	100
	BO222	Paper 2	108	3	25	75	100
	BO223	Paper 3	108	3	25	75	100
	BO224	Practical II	126	4	25	75	100
	Total for Semester II		**450**	**13**	**100**	**300**	**400**
III	BO231	Paper 1	108	3	25	75	100
	BO232	Paper 2	108	3	25	75	100
	BO233	Paper 3	108	3	25	75	100
	BO234	Practical III	126	4	25	75	100
	Total for Semester III		**450**	**13**	**100**	**300**	**400**
IV	BO242	Special Paper I	144	3	25	75	100
	BO243	Special Paper II	144	3	25	75	100
	BO244	Practical IV	126	3	25	75	100
	BO201	Dissertation	36			100	100
	BO202	Viva voce				100	100
		Submissions			25	75	100
	Total for Semester IV		**450**	**13**	**100**	**500**	**600**
Grand Total					**400**	**1400**	**1800**

Distribution of marks in each Semester Examination

Semester	Continuous Assessment		End Semester Assessment		Total marks
	Theory	Practical	Theory	Practical	
I	75	25	225	--	325
II	75	25	225	150(75+75)	475
III	75	25	225	--	325
IV	50	25	150	150(75+75)	375
	Dissertation				100
	Submissions				100
	Comprehensive Viva Voce				100
	Grand Total				**1800**

Distribution of Marks in Practical Examination

Practical Exam	Total Marks	Examination	Record/Submission
I	**75**	**55**	**Record – 10** **submission – 10**
II	**75**	**55**	**Record – 10** **Herbarium/Field note-10**
III	**75**	**65**	**Record – 10**
IV	**75**	**65**	**Record -10**

SEMESTER I

PAPER BO 211.PHYCOLOGY, MYCOLOGY& PLANT PATHOLOGY

144 hrs (Theory: 108 hrs; Practical: 36hrs)

A. PHYCOLOGY 54hrs (3hrs/wk)

1. Principles and modern trends in taxonomy of algae ; Contributions of Indian Algologists . (4h)
2. Classification of Algae (Christensen1964,Round1973;Whittaker&Margulis1978, R.E.Lee). Characteristic features of major divisions (6h)
3. Thallus organization and its morphological variations; Ecological and evolutionary trends. (6h)
4. Cell structure - Prokaryotic, mesokaryotic and eukaryotic organizations (4h)
5. Structure, reproduction and life cycle of the following types:
   Hydrodictyon, Ulva, Pithophora, Draparnaldiopsis, Bulbochaete, Cephaleuros, Codium, Halimeda, Acetabularia, Nitella, Sphacelaria, Padina, Turbinaria, Porphyra, Amphiroa, Gracilaria, Ceramium, Spirulina, Scytonema (30h)
6. Economic Importance of Algae –Algae as biofertilisers, as food, their uses in industry, water blooms and their ecological role.(4h)

Practical 27 hrs (1.5 hrs/wk)

1. A record of the local algal flora – A study of their morphology and structure
2. Field trips to be conducted for students to get familiarized with the local flora

References

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11. Sharma,P.D.2003.A Text book of Botany-Lower plants.Rastogi Publications, Meerut.
12. Smith,G.M.1976. Cryptogamic Botany Vol.1.Tata Mc Graw Hill Publ. Comp.. Ltd. New Delhi.
13. Vashishta,B.R..1999.Algae.S.Chand &Company, New Delhi

B. MYCOLOGY **36 hrs (2hrs/wk)**

1. Principles and modern trends of classification of Fungi (Ainsworth 1973,Alexopoulose *et al.*1996*)*; contributions of Indian Mycologists. (3h)
2. Structure, reproduction and phylogeny of: Phycomycetes,Ascomycetes,Basidiomycetes,and Deuteromycetes. (6h)
3. Thallus structure ,reproduction and life cycle of the following types: *Phytophthora, Albugo, Pilobolus, Penicillium, Aspergillus, Erysiphe, Uromyces, Polyporus, Lycoperdon, Geaster, Dictyophora, Nidularia, Schizophyllum Colletotrichum, Fusarium, Alternaria, Helminthosporium, Cercospora, Parmelia, Graphis* (23h)
4. Economic importance of fungi with special reference to secondary Metabolites; Fungi as biocontrol agent.(2h)
5. Classification, thallus structure ,reproduction, ecological significance and economic importance of Lichens .(2h)

Practical **9hrs(1/2hr/wk)**

Study of the morphology and reproductive structures of the types mentioned in the syllabus.

References

1. Ainsworth,G.C.,Sparrow,K.E., Sussman.The Fungi. Academic Press, NewYork
2.. Alexopoulose,C.J.,Mims,C.W., Blackwell,M.1996.Introductory Mycology. John Wiley & Sons, New York.
3. Bessy,E.A.1979.Morphology and Taxonomy of Fungi.Vikas Publishing House, New Delhi.
4. Burnett,J.H.1968.Fundamentals of Mycology.Edward Arnold Ltd. London.
5. Chopra ,G.L.1998. A text book of Fungi .S.Nagin&Co . Meerut.

6 Dube,H.C.1996. An Introduction to Fungi.Vikas Publish.House, New Delhi.

7. Elizabeth Moore-Landeeker.1996.Fundamentals of Fungi.Prentice Hall, New Jersey.

8. Hale,M.E.1983.Biology of Lichens. Edward Arnold,London.

9. Hudson, H. J. Fungal Biology. Edward Arnold, London.

10..Moore, D..*et al* .1986.Developmental Biology of higher Fungi

11 .Mehrothra,R.S. and Aneja,K.R.1990.An Introduction to Mycology. Wiley Eastern Ltd. New Delhi.

12. Sharma,O.P.2007.Text book of Fungi . Tata McGraw Hill,Publishing Co. Ltd. New Delhi.

13. Sharma,P.D.2004.The Fungi for University students.Rastogi Publications, Meerut.

14 .Srivastava,J.P.1998.Introduction to Fungi. Central Book Depot, Allahabad.

15. Sumbali,G.2005.The Fungi.Narosa Publishing House, New Delhi.

C. PLANT PATHOLOGY **18 hrs (1hr/wk)**

1. History of Plant pathology, General principles and concepts of host-parasite interaction. (2hrs)
2. Defence mechanisms - Systemic Acquired Resistance and Induced Systemic Resistance, major signalling pathways of plant defense mechanism. (4 hrs)
3. Epidemiology and quarantine. (I hr)
4. Principles and methods of Plant disease control: Fungicides and pesticides ,natural pesticides, sanitation ,disease resistance. Biological control :biocontrol agents ,bio-inoculants, natural enemies, bio-traps. (2 hrs)
5. Study of the following plant diseases with reference to symptoms causal organism, disease cycle and control measures.

i.	Paddy	-	Brown spot and false smut
ii.	Sweet potato	-	White rust
iii.	Rubber	-	Powdery mildew
iv.	Coffee	-	Rust
v.	Tea	-	Red rust
vi.	Sugarcane	-	Red rot
vii.	Vanilla	-	Bean rot
viii.	Mango	-	Leaf spot
ix.	Ladies finger	-	Yellow vein mosaic
x.	Pepper	-	Quick wilt (9 hrs)

Practical

A record of all diseases mentioned in the syllabus.

References

1. Agrios, G.N.1997.Plant pathology. Academic Press, New Delhi .
2. Bilgrami,K.S.&H.C.Dube.1990.A text book of modern plant pathology. Vikas Publishing House, New Delhi.
3. Butler,E.J.& Jones,1949.Plant pathology.Mc Millan ,London
4. Chatterjee,P.B..1997.Plant protection techniques .Bharati bhavan, Patna.
5. Chattopadhayay,S.B.1991.Principles and procedures of plant protection Oxford &IBH, New Delhi
6. Manners, J.G.1982.Principles of Plant pathology.Cambridge University Press, London.
7. Marshall,H.1999. Diseases of plants .Anmol Publications Pvt.Ltd. , New Delhi .
8. ehrotra,R.S.2000. Plant pathology. Tata McGraw Hill,Publishing Co.Ltd. New Delhi.
9. Mundkur,B.B.1982. Text book of Plant diseases. Macmillan India Ltd., New Delhi
10. Pathak. V. N. ,Khatri, N. K. and Pathak,M.1996.Fundamentals of Plant pathology. Agrobotanical publishers (India), Bikaner.
11. Rangaswamy, G. and Mahadevan, A.2002. Diseases of crop plants in India. Prentice Hall of India, New Delhi.
12. Sharma,P.D 2005.Plant pathology.Narosa Publishing House, New Delhi.
13. Singh,R.S.2000. Introduction to the principles of Plant pathology. Oxford IBH, New Delhi
14. Swarup *et al.,*1999. Plant diseases. Anmol Publications Pvt.Ltd., New Delhi.

PAPER BO 212. BRYOPHYTA, PTERIDOPHYTA AND GYMNOSPERMS

144hrs (Theory : 108 hrs; Practical : 36hrs)

A. BRYOPHYTA 27hrs (1.5 hrs/wk)

1. General characters and recent systems of classification (Shofield 1985); Contributions of Indian Bryologists. (2 hrs)
2. A general account of morphological and anatomical features, reproduction, life history and phylogeny of : Sphaerocarpales, Marchantiales, Jungermanniales, Calobryales, Anthocerotales, Sphagnales, Andreales, Funariales, Polytrichales. (10 hrs)
3. Life cycle study of the following types:

   Lunularia, Targionia, Cyathodium, Reboulia, Pallavicinia, Porella, Notothylas, Sphagnu, Funaria (12hrs)
4. Origin and evolution of Bryophytes, Brief account on Fossil Bryophytes (2 hrs)
5. Bryophytes as indicators of water and air pollution. (1hr)

Practical 9hrs (1/2 hr /wk)

Morphological and anatomical studies of the types mentioned in the syllabus.

References

1. Cavers ,F.1976. The interrelationship of Bryophyta. S.R.Technic House),Asok Rajpath,Patna.
2. Chopra,R.N. 1998. Topics in Bryology.Allied Printers, New Delhi.
3. Chopra, R.N**.** and Kumara,P.K.1988. Biology of Bryophytes.Wiley East New Delhi.
4. Parihar, N.S. 1980.An introduction to Embryophyta Vol.I.Bryophyta.Central Book Depot, Allahabad.
5. Prem Puri.1981. Bryophytes:Morphology ,Growth and differentiation. Atma Ram and Sons, New Delhi
6. Rashid,A.1998.An introduction to bryophyte . Vikas Publishing House, New Delhi.
7. Shaw,J. and Goffinet,B.2000.Bryophyte Biology,Cambridge University Press.
8. Smith,G.M. 1976. Cryptogamic Botany Vol.II. Tata Mc Graw Hill. Publishing Co. Ltd., New Delhi.

9.Watson,E.V. 1968.The structure and life of Bryophytes.Cambridge University ,London.

B. PTERIDOPHYTA **45hrs (2.5 hrs/wk)**

1. General characters, classification (Bierhost1971) and life cycle of Pteridophytes; Contributions of Indian Pteridologists. (3hrs)
2. Comparative morphology,structure, ecology and phylogeny of the following groups: Psilopsida, Lycopsida, Sphenopsida, Pteropsida. (8hrs)
3. Structure ,reproduction and life cycle of the following types: *Isoetes,Ophioglossum,Angiopteris,Osmunda,Ceratopteris,Blechnum,Lygodium,Adiantum,Gleichenia,Acrostichum,Salvinia,Azolla* (24 hrs)
4. Telome theory-basis, elementary proves- origin of sporophylls in Lycopsida,Sphenopsida and Pteropsida- origin of root- merits and demerits of telome theory; Evolutionary trends in the gametophytes of Pteridophytes. (4 hrs)
5. Conservation of Pteridophytes ; Pteridophytes as ecological indicators. (2 hrs)
6. Principles of Paleobotany, Fossil pteridophytes: *Rhynia,Lepidocarpon,Sphenophyllum,Zygopteris* (4hrs)

Practical **18hrs (1hr/wk)**

1. Structural details of the vegetative and reproductive pars of the types mentioned in the syllabus.
2. Fossil types mentioned above.

References

1. Arnold,C.A.1947. An introduction to Paleobotany. McGraw Hill,New York.
2. Bierhost,D.W.1971.Morphology of vascular plants .Mac millan,London.
3. Eames,E.J.1983 Morphology of vascular plants .Standard University press.
4. Parihar,N.S.1980.An introduction to Embryophyta Vol.II.Pteridophyta Central Book Depot, Allahabad.
5. Rashid,A.1999.Pteridophyta. Vikas Publishing House, New Delhi
6. Scott,D.H.1962.Studies in Fossil Botany .Hafner Publishing Co., New York.
7. Shukla,A.C.and Misra,S.P.1975.Essentias of Paleobotany . Vikas Publishing House, New Delhi.
8. Sharma,O.P 2006.Text book of Pteridophyta. . Macmillan India Ltd.,New Delhi.

9. Smith,G.M.1976. Cryptogamic Botany Vol.II. Tata McGraw Hill, Publishing Co.Ltd. New Delhi.
10. Sporne,K.R. 1986. Morphology of Pteridophytes.Hutchinson University Library, London.
11. Stewart,W.N.1983. Paleobotany and evolution of plants. Cambridge University Press, London.
12. Sundara Rajan,S.1999. Introduction to Pteridophyta.New Age Publications, New Delhi.

C. GYMNOSPERMS 36hrs.(2hrs/wk)

1. General characters, affinities, distribution and classification (Sporne1965; David Bierhost1971); phylogeny and economic importance of Gymnosperms. (6 hrs)
2. Structural details of vegetative and reproductive parts ,phylogeny and inter relationships of the following orders :
   Cycadofilicales, Caytoniales, Bennettitales, Pentoxylales, Cycadales, Ginkgoales, Coniferales, Gnetales. (16 hrs)
3. Structure,reproduction and life cycle of the following types:
   Zamia,Auracaria,Cupressus,Podocarpus,Agathis,Ephedra (12 hrs)

4…Fossil Gymnosperms (Brief account) (2 hrs)

Practical 9hrs (0.5 hr/wk)

1. Structural details of the following fossil types: *Heterangium,Medullosa*.
2. Anatomy of stem (TS,RLS,TLS),leaf and reproductive structures of the types mentioned in the syllabus.

References

1. Bhatnagar,S.P. and Alok Moitra 1997.Gymnosperms.New Age Publications ,New Delhi.
2. Biswas ,C.and Johri,B.M.1999.The Gymnosperms. Narosa Publishing House , New Delhi.
3. Chamberlain,C.J.1955.Gymnosperms-structure and evolution. Dover Publications,Inc.New York.
4. Chamberlain,C.J .2000 Gymnosperms CBS Publishers, New Delhi.
5. Coulter and Chamberlain,1964.Morphology of Gym nosperm Central Book Depot, Allahabad.
6. Ramanujan,C G.K.1976. Indian Gymnosperms in time and space. Today and Tomorrows printers and publishers, New Delhi.

7. Sharma,O.P.1997. Gymnosperms,Pragati Prakasan,Meerut.
8. Sporne,K.R.1986. Morphology of Gymnosperms, Hutchinson University Library, London.
9. Vashishta,P.C.1999. Gymnosperms, S.Chand &Company, New Delhi.

SEMESTER II

PAPER BO 221: TAXONOMY OF ANGIOSPERMS, ECONOMIC BOTANY, ETHNOBOTANY AND EVOLUTION

(Theory 108 H; Practical 36 H) **(Theory 6 H/wk; Practical: 2 H/wk)**

A. TAXONOMY OF ANGIOSPERMS

(Theory: 72H; Practical: 27 H) **(Theory 4 H/wk; Practical: 1 ½ H/wk)**

1. Principles of taxonomy as applied to the systematic and classification of plant kingdom - species concept, taxonomic structure. (**2h)**

2. Classification – brief study of Artificial (Linnaeus), Natural (Benthem and Hooker) and Phylogenetic (Bessey and Takhtajan) systems. **(4 h)**

3. Detailed study of modern system of classification – Angiosperm Phylogeny Group (APG) classification system. **(2 h)**

4. Plant nomenclature, Evolution of ICBN, contents of ICBN, author citation, type concept and different types – publication of names, rule of priority, nomina conservanda and definition of nomenclature terms- autonym, homonym, basionym, tautonym and nomen nudum. **(3 h)**

5. History and development of taxonomy in India. Classification of taxonomical literature, general indices, floras, icons, monographs, reviews and journals; Herbarium – definition, steps involved in the development of herbarium, utility of herbarium and their maintenance, general account of National and regional herbaria with special reference to Central National Herbaria, Calcutta (CAL) and Madras Herbarium (MH), Botanical Survey of India, Botanical gardens and importance of botanical garden in taxonomic studies, important National and International Botanical gardens, Royal Botanical Garden, Kew, Indian Botanical Garden, Calcutta, National Botanical Garden, Lucknow and Tropical Botanical Garden, Trivandrum. **(4 h)**

5. Construction of taxonomic keys (indented and bracketed) and the utilization. **(2 h)**

6. Role and organization of Botanical Survey of India. **(1 h)**

7. Modern concepts and trends in plant taxonomy. Elementary treatment of i. Cytotaxonomy, ii. Chemotaxonomy, iii. Numerical taxonomy (taximetrics), iv. Molecular taxonomy, v.Biosystematics. **(5 h)**

8. Critical study of the current ideas on the origin of angiosperms with special reference to their ancestral stock, time and place of origin. **(2 h)**

9. Study of the following angiosperm families giving importance to morphological peculiarities if any (Special emphasis should be given on morphological and phylogenetic interrelationships, recent revisions and rearrangements between and within the families, and its critical analysis):

(47 h)

Ranunculaceae	Magnoliaceae	Capparidaceae	Bixaceae
Polygalaceae	Caryophyllaceae	Portulacaceae	Dipterocarpaceae
Malvaceae	Geraniaceae	Rhamnaceae	Vitaceae
Sapindaceae	Leguminosae	Rosaceae	Rhizophoraceae
Myrtaceae	Melastomaceae	Passifloraceae	Cucurbitaceae
Apiaceae	Rubiaceae	Asteraceae	lumbaginaceae
Sapotacee	Oleaceae	Asclepiadaceae	Boraginaceae
Solanaceae	Lentibulariaceae	Bignoniaceae	Verbenaceae
Lamiaceae	Amaranthaceae	Aristolochiaceae	Piperaceae
Lauraceae	Loranthaceae	Euphorbiaceae	Urticaceae
Causuarinaceae	Orchidaceae	Scitaminae	Amaryllidaceae
Liliaceae	Commelinaceae	Arecaceae	Araceae
Cyperaceae	Poaceae.		

B. ECONOMIC BOTANY

(Theory: 09H ; Practical: 09 H) (Theory ½ H/wk; Practical: ½ H/wk)

1. Detailed study of occurrence, mode of cultivation, process, product, biochemical and nutritional values of the following crop plants with their botanical details.

a) Cereals and Millets: Rice, Maize.

b) Pulses: Soya bean, Winged bean and Sword bean

c) Sugar yielding plants: Sugarcane and Sugar beet

d) Plantation crops: Coconut, Cocoa, Coffee and Tea

e) Spices and condiments: Pepper, Ginger, Turmeric, Cardamom and Nutmeg

e) Tuber crops-: Potato, Sweet potato and Tapioca

f) Fruits: Mango, Banana, Citrus, Guava, Grapes and Cashew nut

g) Vegetables: Tomato, Brinjal, Cucumber, Ash gourds and Bitter gourd

h) Medicinal plants: Sarpagandha, Belladonna, Cinchona, Vinca, Glycirrhiza.

i) Narcotics: Cannabis, Opium

j) Timber yielding plants: Rose wood, Teak Wood

Practicals

1. Study of representative members of all the prescribed families as evidenced by record of practical work (to be submitted during the practical examination).
2. Identification of fresh and herbarium specimens using flora and other supportive documents like monographs.
3. Visit to a recognized herbaria (The report of the same should be submitted separately).
4. Field work for familiarizing the local flora under the supervision of teachers, and documentation of the proceedings.
5. Study Tour of minimum three days should be conducted to biodiversity rich zones of Western Ghats, for familiarizing the floristic wealth (The report of the same should be submitted for valuation).
6. Preparation of dichotomous key (minimum 5 keys)
7. A minimum of 10 abbreviations of authors' names to be presented in the record.
8. A minimum of 50 herbarium specimens giving representation of minimum of 40 families to be submitted for valuation.
9. Identification of economically important plants and plant parts, and submission of five botanical specimens/ products of economic importance.

Key references:

1. Arora PK and Nayar EK. Wild relatives of Crops plants in India, NBPGR Sci. Monograph No. 7
2. CSIR, The useful plants of India, Publication and Information Directorate, CSIR, New Delhi
3. Judd WS, Campbell CS, Kellog EA & Stevens PF (1999), PlantSystematics. Sinauer Associates, Inc., Massachusetts, USA
4. Kochar LS (1981) Economic Botany in the Tropics, Macmillan
5. Lawrence GHM (1964), Taxonomy of Vascular Plants, Mac Millon Co., New York
6. Rendle AB (1967), Classification of flowering plants, Cambridge University Press
7. Sharma OP (1990) Plant Taxonomy, Oxford Publishers, New Delhi
8. Singh G (1999), Plant systematics: Theory and Practice, Oxford IBH.

Supportive References:

9. Davis PH & Heywood (1963), Principles of Angiosperm Taxonomy, Oliver-Boyd
10. Gamble JS (1935), Flora of Presidency of Madras, London

11. Gibbs RD, Chemotaxonomy of flowering plants
12. Hill AF (1952), Economic Botany, Tata McGraw Hill
13. Hooker JD (1879), Flora of British India. Reeve &Co., London
14. Hutchinson J (1959), Families of flowering plants, Cambridge University Press
15. Lawrence GHM (1955), An Introduction to plant Taxonomy, Central Book Depot
16. Sen S (1992), Economic Botany, New Central Book Agency, Culcutta
17. Sivarajan VV (1991) An introduction to Principles of Taxonomy, London
18. Sivarajan VV (1999), Principles of plat Taxonomy, Oxford and IBH Publishing Co.
19. Stace C (1985), Plant Taxonomy and Biosystematics, London.
20. Takhtajan AL (1969) Flowering plants. Origin and Dispersal, Oliver and Boyed.

C. ETHNOBOTANY

(Theory: 09H) (Theory: ½ H / Wk)

1. Plants and civilization
2. Ethnobotany- relevance in Modern medicine
3. Ethnic societies of Kerala and their traditional herbs
4. Ethnobotanical documentation
5. Medicines derived from herbal drugs
6. Status of ethnobotanical studies in Kerala

Key references:

1. Jain SK (1987). A manual of ethnobotany, Indus Intl. Publishers, New Delhi
2. Jain SK (2001). Medicinal Plants, National Book Trust, India
3. Wood M (1997), The book of herbal wisdom: using plants as medicines, North Atlantic Books, California.

Supportive References:

4. Cunnigham A (2001) Applied ethnobotany: people, wild plant use and conservation, Earthscan, UK
5. Martin GJ (2004) Ethnobotany: a methods manual, Earthscan, UK
6. Jain SK and Mudgal V (1999) A hand book of ethnobotany. Indus Inst. Publishers, New Delhi.

D. EVOLUTION

(Theory: 18H; 1 H / Wk)

1. Origin and evolution of life (including aspects of pre-biotic and molecular evolution) (2hrs)
2. Concepts and theories of evolution. Classical and synthetic theories of evolution. (4hrs)

3. Forces and mechanism of evolution. (3hrs)

4. Speciation (3hrs)

5. Isolation mechanism. (2hrs)

6. Evolution above species level. (2hrs)

7. Molecular evolution. (2hrs)

Key references:

1. Strickberger MW (1996). Evolution, Jones and Bartlett Publishers, New York
2. Savage JM (1969), Evolution, Oxford &IBH, New Delhi.
3. Sproule A (1998) Charles Darwin: Scientist who have changed the world. Orient Longman, New Delhi.

Supportive References:

4. Blackle (1983) Evolutionary principles, Oxford & IBH, New Delhi
5. Briggs D &Walters SM (1984), Plant variation and evolution, Cambridge University Press, london
6. Echrlich & Holm (1974) Process of evolution, Oxford &IBH, New Delhi
7. Wooley P (1983) Molecular theory of evolution, Springer-Verlag, Berlin

PAPER. BO 213.MICROBIOLOGY, HISTOLOGY, MICROTECHNIQUE AND HISTOCHEMISTRY

162 hrs (Theory:108 hrs;Practical:54hrs)

A. MICROBIOLOGY 36hrs (2hrs/wk)

1. Brief history of microbiology. Experiments of Pasteur and Tyndall, Koch's postulates. Methods of sterilization. (4 hrs)
2. Changing concepts in microbial taxonomy- molecular taxonomy-Jackard's similarity coefficient. (2 hrs)
3. Brief account of major classes of microorganisms. (4 hrs)
4. Growth and nutrition of microorganisms. (2 hrs)
5. Microbial diseases in plants, animals and humans (any two). (4 hrs)
6. Microbes in Agriculture: Rhizosphere, Nitrogen fixation, Mycorrhiza**,** Cyanobacter (2 hrs)
7. Industrial Microbiology: Major industrial products from microbes: Beverages, Antibiotics, Secondary metabolites, Recombinant products (2 hrs)
8. Environmental Microbiology: Anthropogenic wastes. Municipal Wastes, Xenobiotics, Xenobiotic degrading consortia, Bioremediation (2 hrs)
9. Immunology
    a. Immunity-mechanism; Innate and adaptive immune system: cells and molecules involved in innate and adaptive immunity.
    b. Antigens, antigenicity and immunogenicity. B and T cell epitopes.
    c. Structure and function of antibody molecules, generation of antibody molecules, generation of antibody diversity, monoclonal antibodies,antibody engineering.
    d. Antigen antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cell, B&T cell receptors.
    e. Humoral and cell mediated immune responses, primary and secondary immune modulation, the complement system, Toll like receptors cell mediated effector functions.
    f. Inflammation, hypersensitivity and auto immunity, immune response during bacterial (tuberculosis) parasitic(malaria) and viral (HIV) infections, congenital and acquired immune-deficiencies, vaccines. (14hrs)

Practical **9hrs (1/2 hr /wk)**

1. Practicals involving preparation of media,principles of isolation , pure culturing aspects and maintainance of culture.
2. Methods of study : Hanging drop for demonstrating bacterial motility;differential staining – gram and acid fast.
3. Isolation of Rhizobium from root nodule of Legumes.
4. Test for coliforms in contaminated water.
5. Isolation of pure bacterial culture by streak plate method.

References

1. Atlas,M.and Bartha,R.2000 Microbial Ecology,Longmann New York .
2. Black,J.,.G.1999.Microbiology –Principles and Explorations,Prentice Hall, London.
3. Brock,T.D.1996.Biolog y of microorganisms Prentice Hall,London
4. Casida,L.E..1997Industrial microbiology .New Age Publishers ,New Delhi
5. Dubey,R.C. and Maheswari,D.K.2010.A Text book of Microbiology,S.Chand & Company, New Delhi
6. Gerald Karp 2008.Cell and Molecular biology-concepts and experiments. John Wiley &sons, New York.
7. Ivan Roitt,1997.Essential Immunology .Black Well Science Ltd ,London.
8. Kumar ,H.D. and Swati kumar.1999.Modern concepts of Microbiology,Vikas Publishing House, New Delhi.
9. Lodish Berk *et al.2008.* Molecular Cell Biology6th ed..W.H.Freeman&Co. New York.
10. Lydyard,P.M.*et al.*1999.Instant notes in Immunology .Viva Books, New Delhi.
11. Pelezar,M.J;Chan,E.C.S and .Kreig,N.R.1993.Microbiology-concepts and Applications. McGraw Hill ,Inc. New York.
12. Powar,C.B.and Daginawala,H.F.General Microbiology Vol.II.Himalaya Publishers,Bombay.
13. Rao,A.S.2001.Introduction to Microbiology. Prentice Hall of India, New Delhi.
14. Sharma,P.D.2005.Environmental microbiology.Narosa publishers, New Delhi.
15. Stainer.R.Y.*et al.*1990The microbial world. Prentice Hall of India,New Delhi.

B. HISTOLOGY 27hrs (1.5 hrs/wk)

1. Origin, structure and function of cambia and their derivatives (6hrs)
2. Seasonal variation in cambial activity, role of cambium in wound healing and grafting (2h)

3. Anomolous cambial activities in *Bignonia, Amaranthus, Mirabilis, Bougainvillea, Piper, Aristolochia, Thunbergia* (6 hrs)
4. Structure of wood- Soft wood, hard wood, Sap wood, Heart wood and role of extractives in wood quality. Wood anatomy of the following wood yielding plants of Kerala: *Artocarpus integrifolia, Tectona grandis ,Dalbergia latifolia, Ailanthus malabarica, Alstonia scholaris* (6h)
5. Nodal anatomy, root –stem transition, transfer cells. (2hrs)
6. Floral anatomy. (1hrs)
7. Histochemical and ultra structural aspects of development, differentiation and morphogenesis. (3hrs)
8. Anatomy in relation to Taxonomy. (1hr)

Practical **9hrs (1/2hr/wk)**

1. Anomolous structures of types mentioned in the syllabus
2. Leaf anatomy:epidermal peels ,stomatal study ,T.S.of lamina.
3. Nodal anatomy and root-stem transition.
4. Maceration of herbaceous and woody stems- separation of different cell types.

References

1. Chandurkar,P.J.1966.Plant anatomy.Oxford &IBH Publication Co.,New Delhi.
2. Cutler,D.F.,1978 .Applied Plant Anatomy .Orient Longman, New Delhi.
3. Cutler,E.G. 1978. Plant Anatomy(Vol.I,II.) Edward Arnold, London.
4. Eames ,A.J.,& Mac Daniels,L.H. 1979.An introduction to Plant Anatomy .Mc Graw Hill New York.
5. Esau,K.1974. Plant Anatomy. Wiley Eastern Ltd. , New Delhi
6. Esau,K.2002. The anatomy of seed plants..John Wiley & Sons,New York.
7. Fahn,A.1989. Plant Anatomy,Pergamon press,Oxford ,New York.
8. Foster,A.S.1960.Practical Plant Anatomy. Van Nostrand & East West, New Delhi.
9. Metcalfe,C.R. and Chalk ,L.1950.Anatomy of the dicotyledons and Monocots(Vol.I,II), Oxford University Press, London.

C. MICROTECHNIQUE AND HISTOCHEMISTRY 45 hrs (2.5 hrs/wk)

1. Scope of Histochemistry and cytochemistry in Biology. (2 hrs)
2. Chemical fixation –reagents and fixatives, chemistry of fixation; Tissue dehydration – reagents, Infiltration and embedding ; Sectioning and mounting (10 hrs)
3. Tissue processing technique for light microscope,hand and serial sections, squashes, smears and maceration (7 hrs)
4. Microtomy-Rotary,sledge,Freezing ,Cryostat and Ultratomes (5hs)
5. Classification and chemistry of biological stains. General and specific vital stains and flurochromes. (5hrs)
6. Micrometry, camera lucida,photomicrography. (3hrs)
7. Tissue processing techniques for electron microscopy (2hrs)
8. Detection and localization of primary metabolites- Carbohydrates (PARS reaction),Proteins (Coomassie brilliant blue staining) Lipids(Sudan Black method) .Brief mention about other methods also. (5hrs)
9. Detection and localization of secondary metabolites- alkaloids, terpenoids, phenolics (3hrs)
10. Enzyme histochemistry- General design and applications. (3hrs)

Practical 36hrs (2hrs/wk)

1. Preparation of double stained free hand sections and identification of the tissues with reasons (Normal or Anomolous secondary thickening).
2. Preparation of serial sections from the given block and identification of the tissues with histological reasoning.
3. Free hand sections showing localization of soluble components –Proteins, Sugars and Lipids.
4. Preparation of squashes and smears; Maceration of tissues for separating cell types
5. Measurement of microscopic objects (algal filaments,spore,pollen etc.)
6. Students are expected to get a thorough understanding on reagents and buffers for tissue processing .
7. Students should submit 15 permanent slides (5 serial,5 hand sections, and 5 slides from squash, mear, whole mount ,sledge and histochemical localization)

References

1. Gahan,P.B.1984.Plant histocchemistry and Cytochemistry. Academic Press, London
2. Gary,P.1964.Hand book of Basic microtechnique. John Wiley & Sons, New York.
3. Harris, Electron Microscopy in Biology
4. Johansen, D.A.1940. Plant Microtechnique. Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
5. Johanson,W.A.1982.Botanical Histochemistry .-Principles and Practice Freeman Co.
6. Johanson,W.A.1984.Plant Microtechnique.McGraw Hill, . New York.
7. John E .SASS.1964. Botanical microtechnique. Oxford & IBH Publishing Co.Calcutta.
8. Kierman,J.A.1999.Histological and Histochemical Methods.Butterworth Publ. London.
9. Pearse,A.G.E.1960. Histochemistry. Vol.I& Vol.II,J&A. Churchill, London.
10. Ruzin,Z.E.1999. Plant Microtechnique and Microscopy.Oxford Press,New York.

Practical I (BO214)

Submissions

Students should submit at least 10 specimens representing algae, fungi, bryophyte, pteridophytes and gymnosperm.

PAPER BO222

ENVIRONMENTAL BIOLOGY, FOREST BOTANY, PHYTOGEOGRAPHY AND CONSERVATION BIOLOGY

(Theory 108 h; Practical 36 h) **(Theory 6 h/wk; Practical 2 h/wk)**

A. ENVIRONMENTAL BIOLOGY

(Theory: 54 h ; Practical: 36 h) **(Theory 3 h/wk; Practical: 2 h/wk)**

1. Introduction to various approaches to the study of ecology based on levels of organization and habitat- interaction between environment and biota. Ecological niches, Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement. **(5 h)**
2. Physical environment; biotic environment; biotic and abiotic interactions. Concepts and dynamics of Ecosystems: Types – Freshwater, marine and terrestrial. Components of ecosystem, application of Law of thermodynamics, food chain, food web, trophic levels, ecological pyramids and recycling - energy flow and transaction. Productivity and Biogeochemical cycles. Development and evolution of ecosystems. Ecosystem management. **(8 h)**
3. Characteristics of a population; population growth curves; population regulation; life history strategies (*r* and *K* selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations. **(4 h)**
4. Nature of communities; community structure and attributes; levels of species diversity and its measurement; edge effect and ecotone. **(4h)**
5. Ecosystem: Structure and function; energy flow and mineral cycling (CNP); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine. Major terrestrial biomes; theory of island biogeography; biogeographical zones of India. **(7h)**
6. Species interactions - types of interactions, interspecific competition, herbivory, carnivory, symbiosis. **(4 h)**
7. Study of climate, their distribution and adaptation to the environment. Deserts (dry and cold) Tundra, Grassland, Savannah, Temperate forests, Tropical rain forests, Mangrove. (**3 h)**
8. Ecological concepts of species: Autecological level (genecology), Synecological level (Ecosystem level). Ecads (Ecophenes), Ecotypes, Ecospecies. **(4 h)**

9. Ecological succession: Types; mechanisms; changes involved in succession; concept of climax **(4 h)**

10. Disaster management, Environmental laws, Global environmental problems- ozone depletion, green house effect, global warming, acid rain, nuclear hazards – Climate change, Eutrophication. **(5 h)**

11. Applied ecology: Environmental pollution; global environmental change; biodiversity-status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches. Current environmental issues in India, Environmental education and awareness. **(6 h)**

12. Practical

1. Analysis of vegetation - Quadrate /line transects to find frequency and interpret the vegetation in terms of Raunkiaer's frequency formula.
2. To find out the dissolved oxygen content in the given water sample (pond, lake, well etc).
3. To find out the primary production in the given water sample using light and dark bottle method.
4. Estimation of carbonate and bicarbonate content in water samples.
5. Estimation of total organic carbon content in the given soil sample
6. Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
7. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural

Key references

1. Odum, F. E. 1971. Fundamentals of Ecology. W.B. Saunders and Company.
2. Sharma, P. D. Enviornmnetal Biology, Himalaya Publications
3. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner

Supportive References:

4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.

5. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi .

6. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication.

7. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai.

B. FOREST BOTANY

(Theory: 9 h; 1/2 h/wk)

1. Forests- definition, study of various forests of the world and India. **(1 h)**
2. Forest products – Major and minor with reference to Kerala. **(2 h)**
3. Influence of forest on environment. **(2 h)**
4. Consequence of deforestation and industrialization. **(2 h)**
5. Sustainable use of bioresources. **(2 h)**

Key references

1. Agarwal AP, Forest in India, Oxford & IBH

2. Gregorve GR, Forest products, production, trade and consumption, quantity and value of raw materials requirements, Ford foundation, New Delhi

Supportive References:

4. Puri GS, Indian Forest Ecology, Vol I & II, Oxfaord & IBH

5. Champion GH & Seth KA, A revised survey of forest types of India.

C. PHYTOGEOGRAPHY

(Theory: 18 h; 1 h/wk)

1. Define – Phytogeography - static and dynamic phytogeography. **(2 h)**
2. Geological history and evolution of plant life. **(4 h)**
3. Factors of plant distribution. Theories concerning present and past distributions-continental drift, glaciations, existence of land bridges and their effect on plant distribution. **(4 h)**
4. Phytogeographic regions of the world (Vegetational belts). **(4 h)**
5. Soil, climate, flora, and vegetation of India. **(4 h)**

Key references

1. Ronald Good. 1964. The geography of flowering plants. Lengmans.

2. Bharucha F.R. 1984. Atext book of plant geography of India. Oxford University Press.

3. Puri G.S. 1983. Indian Forest Ecology, Vol I, II. Oxford, New Delhi.

Supportive References:

4. Schatz, G.E. 1996. *Malagasy / Indo-Australo-Malesian Phytogeographic Connections.* http://www.mobot.org/MOBOT/Madagasc/biomad1.html

5. The International Biogeography Society http://www.biogeography.org/

6. Tree of Life. URL: http://tolweb.org/tree/phylogeny.html

D. CONSERVATION BIOLOGY

(Theory: 27; 1.5 h/wk)

1. Concept, aim and principles of conservation. **(1 h)**
2. Convention on Biological Diversity - Objectives – Definition of biodiversity – Roles of IUC (IUCN), MAB - Red data book - Threatened categories of plants. Conservation strategies - *In-situ* and *Ex-situ* conservation - Sustainable development. Biosphere reserves, Wild life sanctuaries and National parks in India with special reference to Kerala. **(4 h)**
3. Conservation biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves). **(3 h)**
4. Agriculture and conservation of resources. Novel agricultural technologies – Nitrification inhibitors, Wind mills for irrigation, Solar energy for drawing ground water, Biogas for cooking and slurry left to be used as fertilizers. **(3 h)**
5. Urbanization and Conservation – Planning for environmentally compatible human settlements and strategy for sustainable industrial development. **(2 h)**
6. Conservation and energy – Causes of energy crisis, Conventional and Non conventional energy sources. **(2 h)**
7. Plant as a source of renewable energy. Development of non-polluting energy systems - Solar energy, Wind energy, energy recovery from solid wastes. **(2 h)**
8. Conservation of Physical resources. (Mention all physical factors of environment). **(2 h)**
9. Afforestation- social forestry, agroforestry, International Biological programme (IBP), Man and Biosphere (MAB), IUCN, world environment day, wild life preservation act (1972), Indian forest conservation act (1980), United Nations Environmental Programme, Environment protection Act. **(6 h)**
10. Environmental awareness – role of Government and NGOs- Gaia hypothesis. **(2 h)**

Key references

1. Dasman R.F. 1976. Environmental conservation, John Wiley and Sons, New York.
2. Malcom L., Hunter J.R. and James Gibbs. 2007. Fundamentals of Conservation Biology, Blackwell Publishing.

3. Andrew S. Pullin.2002. Conservation Biology, Cambridge University Press.
4. Fred Van Dyke 2008. Conservation Biology, foundation, concept, applications, Springer.

Supportive References:

5. MacDonald and Katrina Service 2007. Key Topics in Conservation Biology, Blackwell Publishing
6. Fiedler, P.I. and Kareiva P.M. 1998. Conservation Biology for the coming decade, Chapman and Hall.

Practical

1. One day visit to ecologically significant location (National parks/ mangroves/estuaries)
2. Each student should plant and maintain at least two plants in the college botanic garden or premises, belonging to IUCN category, and document the same (in the record).

PAPER BO223: CELL AND MOLECULAR BIOLOGY, GENETICS

Theory 108 hrs; Practical 54 hrs (theory 6 hrs/week; Practical 3 hrs/week)

A. CELL AND MOLECULAR BIOLOGY (T- 54 hrs; 3 hrs/wk)

1. A brief account on the structural and functional organization of the cell and cell organelles. Prokaryotic and eukaryotic cells. Cytoskeleton- its role in cell organization and mobility. **4 hrs.**
2. Ultra structure of the cell membrane, nuclear envelope, chloroplast, mitochondrion, Endoplasmic reticulum, lysosomes and ribosomes. Nucleus – structural and functional organization. Mitochondrial and Chloroplast genome organization and function. Nucleolus – origin, ultra structure and function. **6 hrs**
3. Chemistry of chromosomes – DNA – organization, histone and non-histone proteins, RNA and organization of these in the three dimensional configuration of the chromosome. A study on the structure and function of the kinetochore - NOR and other secondary constrictions, satellites, heterochromatic segments and telomeres. **6 hrs**
4. Numerical variations of chromosomes – origin and meiotic behavior of haploids, aneuploids and polyploids.Structural variations of chromosomes – Deletions, duplications, inversions and translocations, meiotic behavior in the above types. **4 hrs**
5. Cell Divisions. Stages in cell cycle – G_1, S, G_2 – Prophase, Metaphase and Telophase. Mitotic apparatus. Cytokinesis. Meiosis – General description. Synaptonemal complex, structure and function with significance of the various stages of meiosis I and II.Theories and mechanisms of crossing over. Molecular mechanism of crossing over. **4 hrs**
6. Cell differentiation - General characteristics, molecular mechanism of cell differentiation. **2 hrs**
7. Prokaryotic and eukaryotic DNA replication- DNA polymerases and proteins involved in DNA synthesis and their specific roles. Structure and properties of RNA polymerases in prokaryotes and eukaryotes. General and specific transcription factors, Mechanism of transcription and post transcriptional modifications of RNAs, RNA editing. **8 hrs**
8. Molecular nature of genes - An introduction to gene functions. Techniques of gene expression: northern and western blotting; Gel retardation; Primer extension; Reporter assay.
9. Molecular tools for studying genes and gene activity. **5 hrs**
   a. Molecular marker technologies
   b. Molecular cloning methods **4 hrs**
10. Technique of DNA Analysis: Preparation of DNA and RNA Probes; Principles of hybridizations and hybridization based techniques (Colony, Plaque, Southern and *in situ* hybridization); Autoradiography; DNA Fingerprinting. **4 hrs**
11. DNA sequencing, chemical synthesis of nucleotides **4 hrs**
12. Polymerase Chain Reaction and its application. **2 hrs**

Practical **36 hrs; 2 hrs/week**

1. Mitosis – Metaphase and Anaphase 6 hrs

2. Meiosis – All stages - *Rhoeo, Chlorophytum, Crotalaria, Datura* (at least two should be recorded) 6 hrs
3. Isolation and purification of genomic DNA. 8 hrs
4. Isolation of total RNA (Demonstration only) 8 hrs
5. Isolation and Partial purification of Proteins. 8 hrs

References

1.De Robertis and De Robertis 1998 Cell and Molecular Biology. B.I. Waverly Pvt Ltd. New Delhi.

2. Strickberger, M. W. 1985. Genetics. Macmillian India, New Delhi.

3. Gerald Karp. 1984. Cell Biology. McGraw Hill, New Delhi.

4. Jurgen Schulz-Scaffer, 1985. Cytogenetics- Plants Animals and Humans. Springer Verlag, Berlin.

5. Cooper, G. M. 1997. The Cell – A Molecular approach. ASM Press, Washington.

B. GENETICS (54 hrs; 3 h/week)

I. Classical Genetics

1 Mendelian Genetics – Brief account. (2 h)

2. Sex determination, Dosage compensation, Barr body, Lyon's hypothesis. (2 h)

3. Linkage, recombination and linkage maps – Bateson's concept of coupling and repulsion. Morgan's concept of linkage, linear arrangement of genes, linkage groups, complete and partial linkage and recombination linkage maps, three point test crosses, interference coefficient of coincidence and negative interference. (4 h)

4. Microbial Genetics – Genetic recombination in viruses – lysogenic and lytic cycles in bacteriophages. Benzer's experiment in the rII locus of T4 phage, retro viruses, reverse transcriptase, onco viruses, and oncogenes. Bacterial recombination - transformation experiment of Griffith, Avery *et al*. Conjugation – F^+, F^- and Hfr F^- conjugations. Conjugation mapping – F - duction(sexduction).Transduction-generalized and specialized.Recombination in fungi (tetrad analysis in *Neurospora*) Complementation tests. (6 h)

5. Biochemical Genetics – Contributions of Garrod, Beadle and Ephrussi, Beadle and Tatum. (1 h)

6. Gene concept – Factor concept of Mendel, Presence absence theory of Bateson. Gene – Enzyme relationship, One gene - One enzyme hypothesis. Benzer's concepts of Cistron, muton and recon. Brief description of the following types of genes- smart genes (luxury genes),

housekeeping genes, transposons overlapping genes, split genes, homeotic genes, pseudogenes, orphan genes, selfish genes, gene cluster, gene families. (3 h)

II Molecular Genetics

1. DNA as the genetic material, DNA constancy, C - Value paradox, structure of B-DNA and Z – DNA. (2h)
2. DNA replication – Stage, unit and mode of replication. Semi conservative mode of replication. Messelson – Stahl experiment. System of replication – template, deoxy nucleotide triphosphate pool, enzymes and protein factors. Mechanism of replication, unidirectional and bidirectional replication. Molecular assembly at the replication fork, leading and lagging strands, Okasaki fragments. DNA polymerases of prokaryotes and eukaryotes, topoisomerases, gyrases, ligases and nucleases. DNA polymerase function, proof reading and repair. Comparison of eukaryotic and prokaryotic DNA replication. Replication of ØX174 DNA. (6h)
3. DNA damage and repair- Photoreactivation repair, excision repair, recombinational repair, SOS repair. Genetic diseases caused by defects of DNA repair system – Blooms syndrome, Xeroderma pigmentosum, Retinoblastoma. (2h)
4. Mutation – Types of mutations, methods of detection (CIB method, attached X method). Molecular mechanism of spontaneous and induced mutations, site directed mutagenesis. Environmental mutagenesis and toxicity testing, high radiation belts of Kerala. Mutagenic effects of food additives and drugs. Ames test. (4h)
5. Genetic code – Genetic code word dictionary. Features of the genetic code and its exceptions. (2h)
6. Protein synthesis - Central dogma, Transcription, organization of transcriptional units. Prokaryotic and eukaryotic RNA polymerases and their function. RNA processing and translation. (2h)
7. Gene Regulation – Gene Regulation in viruses - Cascade model of expression of early middle and late genes in viruses. Gene Regulation in Prokaryotes – Operon concept, positive and negative control attenuation, anti termination.

   Gene Regulation in Eukaryotes – Heterochromatinisation and DNA methylation- DNA methylases, DNA rearrangements. Transcriptional regulation – signal transduction - upstream and downstream. Regulatory sequences and transacting factors, activators and enhancers.

DNA binding by transcription factors. Britten and Davidson model for eukaryotic gene regulation.

Post transcriptional regulation – RNA processing – split genes, hn RNA, introns and exons, capping, polyadenylation, splicing, snRNAs and spliceosomes. Post transcriptional silencing, MicroRNAs, RNA inhibition.

Translational regulation and Post Translational regulation - Cleavage and processing of proteins. Genetic imprinting.

Environmental regulation of gene expression. (8h)

8. Gene synthesis – Khorana's artificial synthesis of the gene for alanine. Transfer RNA and tyrosine transfer RNA of yeast. (2h)
9. Blotting techniques- Southern, Northern and Western blotting. DNA finger printing and foot printing. (2h)

III. Population Genetics and Developmental Genetics

1. Population genetics – Systems of mating and their genetic effects. Hardy Weinberg law and its applications. Factors affecting gene frequencies – mutation, migration, selection, genetic polymorphism and selection. Genetic drift, founder effect, genetic load. Consanguinity and its genetic effect. (4h)

3. Developmental genetics- Genetic control of development in plants and animals with stress to developmental genes in *Arabidopsis* and *Drosophila.* Role of cytoplasm in development. (2h)

Practicals

Work out problems in linkage chromosome mapping, microbial genetics, molecular genetics and population genetic.

Key references

1. Goodenough, U. Genetics. Holt Saunders, New York.
2. Lewin , 2000. Genes VII. Oxford University Press, New York.
3. Lodish *et al*. 2000. Molecular and Cell Biology. W. H.Freeman and Co, New York.
4. Sinnot, E. W. ET AL., 1958. Principles of Genetics. McGraw Hill, New Delhi.
5. Strickberger, M. W. 1985. Genetics. Macmillian India, New Delhi.

SEMESTER III

Paper. BO 231. PLANT BREEDING, HORTICULTURE AND REPRODUCTIVE BIOLOGY

(Theory 108 hrs; Practical 27 hrs)

A. **PLANT BREEDING** **(63 hrs Theory)**

1. Definition, Objectives. Importance of floral biology in plant breeding. (3 hrs)
2. Methods of crop improvement
   a. Plant Introduction: Definition, types and procedure. Sources of germplasm. Centres of genetic diversity. Concepts of de Candolle and Vavilov. Primary, secondary and microcenters. Genetic erosion. Preservation and utilization of germplasm. Gene banks. NBPGR. (4 hrs)
   b. Selection: Principles, genetic basis and methods: Mass selection, pure line selection, clonal selection. (6 hrs)
   c. Hybridization: Objectives. Procedure. Major achievements. Problems and causes of failure of hybridization. Handling of hybrids - Bulk method and pedigree method of selection. Distant hybridization - Role of interspecific and intergeneric hybridization in crop improvement. (7 hrs)
3. Role of incompatibility and sterility in crop improvement. (3 hrs)
4. Backcross breeding: Theory and procedure. (5 hrs)
5. Inbreeding: inbreeding consequences. Heterosis- Definition. Genetic and physiologic basis. Application in plant breeding. Steps in the production of single cross, double cross, three way cross, synthetic cross, multilines. Idiotype breeding: Concept, Achievements: (Wheat – Asana, Donald. Rice – Super Rice). (7 hrs)
6. Polyploidy breeding: induction of autopolyploidy and allopolyploidy. Role of chromosome manipulation. Chromosome addition and substitution lines. Achievements. (6 hrs)
7. Mutation breeding: Principles, objectives, procedure. Induction of mutations: Physical and chemical mutagens - Recurrent irradiation, Split dose irradiation, Combination treatment. Achievements. (6 hrs)
8. Resistance breeding: Principles. Methodology. Basis of resistance: structural biochemical, physiological and genetic. Gene for gene systems of plants. Vertical and

horizontal resistance. Artificial production of epiphytotic conditions and screening procedures for resistance. (7 hrs)

9. Seed production and certification. (4 hrs)

10.Centres of crop breeding: International and National (with special reference to Kerala). (3 hrs)

11.Plant breeder's rights Act. National Biodivesity Policy. (2 hrs)

Practicals (9hrs)

1. Emasculation; preparation of the inflorescence for crossing
2. Estimation of pollen sterility and fertility percentage
3. Pollen germination: *in vitro* and *in vivo* viability tests
4. Study of pollen types using acetolysed and non-acetolysed pollens
5. Developmental stages of anther, ovule, embryo and endosperm.

B. HORTICULTURE (18 hrs Theory)

1.Concept and Scope – Familiarization of famous gardens in the world and in India.(2 hrs)

2.Tools and Implements. (1 hr)

3.Plant growing structures – Greenhouse, Glasshouse and Mist chamber. (1 hr)

4.Plant propagation: Seed propagation and vegetative propagation- natural and artificial. Artificial methods of vegetative propagation: Cuttage, layerage, graftage, budding, micropropagation. (3 hrs)

5.Cultural practices – Thinning, training, trimming and pruning. (1 hr)

6. Fertilizers: NPK, biofertilizers, green manure, compost, vermicompost. (2 hrs)

7.Outdoor horticulture: Components and designs of gardens. Types of gardens: (1hr) Vegetable/ medicinal/ floral. (2) Home gardens, public gardens, vertical gardens, roof gardens. Lawns and landscapes. (2 hrs)

8.Commercial horticulture: Nurseries, Orchards, Floriculture: Production of cut flowers. Floral decorations (Brief account only). Indoor plants. (2 hrs)

9.Arboriculture: Pruning, bracing, feeding and transplanting. Bonsai: Principles and procedure. (2 hrs)

10.Plant growing problems. Control of disease and pests. (1 hr)

Practicals (9 hrs Practical)

1.Budding – 'T' Budding and Patch Budding

2.Layering – Any two methods.

3. Grafting – Any two methods.

4.Designing of gardens and Methods of Landscaping

C. REPRODUCTIVE BIOLOGY (27 hrs)

1. Asexual reproduction: Vegetative apomixes. Adventive embryony. Non recurrent apomixis, diplospory, apospory, parthenogenesis, androgenesis, automixis, semigamy, agamic complex. (4 hrs)
2. Sexual reproduction: Microsporogenesis - male gameteophyte - pollen fertility and sterility Types of male sterility: Gametic and zygotic sterility. Somatoplastic sterility. Cytoplasmic and genetic sterility. Pollen storage. Pollen viability and germination. (5 hrs)
3. Megasporogenesis-embryosacs-development and types. (3 hrs)
4. Pollination biology - primary and secondary attractants of pollination - ultra structural and histochemical details of style and stigma - significance of pollen-pistil interactions. (3 hrs)
5. Fertilization-barriers to fertilization- genetics of incompatibility - methods to overcome incompatibility: intra ovarian pollination and in vitro fertilization - embryo rescue. (4 hrs)
6. Embryo, endosperm and seed development. Polyembryony. Parthenocarpy. (4 hrs)
7. Androgenesis and gynogenesis. (2 hrs)
8. Recent advances in palynological studies - Pollen allergy - Economic importance of pollen - Pollen analysis of honey - role of apiaries in crop improvement. (2 hrs)

Practicals (9 hrs)

1. Pollen germination: *in vitro* and *in vivo* viability tests
2. Study of pollen types using acetolysed and non-acetolysed pollen
3. Developmental stages of anther, ovule, embryo and endosperm.

References

1. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms, Vikas Publishing House Pvt. Ltd. New Delhi.
2. Johri, B.M. 1984. 1984. Embryology of Angiosperms. Springer Verlag. Berlin.
3. Maheswari, P. 1980. Recent Advances in the Embryology of Angiosperms.
4. Pandey, A.K. 1997. Introduction to Embryology of Amngiosperms. CBS Publishers and Distributors, New Delhi.
5. Pandey, S.N. and Chadha, A. 2000. Embryology. Vikas Publishing House Pvt. Ltd. New Delhi.

Paper. BO 232. BIOPHYSICS, BIOCHEMISTRY AND PLANT PHYSIOLOGY

(Theory 108 hrs; Practical 54 hrs)

A. BIOPHYSICS (27 hrs)

1.Chemical bonds: Ionic bond, Covalent bond, Vander Vaal's forces, hydrogen bonding and hydrophobic interactions. Bonding in organic molecules. Effect of bonding on reactivity. Polarity of bonds. Bond length. Bond angle. Dissociation and association constant. (3 hrs)

2.Bioenergetics: Concepts of free energy, Thermodynamic principles in Biology. Energy rich bonds. Coupled reactions and group transfers. Biological energy transducers. (3 hrs)

3.Principles and applications of light and electron microscopy, bright field, phase contrast, fluorescence, scanning and transmission electron microscopy. Cytophotometry, flow cytometry, confocal microscopy, FISH, GISH. (4 hrs)

4.Chromatography: Principle and applications of Gel filtration, Ion exchange and affinity chromatography, thin layer chromatography, gas chromatography, HPLC,HPTLC, LCMS, GCMS. (5 hrs)

5. Electrophoresis. Enzyme localization by electrophoresis. Zymogram and isozyme analysis. ELISA. Electro focusing. (3 hrs)

6.Centrifugation. Ultra centrifugation. (2 hrs)

7. Principles of biophysical methods used for analysis of biopolymers: X-ray diffraction; fluorescence, UV, visible, IR,NMR, ESR Spectroscopy, ORD/CD, hydrodynamic methods, plasma emission spectroscopy. Atomic absorption spectroscopy. (4 hrs)

8. Principles and applications of tracer techniques in biology. Radiation dosimetry. Radioactive isotopes. Autoradiography. Cerenkov radiation. Liquid scintillation. (3 hrs)

Practicals (9 hrs)

Students are expected to get a good exposure on all the devices used in modern analytic methods by conducting study trips to two research institutions and to present a report.

1.Separation of pigments by column chromatography

2. Separation of amino acids by paper chromatography

3. Separation of alkaloids, phenols and pigments by TLC

References

1. Casey, E.J. Biophysics: Concepts and Mechanics**.**

2. Daniel, M. 1999. Basic Biophysics for Biologists. Agro Botanica, Bikaner.

3. David Freifelder. Physical Biochemistry - Application to Biochemistry and Molecular biology.

4. F.M.Slayter. Optical Methods in Biology. Wiley Inter Science.

5. Narayanan, P. 2000. Essentials of Biophysics. New Age International Publishers, New Delhi.

6. Roy, R.N.1999. A Text Book of Biophysics. New Central Book Agency(P) Ltd., Calcutta.

7. Water Hoppe, Wolfgang Lohmann, Hubert Markl and Hubert Zieghr (Eds.) 1983. Biophysics. Springer Verlag, New York.

8. Upadhyay and Nath. Biophysical Chemistry –Principles and techniques. Himalaya Publishing House.

B. BIOCHEMISTRY (36 hrs)

1. Structure, function and metabolism of carbohydrates – Synthesis of starch, cellulose and sucrose. Interconversion of hexoses and pentoses. (10 hrs)
2. Structure, function and metabolism of lipids: Biosynthesis of fatty acids. Biosynthesis of Triacyl glycerol, diacyl glycerol, monoacyl glycerol. Gluconeogenesis. Phospholipids. Lipid oxidation. (10 hrs)
3. Proteins and amino acids: Classification based on structure, function and localization sites. Primary, secondary tertiary and quarternary structure. Biosynthesis. Ramachandran plot. Purification of proteins. (6 hrs)
4. Enzymes: Major groups. Distribution of plant enzymes. Soluble and membrane bound enzymes. Isozymes. Abzymes. (5 hrs)
5. Biosynthesis of purines and pyrimidines. Metabolism of nucleotides. (5 hrs)

Practicals (9 hrs)

1. Preparation of buffers.
2. Preparation of standard solutions of BSA, Glucose, Catechol.

3. Extraction and estimation of soluble proteins by Bradford method.
4. Estimation of reducing sugars.
5. Isolation, assay and determination of specific activity of plant enzymes of germination, growth and fruit ripening, viz amylase, lipase, protease peroxidase, polyphenol oxidase.
6. Isolation and quantification of plant lipids by dry and wet methods.

References

1. Campbell, M.K. 1999. Biochemistry. Saunders College Publishing, New York.
2. Conn, E.E. and Stumpf P.K. et al., 1999. Biochemistry. John Wiley and Sons. New Delhi.
3. David T. Dennis and David H. Trurpin (Eds.) 1993. Plant Physiology. Biochemistry and Molecular Biology. Longmann Scientific and Technical, Singapore.
4. Fisher J. et. al., 1999. Instant notes in Chemistry for Biologists. Viva Books Pvt. Ltd. New Delhi.
5. Goodwin and mercer 1996. Introduction to plant Biochemistry. CBS Publishers and Distributors, New Delhi.
6. Hames, B.D. et al., 1999. Instant notes in Biochemistry. Viva books Pvt. Ltd. New Delhi.
7. Harborne, J.B. 1999. Plant Biochemistry. Chapmann & Hall, New Delhi.
8. Jain, J.L. 2000. Fundamentals of Biochemistry. S. Chand & Co. New Delhi.
9. Plummer, D.T. 1996. An Introduction to practical Biochemistry. McGraw Hill
10. Satyanarayana, U. 1999. Biochemistry. Books and Allied (P) Ltd. Calcutta.
11. Wilson and Goulding. 1992. Biologists Guide to Principles and Techniques of Practical Biochemistry.

C. PLANT PHYSIOLOGY (45 hrs)

1. Photosynthesis: Efficiency and turn over. Light harvesting complexes. Photosystem I and II - Structure and function. Mechanism of electron transport. Water oxidizing clock. RubisCo – Structure and function. Photo inhibition. Phytochromes. CO_2 fixation: C_3, C_4 and CAM pathways. Energetics of CO_2 fixation. (10 hrs)
2. Photorespiration and glycolate metabolism. Mechanism of photorespiration in C_3 and C_4 plants. Factors regulating photorespiration. (6 hrs)

3. Transport of metabolites – Xylem and Phloem sap translocation – current trends. (5 hrs)
4. Photoregulation and growth responses. Growth regulators and their mode of action. Plant morphogenesis. Physiology of flowering, fruit ripening senescence and abscission, Vernalisation. (6 hrs)
5. Seed metabolism, Hydration Phase of germination, Inter relationship between growing seedling and the storage tissues, glyoxylate cycle in fatty seeds during germination. (5 hrs)
6. Physiological response of plants to stresses like drought, heat and cold. Salt tolerance in plants. (5 hrs)
7. Role of phytoalexins. Defence mechanism. Phenyl propanoid pathway in plants. (2 hrs)
8. Tree Physiology – Leaf canopies, Radiation environment, Effect of irradiance in plants; Tree and water relations. (4 hrs)
9. Allelopathy – Plant derived compounds. (2 hrs)

Practicals

1. Extraction and estimation of total proteins by TCA precipitation and Lowrys method.
2. Isolation of chloroplast from fresh leaves and estimation of chlorophyll proteins.
3. Chlorophyll survey of five plants. Quantification, absorption spectra of chlorophyll and carotenoids using different solvents.
4. Hill activity by DCPIP/ ferricyanide reduction.
5. Extraction and estimation of total phenols.
6. Physiological identification of CAM in plant species.

REFERENCES

1. Brett, C.T. and Waldron, K.K. 1996. Physiology and Biochemistry of Plant Cell Walls, Chapman and Hall London.
2. Conn, E.E. and Stumpf P.K. et al., 1999. Biochemistry. John Wiley and Sons. New Delhi.
3. Daphne. J. Osborne, Micheal. B. Jackson. 1989. Cell separation in plants physiology, Biochemistry and Molecular Biology. Springer – Verlag. Berlin.
4. David T. Dennis and David H. Trurpin (Eds.) 1993. Plant Physiology, Biochemistry and Molecular Biology. Longmann Scientific and Technical, Singapore.

5. Devlin and Witham, 1997. Plant Physiology. CBS Publishers and Distributors, New Delhi.
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16. William G. Hopkins, 2002. Introduction to Plant Physiology. John Wiley & Sons. Inc. New York.
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Paper BO 233. RESEARCH METHODOLOGY, BIOSTATISTICS AND PLANT BIOTECHNOLOGY

Theory 108 hrs; Practical 45 hrs)

A. Research Methodology (18 hrs)

1. Introduction to Research methodology. (2 hrs)
2. Research design: objectives , defining a problem, derivation of hypothesis ,review of literature, experimental design, data analysis, writing the thesis (2 hrs)
3. Experimental design : methodology – analytical, biochemical, molecular (2 hrs)
4. Data analysis- use of statistical tools, interpretation of results (4hrs)
5. Thesis preparation : title , abstract, materials and methods, results and discussion (4 hrs)
6. Writing a research paper: using biological literature, deciding on a title, presenting the methodology, drafting and revising the content according to the journal requirements, citing sources in the text, preparing the reference section (4 hrs)

B. Biostatistics (27 hrs)

1. Sampling methods and errors (2 hrs)
2. Processing and presentation of data – tables, graphs (2 hrs)
3. Measures of central tendency- mean, median and mode. (3 hrs)
4. Measures of dispersion – range, quartile deviation, mean deviation, standard deviation, coefficient of variation (4 hrs)
5. Probability – basic concepts, theorems of probability (2 hrs)
6. Experimental designs – randomized block designs, split plot design, latinsquare (2 hrs)
7. Test of significance – t- test, chi square test (4 hrs)
8. Correlation and regression analysis (4 hrs)
9. F-test, ANOVA, Least Significant Difference (LSD), Broad sense heritability (4 hrs)

Practicals (9 hrs)

a. Work out the problems on mean, median, mode
b. Calculation of central tendency and dispersion of data from plant science
c. Find out ANOVA, f- value, LSD of data from plant science
d. Find out broad sense heritability of data from plant science
e. Preparation of graphs using EXCEL or similar packages

C. PLANT BIOTECHNOLOGY (63 hrs Theory; 36 hrs Practical)

1. Definition. Impact of biotechnology - an overview. (2 hrs)
2. Plant tissue culture techniques: Choice of explant, culture media and culture conditions, hormonal regulation of growth and differentiation, micropropagation; shoot tip, nodal segment, meristem cultures: callus culture, callus mediated organogenesis, cell suspension culture, cell line selection. (10 hrs)
3. Somatic cell genetics and Somaclonal variations. (3 hrs)
4. In vitro mutagenesis: Mutagens. Methods of treatment. Selection for biotic (fungi, bacteria and viruses) and abiotic (drought, salinity, herbicides) tolerance. (4 hrs)
5. Somatic embryogenesis. Artificial seeds. Applications. Protoplast culture, Somatic hybridization and its impact on plant breeding. Use of protoplasts in genetic transformations. (7 hrs)
6. Haploid production: anther and ovule culture. Dihaploids and polyhaploids. Applications. (5 hrs)
7. Production of secondary metabolites. Cell immobilization. Bioreactor technology. Conservation of germplasm: in vitro strategies, cryopreservation and inter national exchange of germplasm. (5 hrs)
8. Genomic and organellar DNA isolation. Methods of gene identification. Vector mediated and vectorless methods. Polymerase chain reaction (PCR). Restriction digestion and ligation; Restriction mapping. Genomic and cDNA libraries. (10 hrs)
9. Methods of gene transfer in plants. Agrobacterium and CaMV mediated gene transfer; direct gene transfer using PEG, microinjection, electroporation, microprojectile (biolistics) method, liposme mediated DNA delivery, Transposons as vectors. Use of mixed vectors, Transient and stable gene expression in transgenic plants. (8 hrs)
10. Analysis and expression of cloned genes. DNA markers; Restriction fragment length polymorphism (RFLP) ; Random amplified polymorphic DNA (RAPD). Amplified Fragment Length Polymorphism (AFLP), Ligase Chain Reaction (LCR), Antisense RNA. (5 hrs)

11. Genetic engineering: Methods and applications. Transgenic biology. Allopheny. Applications of gene cloning and transformation techniques in plants. Gene targeting and sequence tags. (2 hrs)

12. Genetically modified organisms and foods (GMO/GMF) - Social and ethical considerations. IPR issues. Patents. Biopiracy. (2 hrs)

Practicals

1. Preparation of culture medium (MS, N&N, SH, B_5), sterilization and inoculation.
2. Shoot multiplication, Callus culture and organogenesis of important crops/medicinal plants/ornamentals.
3. Isolation and estimation of genomic DNA.
4. Demonstration of Agarose gel electrophoresis.
4. Encapsulation of seeds/embryos in calcium alginate.
5. Students have to submit a record of the above.

References

1. Brown, C. M. 1987. Introduction to Biotechnology. Blackwell Scientific Publications, Oxford, London.
2. Brown, C.M. Campbell, I. and Priest, F.G. 1990. Introduction to Biotechnology. Blackwell Scientific Publications, Oxford, London.
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5. Dixon, R.A. and Gonzales, R. A. (Eds.) 1994. Plant Cell Culture - A Practical Approach. Oxford University Press, New York.
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15. Primrose, S.B. 1989. Modern Biotechnology. Blackwell Scientific Publications, Oxford, London.

16. Thomas R. Mertins and Robert. L. Hammorsmith. 1998. Genetics a Loboratory Investigation.

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18. Trivedi, P.C. (Ed.) 2000. Plant Biotechnology - Recent Advances. Panima Publishing Co. New Delhi.

19 Wulf Crueger and Anneliese Crueger. 2000. Biotechnology - A Text book of Industrial Microbiology.

SEMESTER IV
SPECIAL PAPER – I BO 241: BIOINFORMATICS
(THEORY 144 HRS; PRACTICAL 36 HRS)

1. Introduction to Bioinformatics: Definition and History of Bioinformatics - Internet Computational Biology and Bioinformatics. **(12 hrs)**
2. Biological databases- Types of data and databases, Nucleotide sequence database (EMBL, GENBANK, DDBJ)- Protein sequence database (PIR, SWISS-PROT, TrEMBEL), Secendary Databases (PROSITE, PRINTS, BLOCKS), Protein Structure Database (PDB) **(12 hrs)**
3. Information retrieval from databases – search concepts, Tools for searching, homology searching, finding Domain and Functional site homologies **(12 hrs)**
4. Structural Bioinformatics – Molecular Structure viewing tool –Rasmol, Protein Structure Prediction – Secondary Structure prediction (Chou Fasman method and other Bioinformatics tools for secondary structure prediction) and Tertiary structure prediction (Comparative modeling, Abinitio prediction, Homology modeling) **(12 hrs)**
5. Genomics - Types (Structural and Functional), Genome Annotation, Gene Finding , Comparative genomics, Single nucleotide Polymorphisn Gen-SNIP. **(12 hrs)**
6. Proteomics – Protein expression analysis, Mass spectrometry in protein identification, Protein Sorting, Metabolomics, KEGG, Systems Biology-an introduction **(12 hrs)**
7. Sequence Analysis – Global Alignment, pairwise analysis, Scoring Matrices (an introduction), Multiple Sequence Analysis **(12 hrs)**
8. Molecular Phylogeny – Gene and Species tree. Molecular evolution and Kimuras theory, Phylogenetic Trees, Terminology in Phylogenetic tree. Cladogram and Phylogram, Significance of Molecular Phylogeny **(12 hrs)**
9. Computer Aided Drug Design and Molecular Docking, Breif study about Docking tools, AutoDock, molegro virtual docker, GOLD **(12 hrs)**
10. Tools (Softwares) used in Bioinformatics - BLAST (including ALGORITHM of BLAST), Sequin, ClustalX, Clustal W, RasMol, Treeview, Phylip, GRAIL, GENSCAN, PROCRUSTES **(12 hrs)**
11. Use of Linux and Bio-PERL in Bioinformatics **(12 hrs)**
12. Applications of Bioinformatics – Transcriptomics, Metabolomics, Pharmocogenomics, combinational synthesis (Brief Accounts) **(8 hrs)**

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Lesk, A.M. (2002).” Introduction to Bioinformatics”, 1st Edition, Oxford University Press, Oxford, UK.

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Patterson, B.K., Techniques in Quantification and Localization of Gene Expression.

Mount, D.W. (2001).” Bioinformatics – Sequence and GenomeAnalysis”, 1st Edition, Cold Spring Harbor Laboratory Press, New York, USA..

Evens, W.J. and Grant, G.R., Statistical Methods in Bioinformatics: An Introduction.

Liu, B.H., Statistical Genomics: Linkage Mapping and QTL Analysis

Pierre Baldi and SorenBrunak, Bioinformatics: The Machine Learning Approach.

Practicals

1. Blast search with Protein Sequence (Magnolia latahensis sequence)
2. Blast search with Nucleic Acid Sequence (Neanderthal man's PaleoDNA)
3. Phylogenetic tree creation with CLUSTAL X, W and MUSCLE
4. Creation of phylogentic trees for selected families of Eudicots
5. Molecular docking (using either Free or commercial Software)

PAPER BO 242a: SPECIAL PAPER –II ELECTIVE

BIOTECHNOLOGY

(Theory 144 hrs; 90 hrs)

Unit I : Basics of Biotechnology (20 hrs)

1. Genesis, projection of biotechnology as an interdisciplinary pursuit, prospects and bottlenecks
2. Vectors, plasmids, bacteriophage and other viral vectors, cosmids, Ti plasmid, yeast artificial chromosome
3. Enzymes used in genetic engineering, restriction enzymes- their types and target sites
4. Impacts of biotechnology on agri-biodiversity, medicine, industry and environment

Unit II : Microbial Genetics and technology (20 hrs)

1. Replication, regulation of bacterial gene expression
2. mutations, genetic transfer, manipulation of gene expression in prokaryotes
3. Microbial production of amino acids, antibiotics, microbial enzymes, organic acids
4. methods for laboratory fermentations, isolation of fermentation products, Elementary principles of microbial reaction engineering
5. Microbial culture selection, fermented foods,probiotics.

Unit III : Genetic Engineering (40hrs)

1. Generation of Foreign DNA molecules, cutting and joining of DNA molecules – linkers, adapters, homopolymers.
2. Gene isolation, gene cloning, cDNA and genomic DNA library, expression of cloned genes
3. Transposons and gene targeting
4. DNA labeling, DNA sequencing – Polymerase Chain Reactions (PCR), DNA finger printing
5. Southern, Western and Northern blotting,Dot blots, in situ hybridization
6. Molecular marker techniques – RFLP, RAPD, AFLP, SCAR, STR, SSR
7. Site directed mutagenesis
8. Gene transfer technologies – Agrobacterium and CaMV mediated gene transfer direct gene transfer using PEG, Micro injection, electroporation, biolistic method, liposome mediated DNA delivery, gene therapy.

9. Transgenic organisms,Social and ethical issues , IPR, Patents and Biopiracy

Unit IV : Plant Tissue Culture techniques (24 hrs)

1. Techniques and applications – callus culture and regeneration of plants, micropropagation for large scale production of crop plants, medicinal plants and ornamentals
2. Suspension culture and development – methodology, kinetics of growth and production formation, elicitation methods, hairy root culture
3. protoplast culture – isolation , fusion, generation of hybrids, cybrids,preferential elimination of chromosomes, role in cytoplasmic male sterility and genetic transformation.
4. Exploitation of somaclonal and gametoclonal variations for plant improvement

Unit V : Transgenic organisms (20 hrs)

1. Microbes – production of pharmaceuticals (somatostatin, humulin, interferons) Genetically modified microbes – biodegradation, biopesticides, bioremediation, mineral leaching and biofertilizers
2. Plants – insect resistance (Bt), virus resistance-coat protein, satellites, herbicide resistence. Increasing shelf life of foods – flavr savr tomatoes, control of seed germination , genetically modified foods
3. Animals – production of vaccine and pharmaceuticals, hybridomas, monoclonal antibodies

Unit VI : Process Biotechnology (20 hrs)

1. Bioprocess technology for the production of cell biomass and primary/secondary metabolites
2. Microbial production, purification and bioprocess applications of industrial enzymes and organic compounds
3. Bioreactor designs for exploitation of microbial products, scaling up and downstream processing
4. Chromatic and membrane based bioseparation methods, immobilization of enzymes and cells and their application for bioconversion processes.

Practicals

f. Preparation of stock solutions for tissue culture

g. Preparation of solid and liquid media for test tube cultures and petri plate culture
h. Induction of callus culture and suspension culture
i. Encapsulation of embryos using sodium alginate
j. Isolation and quantification of genomic DNA
k. PAGE and AGE – demonstration
l. Restriction digestion and ligation using kits – demonstration

References

1. Lewin B. (2003): Genes – VIII, Oxford University Press, New York.
2. Primrose, S.B. (1989): Animal Biotechnology Blackwell Scientific Publication, London.
3. Old R.W. and Primrose, S.B. (1989): Principles of Gene Manipulation, Blackwel scientific Publication, London.
4. Watson, J.D. *et al*. (1987): Cell and Molecular Biology, John Wiley Publications, NY
5. Freifelder, D. (1993): Molecular Biology, Jones and Bartlett, Publishers, London.

BO 242b : Special paper II : Elective

Environmental Biology

Theory 144 hrs; Practical 90 hrs

Unit I : Ecological concepts **(20 hrs)**

1. Scope and historical perspective – interdisciplinary approach. **(5 hrs)**
2. Systems concept in ecology: organism as an ecological system, levels of organization of living world, relation between organism and environment, homeostasis and ecological balance **(5 hrs)**
3. Concept of model and ecosystem modeling **(5 hrs)**
4. Concept of Biosphere **(5 hrs)**

Unit II : organism and environmental complex **(24 hrs)**

1. Ecological processes: basic laws of energy flow, flow of energy, law of ten percent, Odum's Box pipe model of energy flow. **(8 hrs)**
2. Biogeochemical cycling: Major sedimentary and gaseous types, turnover rate and turn over time, residence time, nutrient budgeting and nutrient sink. **(8 hrs)**
3. Environmental factors: climatic, edaphic, topographic and biotic factors **(8 hrs)**

Unit III: population and community Ecology **(28 hrs)**

1. Concept of population and population attributes – biotic potential, Natality, Mortality, survivorship curves, Life tables, Age structure **(8 hrs)**
2. Population Dynamics: population growth, growth forms, fluctuations, J-shaped and S-shaped growth curves, concept of carrying capacity and environmental resistance, r and k selection **(8 hrs)**
3. Community structure: species diversity, species composition, stratification and quantitative characters. **(6 hrs)**
4. Community energetic **(6hrs)**

Unit IV : Ecosystem Ecology **(24 hrs)**

1. Concept of ecosystem, types – Major terrestrial and aquatic ecosystems **(6 hrs)**
2. Structural attributes of ecosystem – components of ecosystem **(6 hrs)**

3. Functional attributes – Concept of productivity, trophic levels, trophic relations, food chain and food web, ecological pyramids **(6 hrs)**
4. Ecosystem development and evolution **(6hrs)**

Unit V : Environmental Ecology **(28 hrs)**

1. Pollution – major types of pollution, biological effects, environmental impacts at the local and global levels – BOD, eutrophication, bioaccumulation, biomagnifications, ecological imbalance. **(4 hrs)**
2. Land degradation – causes, effects of land degradation, remedial measures. **(4 hrs)**
3. Waste management – waste minimization, recycling of industrial wastes, solid waste management. Waste disposal mechanisms. **(4 hrs)**
4. Environmental biotechnology – bioremediation, technology for biological waste disposal, biogas plants. **(4 hrs)**
5. Environmental issues – global warming, ozone layer depletion, deforestation and desertification, destruction of natural ecosystems. **(4 hrs)**
6. Environmental protection – environmental laws, conservation efforts, UNEP, IPCC, Kyoto protocol, Earth summits. **(4 hrs)**
7. Prospects of remote sensing in environmental studies. **(4 hrs)**

Unit VI : General study on the following areas of applied ecology **(20 hrs)**

1. Physiological ecology – micro climate, gas exchange interactions, stress ecology of salinity, osmotic pressure and temperature. **(6 hrs)**
2. Industrial ecology - remediation of toxic and inhibitory pollutants, microbial conversion of ligno cellulosic wastes, reclamation of polluted water bodies, polymer recycling, concept of clean technologies for crop and food production, ecological engineering, Green design. **(8 hrs)**
3. Molecular ecology – brief account **(6 hrs)**

Practical **(90 hrs)**

1. To find out the primary production in the given sample by using light and dark bottles.
2. Estimation of phosphate and nitrite in the water samples.
3. Estimation of hardness and salinity in the water samples.
4. Quantification of the planktons, present in the given two water samples.
5. Analysis of major elements (Na, K, Ca and Fe) of water samples.

6. Analysis of chlorophyll pigments in water.
7. Elemental analysis of plant samples.
8. Quadrat study of a given area to find out the Importance Value Index (IVI) of the community.

References

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2. Ambasht RS and Ambasht NK, 1996. A text book of Plant Ecology. Students' friends and Co, Varanasi.
3. Dash MC, 1996. Fundementals of Ecology.TMH Publishing Company, New Delhi.
4. Kumar HD, 2000. Modern concepts of Ecology. Vikas Publishing House, New Delhi.
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6. Odum EP, 1971. Fundementals of Ecology. WB Saunders and Co.

BO 242c : Special Paper II

PLANT BIOCHEMISTRY AND ENZYMOLGY

(Theory 144 hrs;Practical 90 hrs)

Plant Biochemisrty

1. Biochemical organization of the cell. (8 hrs)
2. Metabolism and biochemical energetics. (8 hrs)
3. Intermediary metabolism. Major pathways and evolutionary significance. (8 hrs)
4. Primary metabolic pathways and their inter relationships. (8 hrs)
5. Enzyme mediated regulation of metabolism. (8 hrs)
6. Secondary metabolism – main pathways and their inter relationships. (8 hrs)
7. Protein structure, purification and characterization. (8 hrs)
8. Biomolecular interactions – general account (8 hrs)

Enzymology

1. Plant enzymes – general properties, classifications and Nomenclature. (6 hrs)
2. Structural and functional organization of enzymes – primary, secondary and tertiary structure, molecular characterization of functional organization. (10 hrs)
3. Sub cellular localization of enzymes by LM and TEM. Histochemistry of enzyme reaction. (8 hrs)
4. Enzyme purification and characterization – desalting methods, isolation and assay of plant enzymes and enzyme kinetics. (10 hrs)
5. Michaelis Menton equations and its significance, Lineweaver plots, enzyme inhibitions, activation. (6 hrs)
6. Allosteric enzymes, metabolic regulation – sigmoid, kinetic, steady state metabolic pathways by control of enzymatic pathways. (10 hrs)
7. Native PAGE in enzyme localization, principles and methodology, zymogram. (8 hrs)
8. Iso Electric Focusing (IEF). (6 hrs)
9. Immobilization of enzymes, enzyme engineering – techniques and applications. (8 hrs)
10. Biotechnological applications of enzymes. (8 hrs)

Practicals

1. Isolation, partial purification and estimation of specific activity of plant enzymes – poly phenol oxidase, malate dehydrogenase.
2. Isoenzyme analysis and preparation of Zymogram.
3. Separation of enzyme proteins by Native PAGE.

References

1. Adams RLP, Knowler JT, Leader DP, 1986. The biochemistry of Nucleic acids. 10th ed, Chapman and hall.
2. Burdan RH, Knippen berg PH (Edt), 1989. Techniques in Biochemistry and Molecular Biology, 2nd edn, Elsevier.
3. Fersht A, 1985. Enzyme structure and mechanism, 2nd edn, Freeman.
4. Gurr MI, Harwood JL, 1991. Lipid Biochemistry: An introduction. 4th edn. Chapman and Hall.
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6. Voet DJ, Voet JG, 2008. Principle of Biochemistry, 3rd edn. John Wiley Sons Inc.
7. David Freifelder. Physical Biochemistry - Application to Biochemistry and Molecular biology.
8. Campbell, M.K. 1999. Biochemistry. Saunders College Publishing, New York.
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11. Fisher J. et. al., 1999. Instant notes in Chemistry for Biologists. Viva Books Pvt. Ltd. New Delhi.
12. Goodwin and mercer 1996. Introduction to plant Biochemistry. CBS Publishers and Distributors, New Delhi.
13. Hames, B.D. et al., 1999. Instant notes in Biochemistry. Viva books Pvt. Ltd. New Delhi.

BO 242d : Special Paper II

Cytogenetics

(Theory 144 hrs ;Practical 90 hrs)

1. Basic trends in cytogenetics – genetic continuity and variation. (10 hrs)
2. Haploidy – types of haploids, euhaploids, monohaploids, polyhaploids, Aneuhaploids; meiosis in haploids, induction of haploids.
    a. Morphology, anatomy and physiology of haploids.
    b. Genetic control of haploidy, genome analysis, inheritance in haploids- dosage effect.
    c. Significance of haploids in crop improvement. (12 hrs)
3. Polyploids – types of polyploids, numerical variation in chromosomes.
    a. Autopolyploids, allopolyploids, segmental allopolyploids, autoallopolyploids.
    b. Origin of polyploids, meiosis in polyploids, cytological and genetic effects of polyploids.
    c. Role of polyploids in plant diversity and evolution
    d. Induction of polyploidy – methods of induction, morphological and cytological analysis of induced polyploids, significance of induced polyploidy in plant improvement. (12 hrs)
4. Aneuploids – trisomics, double trisomics, tetrasomics, double tetrasomics. Types of trisomics – primary, secondary, tertiary, compensating fragment and telocentric trisomics. Role of aneuploidy in producing variation and its significance in evolution. (10 hrs)
5. Genetics of polyploids and aneuploids – theories of tetrasomic inheritance, Muller's hypothesis, Haldane's hypothesis, double reduction, techniques of nullisomic and monosomic analysis in polyploids, trisomic analysis in diploids. (12 hrs)
6. Structural variations in chromosomes – origin and meiotic characters. (10 hrs)
7. Cytogenetic effects – effect on crossing over, position effect, translocation complex, Renner complex, Renner effect, Breakage, Fusion Bridge cycle. (12 hrs)
8. Cytogenetics of hybrids. (8 hrs)
9. Sexual dimorphism – Genetic theory, cytological basis (8 hrs)

10. Sex chromosomes – undifferentiated structural heteromorphic multiple, protenor (XO), Neosex chromosomes, meiotic behavior of sex chromosomes in *Melandrium album* and *Rumex hastatus*. Evolution of sex chromosomes. Chromosomal mechanism of sex determination in Melandrium and Drosophila and the role of X and Y chromosomes and autosomes in them. (12 hrs)
11. Special types of chromosomes. (8 hrs)
12. B- chromosomes – origin, distribution, terminology, occurrence in different biological groups, morphology, classification, preferential distribution, post meiotic preferential distribution, differential fertilization, elimination, significance and adaptive value of B-chromosomes. (12 hrs)
13. Karyotype analysis and karyotype evolution. (8 hrs)
14. Chromosome banding – techniques and their applications. (10 hrs)
15. Human cytogenetics. (8hrs)

Practical

1. Somatic and meiotic chromosome study in selected polyploid and aneuploid. Eg. *Musa, Crinum.*
2. Allopolyploid - polyploidy series in *Chlorophytum*
3. Induction of polyploidy using Colchicine in selected plants.
4. Cytological and morphological analysis of the colchiploids.
5. Meiotic study of *Rhoeo discolor*
6. Chromosome banding – G – banding

References

1. Ambrose EJ and Easty DM 1980. Cell Biology – 3rd edition, Vikas Publ. New Delhi
2. Bernard John, 1990. Developmental and Cell Biology series, Cambridge. University Press.
3. Heinz herrmann, 1989. Cell Biology. An enquiry into the nature of the living state. Harper and Row Publishers, New York.
4. Sharma DK and Sharma A (Eds) 1985. Advances in chromosomes and Cell genetics. Oxford and IBH Publ. Co, New Delhi.
5. Stebbins GL, 1950. Variation and evolution in higher plants. Columbia Uni. NY.
6. Stebbins GL 1971. Chromosomal Evolution in higher plants. Addison, London.

UNIVERSITY OF KERALA

THIRUVANANTHAPURAM

COURSE STRUCTURE AND SYLLABUS

For

FIRST DEGREE PROGRAMME

In

BOTANY

Under

CHOICE BASED CREDIT- SEMESTER SYSTEM

(w.e.f. 2022 admission)

OBJECTIVES OF THE PROGRAMME

- To impart knowledge of Science is the basic objective ofeducation.
- To develop scientific attitude is the major objective to make the students open minded, critical,curious.
- To develop skill in practical work, experiments and laboratory materials and equipments along with the collection and interpretation of scientific data to contribute thescience.
- To understand scientific terms, concepts, facts, phenomenon and their relationships.
- To make the students aware of natural resources andenvironment.
- To provide practical experience to the students as a part of the course to develop scientific ability to work in the field of research and other fields of their own interest and to make them fit forsociety.
- The students are expected to acquire knowledge of plant and related subjects so as to understand natural phenomenon, manipulation of nature and environment for the benefit of humanbeings.
- To develop ability for the application of the acquired knowledge to improve agriculture and other related fields to make the country self reliant and sufficient.
- Understand and appreciate the role of biology in societal issues, such as the environment and biological resources, biodiversity, ethics and human health and diseases.
- To enrich the students with the latest developments in the field of Information technology, Biotechnology, Bioinformatics and other related fields of research and development
- To create enthusiasm to understand more about the beautiful planet Earth and to give awareness to the public the need to protect the planet from all kinds of exploitation.
- To keep the scientific temper which the student acquired from school level and to develop a research culture
- To introduce the students to industrial activities related to Botany and to get an industry orientation and skills

Table 1.General Structure of the First Degree Programme in Botany

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
I	EN1111	English Language I	5	-	4	3hrs	20%	80%	16
	1111	Additional Language I	4	-	3	,,			
	EN1121	Foundation Course I	4	-	2	,,			
	BO1141	Core Course I	2	2	3	,,			
	CH/BC1131	Compl. courseI(CH/BC)	2	2	2	,,			
	ZO1131	Complementary Course II(ZO)	2	2	2	,,			
II	EN1211	English Language II	5	-	4	,,	20%	80%	20
	EN1212	English Language III	4	-	3	,,			
	1211	Additional Language II	4	-	3	,,			
	BO1221	Foundation Course II	2	2	3	,,			
	CH/BC1231	Compl. Course III(CH/BC)	2	2	2	,,			
	ZO1231	Compl. Course IV(ZO)	2	2	2	,,			
	BO1222	Core II (Practical-I) (BO1141 & BO1221)		(4)*	3	,,			
III	EN1311	English Language IV	5	-	4	,,	20%	80%	17
	1311	Additional Language III	5	-	4	,,			
	BO1341	Core Course III	3	2	3	,,			
	CH/BC1331	Compl. Course V(CH/BC)	3	2	3	,,			
	ZO1331	Compl. Course VI(ZO)	3	2	3	,,			
IV	EN1411	English Language V	5	--	4	,,	20%	80%	29
	1411	Additional Language IV	5	-	4	,,			
	BO1441	Core Course III	3	2	3	,,			
	CH/BC1431	Compl.CourseVII(CH/BC)	3	2	3	,,			
	ZO1431	Compl. courseVIII(ZO)	3	2	3	,,			
	CH/BC1432	Compl IX (Practical CH/BC)	-	(8)*	4	,,			
	ZO1432	Compl X (Practical ZO)	-	(8)*	4	,,			
	BO1442	Core IV (Practical-II - BO1341 & BO1441)		(4)*	4	,,			
V	BO1541	Core Course V	4	3	4	,,	20%	80%	13
	BO1542	Core Course VI	5	2	4	,,			
	BO1543	Core Course VII	4	2	3	,,			
		Open Course I	3		2	,,			
	BO1551.1	Horticulture			-				
	BO1551.2	Mushroom cultivation &							
		Marketing							
	BO1551.3	Forestry							
		Project	-	2					
VI	BO1641	Core Course IX	5	2	4	,,	20%	80%	25
	BO1642	Core Course X	4	2	4	,,			
	BO1643	Core Course XI	4	2	4	,,			
	BO1644	Core (Practical-3)XII	-	(5)*	3	,,			
	BO1645	Core (Practical-4)XIII	-	(8)*	4	,,			
		Idustry based Elective Course	3	-	2	,,			
	BO1661.1	Organic Farming							
	BO1661.2	Mushroom Culture Technology							
	BO1661.3	Nursery and garden management							
	BO1661.4	Medicinal Botany							
	BO1646	Project		3	4				
									120

L = Lecture P = Practical ()*Practical hour already distributed in the semester concerned

Table 2. SEMESTER – I

Se m No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
I	EN1111	English Language I	5	-	4	3hrs	20%	80%	16
	1111	Additional Language I	4	-	3	,,			
	EN1121	Foundation Course I	4	-	2	,,			
	BO1141	Core Course I -Angiosperm Anatomy Reproductive Botany & Palynology	2	2	3	,,			
	CH/BC1131	Compl. CourseI(CH/BC)	2	2	2	,,			
	ZO1131	Compl.CourseII(ZO)	2	2	2	,,			

Table 3. SEMESTER – II

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
II	EN1211	English Language II	5		4	3hrs	20%	80%	17
	EN1212	English Language III	4		3	,,			
	1211	Additional Language II	4		3	,,			
	BO1221	Foundation Course II- Methodology & Perspectives in Plant Science	2	2	3	,,			
	CH/BC1231	Compl. Course III (CH/BC)	2	2	2	,,			
	ZO1231	Compl. Course IV(ZO)	2	2	2	,,			
	BO1222	Core II (Practical-I - BO1141, BO1221)		(4)*	3	,,			

L = Lecture P = Practical *Practical hour already distributed in the semester concerned

Table 4. SEMESTER – III

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
III	EN1311	English Language IV	5	-	4	3 hrs	20%	80%	17
	1311	Additional Language III Core	5	-	4	,,			
	BO1341	Core Course III- Microbiology, Phycology, Mycology, Lichenology & Plant Pathology	3	2	3	,,			
	CH/BC1331	Compl. Course V(CH/BC)	3	2	3	,,			
	ZO1331	Compl. Course VI(ZO)	3	2	3	,,			

L = Lecture P = Practical

Table 5. SEMESTER –IV

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credit
			T	P			Internal	University exam	
IV	EN1411	English Language V Additional	5	-	4	3hrs	20%	80%	29
	1411	Language IV	5	-	4	„			
	BO1441	Core Course IV- Bryology, Pteridology, Gymnosperms &Paleobotany	3	2	3	„			
	CH/BC1431	Compl.CourseVII(CH/BC)	3	2	3	„			
	ZO1431	Complementary CourseVIII(ZO)	3	2	3	„			
	CH/BC1432	Compl IX (PracticalCH/BC)	-	(8)*	4	„			
	ZO1432	Compl X (Practical ZO)	-	(8)*	4	„			
	BO1442	Core V (Practical-II BO1341 & BO1441)		(4)*	4				

L = Lecture P = Practical *Practical hour already distributed in the semester concerned

Table 6. SEMESTER - V

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
V	BO1541	Core Course VI - Angiosperm Morphology, Systematic botany, Economic botany, Ethno botany & Pharmacognosy	4	3	4	3hrs	20%	80%	20
	BO1542	Core Course VII Environmental Studies, Phytogeography & Research Methodology	5	2	4	„			
	BO1543	Core Course VIII- Cell Biology, Genetics & Evolutionary Biology	4	2	3	„ „			
	BO1551.1 BO1551.2 BO1551.3	Open Course Horticulture Mushroom cultivation & Marketing Forestry	3	-	2	„			
		Project		2					

L = Lecture P = Practical *Practical hour already distributed in the semester concerned

Table 7. SEMESTER – VI

Sem No.	Course Code	Course Title	Instructional hours/week		Credits	Uty Exam Duration	Evaluation		Total credits
			T	P			Internal	University exam	
VI	BO1641	Core Course IX Plant physiology &Biochemistry	5	2	4	3hrs	20%	80%	25
	BO1642	Core Course X- Molecular Biology, General informatics and Bioinformatics	4	2	4	„			
	BO1643	Core Course XI- Biotechnology, Nano-biotechnology, Horticulture & Plant breeding,	4	2	4	“			
	BO1644	Core (Practical-3)XII (BO1541 & BO1542)	-	(5)*	3	„			
	BO1645	Core (Practical-4)XIII IV (BO1543, BO1641,BO1642, 1643)	-	(8)*	4	„			
	BO1661.1 BO1661.2 BO1641.3 BO1641.4	Industry based Elective course Organic Farming Mushroom Culture Technology Nursery and garden management Medicinal Botany	3	-	2	„			
	BO1646	Project	-	3	4				

L = Lecture P = Practical *Practical hour already distributed in the semester concerned

Table 8. Distribution of Contact Hours and Credits

(CORE, FOUNDATION & OPEN COURSES, PROJECT/DISSERTATION)

Course Code	Course Title	Semester I			Semester II			Semester III			Semester IV			Semester V			Semester VI			Total	
		Contact hours		credit	Contact hours		credit	Contact hours		credit	Contact hours		credit	Contact hours		credit	Contact hours		credit	Contact hours	Credit
		T	P		T	P		T	P		T	P		T	P		T	P			
BO1141	Angiosperm anatomy Reproductive Botany & Palynology	2	2	3																4	3
BO1221	Methodology & Perspectives in Plant Science				2	2	3													4	3
BO1222	Practical-I (BO1141, BO1221)		2 *			* 2														4	3
BO1341	Microbiology, Phycology, Mycology Lichenology & Plant Pathology							3	2	3										5	3
BO1441	Bryology, Pteridology, Gymnosperms &Paleobotany										3	2	3							5	3
BO1442	Practical-II (BO1341 & BO1441)								* 2			* 2								4	4
BO1541	Angiosperm Morphology Systematic botany, Economic botany Ethno botany & Pharmacognosy													4	3	4				7	4
BO1542	Environmental Studies Phytogeography & Research methodology													5	2	4				7	4
BO1543	Cell Biology, Genetics & Evolutionary Biology													4	2	3				6	3
BO1551.1 BO1551.2 BO1551.3	Horticulture Mushroom cultivation & Marketing Forestry													3						3	2
BO1641	Plant Physiology &Biochemistry																5	2	4	7	4
BO1642	Molecular Biology, General informatics and Bioinformatics																4	2	4	6	4
BO1643	Biotechnology, Nano biotechnology, Horticulture& Plant breeding,																4	2	4	6	4
BO1644	Practical-III (BO1541 & BO1542)														5*						3
BO1645	Practical-IV (BO1543, BO1641,BO1642, 1643)																	8 *			4
BO1661.1 BO1661.2 BO1661.3 BO1661.4	Organic Farming, Mushroom Culture Technology, Nursery and garden management, Medicinal Botany																3			3	2
BO1646	Project report, Tour Diary, Viva-Voce														2			3		5	4
	Total																				**57**

L = Lecture P = Practical *Practical hour already distributed in the semester concerned

Table 9. Scheme of Evaluation of Foundation Course II, Core Courses, Open Courses & Project

Semester	Course Code	Course Title	Marks		Duration of University Exam.
			CE	ESE	
I	BO1141	Angiosperm anatomy Reproductive Botany & Palynology	20	80	3 hrs
II	BO1221	Methodology & Perspectives in Plant Science	20	80	3 hrs
	BO1222	Practical-I (BO1141, BO1221)	20	80	3 hrs
III	BO1341	Microbiology, Phycology, Mycology Lichenology & Plant Pathology	20	80	3 hrs
IV	BO1441	Bryology, Pteridology, Gymnosperms &Paleobotany	20	80	3 hrs
	BO1442	Practical-II (BO1341 & BO1441)	20	80	3 hrs
V	BO1541	Angiosperm Morphology Systematic botany, Economic otany Ethnobotany & Pharmacognosy	20	80	3 hrs
	BO1542	Environmental Studies , Phytogeography & Research Methodology	20	80	3 hrs
	BO1543	Cell biology, Genetics & Evolutionary Biology	20	80	3 hrs
	BO1551.1 BO1551.2 BO1551.3	Horticulture Mushroom cultivation & Marketing Forestry	20	80	3 hrs
VI	BO1641	Plant Physiology &Biochemistry	20	80	3 hrs
	BO1642	Molecular Biology, General informatics and Bioinformatics	20	80	3 hrs
	BO1643	Biotechnology, Nano biotechnology, Horticulture and Plant breeding	20	80	3 hrs
	BO1644	Practical-III (BO1541 & BO1542)	20	80	3 hrs
	BO1645	Practical-IV (BO1543, BO1641,BO1642, 1643)	20	80	3 hrs
	BO1661.1 BO1661.2 BO1661.3 BO1661.4	Organic Farming Mushroom Culture Technology Nursery and garden management Medicinal Botany	20	80	3 hrs
	BO1646	Project report, Tour Diary, Viva-Voce	20	80	-

END SEMESTER ASSESSMENT (ESA)

The University shall conduct the external examinations for all semesters. There will not be any supplementary exams. The practical examinations for **Core courses** shall be conducted after 2nd, 4th and 6th semesters and **Complementary** courses at the end of 4th semester according to the common calendar and questions set up by the University. The Board of Examiners constituted by the University will have the right to make necessary changes in the pattern of practical examination as and when needed with the prior sanction of the Chairman, Board of Studies Botany (Pass). The practicals mentioned in the syllabus under various branches of Botany Core and Complementary Courses should be incorporated in the Practical record.

ELIGIBILITY TO APPEAR FOR PRACTICAL EXAMINATION

Submission of the following

- Certified and bonafide practical record
- Certified herbarium sheets
- Certified field Book
- Certified Tour Report
- Project report/Dissertation (certified and bonafide)

PROJECT

Project work/Dissertation is compulsory. Students have to begin the project in the 5th Semester and submit the project report for valuation at the end of 6th Semester. Viva-Voce may be conducted for each student at the time of Project evaluation. Project can be carried out either individually or by a group not exceeding 15 students ensuring direct and active participation of each student in the group. The topics shall either be allotted by the supervising teacher or be selected by the student in consultation with the supervising teacher. The project report/dissertation duly attested by the Supervising teacher and Certified by the Head of the Department, has to be submitted on the day of examination of **Practical - III (Core)**. The project shall be evaluated by an external examiner. The project report/ Dissertation (not less than 30 pages) shall be prepared in Times New Roman fond size 12 with 1.5 spacing as per the format given below.

1. Title page /Front page (Certified by the**HOD**)
2. Declaration by the candidate
3. Certificate attested by the Supervising Teacher
4. Acknowledgement, if any
5. Table of contents
6. Abbreviation, if any
7. Introduction & Review of Literature
8. Material and Methods
9. Results and Discussion (Not less than 10pages)
10. Summary and Conclusion

11. References

Tables, Graphs, Photographs etc. can be used to present the data. Topics selected once should not be repeated and plagiarism should be avoided.

STUDY TOUR

- Field trip to a place of plant diversity within or outside Kerala with a minimum duration of 3 days is compulsory. (Field trips are to be conducted for three days either as continuous or one daytrips).
- A brief report of the trip has to be submitted at the time of Practical Examination

CORE COURSES

Semester	Course Code	Course Title	Contact hrs/week		Credits
			L	P	
I	BO1141	Angiosperm anatomy Reproductive Botany & Palynology	2	2	3
II	BO1221	Methodology & Perspectives in Plant Science	2	2	3
	BO1222	Practical-I (BO1141, BO1221)		4	3
III	BO1341	Microbiology, Phycology, Mycology Lichenology & Plant Pathology	3	2	3
IV	BO1441	Bryology, Pteridology, Gymnosperms &Paleobotany	3	2	3
	BO1442	Practical-II (BO1341 & BO1441)		4	4
V	BO1541	Angiosperm Morphology Systematic botany, Economic botany Ethno botany & Pharmacognosy	4	3	4
	BO1542	Environmental Studies , Phytogeography & Research Methodology	5	2	4
	BO1543	Cell Biology, Genetics & Evolutionary Biology	4	2	3
VI	BO1641	Plant Physiology &Biochemistry	5	2	4
	BO1642	Molecular Biology, General informatics and Bioinformatics	4	2	4
	BO1643	Biotechnology, Nanobiotechnology, Horticulture and Plant breeding	4	2	4
		Industry based elective course	**3**	**0**	**2**
	BO1661.1	Organic Farming			
	BO1661.2	Mushroom Culture Technology			
	BO1641.3	Nursery and garden management			
	BO1641.4	Medicinal Botany			
	BO1644	Practical-III (BO1541 & BO1542)		5	3
	BO1645	Practical-IV (BO 1543, BO1642, BO1642 & BO1643)		8	4

SEMESTER-I

ANGIOSPERM ANATOMY, REPRODUCTIVE BOTANY AND PALYNOLOGY

Course code BO 1141 Number of credits: 3

Number of contact hours: Lecture: 36 hrs; Practical: 36 hrs; Total: 72 hrs

Distribution of Hours	Theory	Practical
Introduction to Botany	02 hrs	
Angiosperm Anatomy	25 hrs	27 hrs
Reproductive Botany & Palynology	09 hrs	09 hrs
Total	36 hrs	36 hrs

Aim of the course: To generate awareness about anatomical features of Angiosperms &Reproductive biology.

Objectives:

- To develop skills for identification of microscopic structures
- To distinguish various tissue systems and internal structure
- To acquire basic knowledge about embryo development and pollen grains

Expected Outcome

- Students are able to understand the complexities of cell wall organization, microscopic and sub microscopic structures.
- Students can distinguish various anatomical features of monocots and dicots (stem and root) with respect to permanent tissues and tissue systems.
- Identify and differentiate male and female gametophyte development in angiosperms.
- Distinguish monocot and dicot embryo and the basic features of pollen grains.

MODULE – I **02 hrs**

Scope of Botany. Importance of plants. An overview of plant Diversity (Brief Account)
(Introductory - No questions for theory examinations from this module)

Angiosperm Anatomy

MODULE – II **04 hrs**

1. Objective and scope of plant anatomy
2. Cell wall organisation – Gross structure- Primary and secondary wall, pits-plasmodesmata-microscopic and submicroscopic structures- Extra cell wall material (lignin, suberin), Non living inclusions of the cell [Reserve food (carbohydrates,

proteins, fats and oil), secretory products (colouring matter, enzymes, nectar), excretory products (nitrogenous and non nitrogenous including resins, tannins, organic acids, latex, essential oils, glycosides, gums and mineral crystals)].

MODULE - III **09 hrs**

3. Tissues-Meristems: Definition, Classification based on origin, position, growth patterns, functions
4. Apical meristem. Theories on apical organization of shoot apex- Apical cell theory, Histogen theory, Tunica-Corpus theory. Organisation of shoot apex in dicots and monocots. Theories of organization of root apex- Apical cell theory, Histogen theory and Korper Kappe theory. Organization of root apex in dicots and monocots.
5. Permanent tissues – Definition, classification – simple, complex and secretory tissues (glandular tissue, laticifers).
6. Tissue systems- Epidermal tissue system, Ground tissue system and vascular tissue systems. Stomata – structure and functions, types- anomocytic, anisocytic, paracytic, diacytic, graminaceous. Different types of vascular arrangements.

MODULE- IV **12** hrs

7. Primary structure – Root, stem and leaf (Dicot & Monocot)
8. Secondary growth- Root and stem- cambium (structure and function), annual rings, heart wood and sap wood, hard wood and soft wood, tyloses, ring porous wood and diffuse porous wood, periderm formation – phellum, phellogen and phelloderm; lenticels
9. Anomalous secondary growth – *Bignonia, Boerhaavia, Dracaena.*

Practicals **27 hrs**

1. Non-living inclusions – Cystolith, Raphide, Sphaero- raphide (Druses), Aleurone grains
2. Starch grains (Eccentric, Concentric, compound)
3. Simple permanent tissue- Parenchyma, Chlorenchyma, Aerenchyma, Collenchyma, Sclerenchyma
4. Primary structure- Dicot stem- *Centella, Chromolaena*
5. Monocot stem- Grass and *Asparagus*
6. Dicot root- Pea/ *Limnanthemum*
7. Monocot root- Colocasia or any other monocot root
8. Secondary structure – Stem (Normal type) – *Vernonia*
9. Secondary structure – Root (Normal type)- *Carica papaya*, Aerial root- *Tinospora and Ficus*
10. Epidermal structures- Stomata (Anomocytic, anisocytic, paracytic, diacytic)
11. Anomalous secondary thickening – *Bignonia, Boerhaavia, Dracaena*

MODULE – V **09 hrs**

Reproductive Botany and Palynology

1. Introduction to angiosperm embryology, Contribution of P. Maheswary.
2. Microsporogenesis- Structure and functions of wall layers
3. Development of male gametophyte- Dehiscence of anther

4. Megasporogenensis – Development of female gametophyte – Embryo sac- Development and types – Monosporic – *Polygonum* type, Bisporic – *Allium* type, Tetrasporic – *Adoxa* type
5. Pollination- Germination of pollen grains, Fertilization, double fertilization, Barriers of fertilization
6. Structure of embryo – Dicot (*Capsella*). Monocot (*Sagittaria*), Endosperm types (Cellular, nuclear and helobial – Brief account only)
7. Palynology: Pollen structure, aperture morphology, pollen allergy. Economic and taxonomic importance (Brief account only)

Practical **09 hrs**

1. Pollen morphoforms (Colpate, porate and colporate- Photographs/permanent slides. SEM images not needed)
2. Students should be familiar with different types of ovules
3. Students should be familiar with the structure of anther and embryo (Permanent slides can be used)

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SEMESTER-II

FOUNDATION COURSE

METHODOLOGY AND PERSPECTIVES IN PLANT SCIENCES

Course code : BO 1221Number of credits : 3
Number of contact hours: 36 hrs (Lecture); 36hrs (Practical) Total= 72 hours

Distribution of Hours	Theory	Practical
Scientific Studies	**08 hrs**	**0 hrs**
Data handling in science	**12 hrs**	**16 hrs**
Microtechnique	**06 hrs**	**08 hrs**
Biophysics	**10 hrs**	**12 hrs**
Total	**36 hrs**	**36 hrs**

Aim of the course: To introduce the methodology and perspectives of Science in generalso as to enable the students to systematically pursue his particular discipline in science in relation to other disciplines that come under the rubric of sciences.

Objectives:

- To familiarize the students with the fundamental characteristics of science and significance of scientific studies
- To apply scientific methods independently and familiarize instruments in biological labs
- To interpret scientific data using basic statistical methods
- To develop skills for microscopic specimen preparation.

Expected outcome

- Students will be familiarized with the fundamental characteristics of Science.
- Develops an idea about involvement of science in improvement of human life.
- Create awareness of scientific approach towards life and learns the values of ethics in science.
- Develops skills to interpret scientific data using basic statistical methods.
- Create skills to prepare specimens for microscopic and gross anatomical studies and familiarize with different microscopic methods for sample analysis.
- Students become able to prepare buffers, measure pH, separate plant pigments and construct absorption spectrum of a sample

MODULE-I

ScientificStudies 08 hrs

1. Science and pseudoscience. (Definition of Science, Eg. germ theory vs spontaneous generation,
2. Methods of science: Inductive and deductive Methods, (Explain with an example suggestion – Ref. 22 - Page 1-23, or any suitable example).

3. Approaches to develop Knowledge: steps involved – 1) defining the problem 2) making observations, 3) forming a hypothesis, 4) conducting an experiment and 5) drawing conclusions.
4. Botany as a discipline of science. Allied branches of Botany :- (brief account of Plant Tissue culture, Plant Biotechnology, Floriculture. Pharmacognosy, Organic farming, Ethnobotany, Astrobotany)
5. Major Revolutions in Biology (Brief description about Green revolution, blue revolution and white revolution.)
6. Model organisms in Biology – Signifcance - brief account on *E.coli*, *Neurospora* and *Arabidopsis*.
7. Contributions of Indian Botanists (MS. Swaminathan , E.K. Janakiammal, K.S Manilal)

MODULE- II

Data handlinginscience 12hrs

1. Nature and types of data - Typical examples, Data collection, Data presentation-Classification and tabulation, diagrammatic presentation (bar & pie diagrams) and graphic presentation (Histogram, frequency polygon, frequency curve & Ogives).
2. Samples and sampling techniques – simple random sampling, systematic sampling and stratified sampling.
3. Statistical treatment of data: Statistical terms and symbols. Measures of central tendencies (mean, median, mode), Measures of dispersion (range, mean deviation, variance, standard deviation, standard error), Significance tests (chi-square test).

Practicals 16hrs

1. Workout problems on frequency distribution
2. Represent data using bar diagram and histogram
3. Measures of central tendencies (Mean, Median, Mode)
4. Workout problems on measures of dispersion (range, mean deviation,variance,standard deviation, standard error)
5. Workout problems on chi-square test.

MODULE-III

Microtechnique 06hrs

1. Introduction - microscopy - simple and compound – phase contrast; dark field illumination and electron microscopes (SEM and TEM).
2. Micrometry, Camera lucida
3. Sectioning - hand and microtome– rotary and sledge
4. Killing and fixation agents – Carnoy's formula, Farmer's formula, F.A.A
5. Dehydration – reagents – Ethyl Alcohol, Isopropyl Alcohol, Teritiary Butyl Alcohol
6. Stains and staining techniques - Stains: safranin, haematoxylin, acetocarmine, Fast green, eosin. Progressive and regressive, Double staining – Safranin&Fast green

7. Mounting media - D. P. X and Canada balsam
8. Whole mounts - cytological methods: maceration, smear and squash preparation.

Practical **08hrs**

1. Students should be familiar with the use microscope and its parts
2. Familiarize stains, fixatives and mounting media
3. General awareness of Micro technique - maceration, smears & squash
4. Demonstration of microtome sectioning and hand sectioning
5. Measurement of specimens using micrometer (Demonstration only).
6. Photomicrography and Camera lucida drawings (Demonstration only).

MODULE-IV

Biophysics **10hrs**

1. Principles and applications of Colorimeter, Spectrophotometer (UV-Visible) and Centrifuge- centrifugation, types of rotors (swinging bucket, fixed angle), Density gradient and Differential centrifugation.
2. Basic knowledge of the separation methods: - Chromatography (Column chromatography, paper chromatography and TLC), Electrophoresis (PAGE and AGE).
3. Buffers -their functions in biological systems -Uses of buffers in biological research,
4. pH meter.
5. Cryobiology – cryopreservation, freeze drying (lyophilisation) and its applications.

Practical **12hrs**

1. Separation of plant pigments by paper chromatography/TLC.
2. Preparation of buffer
3. Measurement of pH
4. Construct the absorption spectrum of any sample.
5. Familiarise students to equipments like Centrifuge, Spectrophotometer, pH meter, Electrophoresis.

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SEMESTER-III

MICROBIOLOGY, PHYCOLOGY, MYCOLOGY, LICHENOLOGY AND PLANT PATHOLOGY

Course code : BO 1341Number of credits : 3

Number of contact hours: Lecture: 54 hrs; Practical: 36 hrs; Total: 90 hrs

Distribution of Hours	Theory	Practical
Microbiology	09 hrs	08 hrs
Phycology	20hrs	10 hrs
Mycology&Lichenology	20 hrs	15 hrs
Plant Pathology	05 hrs	03 hrs
Total	54 hrs	36 hrs

Aim of the course: To create awareness about the world of microbes and lower groups of plants.

Objectives:

- To familiarize characteristic features of microbes and their significance
- To create awareness about importance of microbes in environment
- To generate idea about types of algae, fungi, lichen and their economic as well as evolutionary significance

Expected outcome

- The student can prepare micropreparations and identify the thallus and reproductive structures of lower plant groups like algae, fungi and lichen
- An awareness created among students about various microbes, structure and economic importance
- Students can use effectively the methodology to isolateand identify bacteria present in curd and root nodules
- Can identify various plant diseases, etiology of pathogens and control measures
- Able to prepare fungisides like tobacco decoction and Bordeaux mixture

MODULE-I

Microbiology **08hrs**

1. History & scope of microbiology.
2. Bacterial classification: Morphological classification, classification based on staining reaction: Ultra structure of bacteria, Reproduction, Economic importance.
3. Mycoplasma & Actinomycetes –General account.
4. Virus-General characteristics,Nomenclature,classification,structure, Chemical composition, properties and reproduction of bacteriophages and T. M. V., Economic importance of viruses.
5. Soil microbiology – Soil microorganisms, the rhizosphere
6. Aquatic microbiology - Microbiology of sewage or waste water. Methods of waste water treatment (Brief account only)

7. Food microbiology - Food spoilage and preservation methods [General account].
8. Agricultural microbiology - Role of microbes in soil fertility, Nitrogen fixation, Biofertilizers

Practical **07hrs**

1. Gram staining of bacteria.
2. Test for the Coliform bacteria in contaminated water.
3. Isolation of *Rhizobium* from root nodules of leguminous plants (Demonstration)
4. Examination of different forms of bacteria (Demonstration)

MODULE - II

Phycology **20hrs**

1. Introduction – Range of thallus structure – Phylogenic trends – Pigments –Reproduction
2. Life cycle – Classification proposed by F .EFritsch
3. Salient features of the following major groups with reference to the structure, reproduction and life cycle of the types given below **(Excluding the developmental details)**

a) Cyanophyceae –*Nostoc*
b) Chlorophyceae - *Chlorella, Volvox, Oedogonium* and *Chara*
c) Xanthophyceae –*Vaucheria*
d) Bacillariophyceae –*Pinnularia*
e) Phaeophyceae –*Sargassum*
f) Rhodophyceae –*Polysiphonia*

Economic importance of algae

a) Commercial products of algae – Agar, Alginates, Carrageenin, Diatomaceous earth, biofuels
b) Algae - medicinal aspects, algal blooms and red tide

Practical **15hrs**

1. Make micro preparations of vegetative and reproductive structures of the types mentioned in the syllabus.
2. Identify the algal specimens up to the generic level and make labeled sketches of the specimens observed.

MODULE-III

Mycology& Lichenology **20hrs**

1. Introduction, structure, reproduction, life cycle, evolutionary trends.
2. Classification of Fungi proposed by G.C. Ainsworth (1973)
3. Distinguishing characters of different classes of fungi representing the following genera (Excluding Developmental details)
   a. Myxomycota –General characters.
   b. Mastigomycotina - *Pythium*
   c. Zygomycotina -*Rhizopus*
   d. Ascomycotina
      - Hemiascomycetes -*Saccharomyces*
      - Plectomycetes -*Penicillium*
      - Pyrenomycetes -*Xylaria*
      - Discomycetes –*Peziza*

e. Basidiomycotina
   - Teliomycetes - *Puccinia*
   - Hymenomycetes -*Agaricus*

f. Deuteromycotina -*Cercospora*.

4. Economic importance of Fungi

Lichenology: General account and economic importance;
Morphology and anatomy of *Usnea*

Practicals **10hrs**

A detailed study of structure and reproductive structures of types given in the syllabus and submission of record

Phythium, Rhizopus, Saccharomyces, Penicillium, Xylaria, Peziza. Puccinia. Agaricus, Cercospora and *Usnea.*

MODULE-IV

PlantPathology **06hrs**

1. Classification of plant diseases on the basis of causative organisms and symptoms – Hostparasite interaction, phytoalexins.
2. Study of the following diseases with emphasis on symptoms, disease cycle and control measures - Leaf mosaic of Tapioca, Citrus Canker, Blast disease of Paddy, Root wilt of Coconut
3. Brief account of the following fungicides- Bordeaux mixture, Lime sulphur, Tobacco decoction, Neem cake & oil.

Practical **04hrs**

1. Identify the Diseases mentioned with respect to causal organism and symptoms- Leaf mosaic of Tapioca, Citrus Canker, Blast disease of Paddy.
2. Students should be trained to prepare the fungicide Bordeaux mixture &Tobacco decoction.

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SEMESTER-IV

BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS AND PALAEOBOTANY

Course code : BO 1441 Number of credits : 3

Number of Contact Hours: Lecture- 54 Hours; Practicals-36 Hours Total- 90 Hrs

Distribution of Hours	Theory	Practical
Bryology	**18 hrs**	**09 hrs**
Pteridology	**18 hrs**	**14 hrs**
Gymnosperms	**14 hrs**	**12 hrs**
Paleobotany	**04 hrs**	**01 hr**
Total	**54 hrs**	**36 hrs**

Aim of the course: To create awareness about non flowering plant groups like Bryophytes, Pteridophytes and Gymnosperms.

Objectives:

- To familiarize the students characteristic features and evolutionary significance of Bryophytes, Pteridophytes and Gymnosperms.
- To generate awareness about lifecycle of Bryophytes, Pteridophytes and Gymnosperms.
- To impart knowledge about fossil formation and its significance

Expected outcome

- Students are able to make micropreparations of thallus and reproductive structures of as well as better understanding of the life cycle of selected members of Bryophytes, Pteridophytes and Gymnosperms
- Can understand the economic and ecologic importance of lower groups of plant kingdom
- Better understanding of fossilization and importance of Palaeobotany
- Identify various parts of fossil plants through micro slides

MODULE-1

Bryology **18hrs**

1. Introduction and general characters, classification- Proskauer (1957)
2. Study of habit, thallus organization, vegetative and sexual reproduction and alternation of generation of the following types (Developmental details are not required)

   Riccia, Marchantia, Anthoceros, Funaria
3. Economic importance of Bryophytes

Practical **09Hrs**

1. *Riccia*- Habit- Internal structure of thallus- V.S.of thallus through archegonia, antheridia and sporophyte
2. *Marchantia*- Habit- thallus with Archegonial receptacle, Male receptacle V.S, Female receptacle V.S. T.S of thallus through gemma, SporophyteV.S
3. *Anthoceros* – Habit with sporophyte, Sporophyte V S
4. *Funaria*- Habit V.S. of archegonial cluster, V.S of Antheridial cluster, SporophyteV.S

MODULE -11

Pteridology **18hrs**

1. Introduction: General characters. Classification as proposed by Smith (1955).
2. Study of the habitat habit, internal structure, reproduction and life cycle of the following types (Developmental details not required). *Psilotum*, *Selaginella*, *Equisetum* and *Pteris*
3. General topics- Stelar evolution in Pteridophytes - Economic importance of Pteridophytes

Practical **14hrs**

1. *Psilotum* -External features, Stem T.S., SynangiumT.S
2. *Selaginella* - Habit , stem and rhizophore , T.S, V.S of strobilus, Megasporophyll and Microsporophylls
3. *Equisetum* – Habit, Stem-T.S., L.S. of strobilus, Sporangium, Spore with elators
4. *Pteris* - Habit , Rachis T.S Sporophyll T.S, Prothallus

MODULE-III

Gymnosperms **14hrs**

1. Introduction –General characters and classification of Gymnosperms (Sporne, 1965)
2. Study of the habit, anatomy, reproduction and life cycle of the following types (Developmental details are not required) *Cycas, Pinus* and *Gnetum*
3. Evolutionary trends in gymnosperms, Economic importance of Gymnosperms

Practical **12hrs**

1. *Cycas*- T.S of leaf, T.S. of coralloid root. Micro and megasporophyll, V S of ovule
2. *Pinus*- T.S. of stem, T.S. of needle, male and female cone, V.S.
3. *Gnetum*-Habit, stem T.S (young and mature), leaf T.S, male and female strobilus,V.S of male and female cone, ovule V.S and seed.

MODULE –IV

Palaeobotany **04hrs**

1. Geological time scale, Fossil formation, types of fossils.
2. Fossil Pteridophytes- *Rhynia, Lepidodendron, Lepidocarpon*. Fossil gymnosperms- *Lyginopteris.*

Practical **01hr**

1. Fossil Pteridophytes- *Rhynia* stem, *Lepidodendron, Lepidocarpon.*

2. Gymnosperm-*Lyginopteris*

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SEMESTER-V

ANGIOSPERM MORPHOLOGY, SYSTEMATIC BOTANY, ECONOMIC BOTANY, ETHNO BOTANY AND PHARMACOGNOSY

Course Code :BO1541Number of Credits :4

Number of contact hours : Lecture: 72 hrs; Practical: 54 hrs; Total: 126 hrs

Distribution of Hours	Theory	Practical
Morphology	14 hr	9 hr
Systematic Botany	40 hr	36 hr
Economic Botany	12 hr	06 hr
Ethnobotany &Pharmacognosy	06 hr	03 hr
Total	72 hr	54 hr

Aim of the course: To understand classification, identification and preservation of angiosperms along with ethnobotanical importance.

Objectives:

- To introduce importance of morphological characters in classification and plant identification.
- To develop skill for herbarium preparation.
- To acquire knowledge about economic, ethnobotanical significance and pharmacognosy of plants

Expected outcome

- Ability to identify different types of inflorescences, flowers and fruits, their arrangement and relative position.
- Familiarization of basic rules of Angiosperm classification and different types of classification.
- Preparation and maintenance of Herbarium.
- Identification of plants to their respective families.
- Understanding of ethnobotanical and pharmacological significance of plants.

MODULE-I

Morphology **14hrs**

1. Morphological description of a flowering plant: Plant habit, Stem (brief account), Leaf – morphotypes, phyllotaxy, Venation (reticulate and parallel).
2. Various types of inflorescence including special types (Cyathium, Verticillaster, Hypanthodium, Coenanthium and Thyrsus) with examples;
3. Floral morphology- Flower-as a modified shoot, Flower parts, their arrangements, relative position, merosity, cohesion, adhesion, symmetry of flower, aestivation types, placentation types. Description of a plant in technical terms, Floral diagram and floral formula
4. Fruit types: simple, aggregate and multiple. Seeds: albuminous and exalbuminous.

MODULE-II

SystematicBotany **05hrs**

Definition, scope and significance of Taxonomy, Historical development of the systems of classification:

1. Artificial- sexual system of Linnaeus
2. Natural - Bentham and Hooker (detailedaccount)
3. Phylogenetic- Engler and Prantl (Brief account only)
4. APG-IV system- Brief account only

MODULE-III **04hrs**

1. Basic rules of Binomial Nomenclature and International Code of Nomenclature for algae, fungi, and plants (**ICN**)
2. Importance of herbarium, Herbarium techniques and Botanical gardens. Brief account on the Modern trends in taxonomy; Chemotaxonomy and Molecular taxonomy

MODULE-IV **31 hr**

A study of the following families with emphasis on the morphological peculiarities and economic importance of its members (based on Bentham & Hooker's system)

1) Annonaceae
2) Nymphaeaceae
3) Malvaceae
4) Rutaceae
5) Anacardiaceae
6) Leguminosae
7) Combretaceae
8) Myrtaceae
9) Cucurbitaceae
10) Apiaceae
11) Rubiaceae
12) Asteraceae
13) Sapotaceae
14) Apocynaceae
15) Asclepiadaceae
16) Solanaceae
17) Acanthaceae
18) Verbenaceae
19) Lamiaceae
20) Nyctaginaceae
21) Euphorbiaceae
22) Orchidaceae
23) Scitaminae
24) Liliaceae
25) Arecaceae
26) Poaceae

Practical **45hrs**

1. Study on various types of inflorescences, Flowers and fruits with vivid record of practical work.
2. Students must be able to identify the angiosperm members included in the syllabus up to the level of families. Draw labeled diagram of the habit, floral parts, L S of flower, T S of ovary, floral diagram, floral formula and describe the salient features of the member in technical terms. (Minimum two plants from each dicot family and one from monocot family).
3. Students must submit practical records, Herbarium sheets (25 Nos: representing one sheet from each family) and Field book at the time of practical examination.
4. Field trips are to be conducted for three days either as continuous or one daytrips.

MODULE-V

a) EconomicBotany **10hrs**

1. Study of the major crops in Kerala - Coconut & Paddy with special reference to their method of cultivation. Botanical description, morphology of the useful part and economic importance—

   (i) Cereals– Wheat & Maize
   (ii) Millets- Ragi & Fox tail millet

(iii) Pulses – Black gram, Green gram, Bengal gram
(iv) Sugar yielding plants – Sugar Cane
(v) Spices- pepper, cloves, cardamom
(vi) Beverages – Coffee, Tea
(vii) Fibre yielding plants – Cotton
(viii) Dye Yielding plants - Henna and *Bixa Orellana*
(ix) Resins- Asafoetida
(x) Tuber crops – Tapioca, Potato
(xi) Oil yielding plants- Sesame, ground nut
(xii) Latex yielding plants- Rubber
(xiii) Medicinal plants - *Sida, Zingiber officinale, Aloe vera* and *Vinca rosea*
(xiv) Insecticide- Neem

Practical **06hrs**

Identify the economic products obtained from the plants mentioned under Economic Botany

b) Ethnobotany **05hrs**

1. Definition — importance, scope, categories and significance.
2. Study of various methods to collect Ethno botanical data.
3. Major tribes of Kerala –Kanikkar, Muthuvan, Kurichiar, Ulladar (bief account only)
4. Plant parts used by tribes in their daily life as food, clothing, shelter, agriculture and medicine.
5. Study of common plants used by tribes. *Aegle marmelos*, *Ficus religiosa*, *Cynodon dactylon*, *Ocimum sanctum* and *Trichopus zeylanicus*

Practical **03hrs**

1. Visit to a tribal area and collection of information on their traditional method of treatment using crude drugs
2. Observe the plants of ethno botanical importance

c) Pharmacognosy **03hrs**

1. Definition and scope of Pharmacognosy
2. Sources of crude drugs – roots, rhizome, bulb, corm, leaves, stems, flowers, fruits andseeds

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SEMESTER-V

ENVIRONMENTAL STUDIES , DISASTER MANAGEMENT, PHYTOGEOGRAPHY & RESEARCH METHODOLOGY

Course code: BO 1542 Number of Credits : 4
Number of contact hours : Lecture: 90 hrs; Practical: 36 hrs; Total: 126 hrs

Distribution of Hours	Theory	Practical
Environmental Studies	58 hrs	36 hrs
Disaster Management	07 hrs	00 hrs
Phytogeography	09 hrs	00 hrs
Research Methodology	16 hrs	00 hrs
Total	90 hrs	36 hrs

Aim of the course: To inculcate environmental awareness among students for protecting the Nature.

Objectives:

1. To create awareness about ecosystem and Natural resources.
2. To generate knowledge about importance of Biodiversity conservation
3. To understand the need to mitigate pollution and strategies for disaster management
4. To impart knowledge about phytogeographical regions
5. To impart knowledge about the methodology of research and preparation of report

Expected outcome

- Develops awareness about natural resources, its conservation and importance of sustainable lifestyles.
- Understands and identify different ecosystems and ecosystem processes.
- Develops deep understanding about biodiversity and importance of its conservation
- Develops skills to identify polluted sites, its major pollutants and recognize the need to mitigate environmental pollution
- Awareness about different types of disasters and to adopt strategies to overcome and reduce the impact
- Identify the importance of phytogeographical sites in India
- Can devise an experimental design and carry out a project
- Students trained about various steps for the conduct of a research project and write a project report

MODULE-I

Natural resources and its conservation **10 hrs**

1. Natural Resources - Renewable and Non-renewable - Land & Soil, Water, Energy, Minerals, Food and agriculture, Forests, Plants & Wild life resources. Degradation of natural resources - Land degradation, degradation of water resources, Loss of flora and fauna; Causes – population explosion, over exploitation, deforestation, agriculture mismanagement, desertification, overgrazing, soil erosion, mining, urbanization and industrialization- change in land use, depletion of water resources .
2. Conservation of Natural resources and sustainable life styles. - Afforestation, regeneration of wasteland, Rain water harvesting, ground water dams, Promoting use of renewable resources-solar, tidal and wind; biodiesel, biofuels. Reforestation, Community forestry programmes

MODULE- II

Ecosystems **18 hr**

1. Ecosystems - Concept, definition, structure and function; components- biotic andabiotic; energyflow
2. Food chains -Food web & ecological Pyramids, biogeochemical cycles - Carbon and Phosphorouscycle
3. Ecological succession-Definition, primary and secondary succession, climax concept, hydrosere and xerosere.
4. Plant adaptations- Morphological, anatomical& physiological adaptations of – Hydrophytes, Xerophytes, Halophytes, Epiphytes, Parasites
5. Introduction- types, characteristic features, structure and functions of thefollowing ecosystems.
6. Forest ecosystem, 2. Grassland ecosystem, 3. Desert ecosystem, 4. Aquatic ecosystems-Ponds, Rivers, Oceans, Estuaries (brief account only)

MODULE-III

Biodiversity anditsconservation **16 hrs**

1. Introduction, Definition- genetic, species and ecosystem diversity; biodiversity index (Shannon index)
2. Hot-spots of biodiversity; India as mega-diversity nation.
3. Threats to biodiversity: land use changes & habitat destruction, poaching of wild life-hunting & export, Overuse of pesticides, invasive species.
4. IUCN, Red data Book; Extinct and Threatened species- endangered & Rare; Endemic species of Western Ghats.
5. Conservation of biodiversity: In-situ (National parks and Wild life sanctuaries) and Ex-situ conservation (botanical gardens); Biosphere Reserves & World Heritage Sites in India-Ramsar sites, Chilka lake.
6. Global initiatives in biodiversity conservation- Stockholm Conference, Montreal Protocol, Convention on Biological diversity Regional initiatives- Chipko movement, National Biodiversity Authority (NBA), Access and Benefit sharing (ABS),A brief account on conservation efforts in Kerala- Kerala State Biodiversity Board (KSBB), People Biodiversity Register.

MODULE-IV

Environmental pollution **14 hrs**

1. Definition, causes, effects and control measures of – 1. Air pollution, 2. Water pollution, 3.

Soil pollution, 4. Noise pollution, 5. Thermal pollution.
2. Solid Waste Management- waste minimization, Recycling and Reuse, Consuming environment friendly products. E-waste management.
3. Environmental Organisations –UNEP, IPCC, WWF, Central Pollution Control Board

MODULE-V
Disaster management **07 hrs**

1. Introduction, Definition and terminologies; scope and concept of disaster management.
2. Natural and Environmental disasters-a brief description of the following disasters- earth quake, flood, coastal disasters, landslides, tsunami (role of mangroves in controlling tsunami disaster), cyclone, dam collapse, nuclear disaster, chemical disaster, biological disaster.
3. Environmental Issues - Global warming and sea level rise, Acid rain, Ozone layer depletion- causes and effects.
4. Disaster management – four phases – mitigation, preparedness, responses, recovery. Emergency procedures and warning systems, application of GIS (brief account only).

MODULE-VI
Phytogeography **9 hrs**

1. Concept & definition, species distribution- continental drift, continuous and discontinuous distribution.
2. Vegetation in India – Forests- tropical, temperate, sholas, sub alpine, alpine, mangroves & Grass lands.
3. Phytogeographical regions of India (Chatterjee 1962) - Western Himalayas, Eastern Himalayas, Indus plain, Gangetic Plain, Central India, Deccan, Western coasts of Malabar, Assam and Bay Islands of Andamna and Nicobar.

Practical **36hrs**
1. Visit a local polluted site and report majorpollutants.
2. Visit a mangrove vegetation and report diversity
3. Study of ecological and anatomical modifications of Xerophytes, Hydrophytes, Halophytes, Epiphytes and Parasites.
4. Observation and study of different ecosystems mentioned in the syllabus.
5. Phytogeographical regions of India- Photos/Diagrams

MODULE-IV **16 hrs**
Research Methodology
1. Introduction; Need for research; Stages of Research – Definition of problem, execution of the problem, interpretation of results
2. Charateristics of Research, Types of research- Qualitative & quantitative.
3. Experimental design, components of experimental designs- Randomized blocks, completely randomized designs.
4. Preparation of a project report : Data analysis and consolidation of photographs, illustrations, tables and graphs, Title, introduction, review of literature, materials and methods, results, discussions, summary, references, acknowledgements; Bibliography – Method of citing and arrangement of references; Brief account of Reference management softwares - EndNote, Mendeley.

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SEMESTER-V

CELL BIOLOGY, GENETICS AND EVOLUTIONARY BIOLOGY

Course Code : BO 1543 **Number of credits : 3**

Number of contact hours : Lecture: 72 hrs; Practical: 36 hrs; Total: 108 hrs

Distribution of Hours	Theory	Practical
Cell biology	25 hrs	12 hrs
Genetics	36 hrs	24 hrs
Evolutionary biology	11 hrs	00 hrs
Total	72 hrs	36 hrs

Aim of the course: To familiarize cellular organelles, Classical Genetics and importance of Evolution.

Objectives:

- To create awareness about cellular organelles.
- To develop skills to identify cell stages and workout problems in classical genetics.
- To introduce different theories of evolution

Expected outcome

- Students have a better understanding of cell structure and cell organelles
- Prepare microslides of cell divisions and identify various stages of mitosis and meiosis
- Able to workout problems in classical genetics, modified mendelian ratios and population genetics
- Able to understand genetic diseases and their inheritance
- Understand evolutionary principles, theories and methods of speciation

MODULE-I

Cell Biology **25hrs**

1. History and progress of cell biology
2. Ultra structure and functions of the cell components and organelles Cell wall; The cell membrane, Endoplasmic reticulum, Ribosomes, Golgi apparatus, Lysosomes, Peroxisomes, Vacuole, Mitochondria, Chloroplast & Nucleus.
3. The chromosomes- Chromosome morphology- Eukaryotic chromosomes and its organization. Chromatin - composition and structure; hetero chromatin and euchromatin; Chemical organization. Nucleoproteins – histones and non –histones. Nucleosome model of DNA organization.
4. Special types of chromosomes- Salivary gland, Lamp brush and B chromosomes
5. Variation in Chromosome number (Numerical aberrations)- anueploidy and Euploidy- haploidy, polyploidy- significance
6. Variation in Chromosome structure (Structural aberrations) - deletion, duplication,

inversion and translocation;significance

7. Mitosis and Meiosis. cell cycle : Significance of mitosis and meiosis

Practical **12hrs**

1. Make acetocarmine squash preparation of onion root tip and to identify different stages of mitosis.
2. Make squash preparation of the flower buds of any of the following plants. *Rhoeo,Capsicum* (To identify Meiosis) Demonstration only

MODULE-II

ClassicalGenetics **36hrs**

1. Mendelian Genetics- Mendel and his experiments, Mendel's success, Mendelian principles, Mendelian ratios, monohybrid and dihybrid crosses, back cross and testcross
2. Genetics after Mendel- Modified Mendelian ratios; Incomplete dominance –Flower color in Mirabilis ; Interaction of genes- Comb pattern in poultry. 9:3:3:1. Epistasis - Recessive. Coat color in mice. 9:3:4; Dominant epistasis. Fruit colour in summer squash. 12:3:1; Complementary genes. Flower color in *Lathyrus* 9:7; Duplicate gene with cumulative effect. Fruit shape in summer squash. 9:6:1; Duplicate dominant genes in shepherd's purse. 15:1; Inhibitory factor. Leaf color in Paddy.13:3
3. Multiple alleles-General account. ABO blood group in man. Rhfactor.
4. Quantitative characters- General characters of quantitative inheritance, polygenic inheritance; Skin color in man, ear size in Maize.
5. Linkage and crossing over- Linkage and its importance, linkage and independent assortment. Complete and incomplete linkage. Crossing over – a general account, two point, three point cross. Determination of gene sequence. Interference and coincidence. Mapping of chromosomes.
6. Sex determination- Sex chromosomes, chromosomal basis of sex determination XX-XY, XX-XO mechanism. Sex determination in higher plants (*Melandrium album*) Sex chromosomal abnormalities in man. Klinefelter's syndrome, Turner's syndrome. Sex linked inheritance. Eye colour in *Drosophila*, Hemophilia in man.
7. Extra nuclear inheritance General account, maternal influence. Plastid inheritance in *Mirabilis*. Shell coiling in snails, kappa particle in *Paramecium*.

Practical **24hrs**

Work out problems in

1. Monohybrid cross (Dominance and incomplete dominance)
2. Dihybrid cross (Dominance and incomplete dominance)
3. Gene interactions (All types of gene interactions mentioned in the syllabus)
   a. Recessive epistasis 9: 3: 4.
   b. Dominant epistasis 12: 3:1
   c. Complementary genes 9:7
   d. Duplicate genes with cumulative effect 9: 6:1
   e. Inhibitory genes 13:3
   f. Duplicate dominant gene 15: 1
   g. Comb pattern in poultry 9:3:3:1
   h. Multiple alleles

4. Linkage and crossing over
5. Two point and three point crosses
6. Construction of genetic map.

MODULE-III

Evolutionary Biology **11hrs**

1. Progressive and Retrogressive evolution.
2. Parallel and Convergent evolution.
3. Micro and Macro evolution.
4. Theory of Lamarck, Wiesman and De Vries, Darwinism, Neo-Darwinism
5. Isolation, Mutation, Genetic drift,Speciation
6. Variation and Evolution – Hybridization and Evolution – Polyploidy and evolution– Mutation and Evolution.

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SEMESTER-VI

PLANT PHYSIOLOGY AND BIOCHEMISTRY

Course code : BO 1641Number of Credits : 4

Number of contact hours: Lecture: 90 hrs; Practical: 36 hrs; Total: 126 hrs

Distribution of Hours	Theory	Practical
Plant Physiology	60 hrs	20 hrs
Biochemistry	30 hrs	16 hrs
Total	90 hrs	36 hrs

Aim of the course: To create awareness about physiological and biochemical aspects of growth & metabolism

Objectives:

- To understand physiology of absorption, photosynthesis and respiration.
- To study physiological responses in growth, movements and flowering of plants
- To generate awareness about biomolecules.
- To develop skill for testing of biomolecules

Expected outcome of the Course

- Students get a clear understanding of the basic concepts of Physiology and Biochemistry.
- Understands photosynthesis, respiration, plant growth regulators, nitrogen metabolism, and stress physiology
- Familiarization of basic physiological practical procedures.
- Students get the basic knowledge about the macromolecules and their overall role in cell metabolism; and secondary plant products.
- Identification of protein, reducing and non reducing sugar by qualitative tests.

MODULE-I **20hrs**

1. General introduction: physiological processes, their significance and applications.
2. Water relations of plants: Importance of water to plant life.
   a. Absorption of water- organs of absorption, root and root hair. Physical aspects of absorption- imbibition, diffusion and osmosis. Plant cell as an osmotic system; water potential and osmotic potential. Plasmolysis and its significance, practical applications. Mechanism of water absorption – active and passive absorption, Pathway of water across root cells.
   b. Ascent of sap- vital theory, root pressure and physical theories (transpiration pull)
   c. Loss of water from plants:transpiration-cuticular,lenticular and stomatal mechanism

- Theories – starch sugar hypothesis, potassium - ion theory. Significance of transpiration - guttation, anti-transpirants, factors affecting transpiration.

3. Mineral nutrition: Gross chemical analysis of the plant body, ash analysis, criteria for essentiality of elements, macro and micro elements, role of essential elements and their deficiency symptoms. Culture methods - hydroponics and aeroponics. Mechanism of mineral absorption (a) passive absorption- ion exchange and Donnan equilibrium (b) active absorption- carrier concept, Lundegardh hypothesis.

MODULE-II **20hrs**

1. Photosynthesis: Introduction, significance and general equation; Photosynthetic apparatus, structure and function of chloroplast, quantasomes - solar spectrum and its importance - Fluorescence and phosphorescence; Red drop, Emerson effect; Two pigment systems; raw material for photosynthesis; Mechanism of photosynthesis- Light reaction - cyclic and non cyclic photophosphorylation; Hill reaction - Dark reaction: Calvin cycle; Comparative study of C3, C4 and CAM plants; Photorespiration, Bacterial photosynthesis and chemosynthesis (Brief account only)
2. Factors affecting photosynthesis - Law of limiting factor.
3. Respiration: Introduction, definition and significance and general equation. Respiratory substrate, types of respiration- aerobic and anaerobic. Aerobic respiration - glycolysis, Krebs's cycle, terminal oxidation. Anaerobic respiration – fermentation: alcoholic and lactic acid fermentation. Energy relation of respiration - R .Q and its significance - Factors affecting respiration.

MODULE-III **20hrs**

1. Translocation of solutes: Path way of movement, phloem transport, mechanism of transport - Munch hypothesis, protoplasmic streaming theory - activated diffusion hypothesis, electro osmotic theory.
2. Nitrogen metabolism: Source of nitrogen - Biological nitrogen fixation – symbiotic and asymbiotic. Nitrogen fixation by blue green algae - rotation of crops. Nif genes - Leghaemoglobin.
3. Growth: Phases of growth - vegetative and reproductive growth - growth curve - plant growth regulators - Auxins, Gibberellins, Cytokinins, Ethylene, Abscissic acid - synthetic plant hormones - practical applications. Senescence and abscission, Photoperiodism, Photoreceptors – Phytochrome and Cryptochrome
4. Vernalization - Physiology of bud and seed dormancy, germination.
5. Plant movements: Tropic and nastic movements. Circadian rhythm and biological clock.
6. Stress physiology: water stress, salt stress.

Practical **20hrs**

1. Water potential of onion peel / *Rhoeo* peel by plasmolytic method.
2. Imbibition of water by different types of seeds.
3. Effect of temperature on permeability.
4. Papaya petiole osmoscope.
5. Determination of stomatal index.
6. Determination of water absorption and transpiration ratio.

7. Measurement of rate of transpiration using Ganong's potometer or Farmer'spotometer.
8. Evolution of oxygen during photosynthesis.
9. Light screen experiment
10. Measurement of photosynthesis by Wilmott's bubbler.
11. Evolution of CO_2 during respiration.
12. Ganong's respirometer and measurement of R.Q
13. Alcoholic fermentation using Kuhn's fermentation vessel
14. Geotropism using clinostat
15. Measurement of growth using Arc auxanometer.

MODULE-IV

Biochemistry **15hrs**

1. Molecules and life.
2. Carbohydrates - Classification, occurrence, structure and functions of monosaccharides (glucose and fructose), oligosaccharides (sucrose and maltose), polysaccharides (starch and cellulose), synthesis of glycosidic bonds – Enzymatic hydrolysis of glycosidic bonds – amylases and invertases.
3. Amino acids- classification based on polarity, structure - Amphoteric property of Aminoacids, Peptide formation; Amino acid metabolism- reductive amination and transamination
4. Proteins – Structure, classification, properties and function; Role of bonds in stabilizing protein structure - hydrolysis of proteins.

MODULE-V **15hrs**

1. Lipids- classification – Simple lipids- fats & oils, waxes; Compound lipids- phospholipids, sphingolipids and glycolipids; Derived lipids- Cholesterol and terpenes; Fatty acids – Alpha- oxidation and Beta-oxidation; Synthesis of ester bonds.
2. Enzymes - general account - structure, classification and nomenclature (recommended by Commission on Enzymes); Mechanism of enzyme action - inhibition of enzymes - regulation of enzymes - allosteric inhibition - Isoenzymes, coenzymes and cofactors
3. Secondary Plant Products – Introduction – classification and function [General account], Phytochemicals- Alkaloids, terpenoids, phenolics, flavonoids

Practical **16hrs**

1. Qualitative test for carbohydrates - Molisch's test, Benedict's test (for reducing sugar)
2. Iodine test for starch
3. Test for proteins – Biuret test

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SEMESTER-VI

MOLECULAR BIOLOGY, GENERAL INFORMATICS &BIOINFORMATICS

Course code : BO 1642Number of credits : 4

Number of contact hours: Lecture: 72 hrs; Practical: 36 hrs; Total: 108 hrs

Distribution of Hours	Theory	Practical
Molecular Biology	36 hrs	9 hrs
General informatics	18 hrs	9 hrs
Bioinformatics	18 hrs	18 hrs
Total	72 hrs	36 hrs

Aim of the course: To develop knowledge about molecular biology of genetic material and gene expression along with information technology and biological databases

Objectives:

- To generate awareness of genetic material and gene expression.
- To get an overview of information technology
- To develop skill for using internet, biological databases and molecular visualization tools

Expected outcome

- Understands DNA as genetic material, develops awareness about chemical composition and different types of DNA including their replication method.
- Students understand various molecular aspects of gene expression and regulation of genes
- Develops awareness about various academic services applied for their studies
- Awareness about features of a computer, different application and system software.
- Recognizes the need for safe use of internet and also become aware about health issues related to over usage of computers and mobile phones as well as cyber crimes and cyber laws.
- Students will be familiarized to molecular phylogeney, Biological Databases, Sequence analysis, Genomics, Proteomics & Comparative genomics

MODULE-I

MolecularBiology **36hrs**

1. DNA as genetic material- experimental evidence- Griffith's experiment on Bacterial transformation, Avery's experiment, Hershey-Chase Experiment.
2. DNA- Chemical Composition, Chargaff's rules, molecular structure of DNA-Watson & Crick's Double Helical Model of DNA, Salient features of double helix, Biological Significance of Double Helical Model of DNA; Forms of DNA - A, B and Z forms; Satellite and repetitive DNA
3. Replication of DNA in prokaryotes- An overview, General principles and features, Semi conservative model- Meselson and Stahl experiment; Leading strand and lagging strand synthesis, Okazaki fragments, replication fork and origin of replication; Unidirectional and Bidirectional replication; Replisome. Enzymology of replication: topoisomerase, helicase, primase, polymerase and ligase; DNA repairing mechanism-photoreactivation.

Replication of DNA in eukaryotes (brief account only).

4. RNA structure- Structure, Properties and functions of tRNA, mRNA and rRNA; Genetic code.
5. Synthesis of protein: Transcription in prokaryotes; Transcription in Eukaryotes and post transcriptional modification of mRNA - introns, exons, removal of introns, spliceosome; Capping and Tailing;
6. Translation in prokaryotes; Translation in Eukaryotes (Brief account only); Central dogma-reverse transcription
7. Concept of gene-Units of a gene, cistron, recon, muton – Modern concept of gene; Types of genes- House keeping genes (constitutive genes), Luxury genes (non constitutive genes), overlapping genes.
8. Regulation of gene expression in prokaryotes and eukaryotes- lac operon; transcriptional gene regulation in eukaryotes-promoters, enhancers, transcription factors; RNA interference, epigenetics-DNA methylation (brief account only).
9. Transposable genetic elements- General account, Characteristic, Transposons (jumping genes), Cellular oncogenes and tumour suppressor genes (general account only).

Practical **9hrs**

1. Study of semi-conservative replication of DNA through micrographs/ schematic representations.
2. Practice problems in molecular biology based on DNA structure and replication

Module-II

General Informatics **18hrs**

1. Knowledge skill for Higher Education**:** Data information and knowledge, knowledge management- Internet as a knowledge repository, academic search techniques, creating your cyber presence, open access initiatives, open access publishing models, basic concepts of IPR, copy rights and patents, plagiarism, introduction to use of IT in teaching and learning, educational software (MS Excel), brief account of educational platforms (MOODLE, Google Classroom, SWAYAM), Academic services-INFLIBNET, NICNET and BRNET.

2. Social Informatics**:** IT and Society- issues and concerns- digital divide, IT and development, new opportunities and new threats, Cyber ethics, Cyber crime, Security, privacy issues, cyber addictions, Information overload, Health issues, guidelines for proper usage of computers, internet and mobile phones. Localization issues-IT and Regional languages-IT for the disabled, the free software debate. IT for Biodiversity Documentation - iNaturalist.

Practical **9hrs**

1. Prepare a table of the mark list of students in a class using MS Excel
2. Prepare a line diagram and bar diagram using MS Excel
3. Calculate Mean and Standard deviation of a given data using statistical functions of MS Excel
4. Students should be familiar to MOODLE, SWAYAM, INFLIBNET, NICNET and BRNET

Module-III

Bioinformatics **18hrs**

1. Introduction: Definition, Origin of concept of Bioinformatics; Brief history, Importance of bioinformatics, Wet lab and Weblab.
2. Basics of Genomics, Proteomics & Comparative genomics
3. Biological databases:
   - Nucleic acid databases (Eg: EMBL, Gen Bank, DDBJ)
   - Protein sequence databases. Eg: PIR, SWISS PROT,UNIPROT
   - Brief account on Model/organism databases, Biodiversity data bases
   - Protein structure databank- PDB
4. Gene sequence, Sequence analysis and alignment (brief account only), Pair wise sequence alignment, multiple sequence alignment, Sequence Alignment Tools: BLAST, CLUSTAL X
5. Bioinformatics in relation to Biomolecular structure.
6. Molecular visualization- use of Rasmol
7. Molecular Phylogeny and Phylogenetic trees- Advantages of Molecular phylogeny and phylogenetic analysis- PHYLIP

Practical **18 hrs**

1. Molecular visualization using Rasmol
2. Blast Search
3. Students should access Gene databases, download and take a print out of any one of gene sequences
4. Students are expected to work with at least any one of the commercial / scientific packages, to explore the WEB and able to find, recognize, download, install and use software in various areas useful to the research in Biology.
5. Students should be familiar with various databases (Nucleic acid and protein sequence and structure data bases)

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WEB RESOURCES

- ✓ www.fgcu.edu/support/office2000
- ✓ www.openoffice.org *Open office officialwebsite*
- ✓ www.microsoft.com/office *MS Officewebsite*
- ✓ www.lgta.org *Office onlinelessons*
- ✓ www.learntheneth.com *WebPrimer*
- ✓ www.computer.org/history/timeline
- ✓ www.computerhistory.org
- ✓ http://computer.howstuffworks.com
- ✓ http://vmoc.museophile.org *Computerhistory*
- ✓ www.dell.com *DellComputers*
- ✓ www.intel.com*Intel*
- ✓ www.ibm.com*IBM*
- ✓ www.keralaitmission.org *Kerala Govt. ITDept.*
- ✓ www.technopark.org
  www.studentworkzone.com/question.php?ID=139

SEMESTER-VI

BIOTECHNOLOGY, NANOBIOTECHNOLOGY, HORTICULTURE & PLANT BREEDING

Course code : BO 1643Number of credits : 4

Number of contact hours: Lecture: 72 hrs; Practical: 36 hrs; Total: 108 hrs

Distribution of Hours	Theory	Practical
Biotechnology	27 hrs	18 hrs
Nanobiotechnology	07 hrs	00 hrs
Horticulture	18 hrs	09 hrs
Plant breeding	18 hrs	09 hrs
	72 hrs	36 hrs

Aim of the course: To introduce horticultural techniques and plant breeding along with awareness in research methodology

Objectives:

- To introduce plant biotechnology, tissue culture and rDNA technology
- To give insight into applications in industrial biotechnology and nano biotechnology
- To get an awareness in principles and methods of gardening
- To understand plant breeding techniques and develop skill for hybridization.
- To get knowledge about research methodology and preparation of projects

Expected Outcome

- Students are familiarized in preparation of culture solutions, sterilization, inoculation of explants, induction of callus and morphogenesis
- They are familiarized in biotechnological tools like RFLP, RAPD and PCR
- techniques
- Appreciate the application of equipments and tools in biotechnology
- Understanding of ethical and legal issues in biotechnology and basic knowledge
- about IPR
- Better understanding of nanosystems, and applications of nanomaterials
- Students able to identify and use various horticultural implements
- Can propagate plants through grafting, budding and layering &can prepare
- manures, fungicides etc
- Can effectively do plant breeding methods and understands ttheir practical
- application in betterment of food crops

MODULE-I

Biotechnology **08 hours**

1. Introduction – History- major achievements-Biotechnology in India.
2. Plant Tissue culture – Totipotency- definition and importance – dedifferentiation, redifferentiation and Cytodifferentiation.
3. Equipments and other requirements in tissue culture laboratory – instruments, tools, glass wares
4. Sterilization- Explants, equipments and medium

5. Culture media-MS Medium, composition and preparation
6. Micropropagation – steps -Innoculation – Subculture, Callus and suspension culture, meristem culture
7. Somaclonal variation- Somatic embryogenesis and organogenesis.
8. Production of haploids – pollen culture, anther culture – protoplast culture – somatic hybrids – cybrids - Synthetic seeds

MODULE-II **07 hours**

Recombinant DNAtechnology:

1. General account of cloning vehicles – plasmid (PBR 322), bacteriophages (λ phage), Brief account of cosmids and phagemids. Cutting and joining of DNA molecules – restriction endonucleases, ligases – Gene library.
2. Brief account of gene transfer techniques – Direct DNA uptake by protoplast –vector method *Agrobacterium* mediated, physical method- electroporation- shot gun method – microinjection.

MODULE- III **08 hours**

1. Methods inBiotechnology.
    a. Isolation and purification of DNA from plant cells.
    b. Agarose gel electrophoresis
    c. PCR, DNA sequencing-Sanger's method, Southern blotting, ELISA.
    d. Molecular markers – RAPD, RFLP
2. Application of biotechnology in
    a. Medicine – edible vaccines from plants, genetherapy.
    b. Agriculture –Genetically modified crops – Bt Cotton, Golden Rice, Flavr Savr tomato
    c. Bioremediation using genetically modified organisms- marine oil spills
3. Biosafety and ethical issues, Intellectual Property Rights (IPR) in recombinant DNA technology.

MODULE- IV

Microbial and Industrial Biotechnology **06hours**

1. Microbes in Biotechnology.
2. Bioreactor – Chemostat and Turbidostat
3. Industrial microbiology: Production of alcohol, vinegar, bread, dairy products & single cell protein (brief account only)

MODULE- V

Nanobiotechnology **07hours**

1. Introduction-background and definition of nanotechnology
2. Nanosystems in nature - Subcellular components
3. Nanoscaled biomolecules (nucleic acids and proteins)
4. Synthesis of nanomaterials – Physical, Chemical and Green synthesis
5. Technologies for visualization of biological structures at the nano scale-atomic force microscope
6. Nanoparticles- Quantum dots, Paramagnetic iron Oxide Crystals, Dendrimers, Carbon nanotubes.
7. Application of nanotechnology in lifesciences; Biosensors

Practicals **18 hours**

1. Visit to a well equipped biotechnology laboratory to familiar with the use of equipments and glasswares. Petri dishes, conical flasks, culture tubes, Pasteur pipettes, forceps, scalpels, hot air oven, autoclave, platform shaker, pH meter and laminar air flowsystem.
2. Preparation of media, sterilization, inoculation and callus induction (demonstration only).
3. DNA isolation from plant tissues (Demonstration only)
4. Familirizing students to equipments like PCR, gel electrophoresis
5. General awareness of Bioreactor
6. Awareness of Genetically modified plants (Bt cotton, Golden rice, Flavr Savr tomato).

MODULE- VI

Horticulture **10hrs**

1. Introduction - Divisions of horticulture- Importance and scope of horticulture.
2. Principles of garden making- types of pots and containers- Potting mixture and potting media – soil, sand, peat, sphagnum moss, vermiculite- Soil types, Soil preparation- Irrigation methods
3. Propagation methods- Cuttings, Layering – Air layering, Ground layering (Tip, Trench and Compound), Budding – T- budding, Grafting – Approach grafting, Bridge grafting, whip and tongue grafting.
4. Garden tools and implements- Lawn mower, hand trowel, nursery spade, spade fork, garden hoe, weeder,tillers
5. Manures and fertilizers- Farmyard manure, compost, vermicompost and biofertilizers; Chemical fertilizers – NPK; Time and application of manures and fertilizers- Foliar sprays
6. Irrigation Methods–Surface, Drip irrigation, Sprinkler irrigation

MODULE- VII **8hrs**

1. Components of Garden- Landscaping principles; Lawns, Trees, shrubs and shrubberies, climbers and creepers, Flower beds and borders, ornamental hedges, edges, Drives, roads, walks and paths, Carpet beds, topiary, trophy, rockery, Conservatory or green houses
2. Indoor garden, Roof garden (Brief account only)
3. Bonsai
4. Flower Arrangement- Containers and requirements for flower arrangements- Free style, Shallow and Mass arrangement- Japanese- Ikebana. Dry flower arrangement

Practical **09 hrs**

1. Familiarise the garden tools and implements mentioned in the syllabus
2. Students must be trained to do Cutting/ layering/ grafting/budding.
3. Visit to a Botanical garden under the guidance of the teacher is recommended

MODULE-VIII **18 hrs**

Plant breeding

1. Introduction, objectives in plant breeding- - Important national and international plant breeding Institutes
2. Plant introduction. Agencies of plant introduction in India, Procedure of introduction - Acclimatization -Achievements.
3. Selection - mass selection, pure line selection and clonal selection. Genetic basis of selection andmethods.

4. Hybridization: Procedure of hybridisation, inter generic, inter specific, inter varietal hybridisation with examples. Composite and synthetic varieties.
5. Heterosis and inbreeding depression- genetic basis; male sterility
6. Mutation breeding – method – achievements in India.
7. Polyploidy breeding
8. Breeding techniques and achievements with reference to the following crops in India: (a). Rice (b). Wheat (c).Potato (d).Coconut

Practical **09 hrs**

1. Techniques of emasculation and hybridization of any bisexual flower.

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32. Manibhushan Rao K (2005). Text Book of Horticulture, Macmillan Publications
33. Shujnrnoto, (1982). The Essentials of Bonsai, David & Charles ,Newton
34. Singh B D (2015).Plant Breeding, Kalyni publishers

OPEN COURSES

Offered to the students of other disciplines choosing Botany open course

Semester	Course Code	Title of the Course	Contact hrs/week	Credits
V	**BO1551.1**	**Horticulture**	**3**	**2**
	BO1551.2	**Mushroom Cultivation and Marketing**		
	BO1551.3	**Forestry**		

INDUSTRY BASED ELECTIVE COURSES

Offered to the students of Botany

Semester	Course Code	Title of the Course	Contact hrs/week	Credits
VI	**BO 1661.1**	ORGANIC FARMING	**3**	**2**
	BO 1661.2	MUSHROOM CULTURE TECHNOLOGY	**3**	**2**
	BO 1661.3	NURSERY AND GARDEN MANAGEMENT	**3**	**2**
	BO 1661.4	MEDICINAL BOTANY	**3**	**2**

OPEN COURSE –I (a)

HORTICULTURE

Course code : BO1551.1 **Number of credits : 2**

Number of contact hours : Lecture: 54 hrs

Aim of the course: To develop knowledge about principles of gardening, propagation and flower arrangement

Objectives:

To introduce horticultural methods
To familiarize propagation methods in plants.
To study types of gardens and flower arrangements

Expected outcome

- Students are familiarized in horticulture implements and methods of gardening
- Better understanding of commercial horticulture, flower arrangement, cut flowers
- Can undertstand about land scaping, fertilizers and Plant protection

MODULE–I **10hrs**

1. Introduction
2. Divisions of horticulture
3. Importance and scope of horticulture.
4. Principles of garden making
5. Types of pots and containers
6. Potting mixture and potting media – soil, sand, peat, sphagnum moss, vermiculite
7. Soil types, Soil preparation
8. Irrigationmethods- drip irrigation and sprinkler irrigation
9. Hydroponics

MODULE–II **12hrs**

1. Propagation methods
    a. Cuttings- root, stem, leaf
    b. Layering – Air layering, Ground layering (Tip, Trench andCompound)
    c. Budding – T-budding
    d. Grafting – Approach grafting, Bridge grafting, whip and tongue grafting.
2. Garden tools and implements
3. Manures and fertilizers
4. Farmyard manure, compost, vermicompost and biofertilizers.
5. Chemical fertilizers –NPK.
6. Time and application of manures and fertilizers.
7. Foliar sprays

MODULE- III **12hrs**

1 Components of Garden
2. Lawns and landscaping Trees, shrubs and shrubberies, climbers and creepers
3. Flower beds and borders,ornamental hedges,edges, Drives, roads, walks and

paths , Carpet beds, topiary, trophy,rockery

4. Conservatory or green houses, Indoor garden, Roof garden
5. Bonsai

MODULE- IV **12hrs**

1. Flower Arrangement -Containers and requirements for flower arrangements Free style, Shallow and Mass arrangement, Japanese –Ikebana
2. Bouquet and garland making
3. Dry flower arrangement
4. Harvesting Methods- Anthurium and Orchid &Storage
5. Marketing of Fruits, vegetables and flowers
6. Preservation and processing of fruits and vegetables

MODULE- V **8hrs**

1. Growth regulators in horticulture
2. Rooting hormones , Growth promoters , Flower induction ,Parthenocarpy
3. Common diseases of Mango and Tomato
4. Plant protection- Weedicides, Fungicides, Pesticides

Field Study: Visit to a Botanical garden under the guidance of the teacher is encouraged.

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2. Bailey L.H (1901). The Standard Cyclopaedia of Horticulture Volume 1,2 and 3, Macmillan Publications.
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10. Singh J (2017) Fundamentals of Horticulture, Kalyani publishers

OPEN COURSE -I (b)

MUSHROOM CULTIVATION AND MARKETING

Course code : BO1551.2 Number of credits : 2

Number of contact hours : Lecture: 54 hrs

Aim of the course: To create awareness about cultivation methods for mushroom and its economic aspects

Objectives:

- To get knowledge about nutritional and medicinal values of mushrooms
- To understand methods of mushroom cultivation.
- To give insight into the economic significance of mushroom cultivation

Expected outcome

- **Identify mushrooms, structure and mode of propagation**
- **Understand commercial mushroom cultivation, marketing and their nutritional value**
- **Better understanding of methods of processing and storage of mushrooms**

MODULE- I **12hrs**

- History and introduction: Edible mushrooms and Poisonous mushrooms.
- Systematicposition, morphology, distribution, structure of *Agaricus*and *Pleurotus.*

MODULE- II **08hrs**

Nutritional value, medicinal value and advantages- types- milky, straw, button and poisonous mushrooms

MODULE- III **12hrs**

1. Cultivation: Paddy straw mushroom – substrate, spawn making. Methods – bed method, polythene bag method, field cultivation.
2. Oyster mushroom cultivation –Substrate, spawning, pre-treatment of substrate. Maintenance of mushroom.
3. Cultivation of white button mushroom – Spawn, composting, spawning, harvesting.

MODULE- IV **12hrs**

1. Diseases- Common pests, disease prevention and control measures- *Agaricus, Pleurotus* and *Volverilla*.
2. Processing - Blanching, steeping, sun drying, canning, pickling, freeze drying.
3. Storage – short term and long term storage.

MODULE–V **10hrs**

1. Common Indian mushrooms.
2. Production level, economic return, Foreign exchange from Mushroom cultivating countries and international trade.

Field Study: Visit to a Laboratory engaged in mushroom cultivation

REFERENCES

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OPEN COURSE -I (c)

FORESTRY

Course code : BO1551.3 **Number of credits : 2**

Number of contact hours : Lecture; 54 hrs

Aim of the course: To enlighten students about forest types and forest produce

Objectives:

- To get a knowledge about types of forest and sylviculture
- To get knowledge about forest produce
- To understand agroforestry

Expected outcome

- Identification of forest types,Forest products and their utilisation and common forest trees of Kerala
- Undertanding timber yielding plants and methods of identification of timber
- Understanding of germination of seeds of forest trees, methods to break dormancy of seeds, forest act and methods of preserving forests
- Get knowledge about silviculture and Social forestry
-

MODULE - I **10hrs**

1. General introduction to forests- Types of Forest- Natural and Manmade; Tropical, temperate, evergreen semi- evergreen, deciduous; Monoculture, multipurpose, social and industrial. Forest and gene conservation.

MODULE - II **16hrs**

1. Silviculture- concept and scope of study of natural and artificial regeneration of forests. Clear felling, uniform shelter, wood selection, coppice and conservation systems. Silviculture of some of the economically important species in India such as *Azadirachta indica, Tectona grandis, Eucalyptus indica, Swietenia mahagoni, Dalbergia sisso* and *Santalum album, Artocarpus heterophyllus, Hevea brasiliensis*.
2. Wood: Homogenous and heterogenous- spring and autumn wood- Porous and non porous wood- Heart and sap wood.
3. Relevance of wood anatomical studies in Kerala- Identification of wood- preparation of key and theiruses

MODULE - III **10hrs**

1. Social and agro forestry. Selection of species and role of multipurpose trees. Food, fodder and energy.
2. Social forest- Avenue plantation. Sacred plants- definition, importance of sacred trees like *Ficus religiosa, Emblica officinalis, Aegle marmelos.*

MODULE - IV **09hrs**

1. Seed orchards, seed dormancy- Types of dormancy, physical and chemical methods to overcome seed dormancy.

2. Forest laws- necessity, General principles, Indian forest act 1927 and their amendment.

MODULE - V **09hrs**

1. Forest resources and utilization. Forest products- timber, pulp wood, secondary timbers, non timber forest products (NTFPs).
2. Definition and scope (brief outline) - Gums, resins, fibers, oil seeds, nuts, rubber, canes and bamboos, medicinal plants, charcoal. Lac collection and marketing.

Field Study

1. Identification of wood using key: Teak, Jack wood, Mahogany, Rubber, *Azadirachta*, Eucalyptus.
2. Visit to a plywood factory to have knowledge of wood based industry.

REFERENCES

1. A Hand book of Kerala Timbers- KFRI, Trichur.
2. Anil Kumar Dhiman. (2003). Sacred plants and their medicinal uses. Daya publishing house, NewDelhi
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SEMESTER-VI

INDUSTRY BASED ELECTIVE COURSE (a)
ORGANIC FARMING

Course code : BO1661.1 **Number of credits : 2**

Number of contact hours : Lecture - 36 hrs and Practice - 18 hrs

Aim of the course: To introduce students to agriculture industry and familiarize students to the potential of Organic farming

Sector / Industry - Agriculture, Companies dealing with production of Biofertilizer/Biopesticide/organic manure

Placement opportunities – Students can start organic farming initiatives, can lead export of organic farm produce, can get inducted in Biofertilizer/Biopesticide/organic manure preparation and marketing companies

Unique Skills – Learn the basic principles of organic farming, preparation of organic manures, biopesticides and biofertilizers

Course outcome –

1. Students will understand the ancient agricultural practices and protect the environment from the recent indiscriminate, avaricious anthropogenic onslaughts that the extent of damage done is at least be mitigated.
2. Students can assess the advantages of organic farming with as an alternative to use of anthropogenic chemicals that biofertilizers and natural means of crop protection including the advocacy of IPM can ensure profitable farming.
3. Students can analyse the various forms of microbes as suppliers of organic nutrients, including nitrates, phosphates enriching the soil that would eventually have a bearing on the methods of cultivation with enhanced nitrogen supply.
4. Students apply the knowledge of using biopesticides without harming the co- living microbiota and life forms in the ecosystem and understand that the use crop protection chemicals can be avoided to safe guard environment.
5. Students will use the acquired knowledge needed to prepare eco friendly commercial formulations meeting national and international standards and regulations and float newer entrepreneurial ventures

Module I. **8 hr**

1. Organic farming definition, Principles and practices of organic farming.Need of organic farming. Types. (Integrated organic farming, Pure organic farming,). Zero Budget Natural Farming (ZBNF), advantages and disadvantages of organic farming
2. Introduction to Agriculture: Domestication of plants – early agricultural practices– inter cropping and crop rotation, major cultivated crops and vegetables in India (Brief description about Rice, wheat, Maize, Brinjal, Ladies finger, Vigna, and Tomato)

Module II. **10 hrs**

1. Organic matter management in agricultural fields , – plant health – sustainable agriculture– supplementation of NPK as bioresource – vermicomposting –mulching, green manure – terrace and kitchen garden
2. Soil: Definition; Soil formation; Composition and characteristics; Types of soil according to composition; Acidic, Alkaline and Saline soils; Effect of soil types on Agriculture; Method of reclamation;
3. Soil productivity: Meaning and Concept. Difference between Soil Fertility and Productivity; Method of Increasing productivity and fertility, importance of microbes in the enrichment of soil fertility. Role of VAM as growth regulator. Drip irrigation, Mulching, Realationship between soil fertility and soil pH

4. Organic Agri-Horticulture in Urban and rural areas ,Value addition in organic products – government policies

Module III. **18 hrs**

1. Biofertilizers: Scope, application, types – mass cultivation of Biological nitrogen fixers – Blue green algae – Rhizobium, Azolla – Phosphate solubilizing bacteria , – Mycorrhiza – cost-benefit analysis.and Protection Measures: Integrate pest and disease managements.
2. Organic pesticides, bio-pesticides- Types and benefits. Microbial biopesticides, and its advantages (*Trichoderma, Pseudomonas fluorescence, Bacillus thuringiensis*) Inorganic pesticides, disadvantages of their use.
3. Seed, seedling and soil Treatment measures. Feasibility of complete dependence on organic sources.
4. Biogas slurry- Organic content. Status of Biogas Usage, benefits and significance. Pipe compost- installation and benefits
5. Economics of organic products- cost of production and financial benefits to cultivator. Good Harvesting Practices; Storage; Transportation; Supply Chain. Need of certification and quality assessment of organic produce.

Modules IV.Practices or field knowledge. **18 hr**

1. Preparation of two organic manure using locally available sources. (cow dung, cow urine , leaves, coir pith, bone dust , etc) .prepare a report with its methodlogy.
2. Preparation of one biopesticide and study its effect on pest .
3. Internship : Visit to the fields where the organic farming practice takes place and work in association with farmers and get a certificate from the farmer (report the activities with photographs).
4. Local survey to find out cost benefit ratio of organic products- small project based on local organic farming and marketing.

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SEMESTER-VI

INDUSTRY BASED ELECTIVE COURSE (b)

MUSHROOM CULTURE TECHNOLOGY

Course code : BO1661.2 **Number of credits : 2**

Number of contact hours : Lecture - 36 hrs and Practice - 18 hrs

Aim of the course: To introduce students to Mushroom cultivation, post harvest storage, value addition and marketing

Sector / Industry - Mushroom cultivation and marketing industry

Placement opportunities – Students may get absorbed in Mushroom production and processing industries. Also the students may become entrepreneurs to start their own small scale mushroom cultivation units.

Unique Skills – Students will learn the technicalities of cultivation, Harvesting, Value addition, packaging and marketing of mushroom.

Expected Course outcome

- At the end of the course, the students will be able to
- Developing skills in identifying locally available common mushrooms, distinguish between edible and non-edible mushrooms.
- Analyze the pest and growth limiting factors affecting growth of mushroom.
- Develop new skills and technologies of growing mushroom among college students.
- Developing skills in making value added products from mushrooms.
- Raise linkages to increase employment opportunities and generating income.

Module I. **(10hrs)**

Introduction

Definition of a Mushroom – Introduction-History and Scope of mushroom cultivation - Nutritional value of mushrooms, Economic value of various mushrooms - Edible and Poisonous Mushrooms- Popular mushrooms - Edible, poisonous, medicinal, hallucinogenic mushrooms – SMEs cultivating mushroom.

Module II **(10 hrs)**

Cultivation of Mushroom:

Common cultivated varieties of Mushrooms- Morphological characters and taxonomical position of *Agaricus, Calocybe, Pleurotus, Volveriella* and *Lentinula*, Life cycle of *Agaricus*- Tray method for large cultivation – Packet method for small scale cultivation-Mushroom Pure culture Development - Production of mother spawn and multiplication of spawn - composting technology - Different cultivation substrates -Beds preparation - compost making – casing of soil, Pest and environmental control.

Module III **(16 hrs)**

Cultivation Units

Spawn production Units-structure and requirements, Structure and construction of mushroom house - Budget for mushroom cultivation unit - maintenance of sanitation in mushroom house – common contaminants, Waste management and recycling in mushroom cultivation Harvesting method - Asepsis- Preservation of mushrooms - Blanching, steeping, sun drying, canning, pickling, freeze drying; Storage - short term and long term storage; Grading, packaging- quality assurance of mushrooms- Labelling, Developing value added products- Dried mushroom – Mushroom Pickle- Mushroom soup powder – Mushroom candy – Mushroom powder etc. Marketing Cost benefit ratio-- Marketing in India and abroad, Export value

Module IV **(18 hrs)**

Practice Session

- Visit to a Mushroom Cultivation Industry
- Demonstration of pure culture development, Mother spawn preparation, Bedding and Bagging
- Establishment of a Mushroom cultivation shed/unit in College Campus

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SEMESTER-VI
INDUSTRY BASED ELECTIVE COURSE (c)

NURSERY AND GARDEN MANAGEMENT

Course code : BO1661.3 **Number of credits : 2**
Number of contact hours : Lecture - 36 hrs and Practice - 18 hrs

Aim of the course: To introduce students to techniques involved in Nursery and Garden management business

Sector / Industry - Agriculture, Nursery business

Placement opportunities – Students can start Nursery and gardening initiatives, Can get employment in commercial nurseries

Unique Skills – Learn the basic principles of nursery and garden management, Learn the various procedures of plant propagation, Sourcing and marketing of new ornamentals and hybrid varieties of fruit plants.

Expected Course outcome

Students would have an understanding of :

- Preparation of quality nursery plants considering the need of farmers
- Root induction from stem cuttings to maximize vegetative propagation
- Methodology of seed storage, identify the ideal conditions for seed sowing and growth
- Possibilities and types of landscaping
- The students are able to carry out best gardening and nursery management practices.
- They become skillful professionals in gardening and managing nurseries as well as in the preparation of nursery beds, soil management, planting procedures, control of seedling density, use of fertilizers, irrigation, and pest control.
- Also Skilled and professional training ensures quality seedling production and their maintenance in nursery.

Module I **(10hrs)**

Nursery: definition, different types, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants. Seed: Structure and types -Seed dormancy; Methods of breaking dormancy - Seed storage: factors affecting seed viability, Seed production technology- seed testing and certification. Nursery management: Definition, Key elements, Essential nursery management practices

Module II (12 hrs)

Common garden tools- water can, digging fork, shovel, garden rake, hand trowel, secateurs, budding/grafting knife. Methods of Vegetative propagation: Cutting, grafting, budding, layering; rooting medium, potting mixture and planting of cuttings, Media for propagating nursery plants – sphagnum moss, peat moss, vermiculite. Technique of plant tissue culture (Outline only), Rearing & Hardening of micropropagated plants – green house, mist chamber,

Poly tunnel, Poly house, shade house and glass house.

Module III (14hrs)

Gardening: definition, objectives and scope - different types of gardening and suitable plants used in each -landscape and home gardening, terrace gardening, indoor gardening, vertical gardens, aquatic gardens, Special types- Bonsai, Terrarium, Kokedoma. computer applications in landscaping (brief account only), Gardening operations: Bed preparation, manuring, Fertilizer application- different fertilizers, biofertilizers, vermicomposting, watering, irrigation methods, management of pests and diseases and harvesting.

Module IV: (18hrs)

Practice session

Practice of the following items and submission of a consolidated report

1. Practice of Bed preparation, Sowing/raising of seeds and seedlings, transplanting of seedlings – Activity in the home or college campus
2. Vermicomposting, preparation of the common fungicides- Bordeaux mixture, Lime sulphur, Tobacco decoction, Neem cake & oil.
3. Field visit to a well-established nursery to study the techniques of gardening. Submission of report
4. Cultivation of any three vegetables either in home garden or campus: Amaranthus, Vigna, momordica, chillies, brinjal, lady's finger, tomato and Submission of report
5. Planting of ornamental plants and their maintenance either in home garden or in campus.

Suggested Readings

1. Ray PK (2012) Plant Nursery Management: How to Start and Operate a Plant Nursery, Scientific Publishers, India
2. Singh DK (2007). Textbook of Plant propagation and Nursery management. Ibdc Publishers, India
3. Vikas Kumar and Anjali Tiwari (2018). Practical Manual of Nursery Management. Agri-Biovet Press, India.
4. Arunkumar Singh and Abhinavkumar (2020). Plant propagation and Nursery management.
5. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH PublishingCo., New Delhi.
6. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
7. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
8. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co.,New Delhi.
9. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture andCooperation, National _Seed Corporation Ltd., New Delhi.
10. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., SanFrancisco, USA.

SEMESTER-VI
INDUSTRY BASED ELECTIVE COURSE (d)

MEDICINAL BOTANY

Course code : BO1661.4 **Number of credits : 2**
Number of contact hours : Lecture - 36 hrs and Practice - 18 hrs

Aim of the course: To introduce students to opportunities in Medicinal plant cultivation, harvesting, storage and marketing of the medicinal plants with market demand

Sector / Industry - Agriculture, Ayurvedic pharma industries

Placement opportunities – Students can join Ayurvedic pharma industries as botanists with additional skill in identification of medicinal plants. They can start initiatives to cultivate and process medicinal plants required for the pharmaceutical industries.

Unique Skills – An appreciation of the contribution of medicinal plants to traditional and modern medicine and the importance of holistic mode of treatment of the Indian traditional systems of medicine. To develop an understanding of the constraints in promotion and marketing of medicinal plants.

Expected Course outcome

The students should be able to

- Identify medicinal plants, describe its morphology, add medicinal knowledge about locally available plant.
- Cultivate medicinal herbs, learn processing, storing and packing of medicinal produce.
- Develop entrepreneurship skills to establish value addition products, botanical extracts and isolation of bioactive compounds.

MODULE I **8 hrs**

1. Introduction to medical practices in India: History – Literatures and physicians of ancient period.
2. Outlines of Ayurvedha, Siddha, Unani and Homeopathic systems of traditional medicine.
3. Role of AYUSH, NMPB, CIMAP and CDRI.
4. Importance and Future prospects of medicinal plants.
5. Conservation and sustainable use of medicinal plants, Gene banks of medicinal plants

MODULE II **10 hrs**

1. Ethnobotany and Folk lore medical practices: Ethnic communities in Kerala and their medicinal plant usage – patented products (Kani Tribe) – popular folklore medicines
2. Role of medicinal plants in traditional and modern system of medicine - methods of documenting the ethnobotanical knowledge – AICRP-MAP.
3. Cultivation and processing of medicinal plants: Propagules (Seed, leaf, stem, root, rhizome and bulbs, micropropagation) – cultivation methods – organic farming practices of medicinal plants - harvesting – processing – Grading -packaging – storage.

4. Medicinal plants in commercial products
5. Adulteration of plant crude drugs and methods of identification - some examples.

MODULE III **18 hrs**

An overview of selected medicinal plants: Morphology, family, vernacular, botanical name, useful part, uses active principles and phytotherapeutics.

- Whole plant (*Phyllanthus amarus, Bacopa monnieri, Scoparia dulcis*)
- Root (*Asparagus racemosus, Rauwolfia serpentina & Gloriosa superba*)
- Leaf (*Aloe vera, Azadirachta indica*)
- Bulb(*Allium cepa, Allim sativum*)
- Rhizome(*Zingiber officinale, Curcuma longa*)
- Fruit (*Solanum nigrum, Solanum xanthocarpum, Phyllanthus emblica*)
- Seed(*Trigonella foenum graceum.Cuminum cyminum*)
- Oil seed (*Cocos nucifera, Ricinus communis*)

MODULE IV **18 hr**

Practice/ Activities

1. Collect any five medicinal plants and establishment of medicinal plant germplsam resource center in their campus and submit report.
2. Observe the medical plants in their locality and identify the scientific name and vernacular names and submit report.
3. Visit to a home garden/medicinal plant nursery and collect information on the importance of medicinal plant in their garden and submit report.

References

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2. Chevallier, A., 1996. The encyclopedia of medicinal plants. D.K publishing, Michigan.
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9. Mathur, N., 2010. Medicinal plants of india. RBSA publishers, New Delhi.
10. Singh, M., 2009. Medicinal plants of india. New central book agency, New Delhi.
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12. Sivarajan V,V and Balachandran I,1994. Ayurvedic Drugs and their Plant Sources, Oxford & IBH Publications.
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Model Question papers

MODEL QUESTION PAPER

FIRST SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

BOTANY CORE COURSE I

BO1141 :ANGIOSPERM ANATOMY, REPRODUCTIVE BOTANY AND PALYNOLOGY

(2022 Admission Onwards)

Time :3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION A

I. Answer all questions. Each question carries 1 mark

Write short notes on

1. What is Primary wall
2. In which plant Bulliform cells are present?
3. What is Endodermis
4. Define Endarch condition
5. What is a Conjunctive tissue
6. Define Raphides
7. What are Tyloses
8. Amoeboid Tapetum
9. Comment on Anatropous ovule
10. Define Porogamy (**10 x 1 =10 marks)**

SECTION B

II. Answer any **Eight** questions. Each question carries 2 mark

11. Write a note on Bordered pits
12. Comment on periderm and its function.
13. Mention different types of Stomata
14. Give an account of Lacticifers
15. Differentiate Heart wood and sap wood
16. Give an account of Quiscent centre
17. Explain Guttation
18. Write a note on Fibers
19. Explain Polyembryony
20. Draw a neat labeled diagram of Dicot embryo with cellular divisions.
21. Write about Pollen kitt
22. Explain Kopper Kappe theory

(8 x 2 =16Marks)

SECTION C

III. Answerany **six** questions. Each question carries 4 marks

23. Write an account on Meristems and its classification
24. Enumerate Different types of vascular arrangement seen in Angiosperms

25. Differentiate dicot stem with that of monocot Stem.
26. With the help of diagram describe the internal structure of young anther
27. Explain different types of Endosperm formation found among Angiosperm
28. Differentiate dicot and monocot root.
29. Briefly describe the theories on apical organization of stem apex.
30. Describe the structure and function of Cambium.
31. Explain about the Non living inclusions of a cell. **(6 x4 =24 Marks)**

SECTION D

IV. Answer any **two** questions. Each carries 15 marks.

32. What are permanent tissues? Explain different types.
33. With suitable diagrams describe normal secondary growth in Dicot stem.
34. Write an account on the process of secondary growth in Bignonia stem with diagrams
35. Explain Megasporogenesis and the *Allium* type of Embryosac development with the help of diagrams. **(2x 15=30 Marks)**

MODEL QUESTION PAPER

SECOND SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

BOTANY :FOUNDATION COURSE II

BO1221: METHODOLOGY AND PERSPECTIVE IN PLANT SCIENCES

(2022 Admission Onwards)

Time: 3 Hours Max. Marks: 80

(*Draw diagrams wherever necessary*)

SECTION - A

I. Answer all questions in **one** or **two** sentences. Each question carries **1** mark.

Write short notes on

1) Primary data
2) Empirical knowledge
3) Range
4) Pictogram
5) Buffer
6) Median
7) Null hypothesis
8) PAGE
9) DPX
10) A killing agent **(10x1=10 marks)**

SECTION - B

II. Answer **any 8** of the following. Each question carries **2** marks.

11) Differentiate primary and secondary source of information.
12) Comment on transparency and honesty in science.
13) Why sharing of knowledge is essential?
14) What is standard deviation?
15) Differentiate hypothesis and null hypothesis.
16) Write notes on Camera Lucida
17) Give the principle of Beer Lamberts Law.
18) What are the steps involved in maceration?
19) Write notes on double staining
20) What is range? How it is calculated?
21) Write different sources of secondary data
22) Describe parts of a table **(8x2=16mark)**

SECTION - C

III. Answer **any six** of the following. Each question carries **4** marks.

23) What is the significance of ethics in science?

24) Differentiate inductive and deductive reasoning.

25) Briefly describe about the working of a phase contrast microscope.

26) What are the applications of SEM and TEM

27) Write brief notes on different types of stains

28) Differentiate PAGE and AGE.

29) Write brief notes on Chi square test.

30) Briefly explain the uses and applications of cryobiology.

31) Write notes on centrifugation and different types of rotors. **(6x4=24marks)**

SECTION - D

IV. Write essay on **anytwo** of the following. Each question carries **15** marks.

32) Write notes on the process of killing and fixing and briefly describe the process of microtome sectioning.

33) Explain the methods of data collection and possible ways of its representation.

34) Explain different separation methods for biological molecules.

35) Discuss science as a human activity. Add notes on major revolutions in science and technology. **(2x15=30 marks)**

MODEL QUESTION PAPER

THIRD SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

BOTANY :CORECOURSE II

BO1341 MICROBIOLOGY, PHYCOLOGY, MYCOLOGY, LICHENOLOGY & PLANT PATHOLOGY

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION –A

I. Answer **all** questions in one word or two sentences. Each question carries **one** mark.

1) Name the causative organism of Citrus canker
2) Write down the male and female sex organs in the fungal partner of *Usnea*
3) What are aflatoxins?
4) Define rhizosphere
5) What is annulus
6) Define coprophilous fungi.
7) Comment on synzoospore
8) What are prions?
9) Which algae is known as stone wort?
10) Name the algal source of carageenin **(10x1 = 10 marks)**

SECTION –B

II. Answer **any eight**questionsin a paragraph : Each question carries **two** marks

11. Write down four characteristic features of retroviruses.
12. Describe Hormogonia as a method of reproduction.
13. What is the plakea stage in *Volvox?*
14. Differentiate auxospore and autospore.
15. Explain asexual reproduction in Pythium?
16. Explain the thallus structure of *Polysiphonia*.
17. Describe the asexual reproduction in *Rhizopus.*
18. Briefly explain the asexual reproduction in yeast.
19. Explain the cleistothecium type of ascocarp in *Penicillium*.
20. Comment on ectomycorrhiza.
21. Differentiate fruticose and foliose lichen with examples.
22. Write a short note on preparation of lime sulphur **(8x2 = 16 marks)**

SECTION –C

III. Answer **any six** questions; not to exceed **120** words. **Each** question carries **four** marks.

23. Write the causative organism, symptoms and control measures of following diseases
    a) Blast disease of paddy
    b) Leaf moasic disease of tapioca
24. Explain the fruiting body and sexual reproduction of *Agaricus*
25. Briefly explain the economic importance of Fungi

26. Describe the asexual and sexual reproduction in *Vaucheria*
27. Give a detailed account on classification of algae by F.E Fritsch.
28. Detail the gene transfer methods in bacteria.
29. With suitable diagrams explain the multiplication cycle of a bacteriophage.
30. Explain the thallus structure and reproduction of *Nostoc.*
31. Describe the apothecium of *Peziza* with a neat labeled diagram**(6x4 = 24 marks)**

SECTION –D

IV. Write an essay on **any two** of the following(not more than three pages)
Each question carries **15** marks.

32. With the help of neat and labeled diagrams describe the lifecycle of *Puccinia*
33. What is diplontic life cycle? Explain the thallus structure, and sexual reproduction of *Sargassum*
34. Compare the nannandrous and macrandrous life cycle of *Oedogonium*
35. Describe the asexual and sexual reproductive methods in *Volvox.*

(2x15 = 30 marks)

MODEL QUESTION PAPER

FOURTH SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

BOTANY: CORE COURSE III

BO1441: BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS & PALAEOBOTANY

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION –A

I. Answer **all** questions in one word or two sentences;Each question carries **one** mark.

1) What is carbon dating?
2) What are amphibious plants?
3) What are elators?
4) Who is the father of palaeobotany?
5) What is a ligule?
6) What is gemma?
7) Name two types of rhizoids in Riccia.
8) What is ramenta?
9) Name a genus with winged pollen.
10) What is parthenocarpy? **(10x1=10 Marks)**

SECTION B

II. Answer **any eight** of the following**;** Each question carries **two** marks

8. Write a short note on Peristome teeth.
9. Comment on Geological timescale
10. What are xerophytic characters of *Equisetum*?
11. What is alternation of generation?
12. Enumerate the salient features of coralloid root.
13. Differentiate homospory and heterospory with examples.
14. What are the angiosperm characters of *Gnetum*?
15. Write a short note on Rhizophore of *Selaginella*.
16. Briefly explain the thallus structure of *Anthoceros*
17. Write a note on Eusporangiate ferns.
18. Explain circinate vernation with example.
19. Write a short note on transfusion tissue. **(8x2=16 marks)**

SECTION C

III. Answer **any six** of the following**;** Each question carries **four**marks

20. What is the role of Palaeobotany in relation to the exploration of fossil fuels?
21. With a labelled diagram, explain the internal structure of Pinus needle.
22. Narrate the economic importance of Gymnosperms.
23. Draw the L. S. of *Cycas* ovule and discuss.
24. Enumerate the dissimilarities of bryophytes with pteridophytes.
25. Explain the structure of rachis of *Cycas*.
26. What are the economic importances of bryophytes?
27. Write down the structure of *Lepidodendron*.
28. Discuss the spore dispersal mechanism in *Pteris*.**(6x4=24marks)**

SECTION D

IV. Write an essay on**any two** of the following**;** Each question carries **fifteen** marks

29. Describe the stelar evolution in Pteridophytes.
30. What are fossils? Discuss various methods of fossilization.
31. Compare the sporophytes of bryophytes that you have studied.
32. Give an account of sexual reproduction in *Gnetum*. Mention the advanced characters.

(2x15=30 Marks)

MODEL QUESTION PAPER

FIFTH SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

BOTANY : CORE COURSE IV

BO 1541- ANGIOSPERM MORPHOLOGY, SYSTEMATIC BOTANY, ECONOMIC BOTANY, ETHNOBOTANY&PHARMACOGNOSY

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION –A

I. Answer **all** questions in one word or two sentences. Each question carries **one** mark.

1. What is Regma ?
2. Name the inflorescence mostly found among Euphorbiaceae members.
3. What is a Legume?
4. Define Phyllotaxy.
5. What is a Floral diagram ?
6. Name the fruit of Asteraceae.
7. Define epigyny
8. Which is the source of Quinine ?
9. Morphology of cotton
10. Name two plant derived drugs used in tribal medicine**(10x1= 10 marks)**

SECTION – B

II. Answer **any eight** questions. **Each** question carries **2** marks. (Answer **not** to exceed **one** paragraph).

11. What is aestivation? Mention different types.
12. Differentiate between actinomorphic and zygomorphic flowers.
13. Give an account of different types of Schizocarpic fruits.
14. Write a note on Binomial nomenclature.
15. Distinguish between syngenesious and synandrous condition
16. Give the binomial and family of two dye yielding plants.
17. Explain the role of BSI in taxonomy.
18. Name an Indian ethnobotanistand mention his/her major contributions
19. Narrate the salient features of Malvaceae.
20. What are the advanced features of Lamiaceae ?
21. Enlist diagnostic characters of Verbenaceae
22. Explain the morphology of tendrils in Cucurbitaceae

(8x2 = 16 marks)

SECTION – C

III. Answer **any six** questions. Each question carries **4** marks. (Answer should **not** exceed **120** words).

23. What is placentation? Explain different types with examples.
24. Compare the salient features of Apocynaceae and Asclepiadaceae.
25. Explain the Principles of ICBN.

26. Write an account of Herbarium techniques.
27. "Flower is a modified shoot".Comment on the statement.
28. Give an account of cereals and millets you have studied.
29. Give a brief account on APG.
30. What is Chemotaxonomy? Write down its applications
31. Explain the advanced characters of Orchidaceae?

(6x4 = 24 marks)

SECTION - D

IV. Answer **any two** questions. **Each** question carries **15** marks. (Answer **not** to exceed **three** pages).

32. Describe Benthem and Hooker's system of classification. Comment on its merits and demerits.
33. Discuss the floral variations in Leguminosae
34. Discuss the advanced features of Asteraceae. Add a note on the reason for the wide distribution of Asteraceae members.
35. Give an account of different types of inflorescences you have studied.

(2x15= 30 marks)

MODEL QUESTION PAPER

FIFTH SEMESTER B.Sc. DEGREE (CBCSS) EXAMINATION

BOTANY:CORE COURSE V

BO 1542 : ENVIRONMENTAL STUDIES, PHYTOGEOGRAPHY AND RESEARCH METHODOLOGY

(2022 Admission Onwards)

Time-3 Hours **Total marks: 80**

(*Draw diagrams wherever necessary*)

SECTION-A

I Answer **all questions** in a word or sentence, each question carries **1** mark

Write short notes on

1) A Natural Hazard
2) Halophyte
3) Food web
4) Red data book
5) Acid rain
6) Edaphic factors
7) Deforestation
8) Mitigation
9) Plagiarism
10) Basic Research **(10x1=10 marks)**

SECTION-B

II. Answer **any 8** of the following in a paragraph.Each question carries **2 marks.**

11) What are ecological pyramids?
12) Define succession
13) Briefly describe energy flow in an ecosystem
14) Write note on Ramsar sites
15) Write about impact of land slides
16) Explain 'Hot spots'
17) Enlist effects of earthquakes
18) Explain randomization in research design
19) What is null hypothesis?
20) What is Green house effect?
21) Define Synecology
22) How Mendeley software is useful for research? **(8x2=16 marks)**

SECTION-C

III. Answer**any 6** of the following.Each question carries**4** marks each

23) Explain different components of an ecosystem.
24) Write about anatomical, morphological and physiological adaptations of hydrophytes
25) Explain nuclear hazards
26) Explain different stages of succession in a hydrosere
27) Give an account on adaptations of mangroves

28) Explain the process of waste water treatment
29) Explain the causes of soil degradation.
30) Distinguish between CRD and RBD
31) Make an account on the structure of project report **(6x4=24marks)**

SECTION-D

IV. Answer **any two** questions. Each question carries**15** marks each

32) Explain Phytogeographical regions of India.
33) Give an account of natural resources and their conservation.
34) Explain various phases of disaster management.
35) Explain scientific method in biological research**.** **(2 x 15= 30 marks)**

MODEL QUESTION PAPER

FIFTH SEMESTER B.Sc. DEGREE (CBCSS) EXAMINATION

BOTANY CORE COURSE VI

BO1543: CELL BIOLOGY, GENETICS AND EVOLUTIONARY BIOLOGY

(2022 Admission Onwards)

Time. 3 Hrs Total Marks: 80

(*Draw diagrams wherever necessary*)

SECTION –A

I. Answer **all** questions in one word or two sentences;Each question carries **one** mark.

1.What is a test cross?
2. What is heredity?
3.What is telomeric chromosome?
4. Who were the rediscoverers of Mendel's work?
5. Name one characteristic each in plant and man, which show polygenic inheritance?
6. Explain genetic drift?
7. Explain aneuploidy?
8. What is SAT chromosome?
9. What is parallel evolution?
10. According to Mendel how recombinants are formed? **(10x1=10 Marks)**

SECTION B

II. Answer any**eight** of the following; Each question carries **two**marks

11. Briefly describe Ribosome and its major functions?
12. People with AB blood groups are called 'Universal acceptors'. Why?
13. Explain holandric genes with suitable examples?
14. Explain Lamarck's theory of evolution?
15. Why colour blindness more frequent in males than in females?
16. Mutation is the basic necessity in the origin of species. Justify the statement?
17. What are salivary gland chromosomes? Give examples?
18. What are nucleoproteins? Differentiate histones and non histones?
19. Explain Neo Darwinism?
20. Describe the role of polyploidy in evolution?
21. What do you mean by criss-cross inheritance?
22. Write notes on Triple X chromosome? **(8X2=16Marks)**

SECTION C

III. Answer any **six** of the following; Each question carries **four** marks

23.Differentiate lysosome and peroxisome?
24.How can isolation of a population leads to speciation?
25. Describe the ultra structure of cell membrane?
26. Write an account on XX-XO system of sex determination?
27. Explain the genetic basis of ABO blood group in man ?
28. Describe the different types of structural chromosomal aberrations?
29. What is meant by Evolution? Give three arguments to convince a layman that evolution has takes place
30. State reasons for Mendels' success in formulating the law of heredity?
31. Are acquired characters inherited? Explain. **(6X4=24 Marks)**

SECTION D

V. Write an essay on any **two** of the following; Each question carries **fifteen** marks

32. What are giant chromosomes? Briefly describe the structure and organization of any two types of giant chromosomes?
33. 'Only the first nuclear division is really meiotic and not the second division'. Explain it with the help of a diagrammatic representation of different stages of meiosis?
34. Explain various sex determination mechanisms in plants?
35. Explain linkage and crossing over? Describe its importance.

(2x15=30Marks)

MODEL QUESTION PAPER

FIFTH SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

OPEN COURSE I

B01551.1 :HORTICULTURE

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION –A

I. Answer **all** questions in one word or two sentences. Each question carries **one** mark.

1) What is Air layering?
2) Define Hydroponics
3) What are the uses of Weedicides
4) Define Parthenocarpy
5) Write two examples for rooting hormone
6) What are Fertilizers?
7) Write common uses of Vermiculite
8) What are foliar sprays?
9) Explain NPK?
10) Define Pomology **(10x1=10 Marks)**

SECTION –B

II. Answer **any eight** of the following; not to exceed one paragraph**.**Each question carries **two**marks

11) Write four principles of garden making?
12) Explain approach grafting
13) Write two examples of garden tools and its uses?
14) What are the advantages of Vermicompost
15) Explainpotting mixture
16) What is carpet beds*?*.
17) What is sphagnum moss*?*
18. Write four uses indoor garden
19. What is Bouquet*?*
20. What is the purpose of storage of flowers?
21. Write uses and examples of fungicide
22. Briefly explain different types cutting **(8x2=16 Marks)**

SECTION –C

III. Answer **any six** of the following; not to exceed 120 words**;** Each question carries **four**marks

23. Explain flower arrangements
24. What is the relevance of conservatory and green house in a garden?
25. Explain different types of layering
26. Briefly explain different types of soil
27. Describe different types of irrigation methods
28. What are the components of a garden*?*
29. Write an account on Bonsai
30. Explain T-budding
31. Explain Methods of Dry flower arrangements **(6x4=24 Marks)**

SECTION –D

IV. Write an essay on any two of the following; Each question carries **fifteen**marks

32. Write an essay on common diseases of fruits and vegetable crops
33. Explain various types of grafting methods
34. Briefly explain different types processing and preservation of fruits and vegetables

35.Give an account ofManures and fertilizers **(2x15=30 marks)**

MODEL QUESTION PAPER

FIFTH SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

OPEN COURSE I

BO1551.2: MUSHROOM CULTIVATION AND MARKETING

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION –A

I. Answer **all** questions in one word or two sentences. Each question carries **one** mark.

1.Give the name of any two edible mushrooms.
2.What is Spawn?
3.Name any one field mushroom.
4.Give an example of medicinal mushroom.
5.What is blanching?
6.Write the scientific name of white button mushroom.
7.Name any two poisonous mushrooms.
8.What is composting?
9.What is the scientific name of milky mushroom or paddy straw mushroom?
10.What is a substrate? **(10x1=10 Marks)**

SECTION B

II. Answer **any eight** of the following; not to exceed one paragraph**.** Each question carries **two**marks.

11.What are the advantages of mushroom cultivation?
12.Write a note on common Indian mushrooms.
13.Write a short note on field cultivation of mushroom.
14.Give an account of poisonous mushrooms.
15.Write a note on the nutritional value of mushrooms.
16.Comment on the medicinal value of mushrooms.
17.Which are the bacterial diseases that affect mushrooms?
18.Write a note on freeze drying.
19.Narrate the harvesting of mushrooms.
20.Write a note on pickling.
21.Write the systematic position of *Agaricus*.
22.Write any two binomial of *Pleurotus*. **(8x2=16 Marks)**

SECTION C

III. Answer **any six** of the following; not to exceed 120 words. Each question carries **four** marks

23.Explain the Spawn preparation?
24.What are the common diseases and pests found in mushrooms?
25.Describe the various measures and methods adopted to prevent and control diseases in mushrooms.

26.Differentiate edible and poisonous mushrooms.
27.Explain pre-treatment of substrate.
28.Which are the steps involved in bed preparation.
29.Briefly explain the cultivation of white button mushroom.
30.Write a note on foreign exchange from mushroom cultivation.

31.Explain the economic importance of mushrooms. **(6x4=24 Marks)**

SECTION D

IV. Write anessay on **any two** of the following. Each question carries **fifteen**marks

32.Explain the distribution, structure and morphology of *Agaricus*.
33.What is the scientific name of *Oyster* mushroom? Discuss about the various steps in the cultivation of *Oyster* mushroom.

34.How mushrooms are stored? Explain the various steps in the processing of mushrooms.
35.Explain different substratum and their processing methods used in the cultivation of mushrooms.

(2x15=30 Marks)

MODEL QUESTION PAPER

FIFTH SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

OPEN COURSE I

B01551.3 : FORESTRY

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION –A

I. Answer **all** questions in one word or two sentences. Each question carries **one** mark.

1) What are Multipurpose trees?
2) What is Shellac?
3) Define Silviculture.
4) What are Tropical Forests?
5) Define Sacred plants.
6) Differentiate Homogenous and Heterogenous wood
7) Explain Avenue plantation.
8) What is NTFPs?
9) Define Seed dormancy
10) Describe Dendrochronology. **(10x1=10 Marks)**

SECTION B

II. Answer **any eight** of the following; not to exceed one paragraph**.** Each question carries **two**marks.

11) What is gene conservation?
12) What are Gums and resins?
13) What is the sacredness of *Aeglemarmelous*?
14) Explain different types of seed dormancy
15) What do you mean by regeneration of forests?
16) Describe the types of seed dormancy.
17) Define Seed Orchard
18. Write uses of Medicinal plants
19. What are Sacred Groves*?*
20. Explain porous and non-porous wood
21. Write the importance of Charcoal **(8x2=16 Marks)**

SECTION C

III. Answer **any six** of the following; not to exceed 120 words**.**Each question carries **four**marks.

22. Briefly explain types of seed dormancy

23. Pint out importance of Evergreen and deciduous forest in forest ecosystem
24. What is the relevance of wood anatomical studies in Kerala?
25. Give an account of Timber Forest Products
26. Write about Silviculture of *Azadirachtaindica*
27. Explain coppice and conservation systems
28. What are the uses of canes and bamboos*?*
29. Write an account of Trees in Sacred groove
30. Write about Lac collection and marketing
31. Explain methods to overcome seed Dormancy **(6x4=24 Marks)**

SECTION D

IV. Write an essay on **any two** of the following**.**Each question carries **fifteen**marks.

32. Write an essay on Silviculture methods
33. Explain various types of Forest in Kerala
34. Briefly explain different types of wood

35.Explain Indian forest act 1927 and theiramendment **(2x15=30 Marks)**

MODEL QUESTION PAPER

SIXTH SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

BOTANY : CORE COURSE IX

BO 1641 - PLANT PHYSIOLOGY AND BIOCHEMISTRY

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION –A

I. Answer **all** questions in one word or two sentences. Each question carries **one** mark

1. What is Kranz anatomy?
2. What are epimers?
3. Why cytochrome a_3 is called terminal oxidase?
4. Represent the overall equation of photosynthesis.
5. What are isoenzymes?
6. What is meant by thigmotropic movement?
7. What is tonicity?
8. Define red drop.
9. What is incipient plasmolysis?
10. How the stomata of CAM plants differ from that of C3 plants?

(10 x 1 = 10 marks)

SECTION – B

IIAnswer any **8** questions. **Each** question carries **2** marks.

11. Give an account on raw materials of photosynthesis.
12. Briefly describe the physiological role of Abscisic acid in plants.
13. Differentiate apoplast and symplast.
14. How root pressure influences water movement in plants?
15. What are derived lipids? Give examples
16. Explain the physiology of senescence.
17. Discuss the amphoteric nature of aminoacids
18. Briefly describe the relation between OP, TP and WP in plants.
19. Comment on hydroponics.
20. Differentiate absorption spectrum and action spectrum.
21. Why fluorescent radiation has higher wavelength than phosphorescent radiation?
22. Point out the differences between photosynthesis in bacteria and higher plants.

(8 x 2 = 16 marks)

SECTION -C

II. Answer any **six** of the following. Each question carries **4** marks

23. Describe the vital and physical theories explaining ascent of sap.
24. How the principle of Limiting factors apply in photosynthesis?

25. Give an account on coenzymes and cofactors.
26. Explain beta oxidation of fatty acids.
27. Desrcibe the classification and function of secondary plant products.
28. Explain the mechanisms of mineral absorption in plants.
29. How anaerobic respiration differs from aerobic in terms of ATP yield?
30. Discuss the mechanism of photorespiration. Enumerate its advantages and disadvantages
31. Explain biological nitrogen fixation.

(6 x 4 = 24 marks)

SECTION - D

III. Answer any **2** questions. Each question carries **15 marks.**

32. Discuss the mechanisms and theories on translocation of organic substances in plants.
33. Explain dark reaction and compare the photosynthetic mechanisms in C3 and CAM plants.
34. Discuss various types of movements exhibited by plants.
35. What are carbohydrates? How are they classified? Mention its function

(2x15 = 30 marks)

MODEL QUESTION PAPER

SIXTH SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

BOTANY : CORE COURSE X

BO-1642-MOLECULAR BIOLOGY, GENERAL INFORMATICS AND BIOINFORMATICS

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION –A

I. Answer **all** questions in one word or two sentences. Each question carries **one** mark

1) Define cistron.
2) How is wet lab different from a web lab?
3) Expand NICNET
4) Name two operating systems used in computers.
5) Mention role of helicases.
6) Explain PIR
7) What are okazaki fragments?
8) Name two nucleic acid databases.
9) What are introns?
10) Write about importance of Reverse transcriptase **(10x1=10 marks)**

SECTION –B

II. Answer **any eight** of the following:Each question carries **two**marks

11) Give any four differences between DNA and RNA.
12) What is Kornberg enzyme.
13) What is plagiarism?
14) What are stop codons? Give their sequence
15) What are replisomes?
16) Describe the health issues faced by regular users of computer.
17) What is SWISS-PROT? Mention any two important features.
18) What you mean by the statement "the genetic code is degenerate"?
19) Write a note on the main objectives of INFLIBNET.
20) Differentiate between Global and Local alignment
21) What are the parts of a typical rooted phylogenetic tree?
22) How CLUSTAL becomes an indispensable tool in Bioinformatics?

(8x2= 16 marks)

SECTION –C

III. Answer **any six** of the following:Each question carries **four**marks

23) Give an account on sequence analysis and alignment in bioinformatics.
24) Write the salient features of Watson and Crick double helical model of DNA.
25) Comment on intellectual property rights.
26) Give an account on operon concept with reference to *lac* operon.

27) What is a phylogram? Describe the various tools used in phylogenetic analysis.
28) Give an account of the different types of RNA
29) Practicing good cyber ethics is a present day necessity. Comment.
30) Describe the experiment of Meselson and Stahl
31) How is Rasmol used in molecular visualization? **(6x4=24 marks)**

SECTION –D

IV. Write **essay** on any two of the following.Each question carries **fifteen**marks

32) What are theadvantages of molecular phylogenetic analysis? Explain the technique
33) Describe the various experiments conducted by scientists to prove that DNA is the genetic material in living organisms.
34) Give a detailed account on different biological databases.
35) What is central dogma in molecular biology? Elucidate the process by which genetic information is transferred from DNA to RNA in a prokaryotic cell.

(2x15 = 30 marks)

MODEL QUESTION PAPER

SIXTH SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

BOTANY : CORE COURSE XI

BO1643: BIOTECHNOLOGY, NANOBIOTECHNOLOGY, HORTICULTURE, PLANT BREEDING

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION –A

I. Answer **all** questions in one word or two sentences. Each question carries **one** mark**.**

1. Define totipotency
2. Define cosmids
3. Define quantum dots
4. Define gene library
5. What are cybrids
6. What are mutagens?
7. Define Pomology.
8. What is floriculture?
9. What is NPK?
10. What is heterosis?. (**10x1= 10 Marks)**

SECTION –B

II Answe**r any eight** of the following ;Each question carries **two**marks**.**

11. What are synthetic seed? Mention the uses
12. What are genetically modified crops? Mention any two GMC you have studied
13. What is Ti Plasmid?
14. Explain genomic DNA library
15. What are cybrids?
16. What is Somatic embryogenesis?
17. Give an account on biofertilizers used in horticulture.
18. Write a short note on quarantine.
19. Explain the advantages of organic manures.
20. Explain the term "pureline".
21. Describe backcross method.
22. What is bonsai?. **(8x 2= 16 Marks)**

SECTION –C

III **A**nswer **any six**of the following**;**Each question carries **four**marks**.**

23. Give an account on Somatic hybridization
24. Discuss the classification of Nanoparticles in detail
25. Give a brief account on various gene transfer mechanisms in plants
26. Explain the requirements and process of Southern blotting

27. Describe polyploidy breeding.
28. Describe the method of vermi-composting.
29. Explain inter-varietal hybridization.
30. Explain the steps to be taken for weed control.
31. Write an account on types of flower arrangement. **(6x4=24 marks)**

SECTION –D

IV Answer **any two** of the following**;**Each question carries **fifteen**marks**.**

32. Define Micropropagation. Explain the steps involved in micropropagation and its application
33. What is PCR? Explain the basic steps and its application.
34. Explain various grafting techniques in plant propagation.
35. Method and application of mutation breeding. **(2x15 = 30 Marks)**

MODEL QUESTION PAPER

SIXTH SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION
INDUSTRY BASED ELECTIVE COURSE -A
BO1661.1 :ORGANIC FARMING
(2022 ADMISSION ONWARDS)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION A

Answer **all** questions. Each Question carries 1 mark

1. Name a Biopesticide
2. ZBNF
3. Mulching
4. Give the names of any two indigenous rice varieties
5. VAM
6. Symbiotic nitrogen fixation
7. Biogas slurry
8. Trychoderma
9. Reclamation
10. What is soil fertility

(1 x 10 = 10 marks)

SECTION B

Answer **any eight** questions. Each Question carries 2 marks

11. Define organic farming.
12. What are Trap Crops?
13. Write down the agronomic benefits of biofertilizers.
14. Write short note on Vermicomposting.
15. What are botanical insecticides?
16. What are the differences between Soil Fertility and Productivity?
17. Write about any two soil amendments.
18. Explain ‘’Natural enemies’’ with at least two examples.
19. How does organic farming help in conservation of ecological balance?
20. Brief up on organic seeds.
21. Write about characteristics of good soil.
22. What is drip irrigation? **(2 x 8 = 16 marks)**

SECTION C

Answer **any six** questions. Each Question carries 4 marks

23. Write down the practices to be followed in an organic farming system.
24. What is the role of organic manures in organic farming?
25. Explain about the use of crop residue in organic farming.
26. Write short notes on (a). NPOP. And (b). Organic logo.
27. Briefly explain the cultural methods for disease and pest control.
28. How does organic farming help in conservation of ecological balance?
29. Write down the organic production requirements as per the national standards.
30. Write down the specific requirements for handling and processing of organic food.
31. What are organic amendments? Write down their advantages and disadvantages.

(6 x 4 = 24 marks)

SECTION D

Answer **any two** questions. Each Question carries 15 marks

32. Write about the basic concept of economics, demand & supply of an organic farm.
33. Discuss on composting methods and vermi-composting.
34. Write the principles of organic farming and explain the benefits of organic farming.
35.Write about Farm Inspection & Certification

(2 x 15 = 30 marks)

MODEL QUESTION PAPER

Sixth semester B. Sc. Degree (CBCSS) Examination

Industry based Elective course -a

BO1661.2 : Mushroom Culture Technology

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

Section – A

I. Answer **all** questions. Each carries **1** mark.

1. Name a poisonous mushroom
2. What is 'mushroom hunting'
3. What is Spawn
4. Genus of Oyster mushroom
5. What are 'Puffballs'
6. Name a disinfectant in mushroom cultivation
7. Name an antidiabetic species of mushroom
8. What is a mushroom bed
9. Example for a contaminant in mushroom cultivation
10. What is canning **(1x10=10)**

Section – B

II. Answer **any eight** of the following. Each carries **2** marks.

11. Blanching
12. Medicinal values of Oyster mushroom
13. Define Pasteurization
14. Draw and label the structure of basidiocarp
15. Difference between mushrooms and toadstools
16. Write down the common cultivated varieties of Pleurotus
17. Name pest control methods used in mushroom cultivation
18. Common medicinal values of mushroom
19. What is casing. Write down its purpose
20. How Sciarids affects mushroom production
21. What is freeze drying process
22. Comment on clamp connection **(2x8=16)**

Section – C

III. Answer **any six** of the following. Each carries **4** marks.

23. History of mushroom cultivation in India – Comment
24. Write an overview of techniques in mushroom cultivation
25. What are thermostats and humidistats
26. What are the chemical and physical properties of materials used in casing
27. What is grading and picking
28. Salient features of Shiitake
29. Explain the steps in mushroom bed preparation
30. Describe any four value added products in mushroom cultivation

31. Discuss any two techniques used in mushroom harvesting **(4x6=24)**

Section - D

IV. Write an essay on **any two** of the following. Each carries **15** marks

32. Write an essay about the structure and construction of a mushroom house
33. Explain the procedures used in compost preparation
34. Describe the life cycle of a mushroom with a neatly labelled diagram
35. Write an essay about pest and environmental control used in mushroom cultivation

(2x15=30)

MODEL QUESTION PAPER

SIXTH SEMESTER B. SC. DEGREE (CBCSS) EXAMINATION

INDUSTRY BASED ELECTIVE COURSE -C

BO1661.3 :NUSRSERY AND GARDEN MANAGEMENT

(2022 Admission Onwards)

Time. 3 Hrs **Total Marks: 80**

(*Draw diagrams wherever necessary*)

SECTION A

Answer **all** questions. Each Question carries 1 mark

1. Sphagnum moss
2. Scion
3. Certified seed
4. Kokedomo
5. Potting mixture
6. Weedicides
7. Vermiculite
8. Foliar application
9. Name the common name of two hanging plants
10. Common name of two high value ornamentals

(1 x 10 = 10 marks)

SECTION B

Answer **any eight** questions. Each Question carries 2 marks

11. What are the different types of seeds?
12. Differentiate between shade house and glass house
13. Write an account on potting mixture
14. Discuss the relevance of computer aided landscape designing
15. Write about mist chamber
16. What is rooting? Give examples of any two rooting agents
17. Write an account on terrace gardening
18. Write four principles of garden making?
19. Write two examples of garden tools and its uses.
20. What are the advantages of Vermicompost?
21. Write notes on two ornamentals that are propagated by cutting.

(2 x 8 = 16 marks)

SECTION C

Answer **any six** questions. Each Question carries 4 marks

22. Define gardening. Give a brief description on different types of gardening
23. Write about the hardening procedure for micropropagated plants. Mention its significance

24. Write brief account on gardening operations and the management of pests and disease in a nursery
25. Give an account on different methods for breaking the seed dormancy
26. Briefly explain different types of soil
27. Describe different types of irrigation methods
28. What are the components of a garden?
29. Write an account on Bonsai
27. What is the relevance of a polyhouse in a garden?
28. Write an account on the general operations during generating and sale of a batch of ornamental plant.
29. Explain the process of seed bed preparation
30. Why some plants are transplanted after germination in seed beds?

(6 x 4 = 24 marks)

SECTION D

Answer **any two** questions. Each Question carries 15 marks

31. Write an essay on different seed types and outline the procedure of seed testing and certification
32. Describe the different methods of vegetative propagation
33. Give an account of Manures and fertilizers
34. Write an essay on the potential of a commercial ornamental plant nursery in Kerala

(2 x 15 = 30 marks)

MODEL QUESTION PAPER
SIXth semester B. Sc. Degree (CBCSS) Examination
Industry based Elective course -d
BO1661.4 : Medicinal Botany
(2022 Admission Onwards)

Time :3Hours **Max. Marks :80**

SECTION –A

Answer all questions in a word or one or two sentences. Each question carries 1mark. Draw diagrams only if specified in the question.

1. Mention the binomial of Tulsi.
2. Which plant is used to cure hepatitis?
3. Name two medicinal plants propagated by Bulbs
4. Mention the use Brahmi
5. Expansion of CIMAP.
6. What is Medicina plant Bank.
7. Name a plant that can be used as biopesticide
8. Give the binomial of Sarpagandha
9. What is NMPB?
10. What do you meant by red data book?

(10 x 1 = 10 marks)

SECTION - B

Answer any 8 questions. Each question carries 2 marks. Answer not to exceed one paragraph

11. Name two commercial products having herbals as ingredients and mention its manufacturer.
12. What is micropropagation?.
13. Mention propagation methods of four medicinal plants.
14. What are folkmedicines?
15. Comment on the medicinal value ofAsoka.
16. Mention two ayurvedic products in which Aonla is an ingredient
17. What is the soil conditions in which Aonla grows well?
18. Explain organic farming of medicianal plants?
19. How microbial biofertlizers are beneficial to medicinal plant cultivation?
20. Name two plants whose seeds are medicinally important
21. Which all medical systems comes under AYUSH
22. What is the role of Herbaria in medicinal plant conservation.

(8x2 = 16 marks)

SECTION -C

Answer any six of the following. (Answer not to exceed 120words). Each question carries 4 marks

23. Name four medicinal plants which are having consumption of more than 1000 tonnes per year.
24. Why medicinal plants are considered as part and parcel of culture and rituals of Kerala and India? Explain with sufficient examples.

25. Write a brief account on the product "Jeevani"
26. Write a brief account on the history of Ayurvedic system of medicine
27. Explain the objectives and functioning of 'AICRP-MAP'
28. What are adulterants in medicinal products? Name two plants used as adulterants
29. Discuss the agencies and their role in cultivation of medicinal plants
30. What are difficulties faced by farmers with growing and marketing of medicinal plants?
31. What is the importance of medicinal plant conservation for Kerala being a state traversed by western Ghats?

(6x4 = 24 marks)

SECTION - D

Answer any 2 questions. (Not more than three pages). Each question carries 15 marks.

32. Explain the post harvest processing and maketing of three medicinal plants. Mention the end users of these products.
33. Write a detailed account on the cultivation, harvesting, storage and marketing of two medicinal plants.
34. Write the common propagation methods of medicinal plants citing examples
35. Describe in detail the cultivation of 3 medicnal plants of importance to Ayurveda. Mention their binomial and uses.

(2X15=30 marks)

Model Question Paper
First Degree Programme in Botany (CBCSS) Practical Examination
Botany Core (Practical I) VII-Course Code: BO1222
Angiosperm Anatomy, Reproductive Botany, Palynology, Methodology and Perspectives in Plant Science
(2022 Admission Onwards)

Time: 3 Hours **Max. Marks: 80**

1. Make suitable micropreparation of **A** and B; identify giving reasons and describe its structure with the help of 101abeled diagrams. Leave the preparation for valuation. (Preparation-3,Labelled diagram-3, Reasons-3, Identification-1) **10x2 = 20 Marks**

2. Construct a frequency table (Discrete/Continuous) from the given data **C** **4 Marks**

3. Construct histogram/Bar diagram from the data **D**. **4 Marks**

4. Workout the problem **E** **4 Marks**
(Calculation- 3, Result-1)

5. Identify the instrument **F**. Comment on its working principle. **4 Marks**
(Identification-1, Aim-1, Working Principle-2)

6. Identify the separation technique **G**. Comment on its procedure. **4 Marks**
(Identification-1, Aim-1, Procedure-2)

7. Comment on **H** **3 Marks**
(Major group-1, Notes-2)

8. Write critical notes on **I** **3 Marks**
(Identification -1,Notes-2)

10. Identify the type of stomata in specimen **J** **3 Marks**
(Identification-1, Labelled Diagram-1, Reasons-1)

11. Identify and describe the type of cellular inclusions in specimen **K** **4 Marks**
(Identification-1, Description-2, Labelled Diagram-1)

12. Identify **L** and draw a neat labelled diagram **4 Marks**
(Identification-1, Labelled Diagram-3)

13. Comment on **M**
(Identification-1, Notes-2) **3 Marks**

Record (Content-15, Neatness-5) **20Marks**

KEY TO SPECIMENS

A Primary/Normal Secondary Root/Stem
B Stem with anomalous secondary structure (*Bignonia, Boerhaavia, Dracaena*)
C Numerical data
D Frequency table data -
E Frequency table/Numerical Data–Problem from measures of central tendancy/ Chi squared test
F Instruments from Biophysics
G Biophysics- Chromatography/Electrophoresis
H Fixatives/ Stains/ Mounting media
I Dissection/Compound microscope / Part of Microscope/ Microtome / Camera lucida/ Micrometer
J Stomatal type-
K Cell inclusions mentioned inthe syllabus
L Anther T. S /Dicot embryo L. S/ Monocot embryo L.S. Embryosac (*Polygonum* type) Ovule (Orthotropous/ Anatropus) (*Permanent slides /diagrams*)
M Pollen Aperture type mentioned in the syllabus

First Degree Programme in Botany (CBCSS) Practical Examination
Botany Core (Practical II) VIII-Course Code: BO1442
Microbiology, Phycology, Mycology, Lichenology & Plant Pathology
Bryology, Pteridology, Gymnosperms & Paleobotany
(2022 Admission Onwards)

Time: 3 Hours **Max. Marks: 80**

1. Make suitable micro preparations to bring out the structure of **A, B, C** and **D**. Draw a cellular diagram of each and label the parts. Identify giving reasons and leave the preparation for valuation.
   (Preparation-2, Labelled diagram-2, Reasons, 2, Identification-1) **4 x 7= 28 Marks**

2. Identify any two algal specimens from the mixture **E**, giving reasons
   (Diagram-1, Reasons-1, Identification-1) **2 x 3 = 6 Marks**

3. Observe **F** under microscope, identify and write down its procedure.
   (Procedure-3, Identification -1) **4 Marks**

4. Identify the disease in plant specimen **G** and give the name of the causative organism along with important symptoms associated with it.
   (Disease-1, Pathogen-1, Symptoms-2) **4 Marks**

5. Spot at sight **H, I, J, K, L** and **M**
   (Genus name-1, Part of the plant-1, Major group-1) **6 x 3 = 18 Marks**

   Record (Content-15, Neatness-5) **20 Marks**

KEY TO SPECIMEN

A Fungus mentioned in the syllabus
B Bryophyte mentioned in the syllabus
C Pteridophyte mentioned in the syllabus
D Gymnosperm mentioned in the syllabus
E Algal Mixture (Mixture of different algae (at least four members) mentioned in the syllabus.
F Bacterial Smear (Gram positive/ Gram negative)
G Plant disease mentioned in the syllabus
H Alga (Macroscopic)
I Fungus/Lichen
J Bryophyte
K Pteridophyte
L Gymnosperm
M Fossil form mentioned in the syllabus(Permanent slide /Photograph)

MODEL QUESTION PAPER
First Degree Programme in Botany (CBCSS) Practical Examination
Botany Core (Practical III)XII-Course Code: BO1644
Angiosperm Morphology, Systematic Botany, Economic Botany, Ethnobotany and Environmental Studies
(2022 Admission Onwards)

Time: 3 Hours **Max. Marks: 80**

1. Identify and write notes on **A** with a labelled diagram.
   (Notes-2, Labelled diagram-1) **(3 Marks)**

2. Comment on **B**
   (Notes 2, Diagram-1) **(3 Marks)**

3. Describe **C** in technical terms. Draw a labelled sketch of the L. S. of the flower **C**. Construct a floral diagram and write the floral formula.
   (Description-2, Labelled sketch-2, Floral diagram-1, Floral formula-1) **(6 Marks)**

4. Refer **D** and **E** to their respective families, pointing out the class, subclass and series with reasons. (Reasons upto series-2, Description of plant in technical terms- 2, Family characters-2, Identification of family-1) **(7 x 2 = 14 Marks)**

5. Write the generic name and family of **F** and **G**
   (Generic name-1, Family-1) **(2 x 2 = 4 Marks)**

6. Spot at sight **H** and **I**
   (Binomial-1, Family-1, Morphology of the useful part-1) **(3 x2 = 6 Marks)**

7. Identify and write critical notes on **J**
   (Binomial -1, Family-1, Notes-2) **(4 Marks)**

8. Make a suitable micropreparation of **K**. Write the anatomical adaptations and identify the ecological group.
   (Preparation-1, Adaptations-2, Ecological group-1) **(4 Marks)**

9. Identify the ecological group **L** and write its morphological adaptations.
   (Ecological group-1, Adaptations-2) **(3 Marks)**

10. Identify and write notes on **M**
    (Identification-1, Notes-2) **(3 Marks)**

- **Herbarium submission -7; Field Note & Tour Report-3** **(10 Marks)**
- **Record (Content-15 Marks. Neatness-5 Marks)** **(20 Marks)**

KEY TO SPECIMEN

A.	Inflorescence (*Mentioned in the syllabus*)
B.	Fruits (*Mentioned in the syllabus*)
C.	Systematic Botany – Flowering twigs (along with floral buds) from **Polypetalae/Gamopetalae**
D.	Any Dicot family mentioned in the syllabus (Flowering twigs from **Polypetalae/Monochlamydeae**)
E.	Any Dicot family mentioned in the syllabus (Flowering twigs from **Gamopetalae**)
F & G	Herbarium sheets
H & I	Economic Botany (*Mentioned in the syllabus*)
J	Ethnobotany (*only plants mentioned in the syllabus*)
K & L	Ecological groups mentioned in the syllabus
M	Ecosystems (*Photographs, Pictures or Diagrams of ecosystems mentioned in the syllabus*)

MODEL QUESTION PAPER
First Degree Programme in Botany (CBCSS) Practical Examination
Botany Core (Practical IV)XIII-Course Code: BO1645

Cell Biology,Genetics, Plant Physiology, Biochemistry,Molecular Biology, Bioinformatics, General Informatics, Biotechnology, PlantBreeding & Horticulture
(2022 Admission onwards)

Time: 3 Hours **Max. Marks: 80**

1. Make acetocarmine squash preparation of material **A**. Identify metaphase and anaphase stages of cell division and draw labelled sketches of identified stages.
[Preparation-3, Identification-2 (1x2), Labelled diagram- 4 (2x2)] **9Marks**

2. Work out the problems **B, C &D**
(B-4 Marks, C-5 Marks, D-3 Marks) **12Marks**

3. With the help of a labelled diagram, explain the working of Experiment **E.**
(Aim-1, Labelled diagram-2, Working-3, Inference-1) **7 Marks**

4. Detect the presence of proteins/reducing sugar/non reducing sugar/starch in **F**. Write down the procedure.
(Conduct of experiment-2, Procedure-3, Identification-1) **6 Marks**

5. Write down the procedure and demonstrate emasculation using material **G**. Submit for valuation.
(Demonstration-4, Procedure-2) **6Marks**

7. Write down the procedure and demonstrate T-Budding/Air layering/Grafting (Wedge/Whip) using **H**. Submit for valuation.
(Demonstration-3,Procedure-2) **5Marks**

8. Identify and write critical notes on **I, J &K**
(Identification-1, Notes 3) **12 Marks**

Submission of report (Industry based Elective course) **3Marks**

Record (Content- 15, Neatness-5) **20 Marks**

MODEL QUESTION PAPER

KEY TO SPECIMENS

A. Onion Root tips
B. Genetics problem (*Incomplete Dominance / Dihybrid*)
C. Genetics problem (*Interaction of Genes*)
D. Molecular Biology problem
E.Physiology experiments
F. Biochemistry (proteins/ reducing sugar/non reducing sugar/starch)
G. Plant Breeding: Inflorescence suitable for emasculation
H. Horticulture
I. Critical note from Biotechnology (PCR, Flavr Savr tomato, Bt cotton, Golden rice, PBR322, Bioreactor, Restriction enzymes, Agarose, Acrylamide)
J. Critical note from Bioinformatics (NCBI BLAST, EMBL, SWISSPROT, PDB, Rasmol, Protein 3D structure)
K. Prepare a bar diagram / line diagram / do calculation of Mean and standard deviation from a given data using MS Excel
OR
Crtical note from General informatics (INFLIBNET, BRNET, NICNET, SWAYAM, INaturalist)

BO1646: PROJECT

The project work/ Dissertation can be carried out individually or group ofstudents. Project report, duly attested by the Supervising teacher and certifiedby Head of the Department, has to be submitted on the day of Core Practical III examination. Viva voce has to be conducted individually.

Project Report - 80 Marks Viva voce - 20 marks Total – 100Marks

UNIVERSITY OF KERALA

THIRUVANANTHAPURAM

MSc Degree in Botany (Semester System)

Revised Course structure and Syllabus

(2013 Admissions onwards)

January 2012

PG BOARD OF STUDIES IN BOTANY

UNIVERSITY OF KERALA

MSc Degree in Botany (Semester System)

Revised Course structure

semester	Paper Code	Title of the paper	Hours/ semester	Hours / week		ESA hours	Maximum Marks		
				L	P	3	CA	ESA	Total
I	BO 211	Phycology, Mycology & Plant Pathology	108	6	2	3	25	75	100
	BO212	Bryophyta, Pteridophyta & Gymnosperms	108	6	2	3	25	75	100
	BO213	Microbiology, histology, Microtechnique & histochemistry	108	6	3	3	25	75	100
	BO214	Practical I	126		7	4	25	75	100
	Total for Semester I		**450**	**18**	**7**	**13**	**100**	**300**	**400**
II	BO 221	Taxonomy, Economic Botany & Ethnobotany	108	6	2	3	25	75	100
	BO 222	Environmental Biology,Phytogeography, Conservation Biology & Evolution	108	6	2	3	25	75	100
	BO 223	Cell and Molecular Biology & Genetics	108	6	3	3	25	75	100
	BO224	Practical II	126		7	4	25	75	100
	Total for Semester II		**450**	**18**	**7**	**13**	**100**	**300**	**400**
III	BO 231	Plant Breeding, Horticulture & Reproductive Biology	108	6	1.5	3	25	75	100
	BO232	Biophysics , biochemistry & Plant physiology	108	6	3	3	25	75	100
	BO233	Research Methodology, Biostatistics Plant Biotechnology	108	6	2.5	3	25	75	100
	BO234	Practical III	126		7	4	25	75	100
	Total for Semester III		**450**	**18**	**7**	**13**	**100**	**300**	**400**
IV	BO241	Special Paper –I Bioinformatics	144	8	2	3	25	75	100
	BO242	special Paper –II Elective	144	8	5	3	25	75	100
	BO243	Practical IV	126		7	4	25	75	100
	BO201	Dissertation	36	2				100	100
	BO202	Submissions					25	75	100
	BO203	Comprehensive Viva Voce						100	100
	Total for Semester IV		**450**	**18**	**7**	**10**	**100**	**500**	**600**
		Grand Total					**400**	**1400**	**1800**
L-Lecture, P-practical, ESA-End Semester Assessment, CA-Continuous Assessment(internal)									

SCHEDULE OF WORK LOAD

Semester	Paper code	Subject	Total hours		T Hours/week	P Hours/week
			T	P		
I	BO 211	Phycology	54	27	3	1.5
		Mycology	36	9	2	0.5
		Plant pathology	18	0	1	0
	BO 212	Bryophyta	27	9	1.5	0.5
		Pteridophyta	45	18	2.5	1
		Gymnosperms	36	9	2	0.5
	BO 213	Microbiology	36	9	2	0.5
		Histology	27	9	1.5	0.5
		Microtechnique & histochemistry	45	36	2.5	2
II	BO 221	Taxonomy	72	27	4	1.5
		Economic botany	9	9	.5	.5
		Ethnobotany	9	0	.5	0
		Evolution	18	0	1	0
	BO 222	Environmental Biology	72	36	4	2
		Phytogeography	18	0	1	0
		Conservation Biology	18	0	1	0
	BO 223	Cell & Molecular Biology	54	36	3	2
		Genetics	54	18	3	1
III	BO 231	Plant Breeding	63	9	3.5	0.5
		Horticulture	18	9	1	0.5
		Reproductive biology	27	9	1.5	0.5
	BO 232	Biophysics	27	9	1.5	0.5
		Biochemistry	36	18	2	1
		Plant Physiology	45	27	2.5	1.5
	BO 233	Research Methodology	18	0	1	0
		Biostatistics	27	9	1.5	0.5
		Plant Biotechnology	63	36	3.5	2
IV	BO 241	Special Paper – I Bioinformatics	144	36	8	2
	BO242	Special paper – II Elective	144	90	8	5
		Dissertation	18	0	2	0

Elective Special Papers

BO 242a : Biotechnology

BO 242b : Environmental Biology

BO 242c : Plant Biochemistry and Enzymology

BO 242d : Cytogenetics

The special paper comprises detailed studies in certain areas of a subject. Normally a department shall offer one of the above subjects as special paper. There shall be provision for change of subject for special paper, if necessary, in the ensuing years.

Study Tour

Study tour in the 2nd and 4th semesters of the PG programme is compulsory.

2nd Semester : minimum three one day field trips or 3 to 4 day study tour for flora awareness.

4th Semester : Visit to at least two regional and two national research institutions.

Submissions (4th Semester Practical Examination)

1. Detailed report on visit to research institutions and the type of research works undertaken by these centers
2. A Model research proposal seeking fund to carry out research on a specific problem
3. Power Point presentation of the dissertation carried out by the student before the examiner.

Dissertation/ Project work

Topic of the dissertation may be chosen from any area of botany and may be laboratory based, field based or both or computational, with emphasis on originality of approach. It may be started during 2nd/3rd semester and shall be completed by the end of the 4th semester. It should be duly signed by the research guide and the head of the Department and submitted for evaluation. The dissertation to be submitted should include:

- Introduction
- Objectives of the study
- Materials and methods
- Results and discussion
- Summery and conclusion
- References

Scheme for Practicals	**Duration**	**CA**	**ESA**	**Total Marks**
Practical I (BO 214) includes all the topics under papers BO 211, 212 & 213	4 hrs	25	75	100
Practical II (BO 224) includes all the topics under papers BO 221, 222 & 223	4 hrs	25	75	100
Practical III (BO 234) includes all the topics under papers BO 231, 232 & 233	4 hrs	25	75	100
Practical IV (BO 243) includes all the topics under papers BO 241 & 242	4 hrs	25	75	100

The practical examinations are conducted at the end of the semester II and Semester IV. Practical I and II examinations will be conducted at the end of the Semester II and Practical III and IV examinations will be conducted at the end of the Semester IV.Certified records of practical works done and submissions, if any, should be submitted at the time of each practical examinations.

SCHEME OF EXAMINATION AND MARK DISTRIBUTION

Semester	Paper code	Paper	Hours/ Semester	ESA hours	Maximum marks		
					CA	ESA	Total
I	BO211	Paper 1	108	3	25	75	100
	BO212	Paper 2	108	3	25	75	100
	BO213	Paper 3	108	3	25	75	100
	BO214	Practical I	126	4*	25	75*	100
	Total for Semester I		**450**	**13**	**100**	**300**	**400**
II	BO221	Paper 1	108	3	25	75	100
	BO222	Paper 2	108	3	25	75	100
	BO223	Paper 3	108	3	25	75	100
	BO224	Practical II	126	4	25	75	100
	Total for Semester II		**450**	**13**	**100**	**300**	**400**
III	BO231	Paper 1	108	3	25	75	100
	BO232	Paper 2	108	3	25	75	100
	BO233	Paper 3	108	3	25	75	100
	BO234	Practical III	126	4	25	75	100
	Total for Semester III		**450**	**13**	**100**	**300**	**400**
IV	BO242	Special Paper I	144	3	25	75	100
	BO243	Special Paper II	144	3	25	75	100
	BO244	Practical IV	126	3	25	75	100
	BO201	Dissertation	36			100	100
	BO202	Viva voce				100	100
		Submissions			25	75	100
	Total for Semester IV		**450**	**13**	**100**	**500**	**600**
Grand Total					**400**	**1400**	**1800**

Distribution of marks in each Semester Examination

Semester	Continuous Assessment		End Semester Assessment		Total marks
	Theory	Practical	Theory	Practical	
I	75	25	225	--	325
II	75	25	225	150(75+75)	475
III	75	25	225	--	325
IV	50	25	150	150(75+75)	375
	Dissertation				100
	Submissions				100
	Comprehensive Viva Voce				100
	Grand Total				**1800**

Distribution of Marks in Practical Examination

Practical Exam	Total Marks	Examination	Record/Submission
I	**75**	**55**	**Record – 10** **submission – 10**
II	**75**	**55**	**Record – 10** **Herbarium/Field note-10**
III	**75**	**65**	**Record – 10**
IV	**75**	**65**	**Record -10**

SEMESTER I

PAPER BO 211.PHYCOLOGY, MYCOLOGY& PLANT PATHOLOGY

144 hrs (Theory: 108 hrs; Practical: 36hrs)

A. PHYCOLOGY 54hrs (3hrs/wk)

1. Principles and modern trends in taxonomy of algae ; Contributions of Indian Algologists . (4h)
2. Classification of Algae (Christensen1964,Round1973;Whittaker&Margulis1978, R.E.Lee). Characteristic features of major divisions (6h)
3. Thallus organization and its morphological variations; Ecological and evolutionary trends. (6h)
4. Cell structure - Prokaryotic, mesokaryotic and eukaryotic organizations (4h)
5. Structure, reproduction and life cycle of the following types:
   Hydrodictyon, Ulva, Pithophora, Draparnaldiopsis, Bulbochaete, Cephaleuros, Codium, Halimeda, Acetabularia, Nitella, Sphacelaria, Padina, Turbinaria, Porphyra, Amphiroa, Gracilaria, Ceramium, Spirulina, Scytonema (30h)
6. Economic Importance of Algae –Algae as biofertilisers, as food, their uses in industry, water blooms and their ecological role.(4h)

Practical 27 hrs (1.5 hrs/wk)

1. A record of the local algal flora – A study of their morphology and structure
2. Field trips to be conducted for students to get familiarized with the local flora

References

1. Bhattia,A.2004.Treatise on Algae.S.Chand & Company ,New Delhi
2. Bilgarmi,K.S and Saha,L.C.1996.A text book of Algae.CBS Publishers, New Delhi
3. Bold ,H.C.&Wynne,M.J.1995.Introduction to Algae.Prentice Hall of India, New Delhi.
4. Kashyap,A.K.and Kumar,H.D. Recent advances in Phycology.Rastogy & company.

5 . Kumar,H.D.1985.Algal cell biology.East West Press,New Delhi.

6. Kumar ,H. D.1999.Introductory Phycology .East West Pvt. Ltd.,New Delhi.
7. Pandey,B.P.2004. Algae.S.Chand & Company Ltd.New Delhi.
8. Prescott,G.W.1969.The Algae: A review .Nelson Publ.

9. Round,F.E.1984.The Ecology of Algae.Cambridge University, Press, London.
10. Sharma,O.P.2002. Text book of Algae.Tata McGraw Hill Publ. Comp. Ltd. New Delhi.
11. Sharma,P.D.2003.A Text book of Botany-Lower plants.Rastogi Publications, Meerut.
12. Smith,G.M.1976. Cryptogamic Botany Vol.1.Tata Mc Graw Hill Publ. Comp.. Ltd. New Delhi.
13. Vashishta,B.R..1999.Algae.S.Chand &Company, New Delhi

B. MYCOLOGY **36 hrs (2hrs/wk)**

1. Principles and modern trends of classification of Fungi (Ainsworth 1973,Alexopoulose *et al.*1996*)*; contributions of Indian Mycologists. (3h)
2. Structure, reproduction and phylogeny of: Phycomycetes,Ascomycetes,Basidiomycetes,and Deuteromycetes. (6h)
3. Thallus structure ,reproduction and life cycle of the following types: *Phytophthora, Albugo, Pilobolus, Penicillium, Aspergillus, Erysiphe, Uromyces, Polyporus, Lycoperdon, Geaster, Dictyophora, Nidularia, Schizophyllum Colletotrichum, Fusarium, Alternaria, Helminthosporium, Cercospora, Parmelia, Graphis* (23h)
4. Economic importance of fungi with special reference to secondary Metabolites; Fungi as biocontrol agent.(2h)
5. Classification, thallus structure ,reproduction, ecological significance and economic importance of Lichens .(2h)

Practical **9hrs(1/2hr/wk)**

Study of the morphology and reproductive structures of the types mentioned in the syllabus.

References

1. Ainsworth,G.C.,Sparrow,K.E., Sussman.The Fungi. Academic Press, NewYork
2.. Alexopoulose,C.J.,Mims,C.W., Blackwell,M.1996.Introductory Mycology. John Wiley & Sons, New York.
3. Bessy,E.A.1979.Morphology and Taxonomy of Fungi.Vikas Publishing House, New Delhi.
4. Burnett,J.H.1968.Fundamentals of Mycology.Edward Arnold Ltd. London.
5. Chopra ,G.L.1998. A text book of Fungi .S.Nagin&Co . Meerut.

6 Dube,H.C.1996. An Introduction to Fungi.Vikas Publish.House, New Delhi.

7. Elizabeth Moore-Landeeker.1996.Fundamentals of Fungi.Prentice Hall, New Jersey.

8. Hale,M.E.1983.Biology of Lichens. Edward Arnold,London.

9. Hudson, H. J. Fungal Biology. Edward Arnold, London.

10..Moore, D..*et al* .1986.Developmental Biology of higher Fungi

11 .Mehrothra,R.S. and Aneja,K.R.1990.An Introduction to Mycology. Wiley Eastern Ltd. New Delhi.

12. Sharma,O.P.2007.Text book of Fungi . Tata McGraw Hill,Publishing Co. Ltd. New Delhi.

13. Sharma,P.D.2004.The Fungi for University students.Rastogi Publications, Meerut.

14 .Srivastava,J.P.1998.Introduction to Fungi. Central Book Depot, Allahabad.

15. Sumbali,G.2005.The Fungi.Narosa Publishing House, New Delhi.

C. PLANT PATHOLOGY **18 hrs (1hr/wk)**

1. History of Plant pathology, General principles and concepts of host-parasite interaction. (2hrs)
2. Defence mechanisms - Systemic Acquired Resistance and Induced Systemic Resistance, major signalling pathways of plant defense mechanism. (4 hrs)
3. Epidemiology and quarantine. (I hr)
4. Principles and methods of Plant disease control: Fungicides and pesticides ,natural pesticides, sanitation ,disease resistance. Biological control :biocontrol agents ,bio-inoculants, natural enemies, bio-traps. (2 hrs)
5. Study of the following plant diseases with reference to symptoms causal organism, disease cycle and control measures.

i.	Paddy	-	Brown spot and false smut
ii.	Sweet potato	-	White rust
iii.	Rubber	-	Powdery mildew
iv.	Coffee	-	Rust
v.	Tea	-	Red rust
vi.	Sugarcane	-	Red rot
vii.	Vanilla	-	Bean rot
viii.	Mango	-	Leaf spot
ix.	Ladies finger	-	Yellow vein mosaic
x.	Pepper	-	Quick wilt (9 hrs)

Practical

A record of all diseases mentioned in the syllabus.

References

1. Agrios, G.N.1997.Plant pathology. Academic Press, New Delhi .
2. Bilgrami,K.S.&H.C.Dube.1990.A text book of modern plant pathology. Vikas Publishing House, New Delhi.
3. Butler,E.J.& Jones,1949.Plant pathology.Mc Millan ,London
4. Chatterjee,P.B..1997.Plant protection techniques .Bharati bhavan, Patna.
5. Chattopadhayay,S.B.1991.Principles and procedures of plant protection Oxford &IBH, New Delhi
6. Manners, J.G.1982.Principles of Plant pathology.Cambridge University Press, London.
7. Marshall,H.1999. Diseases of plants .Anmol Publications Pvt.Ltd. , New Delhi .
8. ehrotra,R.S.2000. Plant pathology. Tata McGraw Hill,Publishing Co.Ltd. New Delhi.
9. Mundkur,B.B.1982. Text book of Plant diseases. Macmillan India Ltd., New Delhi
10. Pathak. V. N. ,Khatri, N. K. and Pathak,M.1996.Fundamentals of Plant pathology. Agrobotanical publishers (India), Bikaner.
11. Rangaswamy, G. and Mahadevan, A.2002. Diseases of crop plants in India. Prentice Hall of India, New Delhi.
12. Sharma,P.D 2005.Plant pathology.Narosa Publishing House, New Delhi.
13. Singh,R.S.2000. Introduction to the principles of Plant pathology. Oxford IBH, New Delhi
14. Swarup *et al.,*1999. Plant diseases. Anmol Publications Pvt.Ltd., New Delhi.

PAPER BO 212. BRYOPHYTA, PTERIDOPHYTA AND GYMNOSPERMS

144hrs (Theory : 108 hrs; Practical : 36hrs)

A. BRYOPHYTA 27hrs (1.5 hrs/wk)

1. General characters and recent systems of classification (Shofield 1985); Contributions of Indian Bryologists. (2 hrs)
2. A general account of morphological and anatomical features, reproduction, life history and phylogeny of : Sphaerocarpales, Marchantiales, Jungermanniales, Calobryales, Anthocerotales, Sphagnales, Andreales, Funariales, Polytrichales. (10 hrs)
3. Life cycle study of the following types:

   Lunularia, Targionia, Cyathodium, Reboulia, Pallavicinia, Porella, Notothylas, Sphagnu, Funaria (12hrs)
4. Origin and evolution of Bryophytes, Brief account on Fossil Bryophytes (2 hrs)
5. Bryophytes as indicators of water and air pollution. (1hr)

Practical 9hrs (1/2 hr /wk)

Morphological and anatomical studies of the types mentioned in the syllabus.

References

1. Cavers ,F.1976. The interrelationship of Bryophyta. S.R.Technic House),Asok Rajpath,Patna.
2. Chopra,R.N. 1998. Topics in Bryology.Allied Printers, New Delhi.
3. Chopra, R.N**.** and Kumara,P.K.1988. Biology of Bryophytes.Wiley East New Delhi.
4. Parihar, N.S. 1980.An introduction to Embryophyta Vol.I.Bryophyta.Central Book Depot, Allahabad.
5. Prem Puri.1981. Bryophytes:Morphology ,Growth and differentiation. Atma Ram and Sons, New Delhi
6. Rashid,A.1998.An introduction to bryophyte . Vikas Publishing House, New Delhi.
7. Shaw,J. and Goffinet,B.2000.Bryophyte Biology,Cambridge University Press.
8. Smith,G.M. 1976. Cryptogamic Botany Vol.II. Tata Mc Graw Hill. Publishing Co. Ltd., New Delhi.

9.Watson,E.V. 1968.The structure and life of Bryophytes.Cambridge University ,London.

B. PTERIDOPHYTA **45hrs (2.5 hrs/wk)**

1. General characters, classification (Bierhost1971) and life cycle of Pteridophytes; Contributions of Indian Pteridologists. (3hrs)
2. Comparative morphology,structure, ecology and phylogeny of the following groups: Psilopsida, Lycopsida, Sphenopsida, Pteropsida. (8hrs)
3. Structure ,reproduction and life cycle of the following types: *Isoetes,Ophioglossum,Angiopteris,Osmunda,Ceratopteris,Blechnum,Lygodium,Adiantum,Gleichenia,Acrostichum,Salvinia,Azolla* (24 hrs)
4. Telome theory-basis, elementary proves- origin of sporophylls in Lycopsida,Sphenopsida and Pteropsida- origin of root- merits and demerits of telome theory; Evolutionary trends in the gametophytes of Pteridophytes. (4 hrs)
5. Conservation of Pteridophytes ; Pteridophytes as ecological indicators. (2 hrs)
6. Principles of Paleobotany, Fossil pteridophytes: *Rhynia,Lepidocarpon,Sphenophyllum,Zygopteris* (4hrs)

Practical **18hrs (1hr/wk)**

1. Structural details of the vegetative and reproductive pars of the types mentioned in the syllabus.
2. Fossil types mentioned above.

References

1. Arnold,C.A.1947. An introduction to Paleobotany. McGraw Hill,New York.
2. Bierhost,D.W.1971.Morphology of vascular plants .Mac millan,London.
3. Eames,E.J.1983 Morphology of vascular plants .Standard University press.
4. Parihar,N.S.1980.An introduction to Embryophyta Vol.II.Pteridophyta Central Book Depot, Allahabad.
5. Rashid,A.1999.Pteridophyta. Vikas Publishing House, New Delhi
6. Scott,D.H.1962.Studies in Fossil Botany .Hafner Publishing Co., New York.
7. Shukla,A.C.and Misra,S.P.1975.Essentias of Paleobotany . Vikas Publishing House, New Delhi.
8. Sharma,O.P 2006.Text book of Pteridophyta. . Macmillan India Ltd.,New Delhi.

9. Smith,G.M.1976. Cryptogamic Botany Vol.II. Tata McGraw Hill, Publishing Co.Ltd. New Delhi.
10. Sporne,K.R. 1986. Morphology of Pteridophytes.Hutchinson University Library, London.
11. Stewart,W.N.1983. Paleobotany and evolution of plants. Cambridge University Press, London.
12. Sundara Rajan,S.1999. Introduction to Pteridophyta.New Age Publications, New Delhi.

C. GYMNOSPERMS 36hrs.(2hrs/wk)

1. General characters, affinities, distribution and classification (Sporne1965; David Bierhost1971); phylogeny and economic importance of Gymnosperms. (6 hrs)
2. Structural details of vegetative and reproductive parts ,phylogeny and inter relationships of the following orders :
   Cycadofilicales, Caytoniales, Bennettitales, Pentoxylales, Cycadales, Ginkgoales, Coniferales, Gnetales. (16 hrs)
3. Structure,reproduction and life cycle of the following types:
   Zamia,Auracaria,Cupressus,Podocarpus,Agathis,Ephedra (12 hrs)

4…Fossil Gymnosperms (Brief account) (2 hrs)

Practical 9hrs (0.5 hr/wk)

1. Structural details of the following fossil types: *Heterangium,Medullosa*.
2. Anatomy of stem (TS,RLS,TLS),leaf and reproductive structures of the types mentioned in the syllabus.

References

1. Bhatnagar,S.P. and Alok Moitra 1997.Gymnosperms.New Age Publications ,New Delhi.
2. Biswas ,C.and Johri,B.M.1999.The Gymnosperms. Narosa Publishing House , New Delhi.
3. Chamberlain,C.J.1955.Gymnosperms-structure and evolution. Dover Publications,Inc.New York.
4. Chamberlain,C.J .2000 Gymnosperms CBS Publishers, New Delhi.
5. Coulter and Chamberlain,1964.Morphology of Gym nosperm Central Book Depot, Allahabad.
6. Ramanujan,C G.K.1976. Indian Gymnosperms in time and space. Today and Tomorrows printers and publishers, New Delhi.

7. Sharma,O.P.1997. Gymnosperms,Pragati Prakasan,Meerut.
8. Sporne,K.R.1986. Morphology of Gymnosperms, Hutchinson University Library, London.
9. Vashishta,P.C.1999. Gymnosperms, S.Chand &Company, New Delhi.

SEMESTER II

PAPER BO 221: TAXONOMY OF ANGIOSPERMS, ECONOMIC BOTANY, ETHNOBOTANY AND EVOLUTION

(Theory 108 H; Practical 36 H) **(Theory 6 H/wk; Practical: 2 H/wk)**

A. TAXONOMY OF ANGIOSPERMS

(Theory: 72H; Practical: 27 H) **(Theory 4 H/wk; Practical: 1 ½ H/wk)**

1. Principles of taxonomy as applied to the systematic and classification of plant kingdom - species concept, taxonomic structure. (**2h)**

2. Classification – brief study of Artificial (Linnaeus), Natural (Benthem and Hooker) and Phylogenetic (Bessey and Takhtajan) systems. **(4 h)**

3. Detailed study of modern system of classification – Angiosperm Phylogeny Group (APG) classification system. **(2 h)**

4. Plant nomenclature, Evolution of ICBN, contents of ICBN, author citation, type concept and different types – publication of names, rule of priority, nomina conservanda and definition of nomenclature terms- autonym, homonym, basionym, tautonym and nomen nudum. **(3 h)**

5. History and development of taxonomy in India. Classification of taxonomical literature, general indices, floras, icons, monographs, reviews and journals; Herbarium – definition, steps involved in the development of herbarium, utility of herbarium and their maintenance, general account of National and regional herbaria with special reference to Central National Herbaria, Calcutta (CAL) and Madras Herbarium (MH), Botanical Survey of India, Botanical gardens and importance of botanical garden in taxonomic studies, important National and International Botanical gardens, Royal Botanical Garden, Kew, Indian Botanical Garden, Calcutta, National Botanical Garden, Lucknow and Tropical Botanical Garden, Trivandrum. **(4 h)**

5. Construction of taxonomic keys (indented and bracketed) and the utilization. **(2 h)**

6. Role and organization of Botanical Survey of India. **(1 h)**

7. Modern concepts and trends in plant taxonomy. Elementary treatment of i. Cytotaxonomy, ii. Chemotaxonomy, iii. Numerical taxonomy (taximetrics), iv. Molecular taxonomy, v.Biosystematics. **(5 h)**

8. Critical study of the current ideas on the origin of angiosperms with special reference to their ancestral stock, time and place of origin. **(2 h)**

9. Study of the following angiosperm families giving importance to morphological peculiarities if any (Special emphasis should be given on morphological and phylogenetic interrelationships, recent revisions and rearrangements between and within the families, and its critical analysis):

(47 h)

Ranunculaceae	Magnoliaceae	Capparidaceae	Bixaceae
Polygalaceae	Caryophyllaceae	Portulacaceae	Dipterocarpaceae
Malvaceae	Geraniaceae	Rhamnaceae	Vitaceae
Sapindaceae	Leguminosae	Rosaceae	Rhizophoraceae
Myrtaceae	Melastomaceae	Passifloraceae	Cucurbitaceae
Apiaceae	Rubiaceae	Asteraceae	lumbaginaceae
Sapotacee	Oleaceae	Asclepiadaceae	Boraginaceae
Solanaceae	Lentibulariaceae	Bignoniaceae	Verbenaceae
Lamiaceae	Amaranthaceae	Aristolochiaceae	Piperaceae
Lauraceae	Loranthaceae	Euphorbiaceae	Urticaceae
Causuarinaceae	Orchidaceae	Scitaminae	Amaryllidaceae
Liliaceae	Commelinaceae	Arecaceae	Araceae
Cyperaceae	Poaceae.		

B. ECONOMIC BOTANY

(Theory: 09H ; Practical: 09 H) (Theory ½ H/wk; Practical: ½ H/wk)

1. Detailed study of occurrence, mode of cultivation, process, product, biochemical and nutritional values of the following crop plants with their botanical details.

a) Cereals and Millets: Rice, Maize.

b) Pulses: Soya bean, Winged bean and Sword bean

c) Sugar yielding plants: Sugarcane and Sugar beet

d) Plantation crops: Coconut, Cocoa, Coffee and Tea

e) Spices and condiments: Pepper, Ginger, Turmeric, Cardamom and Nutmeg

e) Tuber crops-: Potato, Sweet potato and Tapioca

f) Fruits: Mango, Banana, Citrus, Guava, Grapes and Cashew nut

g) Vegetables: Tomato, Brinjal, Cucumber, Ash gourds and Bitter gourd

h) Medicinal plants: Sarpagandha, Belladonna, Cinchona, Vinca, Glycirrhiza.

i) Narcotics: Cannabis, Opium

j) Timber yielding plants: Rose wood, Teak Wood

Practicals

1. Study of representative members of all the prescribed families as evidenced by record of practical work (to be submitted during the practical examination).
2. Identification of fresh and herbarium specimens using flora and other supportive documents like monographs.
3. Visit to a recognized herbaria (The report of the same should be submitted separately).
4. Field work for familiarizing the local flora under the supervision of teachers, and documentation of the proceedings.
5. Study Tour of minimum three days should be conducted to biodiversity rich zones of Western Ghats, for familiarizing the floristic wealth (The report of the same should be submitted for valuation).
6. Preparation of dichotomous key (minimum 5 keys)
7. A minimum of 10 abbreviations of authors' names to be presented in the record.
8. A minimum of 50 herbarium specimens giving representation of minimum of 40 families to be submitted for valuation.
9. Identification of economically important plants and plant parts, and submission of five botanical specimens/ products of economic importance.

Key references:

1. Arora PK and Nayar EK. Wild relatives of Crops plants in India, NBPGR Sci. Monograph No. 7
2. CSIR, The useful plants of India, Publication and Information Directorate, CSIR, New Delhi
3. Judd WS, Campbell CS, Kellog EA & Stevens PF (1999), PlantSystematics. Sinauer Associates, Inc., Massachusetts, USA
4. Kochar LS (1981) Economic Botany in the Tropics, Macmillan
5. Lawrence GHM (1964), Taxonomy of Vascular Plants, Mac Millon Co., New York
6. Rendle AB (1967), Classification of flowering plants, Cambridge University Press
7. Sharma OP (1990) Plant Taxonomy, Oxford Publishers, New Delhi
8. Singh G (1999), Plant systematics: Theory and Practice, Oxford IBH.

Supportive References:

9. Davis PH & Heywood (1963), Principles of Angiosperm Taxonomy, Oliver-Boyd
10. Gamble JS (1935), Flora of Presidency of Madras, London

11. Gibbs RD, Chemotaxonomy of flowering plants
12. Hill AF (1952), Economic Botany, Tata McGraw Hill
13. Hooker JD (1879), Flora of British India. Reeve &Co., London
14. Hutchinson J (1959), Families of flowering plants, Cambridge University Press
15. Lawrence GHM (1955), An Introduction to plant Taxonomy, Central Book Depot
16. Sen S (1992), Economic Botany, New Central Book Agency, Culcutta
17. Sivarajan VV (1991) An introduction to Principles of Taxonomy, London
18. Sivarajan VV (1999), Principles of plat Taxonomy, Oxford and IBH Publishing Co.
19. Stace C (1985), Plant Taxonomy and Biosystematics, London.
20. Takhtajan AL (1969) Flowering plants. Origin and Dispersal, Oliver and Boyed.

C. ETHNOBOTANY

(Theory: 09H) (Theory: ½ H / Wk)

1. Plants and civilization
2. Ethnobotany- relevance in Modern medicine
3. Ethnic societies of Kerala and their traditional herbs
4. Ethnobotanical documentation
5. Medicines derived from herbal drugs
6. Status of ethnobotanical studies in Kerala

Key references:

1. Jain SK (1987). A manual of ethnobotany, Indus Intl. Publishers, New Delhi
2. Jain SK (2001). Medicinal Plants, National Book Trust, India
3. Wood M (1997), The book of herbal wisdom: using plants as medicines, North Atlantic Books, California.

Supportive References:

4. Cunnigham A (2001) Applied ethnobotany: people, wild plant use and conservation, Earthscan, UK
5. Martin GJ (2004) Ethnobotany: a methods manual, Earthscan, UK
6. Jain SK and Mudgal V (1999) A hand book of ethnobotany. Indus Inst. Publishers, New Delhi.

D. EVOLUTION

(Theory: 18H; 1 H / Wk)

1. Origin and evolution of life (including aspects of pre-biotic and molecular evolution) (2hrs)
2. Concepts and theories of evolution. Classical and synthetic theories of evolution. (4hrs)

3. Forces and mechanism of evolution. (3hrs)

4. Speciation (3hrs)

5. Isolation mechanism. (2hrs)

6. Evolution above species level. (2hrs)

7. Molecular evolution. (2hrs)

Key references:

1. Strickberger MW (1996). Evolution, Jones and Bartlett Publishers, New York
2. Savage JM (1969), Evolution, Oxford &IBH, New Delhi.
3. Sproule A (1998) Charles Darwin: Scientist who have changed the world. Orient Longman, New Delhi.

Supportive References:

4. Blackle (1983) Evolutionary principles, Oxford & IBH, New Delhi
5. Briggs D &Walters SM (1984), Plant variation and evolution, Cambridge University Press, london
6. Echrlich & Holm (1974) Process of evolution, Oxford &IBH, New Delhi
7. Wooley P (1983) Molecular theory of evolution, Springer-Verlag, Berlin

PAPER. BO 213.MICROBIOLOGY, HISTOLOGY, MICROTECHNIQUE AND HISTOCHEMISTRY

162 hrs (Theory:108 hrs;Practical:54hrs)

A. MICROBIOLOGY 36hrs (2hrs/wk)

1. Brief history of microbiology. Experiments of Pasteur and Tyndall, Koch's postulates. Methods of sterilization. (4 hrs)
2. Changing concepts in microbial taxonomy- molecular taxonomy-Jackard's similarity coefficient. (2 hrs)
3. Brief account of major classes of microorganisms. (4 hrs)
4. Growth and nutrition of microorganisms. (2 hrs)
5. Microbial diseases in plants, animals and humans (any two). (4 hrs)
6. Microbes in Agriculture: Rhizosphere, Nitrogen fixation, Mycorrhiza**,** Cyanobacter (2 hrs)
7. Industrial Microbiology: Major industrial products from microbes: Beverages, Antibiotics, Secondary metabolites, Recombinant products (2 hrs)
8. Environmental Microbiology: Anthropogenic wastes. Municipal Wastes, Xenobiotics, Xenobiotic degrading consortia, Bioremediation (2 hrs)
9. Immunology
    a. Immunity-mechanism; Innate and adaptive immune system: cells and molecules involved in innate and adaptive immunity.
    b. Antigens, antigenicity and immunogenicity. B and T cell epitopes.
    c. Structure and function of antibody molecules, generation of antibody molecules, generation of antibody diversity, monoclonal antibodies,antibody engineering.
    d. Antigen antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cell, B&T cell receptors.
    e. Humoral and cell mediated immune responses, primary and secondary immune modulation, the complement system, Toll like receptors cell mediated effector functions.
    f. Inflammation, hypersensitivity and auto immunity, immune response during bacterial (tuberculosis) parasitic(malaria) and viral (HIV) infections, congenital and acquired immune-deficiencies, vaccines. (14hrs)

Practical **9hrs (1/2 hr /wk)**

1. Practicals involving preparation of media,principles of isolation , pure culturing aspects and maintainance of culture.
2. Methods of study : Hanging drop for demonstrating bacterial motility;differential staining – gram and acid fast.
3. Isolation of Rhizobium from root nodule of Legumes.
4. Test for coliforms in contaminated water.
5. Isolation of pure bacterial culture by streak plate method.

References

1. Atlas,M.and Bartha,R.2000 Microbial Ecology,Longmann New York .
2. Black,J.,.G.1999.Microbiology –Principles and Explorations,Prentice Hall, London.
3. Brock,T.D.1996.Biolog y of microorganisms Prentice Hall,London
4. Casida,L.E..1997Industrial microbiology .New Age Publishers ,New Delhi
5. Dubey,R.C. and Maheswari,D.K.2010.A Text book of Microbiology,S.Chand & Company, New Delhi
6. Gerald Karp 2008.Cell and Molecular biology-concepts and experiments. John Wiley &sons, New York.
7. Ivan Roitt,1997.Essential Immunology .Black Well Science Ltd ,London.
8. Kumar ,H.D. and Swati kumar.1999.Modern concepts of Microbiology,Vikas Publishing House, New Delhi.
9. Lodish Berk *et al.2008.* Molecular Cell Biology6th ed..W.H.Freeman&Co. New York.
10. Lydyard,P.M.*et al.*1999.Instant notes in Immunology .Viva Books, New Delhi.
11. Pelezar,M.J;Chan,E.C.S and .Kreig,N.R.1993.Microbiology-concepts and Applications. McGraw Hill ,Inc. New York.
12. Powar,C.B.and Daginawala,H.F.General Microbiology Vol.II.Himalaya Publishers,Bombay.
13. Rao,A.S.2001.Introduction to Microbiology. Prentice Hall of India, New Delhi.
14. Sharma,P.D.2005.Environmental microbiology.Narosa publishers, New Delhi.
15. Stainer.R.Y.*et al.*1990The microbial world. Prentice Hall of India,New Delhi.

B. HISTOLOGY 27hrs (1.5 hrs/wk)

1. Origin, structure and function of cambia and their derivatives (6hrs)
2. Seasonal variation in cambial activity, role of cambium in wound healing and grafting (2h)

3. Anomolous cambial activities in *Bignonia, Amaranthus, Mirabilis, Bougainvillea, Piper, Aristolochia, Thunbergia* (6 hrs)
4. Structure of wood- Soft wood, hard wood, Sap wood, Heart wood and role of extractives in wood quality. Wood anatomy of the following wood yielding plants of Kerala: *Artocarpus integrifolia, Tectona grandis ,Dalbergia latifolia, Ailanthus malabarica, Alstonia scholaris* (6h)
5. Nodal anatomy, root –stem transition, transfer cells. (2hrs)
6. Floral anatomy. (1hrs)
7. Histochemical and ultra structural aspects of development, differentiation and morphogenesis. (3hrs)
8. Anatomy in relation to Taxonomy. (1hr)

Practical **9hrs (1/2hr/wk)**

1. Anomolous structures of types mentioned in the syllabus
2. Leaf anatomy:epidermal peels ,stomatal study ,T.S.of lamina.
3. Nodal anatomy and root-stem transition.
4. Maceration of herbaceous and woody stems- separation of different cell types.

References

1. Chandurkar,P.J.1966.Plant anatomy.Oxford &IBH Publication Co.,New Delhi.
2. Cutler,D.F.,1978 .Applied Plant Anatomy .Orient Longman, New Delhi.
3. Cutler,E.G. 1978. Plant Anatomy(Vol.I,II.) Edward Arnold, London.
4. Eames ,A.J.,& Mac Daniels,L.H. 1979.An introduction to Plant Anatomy .Mc Graw Hill New York.
5. Esau,K.1974. Plant Anatomy. Wiley Eastern Ltd. , New Delhi
6. Esau,K.2002. The anatomy of seed plants..John Wiley & Sons,New York.
7. Fahn,A.1989. Plant Anatomy,Pergamon press,Oxford ,New York.
8. Foster,A.S.1960.Practical Plant Anatomy. Van Nostrand & East West, New Delhi.
9. Metcalfe,C.R. and Chalk ,L.1950.Anatomy of the dicotyledons and Monocots(Vol.I,II), Oxford University Press, London.

C. MICROTECHNIQUE AND HISTOCHEMISTRY 45 hrs (2.5 hrs/wk)

1. Scope of Histochemistry and cytochemistry in Biology. (2 hrs)
2. Chemical fixation –reagents and fixatives, chemistry of fixation; Tissue dehydration – reagents, Infiltration and embedding ; Sectioning and mounting (10 hrs)
3. Tissue processing technique for light microscope,hand and serial sections, squashes, smears and maceration (7 hrs)
4. Microtomy-Rotary,sledge,Freezing ,Cryostat and Ultratomes (5hs)
5. Classification and chemistry of biological stains. General and specific vital stains and flurochromes. (5hrs)
6. Micrometry, camera lucida,photomicrography. (3hrs)
7. Tissue processing techniques for electron microscopy (2hrs)
8. Detection and localization of primary metabolites- Carbohydrates (PARS reaction),Proteins (Coomassie brilliant blue staining) Lipids(Sudan Black method) .Brief mention about other methods also. (5hrs)
9. Detection and localization of secondary metabolites- alkaloids, terpenoids, phenolics (3hrs)
10. Enzyme histochemistry- General design and applications. (3hrs)

Practical 36hrs (2hrs/wk)

1. Preparation of double stained free hand sections and identification of the tissues with reasons (Normal or Anomolous secondary thickening).
2. Preparation of serial sections from the given block and identification of the tissues with histological reasoning.
3. Free hand sections showing localization of soluble components –Proteins, Sugars and Lipids.
4. Preparation of squashes and smears; Maceration of tissues for separating cell types
5. Measurement of microscopic objects (algal filaments,spore,pollen etc.)
6. Students are expected to get a thorough understanding on reagents and buffers for tissue processing .
7. Students should submit 15 permanent slides (5 serial,5 hand sections, and 5 slides from squash, mear, whole mount ,sledge and histochemical localization)

References

1. Gahan,P.B.1984.Plant histocchemistry and Cytochemistry. Academic Press, London
2. Gary,P.1964.Hand book of Basic microtechnique. John Wiley & Sons, New York.
3. Harris, Electron Microscopy in Biology
4. Johansen, D.A.1940. Plant Microtechnique. Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
5. Johanson,W.A.1982.Botanical Histochemistry .-Principles and Practice Freeman Co.
6. Johanson,W.A.1984.Plant Microtechnique.McGraw Hill, . New York.
7. John E .SASS.1964. Botanical microtechnique. Oxford & IBH Publishing Co.Calcutta.
8. Kierman,J.A.1999.Histological and Histochemical Methods.Butterworth Publ. London.
9. Pearse,A.G.E.1960. Histochemistry. Vol.I& Vol.II,J&A. Churchill, London.
10. Ruzin,Z.E.1999. Plant Microtechnique and Microscopy.Oxford Press,New York.

Practical I (BO214)

Submissions

Students should submit at least 10 specimens representing algae, fungi, bryophyte, pteridophytes and gymnosperm.

PAPER BO222

ENVIRONMENTAL BIOLOGY, FOREST BOTANY, PHYTOGEOGRAPHY AND CONSERVATION BIOLOGY

(Theory 108 h; Practical 36 h) **(Theory 6 h/wk; Practical 2 h/wk)**

A. ENVIRONMENTAL BIOLOGY

(Theory: 54 h ; Practical: 36 h) **(Theory 3 h/wk; Practical: 2 h/wk)**

1. Introduction to various approaches to the study of ecology based on levels of organization and habitat- interaction between environment and biota. Ecological niches, Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement. **(5 h)**
2. Physical environment; biotic environment; biotic and abiotic interactions. Concepts and dynamics of Ecosystems: Types – Freshwater, marine and terrestrial. Components of ecosystem, application of Law of thermodynamics, food chain, food web, trophic levels, ecological pyramids and recycling - energy flow and transaction. Productivity and Biogeochemical cycles. Development and evolution of ecosystems. Ecosystem management. **(8 h)**
3. Characteristics of a population; population growth curves; population regulation; life history strategies (*r* and *K* selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations. **(4 h)**
4. Nature of communities; community structure and attributes; levels of species diversity and its measurement; edge effect and ecotone. **(4h)**
5. Ecosystem: Structure and function; energy flow and mineral cycling (CNP); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine. Major terrestrial biomes; theory of island biogeography; biogeographical zones of India. **(7h)**
6. Species interactions - types of interactions, interspecific competition, herbivory, carnivory, symbiosis. **(4 h)**
7. Study of climate, their distribution and adaptation to the environment. Deserts (dry and cold) Tundra, Grassland, Savannah, Temperate forests, Tropical rain forests, Mangrove. (**3 h)**
8. Ecological concepts of species: Autecological level (genecology), Synecological level (Ecosystem level). Ecads (Ecophenes), Ecotypes, Ecospecies. **(4 h)**

9. Ecological succession: Types; mechanisms; changes involved in succession; concept of climax **(4 h)**

10. Disaster management, Environmental laws, Global environmental problems- ozone depletion, green house effect, global warming, acid rain, nuclear hazards – Climate change, Eutrophication. **(5 h)**

11. Applied ecology: Environmental pollution; global environmental change; biodiversity-status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches. Current environmental issues in India, Environmental education and awareness. **(6 h)**

12. Practical

1. Analysis of vegetation - Quadrate /line transects to find frequency and interpret the vegetation in terms of Raunkiaer's frequency formula.
2. To find out the dissolved oxygen content in the given water sample (pond, lake, well etc).
3. To find out the primary production in the given water sample using light and dark bottle method.
4. Estimation of carbonate and bicarbonate content in water samples.
5. Estimation of total organic carbon content in the given soil sample
6. Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
7. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural

Key references

1. Odum, F. E. 1971. Fundamentals of Ecology. W.B. Saunders and Company.
2. Sharma, P. D. Enviornmnetal Biology, Himalaya Publications
3. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner

Supportive References:

4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.

5. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi .

6. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication.

7. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai.

B. FOREST BOTANY

(Theory: 9 h; 1/2 h/wk)

1. Forests- definition, study of various forests of the world and India. **(1 h)**
2. Forest products – Major and minor with reference to Kerala. **(2 h)**
3. Influence of forest on environment. **(2 h)**
4. Consequence of deforestation and industrialization. **(2 h)**
5. Sustainable use of bioresources. **(2 h)**

Key references

1. Agarwal AP, Forest in India, Oxford & IBH

2. Gregorve GR, Forest products, production, trade and consumption, quantity and value of raw materials requirements, Ford foundation, New Delhi

Supportive References:

4. Puri GS, Indian Forest Ecology, Vol I & II, Oxfaord & IBH

5. Champion GH & Seth KA, A revised survey of forest types of India.

C. PHYTOGEOGRAPHY

(Theory: 18 h; 1 h/wk)

1. Define – Phytogeography - static and dynamic phytogeography. **(2 h)**
2. Geological history and evolution of plant life. **(4 h)**
3. Factors of plant distribution. Theories concerning present and past distributions-continental drift, glaciations, existence of land bridges and their effect on plant distribution. **(4 h)**
4. Phytogeographic regions of the world (Vegetational belts). **(4 h)**
5. Soil, climate, flora, and vegetation of India. **(4 h)**

Key references

1. Ronald Good. 1964. The geography of flowering plants. Lengmans.

2. Bharucha F.R. 1984. Atext book of plant geography of India. Oxford University Press.

3. Puri G.S. 1983. Indian Forest Ecology, Vol I, II. Oxford, New Delhi.

Supportive References:

4. Schatz, G.E. 1996. *Malagasy / Indo-Australo-Malesian Phytogeographic Connections.* http://www.mobot.org/MOBOT/Madagasc/biomad1.html

5. The International Biogeography Society http://www.biogeography.org/

6. Tree of Life. URL: http://tolweb.org/tree/phylogeny.html

D. CONSERVATION BIOLOGY

(Theory: 27; 1.5 h/wk)

1. Concept, aim and principles of conservation. **(1 h)**
2. Convention on Biological Diversity - Objectives – Definition of biodiversity – Roles of IUC (IUCN), MAB - Red data book - Threatened categories of plants. Conservation strategies - *In-situ* and *Ex-situ* conservation - Sustainable development. Biosphere reserves, Wild life sanctuaries and National parks in India with special reference to Kerala. **(4 h)**
3. Conservation biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves). **(3 h)**
4. Agriculture and conservation of resources. Novel agricultural technologies – Nitrification inhibitors, Wind mills for irrigation, Solar energy for drawing ground water, Biogas for cooking and slurry left to be used as fertilizers. **(3 h)**
5. Urbanization and Conservation – Planning for environmentally compatible human settlements and strategy for sustainable industrial development. **(2 h)**
6. Conservation and energy – Causes of energy crisis, Conventional and Non conventional energy sources. **(2 h)**
7. Plant as a source of renewable energy. Development of non-polluting energy systems - Solar energy, Wind energy, energy recovery from solid wastes. **(2 h)**
8. Conservation of Physical resources. (Mention all physical factors of environment). **(2 h)**
9. Afforestation- social forestry, agroforestry, International Biological programme (IBP), Man and Biosphere (MAB), IUCN, world environment day, wild life preservation act (1972), Indian forest conservation act (1980), United Nations Environmental Programme, Environment protection Act. **(6 h)**
10. Environmental awareness – role of Government and NGOs- Gaia hypothesis. **(2 h)**

Key references

1. Dasman R.F. 1976. Environmental conservation, John Wiley and Sons, New York.
2. Malcom L., Hunter J.R. and James Gibbs. 2007. Fundamentals of Conservation Biology, Blackwell Publishing.

3. Andrew S. Pullin.2002. Conservation Biology, Cambridge University Press.
4. Fred Van Dyke 2008. Conservation Biology, foundation, concept, applications, Springer.

Supportive References:

5. MacDonald and Katrina Service 2007. Key Topics in Conservation Biology, Blackwell Publishing
6. Fiedler, P.I. and Kareiva P.M. 1998. Conservation Biology for the coming decade, Chapman and Hall.

Practical

1. One day visit to ecologically significant location (National parks/ mangroves/estuaries)
2. Each student should plant and maintain at least two plants in the college botanic garden or premises, belonging to IUCN category, and document the same (in the record).

PAPER BO223: CELL AND MOLECULAR BIOLOGY, GENETICS

Theory 108 hrs; Practical 54 hrs (theory 6 hrs/week; Practical 3 hrs/week)

A. CELL AND MOLECULAR BIOLOGY (T- 54 hrs; 3 hrs/wk)

1. A brief account on the structural and functional organization of the cell and cell organelles. Prokaryotic and eukaryotic cells. Cytoskeleton- its role in cell organization and mobility. **4 hrs.**
2. Ultra structure of the cell membrane, nuclear envelope, chloroplast, mitochondrion, Endoplasmic reticulum, lysosomes and ribosomes. Nucleus – structural and functional organization. Mitochondrial and Chloroplast genome organization and function. Nucleolus – origin, ultra structure and function. **6 hrs**
3. Chemistry of chromosomes – DNA – organization, histone and non-histone proteins, RNA and organization of these in the three dimensional configuration of the chromosome. A study on the structure and function of the kinetochore - NOR and other secondary constrictions, satellites, heterochromatic segments and telomeres. **6 hrs**
4. Numerical variations of chromosomes – origin and meiotic behavior of haploids, aneuploids and polyploids.Structural variations of chromosomes – Deletions, duplications, inversions and translocations, meiotic behavior in the above types. **4 hrs**
5. Cell Divisions. Stages in cell cycle – G_1, S, G_2 – Prophase, Metaphase and Telophase. Mitotic apparatus. Cytokinesis. Meiosis – General description. Synaptonemal complex, structure and function with significance of the various stages of meiosis I and II.Theories and mechanisms of crossing over. Molecular mechanism of crossing over. **4 hrs**
6. Cell differentiation - General characteristics, molecular mechanism of cell differentiation. **2 hrs**
7. Prokaryotic and eukaryotic DNA replication- DNA polymerases and proteins involved in DNA synthesis and their specific roles. Structure and properties of RNA polymerases in prokaryotes and eukaryotes. General and specific transcription factors, Mechanism of transcription and post transcriptional modifications of RNAs, RNA editing. **8 hrs**
8. Molecular nature of genes - An introduction to gene functions. Techniques of gene expression: northern and western blotting; Gel retardation; Primer extension; Reporter assay.
9. Molecular tools for studying genes and gene activity. **5 hrs**
   a. Molecular marker technologies
   b. Molecular cloning methods **4 hrs**
10. Technique of DNA Analysis: Preparation of DNA and RNA Probes; Principles of hybridizations and hybridization based techniques (Colony, Plaque, Southern and *in situ* hybridization); Autoradiography; DNA Fingerprinting. **4 hrs**
11. DNA sequencing, chemical synthesis of nucleotides **4 hrs**
12. Polymerase Chain Reaction and its application. **2 hrs**

Practical **36 hrs; 2 hrs/week**

1. Mitosis – Metaphase and Anaphase 6 hrs

2. Meiosis – All stages - *Rhoeo, Chlorophytum, Crotalaria, Datura* (at least two should be recorded) 6 hrs
3. Isolation and purification of genomic DNA. 8 hrs
4. Isolation of total RNA (Demonstration only) 8 hrs
5. Isolation and Partial purification of Proteins. 8 hrs

References

1.De Robertis and De Robertis 1998 Cell and Molecular Biology. B.I. Waverly Pvt Ltd. New Delhi.

2. Strickberger, M. W. 1985. Genetics. Macmillian India, New Delhi.

3. Gerald Karp. 1984. Cell Biology. McGraw Hill, New Delhi.

4. Jurgen Schulz-Scaffer, 1985. Cytogenetics- Plants Animals and Humans. Springer Verlag, Berlin.

5. Cooper, G. M. 1997. The Cell – A Molecular approach. ASM Press, Washington.

B. GENETICS (54 hrs; 3 h/week)

I. Classical Genetics

1 Mendelian Genetics – Brief account. (2 h)

2. Sex determination, Dosage compensation, Barr body, Lyon's hypothesis. (2 h)

3. Linkage, recombination and linkage maps – Bateson's concept of coupling and repulsion. Morgan's concept of linkage, linear arrangement of genes, linkage groups, complete and partial linkage and recombination linkage maps, three point test crosses, interference coefficient of coincidence and negative interference. (4 h)

4. Microbial Genetics – Genetic recombination in viruses – lysogenic and lytic cycles in bacteriophages. Benzer's experiment in the rII locus of T4 phage, retro viruses, reverse transcriptase, onco viruses, and oncogenes. Bacterial recombination - transformation experiment of Griffith, Avery *et al*. Conjugation – F^+, F^- and Hfr F^- conjugations. Conjugation mapping – F - duction(sexduction).Transduction-generalized and specialized.Recombination in fungi (tetrad analysis in *Neurospora*) Complementation tests. (6 h)

5. Biochemical Genetics – Contributions of Garrod, Beadle and Ephrussi, Beadle and Tatum. (1 h)

6. Gene concept – Factor concept of Mendel, Presence absence theory of Bateson. Gene – Enzyme relationship, One gene - One enzyme hypothesis. Benzer's concepts of Cistron, muton and recon. Brief description of the following types of genes- smart genes (luxury genes),

housekeeping genes, transposons overlapping genes, split genes, homeotic genes, pseudogenes, orphan genes, selfish genes, gene cluster, gene families. (3 h)

II Molecular Genetics

1. DNA as the genetic material, DNA constancy, C - Value paradox, structure of B-DNA and Z – DNA. (2h)
2. DNA replication – Stage, unit and mode of replication. Semi conservative mode of replication. Messelson – Stahl experiment. System of replication – template, deoxy nucleotide triphosphate pool, enzymes and protein factors. Mechanism of replication, unidirectional and bidirectional replication. Molecular assembly at the replication fork, leading and lagging strands, Okasaki fragments. DNA polymerases of prokaryotes and eukaryotes, topoisomerases, gyrases, ligases and nucleases. DNA polymerase function, proof reading and repair. Comparison of eukaryotic and prokaryotic DNA replication. Replication of ØX174 DNA. (6h)
3. DNA damage and repair- Photoreactivation repair, excision repair, recombinational repair, SOS repair. Genetic diseases caused by defects of DNA repair system – Blooms syndrome, Xeroderma pigmentosum, Retinoblastoma. (2h)
4. Mutation – Types of mutations, methods of detection (CIB method, attached X method). Molecular mechanism of spontaneous and induced mutations, site directed mutagenesis. Environmental mutagenesis and toxicity testing, high radiation belts of Kerala. Mutagenic effects of food additives and drugs. Ames test. (4h)
5. Genetic code – Genetic code word dictionary. Features of the genetic code and its exceptions. (2h)
6. Protein synthesis - Central dogma, Transcription, organization of transcriptional units. Prokaryotic and eukaryotic RNA polymerases and their function. RNA processing and translation. (2h)
7. Gene Regulation – Gene Regulation in viruses - Cascade model of expression of early middle and late genes in viruses. Gene Regulation in Prokaryotes – Operon concept, positive and negative control attenuation, anti termination.

   Gene Regulation in Eukaryotes – Heterochromatinisation and DNA methylation- DNA methylases, DNA rearrangements. Transcriptional regulation – signal transduction - upstream and downstream. Regulatory sequences and transacting factors, activators and enhancers.

DNA binding by transcription factors. Britten and Davidson model for eukaryotic gene regulation.

Post transcriptional regulation – RNA processing – split genes, hn RNA, introns and exons, capping, polyadenylation, splicing, snRNAs and spliceosomes. Post transcriptional silencing, MicroRNAs, RNA inhibition.

Translational regulation and Post Translational regulation - Cleavage and processing of proteins. Genetic imprinting.

Environmental regulation of gene expression. (8h)

8. Gene synthesis – Khorana's artificial synthesis of the gene for alanine. Transfer RNA and tyrosine transfer RNA of yeast. (2h)
9. Blotting techniques- Southern, Northern and Western blotting. DNA finger printing and foot printing. (2h)

III. Population Genetics and Developmental Genetics

1. Population genetics – Systems of mating and their genetic effects. Hardy Weinberg law and its applications. Factors affecting gene frequencies – mutation, migration, selection, genetic polymorphism and selection. Genetic drift, founder effect, genetic load. Consanguinity and its genetic effect. (4h)

3. Developmental genetics- Genetic control of development in plants and animals with stress to developmental genes in *Arabidopsis* and *Drosophila.* Role of cytoplasm in development. (2h)

Practicals

Work out problems in linkage chromosome mapping, microbial genetics, molecular genetics and population genetic.

Key references

1. Goodenough, U. Genetics. Holt Saunders, New York.
2. Lewin , 2000. Genes VII. Oxford University Press, New York.
3. Lodish *et al*. 2000. Molecular and Cell Biology. W. H.Freeman and Co, New York.
4. Sinnot, E. W. ET AL., 1958. Principles of Genetics. McGraw Hill, New Delhi.
5. Strickberger, M. W. 1985. Genetics. Macmillian India, New Delhi.

SEMESTER III

Paper. BO 231. PLANT BREEDING, HORTICULTURE AND REPRODUCTIVE BIOLOGY

(Theory 108 hrs; Practical 27 hrs)

A. **PLANT BREEDING** **(63 hrs Theory)**

1. Definition, Objectives. Importance of floral biology in plant breeding. (3 hrs)
2. Methods of crop improvement
   a. Plant Introduction: Definition, types and procedure. Sources of germplasm. Centres of genetic diversity. Concepts of de Candolle and Vavilov. Primary, secondary and microcenters. Genetic erosion. Preservation and utilization of germplasm. Gene banks. NBPGR. (4 hrs)
   b. Selection: Principles, genetic basis and methods: Mass selection, pure line selection, clonal selection. (6 hrs)
   c. Hybridization: Objectives. Procedure. Major achievements. Problems and causes of failure of hybridization. Handling of hybrids - Bulk method and pedigree method of selection. Distant hybridization - Role of interspecific and intergeneric hybridization in crop improvement. (7 hrs)
3. Role of incompatibility and sterility in crop improvement. (3 hrs)
4. Backcross breeding: Theory and procedure. (5 hrs)
5. Inbreeding: inbreeding consequences. Heterosis- Definition. Genetic and physiologic basis. Application in plant breeding. Steps in the production of single cross, double cross, three way cross, synthetic cross, multilines. Idiotype breeding: Concept, Achievements: (Wheat – Asana, Donald. Rice – Super Rice). (7 hrs)
6. Polyploidy breeding: induction of autopolyploidy and allopolyploidy. Role of chromosome manipulation. Chromosome addition and substitution lines. Achievements. (6 hrs)
7. Mutation breeding: Principles, objectives, procedure. Induction of mutations: Physical and chemical mutagens - Recurrent irradiation, Split dose irradiation, Combination treatment. Achievements. (6 hrs)
8. Resistance breeding: Principles. Methodology. Basis of resistance: structural biochemical, physiological and genetic. Gene for gene systems of plants. Vertical and

horizontal resistance. Artificial production of epiphytotic conditions and screening procedures for resistance. (7 hrs)

9. Seed production and certification. (4 hrs)

10.Centres of crop breeding: International and National (with special reference to Kerala). (3 hrs)

11.Plant breeder's rights Act. National Biodivesity Policy. (2 hrs)

Practicals (9hrs)

1. Emasculation; preparation of the inflorescence for crossing
2. Estimation of pollen sterility and fertility percentage
3. Pollen germination: *in vitro* and *in vivo* viability tests
4. Study of pollen types using acetolysed and non-acetolysed pollens
5. Developmental stages of anther, ovule, embryo and endosperm.

B. HORTICULTURE (18 hrs Theory)

1.Concept and Scope – Familiarization of famous gardens in the world and in India.(2 hrs)

2.Tools and Implements. (1 hr)

3.Plant growing structures – Greenhouse, Glasshouse and Mist chamber. (1 hr)

4.Plant propagation: Seed propagation and vegetative propagation- natural and artificial. Artificial methods of vegetative propagation: Cuttage, layerage, graftage, budding, micropropagation. (3 hrs)

5.Cultural practices – Thinning, training, trimming and pruning. (1 hr)

6. Fertilizers: NPK, biofertilizers, green manure, compost, vermicompost. (2 hrs)

7.Outdoor horticulture: Components and designs of gardens. Types of gardens: (1hr) Vegetable/ medicinal/ floral. (2) Home gardens, public gardens, vertical gardens, roof gardens. Lawns and landscapes. (2 hrs)

8.Commercial horticulture: Nurseries, Orchards, Floriculture: Production of cut flowers. Floral decorations (Brief account only). Indoor plants. (2 hrs)

9.Arboriculture: Pruning, bracing, feeding and transplanting. Bonsai: Principles and procedure. (2 hrs)

10.Plant growing problems. Control of disease and pests. (1 hr)

Practicals (9 hrs Practical)

1.Budding – 'T' Budding and Patch Budding

2.Layering – Any two methods.

3. Grafting – Any two methods.

4.Designing of gardens and Methods of Landscaping

C. REPRODUCTIVE BIOLOGY (27 hrs)

1. Asexual reproduction: Vegetative apomixes. Adventive embryony. Non recurrent apomixis, diplospory, apospory, parthenogenesis, androgenesis, automixis, semigamy, agamic complex. (4 hrs)
2. Sexual reproduction: Microsporogenesis - male gameteophyte - pollen fertility and sterility Types of male sterility: Gametic and zygotic sterility. Somatoplastic sterility. Cytoplasmic and genetic sterility. Pollen storage. Pollen viability and germination. (5 hrs)
3. Megasporogenesis-embryosacs-development and types. (3 hrs)
4. Pollination biology - primary and secondary attractants of pollination - ultra structural and histochemical details of style and stigma - significance of pollen-pistil interactions. (3 hrs)
5. Fertilization-barriers to fertilization- genetics of incompatibility - methods to overcome incompatibility: intra ovarian pollination and in vitro fertilization - embryo rescue. (4 hrs)
6. Embryo, endosperm and seed development. Polyembryony. Parthenocarpy. (4 hrs)
7. Androgenesis and gynogenesis. (2 hrs)
8. Recent advances in palynological studies - Pollen allergy - Economic importance of pollen - Pollen analysis of honey - role of apiaries in crop improvement. (2 hrs)

Practicals (9 hrs)

1. Pollen germination: *in vitro* and *in vivo* viability tests
2. Study of pollen types using acetolysed and non-acetolysed pollen
3. Developmental stages of anther, ovule, embryo and endosperm.

References

1. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms, Vikas Publishing House Pvt. Ltd. New Delhi.
2. Johri, B.M. 1984. 1984. Embryology of Angiosperms. Springer Verlag. Berlin.
3. Maheswari, P. 1980. Recent Advances in the Embryology of Angiosperms.
4. Pandey, A.K. 1997. Introduction to Embryology of Amngiosperms. CBS Publishers and Distributors, New Delhi.
5. Pandey, S.N. and Chadha, A. 2000. Embryology. Vikas Publishing House Pvt. Ltd. New Delhi.

Paper. BO 232. BIOPHYSICS, BIOCHEMISTRY AND PLANT PHYSIOLOGY

(Theory 108 hrs; Practical 54 hrs)

A. BIOPHYSICS (27 hrs)

1.Chemical bonds: Ionic bond, Covalent bond, Vander Vaal's forces, hydrogen bonding and hydrophobic interactions. Bonding in organic molecules. Effect of bonding on reactivity. Polarity of bonds. Bond length. Bond angle. Dissociation and association constant. (3 hrs)

2.Bioenergetics: Concepts of free energy, Thermodynamic principles in Biology. Energy rich bonds. Coupled reactions and group transfers. Biological energy transducers. (3 hrs)

3.Principles and applications of light and electron microscopy, bright field, phase contrast, fluorescence, scanning and transmission electron microscopy. Cytophotometry, flow cytometry, confocal microscopy, FISH, GISH. (4 hrs)

4.Chromatography: Principle and applications of Gel filtration, Ion exchange and affinity chromatography, thin layer chromatography, gas chromatography, HPLC,HPTLC, LCMS, GCMS. (5 hrs)

5. Electrophoresis. Enzyme localization by electrophoresis. Zymogram and isozyme analysis. ELISA. Electro focusing. (3 hrs)

6.Centrifugation. Ultra centrifugation. (2 hrs)

7. Principles of biophysical methods used for analysis of biopolymers: X-ray diffraction; fluorescence, UV, visible, IR,NMR, ESR Spectroscopy, ORD/CD, hydrodynamic methods, plasma emission spectroscopy. Atomic absorption spectroscopy. (4 hrs)

8. Principles and applications of tracer techniques in biology. Radiation dosimetry. Radioactive isotopes. Autoradiography. Cerenkov radiation. Liquid scintillation. (3 hrs)

Practicals (9 hrs)

Students are expected to get a good exposure on all the devices used in modern analytic methods by conducting study trips to two research institutions and to present a report.

1.Separation of pigments by column chromatography

2. Separation of amino acids by paper chromatography

3. Separation of alkaloids, phenols and pigments by TLC

References

1. Casey, E.J. Biophysics: Concepts and Mechanics**.**

2. Daniel, M. 1999. Basic Biophysics for Biologists. Agro Botanica, Bikaner.

3. David Freifelder. Physical Biochemistry - Application to Biochemistry and Molecular biology.

4. F.M.Slayter. Optical Methods in Biology. Wiley Inter Science.

5. Narayanan, P. 2000. Essentials of Biophysics. New Age International Publishers, New Delhi.

6. Roy, R.N.1999. A Text Book of Biophysics. New Central Book Agency(P) Ltd., Calcutta.

7. Water Hoppe, Wolfgang Lohmann, Hubert Markl and Hubert Zieghr (Eds.) 1983. Biophysics. Springer Verlag, New York.

8. Upadhyay and Nath. Biophysical Chemistry –Principles and techniques. Himalaya Publishing House.

B. BIOCHEMISTRY (36 hrs)

1. Structure, function and metabolism of carbohydrates – Synthesis of starch, cellulose and sucrose. Interconversion of hexoses and pentoses. (10 hrs)
2. Structure, function and metabolism of lipids: Biosynthesis of fatty acids. Biosynthesis of Triacyl glycerol, diacyl glycerol, monoacyl glycerol. Gluconeogenesis. Phospholipids. Lipid oxidation. (10 hrs)
3. Proteins and amino acids: Classification based on structure, function and localization sites. Primary, secondary tertiary and quarternary structure. Biosynthesis. Ramachandran plot. Purification of proteins. (6 hrs)
4. Enzymes: Major groups. Distribution of plant enzymes. Soluble and membrane bound enzymes. Isozymes. Abzymes. (5 hrs)
5. Biosynthesis of purines and pyrimidines. Metabolism of nucleotides. (5 hrs)

Practicals (9 hrs)

1. Preparation of buffers.
2. Preparation of standard solutions of BSA, Glucose, Catechol.

3. Extraction and estimation of soluble proteins by Bradford method.
4. Estimation of reducing sugars.
5. Isolation, assay and determination of specific activity of plant enzymes of germination, growth and fruit ripening, viz amylase, lipase, protease peroxidase, polyphenol oxidase.
6. Isolation and quantification of plant lipids by dry and wet methods.

References

1. Campbell, M.K. 1999. Biochemistry. Saunders College Publishing, New York.
2. Conn, E.E. and Stumpf P.K. et al., 1999. Biochemistry. John Wiley and Sons. New Delhi.
3. David T. Dennis and David H. Trurpin (Eds.) 1993. Plant Physiology. Biochemistry and Molecular Biology. Longmann Scientific and Technical, Singapore.
4. Fisher J. et. al., 1999. Instant notes in Chemistry for Biologists. Viva Books Pvt. Ltd. New Delhi.
5. Goodwin and mercer 1996. Introduction to plant Biochemistry. CBS Publishers and Distributors, New Delhi.
6. Hames, B.D. et al., 1999. Instant notes in Biochemistry. Viva books Pvt. Ltd. New Delhi.
7. Harborne, J.B. 1999. Plant Biochemistry. Chapmann & Hall, New Delhi.
8. Jain, J.L. 2000. Fundamentals of Biochemistry. S. Chand & Co. New Delhi.
9. Plummer, D.T. 1996. An Introduction to practical Biochemistry. McGraw Hill
10. Satyanarayana, U. 1999. Biochemistry. Books and Allied (P) Ltd. Calcutta.
11. Wilson and Goulding. 1992. Biologists Guide to Principles and Techniques of Practical Biochemistry.

C. PLANT PHYSIOLOGY (45 hrs)

1. Photosynthesis: Efficiency and turn over. Light harvesting complexes. Photosystem I and II - Structure and function. Mechanism of electron transport. Water oxidizing clock. RubisCo – Structure and function. Photo inhibition. Phytochromes. CO_2 fixation: C_3, C_4 and CAM pathways. Energetics of CO_2 fixation. (10 hrs)
2. Photorespiration and glycolate metabolism. Mechanism of photorespiration in C_3 and C_4 plants. Factors regulating photorespiration. (6 hrs)

3. Transport of metabolites – Xylem and Phloem sap translocation – current trends. (5 hrs)
4. Photoregulation and growth responses. Growth regulators and their mode of action. Plant morphogenesis. Physiology of flowering, fruit ripening senescence and abscission, Vernalisation. (6 hrs)
5. Seed metabolism, Hydration Phase of germination, Inter relationship between growing seedling and the storage tissues, glyoxylate cycle in fatty seeds during germination. (5 hrs)
6. Physiological response of plants to stresses like drought, heat and cold. Salt tolerance in plants. (5 hrs)
7. Role of phytoalexins. Defence mechanism. Phenyl propanoid pathway in plants. (2 hrs)
8. Tree Physiology – Leaf canopies, Radiation environment, Effect of irradiance in plants; Tree and water relations. (4 hrs)
9. Allelopathy – Plant derived compounds. (2 hrs)

Practicals

1. Extraction and estimation of total proteins by TCA precipitation and Lowrys method.
2. Isolation of chloroplast from fresh leaves and estimation of chlorophyll proteins.
3. Chlorophyll survey of five plants. Quantification, absorption spectra of chlorophyll and carotenoids using different solvents.
4. Hill activity by DCPIP/ ferricyanide reduction.
5. Extraction and estimation of total phenols.
6. Physiological identification of CAM in plant species.

REFERENCES

1. Brett, C.T. and Waldron, K.K. 1996. Physiology and Biochemistry of Plant Cell Walls, Chapman and Hall London.
2. Conn, E.E. and Stumpf P.K. et al., 1999. Biochemistry. John Wiley and Sons. New Delhi.
3. Daphne. J. Osborne, Micheal. B. Jackson. 1989. Cell separation in plants physiology, Biochemistry and Molecular Biology. Springer – Verlag. Berlin.
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7. Hall, D.O. and Rao, K.K. 1999. Photosynthesis. Cambridge University Press.
8. Hatch, M.D. et. al., 1971. Photosynthesis and Photorespiration.
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11. Lincoln Taiz and Eduardo Zeiger, 1991. Plant Physiology. The Benjamin/ Cummings publishing Company, Inc.
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14. Strafford, G.A. 1979 Essentials of Plant Physiology. Heinemann Publishing Co. New York.
15. Wilkins, M.B. (Ed) 1984. Advanced Plant Physiology, Pitman Publishing Co. New York.
16. William G. Hopkins, 2002. Introduction to Plant Physiology. John Wiley & Sons. Inc. New York.
17. Taiz and Zeiger,2003. Plant Physiology. Panima Publishers, New Delhi.

Paper BO 233. RESEARCH METHODOLOGY, BIOSTATISTICS AND PLANT BIOTECHNOLOGY

Theory 108 hrs; Practical 45 hrs)

A. Research Methodology (18 hrs)

1. Introduction to Research methodology. (2 hrs)
2. Research design: objectives , defining a problem, derivation of hypothesis ,review of literature, experimental design, data analysis, writing the thesis (2 hrs)
3. Experimental design : methodology – analytical, biochemical, molecular (2 hrs)
4. Data analysis- use of statistical tools, interpretation of results (4hrs)
5. Thesis preparation : title , abstract, materials and methods, results and discussion (4 hrs)
6. Writing a research paper: using biological literature, deciding on a title, presenting the methodology, drafting and revising the content according to the journal requirements, citing sources in the text, preparing the reference section (4 hrs)

B. Biostatistics (27 hrs)

1. Sampling methods and errors (2 hrs)
2. Processing and presentation of data – tables, graphs (2 hrs)
3. Measures of central tendency- mean, median and mode. (3 hrs)
4. Measures of dispersion – range, quartile deviation, mean deviation, standard deviation, coefficient of variation (4 hrs)
5. Probability – basic concepts, theorems of probability (2 hrs)
6. Experimental designs – randomized block designs, split plot design, latinsquare (2 hrs)
7. Test of significance – t- test, chi square test (4 hrs)
8. Correlation and regression analysis (4 hrs)
9. F-test, ANOVA, Least Significant Difference (LSD), Broad sense heritability (4 hrs)

Practicals (9 hrs)

a. Work out the problems on mean, median, mode
b. Calculation of central tendency and dispersion of data from plant science
c. Find out ANOVA, f- value, LSD of data from plant science
d. Find out broad sense heritability of data from plant science
e. Preparation of graphs using EXCEL or similar packages

C. PLANT BIOTECHNOLOGY (63 hrs Theory; 36 hrs Practical)

1. Definition. Impact of biotechnology - an overview. (2 hrs)
2. Plant tissue culture techniques: Choice of explant, culture media and culture conditions, hormonal regulation of growth and differentiation, micropropagation; shoot tip, nodal segment, meristem cultures: callus culture, callus mediated organogenesis, cell suspension culture, cell line selection. (10 hrs)
3. Somatic cell genetics and Somaclonal variations. (3 hrs)
4. In vitro mutagenesis: Mutagens. Methods of treatment. Selection for biotic (fungi, bacteria and viruses) and abiotic (drought, salinity, herbicides) tolerance. (4 hrs)
5. Somatic embryogenesis. Artificial seeds. Applications. Protoplast culture, Somatic hybridization and its impact on plant breeding. Use of protoplasts in genetic transformations. (7 hrs)
6. Haploid production: anther and ovule culture. Dihaploids and polyhaploids. Applications. (5 hrs)
7. Production of secondary metabolites. Cell immobilization. Bioreactor technology. Conservation of germplasm: in vitro strategies, cryopreservation and inter national exchange of germplasm. (5 hrs)
8. Genomic and organellar DNA isolation. Methods of gene identification. Vector mediated and vectorless methods. Polymerase chain reaction (PCR). Restriction digestion and ligation; Restriction mapping. Genomic and cDNA libraries. (10 hrs)
9. Methods of gene transfer in plants. Agrobacterium and CaMV mediated gene transfer; direct gene transfer using PEG, microinjection, electroporation, microprojectile (biolistics) method, liposme mediated DNA delivery, Transposons as vectors. Use of mixed vectors, Transient and stable gene expression in transgenic plants. (8 hrs)
10. Analysis and expression of cloned genes. DNA markers; Restriction fragment length polymorphism (RFLP) ; Random amplified polymorphic DNA (RAPD). Amplified Fragment Length Polymorphism (AFLP), Ligase Chain Reaction (LCR), Antisense RNA. (5 hrs)

11. Genetic engineering: Methods and applications. Transgenic biology. Allopheny. Applications of gene cloning and transformation techniques in plants. Gene targeting and sequence tags. (2 hrs)

12. Genetically modified organisms and foods (GMO/GMF) - Social and ethical considerations. IPR issues. Patents. Biopiracy. (2 hrs)

Practicals

1. Preparation of culture medium (MS, N&N, SH, B_5), sterilization and inoculation.
2. Shoot multiplication, Callus culture and organogenesis of important crops/medicinal plants/ornamentals.
3. Isolation and estimation of genomic DNA.
4. Demonstration of Agarose gel electrophoresis.
4. Encapsulation of seeds/embryos in calcium alginate.
5. Students have to submit a record of the above.

References

1. Brown, C. M. 1987. Introduction to Biotechnology. Blackwell Scientific Publications, Oxford, London.
2. Brown, C.M. Campbell, I. and Priest, F.G. 1990. Introduction to Biotechnology. Blackwell Scientific Publications, Oxford, London.
3. Brown, T.A. 1999. Genomes. John Wiley & Sons. New York.
4. Chawla, H.S. 2000. Introduction to Plant Biotechnology. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
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7. Griffiths el al., 1999. Modern Genetic Analysis. W.H. Freeman & Co. New York.
8. Gupta, P.K. 1999. Elements of Biotechnology. Rastogi Publications, Meerut.

9. Jefrey. M.. Backer el al., 1996. Biotechnology- A Laboratory Course. Academic Press, New York.

10 Keshav Trehan, 1991. Biotechnology. Wiley Eastern Ltd, New Delhi.

11. Kumar, H.D. 2000. Modern concepts of Biotechnology. Vikas Publishing House Pvt. Ltd. New Delhi.

12. Old, R.W. and Primrose, S.B 1983. Principles of Gene Manipulation. Blackwell Scientific Publications, Oxford, London.

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16. Thomas R. Mertins and Robert. L. Hammorsmith. 1998. Genetics a Loboratory Investigation.

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19 Wulf Crueger and Anneliese Crueger. 2000. Biotechnology - A Text book of Industrial Microbiology.

SEMESTER IV
SPECIAL PAPER – I BO 241: BIOINFORMATICS
(THEORY 144 HRS; PRACTICAL 36 HRS)

1. Introduction to Bioinformatics: Definition and History of Bioinformatics - Internet Computational Biology and Bioinformatics. **(12 hrs)**
2. Biological databases- Types of data and databases, Nucleotide sequence database (EMBL, GENBANK, DDBJ)- Protein sequence database (PIR, SWISS-PROT, TrEMBEL), Secendary Databases (PROSITE, PRINTS, BLOCKS), Protein Structure Database (PDB) **(12 hrs)**
3. Information retrieval from databases – search concepts, Tools for searching, homology searching, finding Domain and Functional site homologies **(12 hrs)**
4. Structural Bioinformatics – Molecular Structure viewing tool –Rasmol, Protein Structure Prediction – Secondary Structure prediction (Chou Fasman method and other Bioinformatics tools for secondary structure prediction) and Tertiary structure prediction (Comparative modeling, Abinitio prediction, Homology modeling) **(12 hrs)**
5. Genomics - Types (Structural and Functional), Genome Annotation, Gene Finding , Comparative genomics, Single nucleotide Polymorphisn Gen-SNIP. **(12 hrs)**
6. Proteomics – Protein expression analysis, Mass spectrometry in protein identification, Protein Sorting, Metabolomics, KEGG, Systems Biology-an introduction **(12 hrs)**
7. Sequence Analysis – Global Alignment, pairwise analysis, Scoring Matrices (an introduction), Multiple Sequence Analysis **(12 hrs)**
8. Molecular Phylogeny – Gene and Species tree. Molecular evolution and Kimuras theory, Phylogenetic Trees, Terminology in Phylogenetic tree. Cladogram and Phylogram, Significance of Molecular Phylogeny **(12 hrs)**
9. Computer Aided Drug Design and Molecular Docking, Breif study about Docking tools, AutoDock, molegro virtual docker, GOLD **(12 hrs)**
10. Tools (Softwares) used in Bioinformatics - BLAST (including ALGORITHM of BLAST), Sequin, ClustalX, Clustal W, RasMol, Treeview, Phylip, GRAIL, GENSCAN, PROCRUSTES **(12 hrs)**
11. Use of Linux and Bio-PERL in Bioinformatics **(12 hrs)**
12. Applications of Bioinformatics – Transcriptomics, Metabolomics, Pharmocogenomics, combinational synthesis (Brief Accounts) **(8 hrs)**

Bibliography

Lesk, A.M. (2002).” Introduction to Bioinformatics”, 1st Edition, Oxford University Press, Oxford, UK.

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Kumar, SA, Mohan TCK, Murugan K and Subramaniyan, S (2011) General Informatics and BioinformaticsAne Books India Pvt LTD.

Claverie, J.M. and Notredame C. 2003 Bioinformatics for Dummies.Wiley Editor.

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Patterson, B.K., Techniques in Quantification and Localization of Gene Expression.

Mount, D.W. (2001).” Bioinformatics – Sequence and GenomeAnalysis”, 1st Edition, Cold Spring Harbor Laboratory Press, New York, USA..

Evens, W.J. and Grant, G.R., Statistical Methods in Bioinformatics: An Introduction.

Liu, B.H., Statistical Genomics: Linkage Mapping and QTL Analysis

Pierre Baldi and SorenBrunak, Bioinformatics: The Machine Learning Approach.

Practicals

1. Blast search with Protein Sequence (Magnolia latahensis sequence)
2. Blast search with Nucleic Acid Sequence (Neanderthal man's PaleoDNA)
3. Phylogenetic tree creation with CLUSTAL X, W and MUSCLE
4. Creation of phylogentic trees for selected families of Eudicots
5. Molecular docking (using either Free or commercial Software)

PAPER BO 242a: SPECIAL PAPER –II ELECTIVE

BIOTECHNOLOGY

(Theory 144 hrs; 90 hrs)

Unit I : Basics of Biotechnology (20 hrs)

1. Genesis, projection of biotechnology as an interdisciplinary pursuit, prospects and bottlenecks
2. Vectors, plasmids, bacteriophage and other viral vectors, cosmids, Ti plasmid, yeast artificial chromosome
3. Enzymes used in genetic engineering, restriction enzymes- their types and target sites
4. Impacts of biotechnology on agri-biodiversity, medicine, industry and environment

Unit II : Microbial Genetics and technology (20 hrs)

1. Replication, regulation of bacterial gene expression
2. mutations, genetic transfer, manipulation of gene expression in prokaryotes
3. Microbial production of amino acids, antibiotics, microbial enzymes, organic acids
4. methods for laboratory fermentations, isolation of fermentation products, Elementary principles of microbial reaction engineering
5. Microbial culture selection, fermented foods,probiotics.

Unit III : Genetic Engineering (40hrs)

1. Generation of Foreign DNA molecules, cutting and joining of DNA molecules – linkers, adapters, homopolymers.
2. Gene isolation, gene cloning, cDNA and genomic DNA library, expression of cloned genes
3. Transposons and gene targeting
4. DNA labeling, DNA sequencing – Polymerase Chain Reactions (PCR), DNA finger printing
5. Southern, Western and Northern blotting,Dot blots, in situ hybridization
6. Molecular marker techniques – RFLP, RAPD, AFLP, SCAR, STR, SSR
7. Site directed mutagenesis
8. Gene transfer technologies – Agrobacterium and CaMV mediated gene transfer direct gene transfer using PEG, Micro injection, electroporation, biolistic method, liposome mediated DNA delivery, gene therapy.

9. Transgenic organisms,Social and ethical issues , IPR, Patents and Biopiracy

Unit IV : Plant Tissue Culture techniques (24 hrs)

1. Techniques and applications – callus culture and regeneration of plants, micropropagation for large scale production of crop plants, medicinal plants and ornamentals
2. Suspension culture and development – methodology, kinetics of growth and production formation, elicitation methods, hairy root culture
3. protoplast culture – isolation , fusion, generation of hybrids, cybrids,preferential elimination of chromosomes, role in cytoplasmic male sterility and genetic transformation.
4. Exploitation of somaclonal and gametoclonal variations for plant improvement

Unit V : Transgenic organisms (20 hrs)

1. Microbes – production of pharmaceuticals (somatostatin, humulin, interferons) Genetically modified microbes – biodegradation, biopesticides, bioremediation, mineral leaching and biofertilizers
2. Plants – insect resistance (Bt), virus resistance-coat protein, satellites, herbicide resistence. Increasing shelf life of foods – flavr savr tomatoes, control of seed germination , genetically modified foods
3. Animals – production of vaccine and pharmaceuticals, hybridomas, monoclonal antibodies

Unit VI : Process Biotechnology (20 hrs)

1. Bioprocess technology for the production of cell biomass and primary/secondary metabolites
2. Microbial production, purification and bioprocess applications of industrial enzymes and organic compounds
3. Bioreactor designs for exploitation of microbial products, scaling up and downstream processing
4. Chromatic and membrane based bioseparation methods, immobilization of enzymes and cells and their application for bioconversion processes.

Practicals

f. Preparation of stock solutions for tissue culture

g. Preparation of solid and liquid media for test tube cultures and petri plate culture
h. Induction of callus culture and suspension culture
i. Encapsulation of embryos using sodium alginate
j. Isolation and quantification of genomic DNA
k. PAGE and AGE – demonstration
l. Restriction digestion and ligation using kits – demonstration

References

1. Lewin B. (2003): Genes – VIII, Oxford University Press, New York.
2. Primrose, S.B. (1989): Animal Biotechnology Blackwell Scientific Publication, London.
3. Old R.W. and Primrose, S.B. (1989): Principles of Gene Manipulation, Blackwel scientific Publication, London.
4. Watson, J.D. *et al*. (1987): Cell and Molecular Biology, John Wiley Publications, NY
5. Freifelder, D. (1993): Molecular Biology, Jones and Bartlett, Publishers, London.

BO 242b : Special paper II : Elective

Environmental Biology

Theory 144 hrs; Practical 90 hrs

Unit I : Ecological concepts **(20 hrs)**

1. Scope and historical perspective – interdisciplinary approach. **(5 hrs)**
2. Systems concept in ecology: organism as an ecological system, levels of organization of living world, relation between organism and environment, homeostasis and ecological balance **(5 hrs)**
3. Concept of model and ecosystem modeling **(5 hrs)**
4. Concept of Biosphere **(5 hrs)**

Unit II : organism and environmental complex **(24 hrs)**

1. Ecological processes: basic laws of energy flow, flow of energy, law of ten percent, Odum's Box pipe model of energy flow. **(8 hrs)**
2. Biogeochemical cycling: Major sedimentary and gaseous types, turnover rate and turn over time, residence time, nutrient budgeting and nutrient sink. **(8 hrs)**
3. Environmental factors: climatic, edaphic, topographic and biotic factors **(8 hrs)**

Unit III: population and community Ecology **(28 hrs)**

1. Concept of population and population attributes – biotic potential, Natality, Mortality, survivorship curves, Life tables, Age structure **(8 hrs)**
2. Population Dynamics: population growth, growth forms, fluctuations, J-shaped and S-shaped growth curves, concept of carrying capacity and environmental resistance, r and k selection **(8 hrs)**
3. Community structure: species diversity, species composition, stratification and quantitative characters. **(6 hrs)**
4. Community energetic **(6hrs)**

Unit IV : Ecosystem Ecology **(24 hrs)**

1. Concept of ecosystem, types – Major terrestrial and aquatic ecosystems **(6 hrs)**
2. Structural attributes of ecosystem – components of ecosystem **(6 hrs)**

3. Functional attributes – Concept of productivity, trophic levels, trophic relations, food chain and food web, ecological pyramids **(6 hrs)**
4. Ecosystem development and evolution **(6hrs)**

Unit V : Environmental Ecology **(28 hrs)**

1. Pollution – major types of pollution, biological effects, environmental impacts at the local and global levels – BOD, eutrophication, bioaccumulation, biomagnifications, ecological imbalance. **(4 hrs)**
2. Land degradation – causes, effects of land degradation, remedial measures. **(4 hrs)**
3. Waste management – waste minimization, recycling of industrial wastes, solid waste management. Waste disposal mechanisms. **(4 hrs)**
4. Environmental biotechnology – bioremediation, technology for biological waste disposal, biogas plants. **(4 hrs)**
5. Environmental issues – global warming, ozone layer depletion, deforestation and desertification, destruction of natural ecosystems. **(4 hrs)**
6. Environmental protection – environmental laws, conservation efforts, UNEP, IPCC, Kyoto protocol, Earth summits. **(4 hrs)**
7. Prospects of remote sensing in environmental studies. **(4 hrs)**

Unit VI : General study on the following areas of applied ecology **(20 hrs)**

1. Physiological ecology – micro climate, gas exchange interactions, stress ecology of salinity, osmotic pressure and temperature. **(6 hrs)**
2. Industrial ecology - remediation of toxic and inhibitory pollutants, microbial conversion of ligno cellulosic wastes, reclamation of polluted water bodies, polymer recycling, concept of clean technologies for crop and food production, ecological engineering, Green design. **(8 hrs)**
3. Molecular ecology – brief account **(6 hrs)**

Practical **(90 hrs)**

1. To find out the primary production in the given sample by using light and dark bottles.
2. Estimation of phosphate and nitrite in the water samples.
3. Estimation of hardness and salinity in the water samples.
4. Quantification of the planktons, present in the given two water samples.
5. Analysis of major elements (Na, K, Ca and Fe) of water samples.

6. Analysis of chlorophyll pigments in water.
7. Elemental analysis of plant samples.
8. Quadrat study of a given area to find out the Importance Value Index (IVI) of the community.

References

1. Aradhana PS (ed) 1998, Envirnmental Management, Rajat Publications, Delhi.
2. Ambasht RS and Ambasht NK, 1996. A text book of Plant Ecology. Students' friends and Co, Varanasi.
3. Dash MC, 1996. Fundementals of Ecology.TMH Publishing Company, New Delhi.
4. Kumar HD, 2000. Modern concepts of Ecology. Vikas Publishing House, New Delhi.
5. Kumar HD, 1997. General Ecology. Vikas Publishing House, New Delhi.
6. Odum EP, 1971. Fundementals of Ecology. WB Saunders and Co.

BO 242c : Special Paper II

PLANT BIOCHEMISTRY AND ENZYMOLGY

(Theory 144 hrs;Practical 90 hrs)

Plant Biochemisrty

1. Biochemical organization of the cell. (8 hrs)
2. Metabolism and biochemical energetics. (8 hrs)
3. Intermediary metabolism. Major pathways and evolutionary significance. (8 hrs)
4. Primary metabolic pathways and their inter relationships. (8 hrs)
5. Enzyme mediated regulation of metabolism. (8 hrs)
6. Secondary metabolism – main pathways and their inter relationships. (8 hrs)
7. Protein structure, purification and characterization. (8 hrs)
8. Biomolecular interactions – general account (8 hrs)

Enzymology

1. Plant enzymes – general properties, classifications and Nomenclature. (6 hrs)
2. Structural and functional organization of enzymes – primary, secondary and tertiary structure, molecular characterization of functional organization. (10 hrs)
3. Sub cellular localization of enzymes by LM and TEM. Histochemistry of enzyme reaction. (8 hrs)
4. Enzyme purification and characterization – desalting methods, isolation and assay of plant enzymes and enzyme kinetics. (10 hrs)
5. Michaelis Menton equations and its significance, Lineweaver plots, enzyme inhibitions, activation. (6 hrs)
6. Allosteric enzymes, metabolic regulation – sigmoid, kinetic, steady state metabolic pathways by control of enzymatic pathways. (10 hrs)
7. Native PAGE in enzyme localization, principles and methodology, zymogram. (8 hrs)
8. Iso Electric Focusing (IEF). (6 hrs)
9. Immobilization of enzymes, enzyme engineering – techniques and applications. (8 hrs)
10. Biotechnological applications of enzymes. (8 hrs)

Practicals

1. Isolation, partial purification and estimation of specific activity of plant enzymes – poly phenol oxidase, malate dehydrogenase.
2. Isoenzyme analysis and preparation of Zymogram.
3. Separation of enzyme proteins by Native PAGE.

References

1. Adams RLP, Knowler JT, Leader DP, 1986. The biochemistry of Nucleic acids. 10th ed, Chapman and hall.
2. Burdan RH, Knippen berg PH (Edt), 1989. Techniques in Biochemistry and Molecular Biology, 2nd edn, Elsevier.
3. Fersht A, 1985. Enzyme structure and mechanism, 2nd edn, Freeman.
4. Gurr MI, Harwood JL, 1991. Lipid Biochemistry: An introduction. 4th edn. Chapman and Hall.
5. Vance DE, Vance JE (Edt): 1991. Biochemistry of Lipips, Lipoproteins and membranes, Elsevier.
6. Voet DJ, Voet JG, 2008. Principle of Biochemistry, 3rd edn. John Wiley Sons Inc.
7. David Freifelder. Physical Biochemistry - Application to Biochemistry and Molecular biology.
8. Campbell, M.K. 1999. Biochemistry. Saunders College Publishing, New York.
9. Conn, E.E. and Stumpf P.K. et al., 1999. Biochemistry. John Wiley and Sons. New Delhi.
10. David T. Dennis and David H. Trurpin (Eds.) 1993. Plant Physiology. Biochemistry and Molecular Biology. Longmann Scientific and Technical, Singapore.
11. Fisher J. et. al., 1999. Instant notes in Chemistry for Biologists. Viva Books Pvt. Ltd. New Delhi.
12. Goodwin and mercer 1996. Introduction to plant Biochemistry. CBS Publishers and Distributors, New Delhi.
13. Hames, B.D. et al., 1999. Instant notes in Biochemistry. Viva books Pvt. Ltd. New Delhi.

BO 242d : Special Paper II

Cytogenetics

(Theory 144 hrs ;Practical 90 hrs)

1. Basic trends in cytogenetics – genetic continuity and variation. (10 hrs)
2. Haploidy – types of haploids, euhaploids, monohaploids, polyhaploids, Aneuhaploids; meiosis in haploids, induction of haploids.
    a. Morphology, anatomy and physiology of haploids.
    b. Genetic control of haploidy, genome analysis, inheritance in haploids- dosage effect.
    c. Significance of haploids in crop improvement. (12 hrs)
3. Polyploids – types of polyploids, numerical variation in chromosomes.
    a. Autopolyploids, allopolyploids, segmental allopolyploids, autoallopolyploids.
    b. Origin of polyploids, meiosis in polyploids, cytological and genetic effects of polyploids.
    c. Role of polyploids in plant diversity and evolution
    d. Induction of polyploidy – methods of induction, morphological and cytological analysis of induced polyploids, significance of induced polyploidy in plant improvement. (12 hrs)
4. Aneuploids – trisomics, double trisomics, tetrasomics, double tetrasomics. Types of trisomics – primary, secondary, tertiary, compensating fragment and telocentric trisomics. Role of aneuploidy in producing variation and its significance in evolution. (10 hrs)
5. Genetics of polyploids and aneuploids – theories of tetrasomic inheritance, Muller's hypothesis, Haldane's hypothesis, double reduction, techniques of nullisomic and monosomic analysis in polyploids, trisomic analysis in diploids. (12 hrs)
6. Structural variations in chromosomes – origin and meiotic characters. (10 hrs)
7. Cytogenetic effects – effect on crossing over, position effect, translocation complex, Renner complex, Renner effect, Breakage, Fusion Bridge cycle. (12 hrs)
8. Cytogenetics of hybrids. (8 hrs)
9. Sexual dimorphism – Genetic theory, cytological basis (8 hrs)

10. Sex chromosomes – undifferentiated structural heteromorphic multiple, protenor (XO), Neosex chromosomes, meiotic behavior of sex chromosomes in *Melandrium album* and *Rumex hastatus*. Evolution of sex chromosomes. Chromosomal mechanism of sex determination in Melandrium and Drosophila and the role of X and Y chromosomes and autosomes in them. (12 hrs)
11. Special types of chromosomes. (8 hrs)
12. B- chromosomes – origin, distribution, terminology, occurrence in different biological groups, morphology, classification, preferential distribution, post meiotic preferential distribution, differential fertilization, elimination, significance and adaptive value of B-chromosomes. (12 hrs)
13. Karyotype analysis and karyotype evolution. (8 hrs)
14. Chromosome banding – techniques and their applications. (10 hrs)
15. Human cytogenetics. (8hrs)

Practical

1. Somatic and meiotic chromosome study in selected polyploid and aneuploid. Eg. *Musa, Crinum.*
2. Allopolyploid - polyploidy series in *Chlorophytum*
3. Induction of polyploidy using Colchicine in selected plants.
4. Cytological and morphological analysis of the colchiploids.
5. Meiotic study of *Rhoeo discolor*
6. Chromosome banding – G – banding

References

1. Ambrose EJ and Easty DM 1980. Cell Biology – 3rd edition, Vikas Publ. New Delhi
2. Bernard John, 1990. Developmental and Cell Biology series, Cambridge. University Press.
3. Heinz herrmann, 1989. Cell Biology. An enquiry into the nature of the living state. Harper and Row Publishers, New York.
4. Sharma DK and Sharma A (Eds) 1985. Advances in chromosomes and Cell genetics. Oxford and IBH Publ. Co, New Delhi.
5. Stebbins GL, 1950. Variation and evolution in higher plants. Columbia Uni. NY.
6. Stebbins GL 1971. Chromosomal Evolution in higher plants. Addison, London.

TARTARIC ACID MODIFIED POMEGRANATE PEEL BIOCHAR FOR EFFECTIVE ADSORPTION OF METHYLENE BLUE

A DISSERTATION SUBMITTED TO THE UNIVERSITY OF KERALA IN PARTIAL FULLFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE IN CHEMISTRY BY

1	ANAGHA R	: 23520125005
2	SABANA A	: 23520125038
3	SANDRA SANTHOSH	: 23520125039
4	SHEJIN SALAM	: 23520125040
5	NANDANA M	: 23520125042

FIRST DEGREE PROGRAM IN CHEMISTRY UNDER CBCSS

EXAMINATION CODE : DISSERTION CODE:

Name and signature of examiners:

1.

2.

POST GRADUATE DEPARTMENT OF CHEMISTRY

SANATHANA DHARMA COLLEGE

ALAPPUZHA 688003

POST GRADUATE DEPARTMENT OF CHEMISTRY

SANATANA DHARMA COLLEGE,

SANATHANAPURAM P.O., ALAPPUZHA 688 003 KERALA

(NAAC Re - Accredited Grade 'A+' College affiliated to University of Kerala)

e-mail: chemsdc@gmail.com

CERTIFICATE

This is to certify that the work described in this dissertation entitled **"TARTARIC ACID MODIFIED POMEGRANATE PEEL BIOCHAR FOR EFFECTIVE ADSORPTION OF METHYLENE BLUE"** is an authentic record of the work done by **ANAGHA R, SABANA A, SANDRA SANTHOSH, SHEJIN SALAM, NANDANA M** for B.Sc. degree program in chemistry under CBCSS at the department of chemistry SD College, Alappuzha under my guidance and supervision.

Head of the Department

Supervising Teacher

04/05/2023

UNIVERSITY OF KERALA

Scheme & Syllabi

For First Degree Programme in Hindi (Other than General English)

(Faculty of Oriental Studies)

Under the Choice based Credit and Semester system (CBCSS)

2023 admission onwards

Preface

The proposed revised syllabus to be implemented with effect from 2023 admission onwards has been prepared by Board of Studies in Hindi (Pass) of the University of Kerala as ‘outcome based as per the instructions of University Grants Commission, the Kerala State Higher Education Council and Kerala University. The aim of each course is identified and the syllabus of each course is divided accordingly, into different modules.The outcome of each module and the course outcome of each of the 36 courses is outlined in the syllabus. The outcome of the programme is that the students who pass this programme (FDP in Hindi under CBCSS) will have comprehensive knowledge of Hindi literature both prose and poetry from the Ancient period to contemporary period. They will be proficient in grammer. The programme will kindle their aspiration for a career as Teacher /translator/Hindi Officer/Journalist /content writer in Hindi.

I extend my sincere thanks to all those Teachers in various Colleges affiliated with Kerala University who have actively participated in the Syllabus workshop which was conducted as part of revising the syllabus and for their valuable suggestions. I thank all members of the Board of studies in Hindi (pass) for helping me in preparing study materials, compiling study materials, editing textbooks. Hope the students will find the syllabus interesting and helpful.

Trivandrum
19/05/2023

Prof.(Dr.)B.Asok

Chairman, BOS Hindi (Pass)

Board of Studies in Hindi (Pass)

Chairman

Dr. B.Asok

Professor and Head ,

Dept.of Hindi ,

University College

Trivandrum

Members

1. Dr.Shamli.M M
   Professor,Dept of Hindi ,
   Govt.Arts &Science College
   Calicut

2 Dr. Rajan T K
   Asst. Prof. of Hindi
   SDE, University of Kerala

3 Dr. Veena J
   Associate Professor of Hindi
   S D College ,Allappuzha

6 Dr. Sheela.T. Nair
   Associate Prof.of Hindi,
   NSS College Pandalam

7 Dr. Gopakumar G
   Associate. Prof. of Hindi
   Govt. College, Chavara

8 Dr. Manju A
   Professor of Hindi
   S N College for Women,Kollam

4 Dr. Beena K S

Associate Prof. of Hindi

MMNSS College

,Kottiyam

9 Dr. Sushmita O V

Asst. Prof. of Hindi

N S S College ,Dhanuvachapuram

5 Dr. Sreeja B R

Asst. Prof. of Hindi

N S S College , Nilamel

10 Dr. R. Jayachandran

Chairman, BOS Hindi (PG)

Special Invitee

Dr. Suma S

Associate Prof. of Hindi

Govt.College for Women ,Trivandrum

University of Kerala

Scheme & Syllabi

For the First Degree Programme in Hindi (Other than General English) Faculty of Oriental Studies) w.e.f. 2023 admission

General Scheme

Duration : 6 semesters of 18 weeks/ 90 working days per semester

Total Courses : 36
Total credits : 120
Total lecture hrs. : 150/week

Summary of Course in Hindi Language and Literature

Course Type	Name of Course	No. of Courses	Credits	Lecture Hr./week
a	Common course for BA/BSc.	4	14	18
	Common Course for B.Com	2	8	8
	Common Course for restructured B.Com	2	8	10
	Common course for career related BA/BSc	2	8	10
b	Foundation Course	1	3	4
c	Complementary courses	8	22	24
d	Core Courses	14	52	64
e	open course	1	2	3

f	elective course	1	2	3
g	Project/Dissertation	1	4	6

Outline of Common Courses

(i) **BA/BSC Degree Programmes**

Course Code	Course Type	Course Title	Credits	Lecture hrs /Week
HN 1111.1	Common Course I	Hindi Kahani Sahitya	3	4
HN1211.1	Common Course II	Kathetar Hindi Gadya Vidhaayein	3	4
HN 1311.1	Common Course III	Hindi Kavita Sahitya	4	5
HN1411.1	Common Course IV	Hindi Ekanki ,Vyakaran Tatha Anuvad	4	5

(ii) **B.Com Degree Programme**

Course Code	Course Type	Course Title	Credit	Lecture hrs/week
HN1111.2	Common Course I	Hindi Gadya aur Patra lekhan	4	4
HN 1211.2	Common Course II	Hindi Kavita aur Anuvad	4	4

(iii) **B.Com Degree (restructured)programme**

Course Code	Course Type	Course title	Credit	Lecture hrs./week
HN 1111.4	Common Course I	Patra Lekhan aur Adhunik Hindi Kavita	4	5
HN 1211.4	Common Course II	Anuvad Tatha Aadhunik Hindi	4	5

		Gadya Sahitya		
(iv) **BA/BSc (Career related)Programme**				
Course Code	Course Type	Course Title	Credit	Lecture hrs/week
HN 1111.3	Common course I	Hindi Gadya Sahitya	4	5
HN 1211.3	Common Course II	Hindi Padya Sahitya	4	5
Outline of FDP in Hindi language and literature (Foundation course, Complementary Courses , Core Courses, Open Course, Elective Course& Dissertation)				
b. Foundation course				
Course code	Course type	Course title	credit	lecture hrs/week
HN 1321	Foundation Course II	Soochana Praudyogiki aur Adhunik Patrakarita	3	4
c. Complementary courses				
Course code	Course type	Course title	credit	lecture hrs/week
HN 1131	Complementary Course I (compulsory)	Samkaleen Sahityik Vimarsh	2	3
HN 1132/ SK1131.1	Complementary Course II (Optional)	Pracheen Tatha Madhyakaleen Bharateeya Sanskriti	2	3
HN 1231	Complementary Course III (Compulsory)	Kathakar Premchand	3	3
HN 1232/ SK 1231.1	Complementary Course IV (optional)	Paristhithik path aur Hindi Sahitya	3	3
HN 1331/ SK 1331.1	Complementary Course V	Tulnatmak Adhyayan	3	3

	(optional)			
HN 1332	Complementary Course VI (Compulsory)	Rajbhasha Prabandhan	3	3
HN 1431	Complementary Course VII (Compulsory)	Bharatiya Sahitya	3	3
HN 1432/ SK 1432.1	Complementary Course VIII (optional)	Patkatha Lekhan va vigyapan	3	3
d. Core Courses				
Course code	Course type	Course title	credit	lecture hrs/week
HN 1141	Core Course I	Hindi kathethar Gadya sahitya	4	6
HN 1241	Core Course II	Hindi Sahitya ka itihas – Ritikal tak	4	6
HN 1341	Core Course III	Hindi Sahitya Ka Itihas- Adhunik Kal	4	5
HN 1441	Core Course IV	Hindi Natak aur Rangmanch	4	5
HN 1442	Core Course V	Vishesh Lekhak Agney	3	4
HN 1541	Core Course VI	Pracheen evam Madhyakaleen Hindi Kavya	4	4
HN 1542	Core Course VII	Adhunik Hindi Kavya	4	4
HN 1543	Core Course VIII	Adhunik Hindi Katha Sahitya	2	3
HN 1544	Core Course IX	Hindi Vyakaran	4	4
HN 1545	Core Course X	Bhasha Vigyan Tathaa Bhasha Ka Itihas	4	4
HN 1641	Core Course XI	Samkaleen Hindi Katha Sahitya	4	5
HN 1642	Core Course XII	Bharatiya evam Paschatya	4	5

		kavya shastra		
HN 1643	Core Course XIII	Anuvad: sidhant tatha prayog	4	5
HN 1644	Core Course XIV	Hindi Vyangya Sahitya	3	4
e. Project/Dissertation				
Course code	Course type	Course title	credit	lecture hrs/week
HN 1645	Dissertation/Essay	Dissertation Laghu shodh Prabhandh/Essay	4	6
f.Open Course				
Course Code	Course type	Course title	credit	lecture hrs/week
HN 1551	Open Course I	Hindi cinema	2	3
g Elective Course				
Course code	Course type	Course title	credit	lecture hrs/week
HN 1661	Elective Course	Jan Sanchar aur Hindi Cinema	2	3

Semester wise Break-up of courses

Semester-I

Course code	Course type	Course title	credit	lecture hrs/week
EN 1111.1	English Language course I		4	5./week
HN 1111.1	Common Course 1	Hindi Kahani Sahitya	3	4/week
EN 1123	Foundation course I (English)		2	4/week
HN 1131	Complementary course I (Compulsory)	Samkaleen Sahityik Vimarsh	2	3/week
HN 1132/ SK 1131.1	Complementary	Pracheen Tatha	2	3/week

	Course II (Optional)	Madhyakaleen Bhartiya Sanskriti		
HN 1141	Core Course I	Hindi katethar Gadya Sahitya	4	6/week
			17	25

Semester II

Course code	Course type	Course title	credit	lecture hrs/week
EN 1211	English		4	5./week
EN 1212	English		3	4/week
HN 1211.1	Common Course II	Kathetar Hindi Gadya Vidhaayein	3	4/week
HN 1231	Complementary course III (Compulsory)	Kathakar Premchand	3	3/week
HN 1232/ SK1231.1	Complementary Course IV (Optional)	Paristhithik path aur Hindi Sahitya	3	3/week
HN 1241	Core Course II	Hindi Sahitya ka Itihas (Reetikal tak)	4	6/week
			20	25

Semester III

Course code	Course type	Course title	credit	lecture hrs/week
EN 1311	English		4	5./week
HN 1311.1	Common Course III	Hindi Kavita Sahitya	4	5/week
HN 1321	Foundation course II	Soochana Praudyogiki Aur adhunikpatrakarita	3	4/week
HN 1331/ SK 1331.1	Complementary course V (Optional)	Tulnatmak adhyayan	3	3/week

HN 1332	Complementary CourseVI (Compulsory)	Rajbhasha Prabandhan	3	3/week
HN 1341	Core Course III	Hindi Sahitya ka itihas (Adhunik kal)	4	5/week
			21	25

Semester IV

Course code	Course type	Course title	credit	lecture hrs/week
EN 1411	English		4	5./week
HN 1411.1	Common Course IV	Hindi Ekanki ,Vyakaran Tatha Anuvad	4	5/week
HN 1431	Complementary Course VII (compulsory)	Bharatiya Sahitya	3	3/week
HN 1432/ SK 1431.1	Complementary course VIII (optional)	Pat katha lekhan va vigyapan	3	3/week
HN 1441/	Core Course IV	Hindi Natak	4	5/week
HN 1442	Core Course V	Vishesh lekhak Agney	3	4/week
			21	25

Semester V

Course code	Course type	Course title	credit	lecture hrs/week
EN 1541	Core Course VI	Pracheen evam Madhya Kaleen Hindi Kavya	4	4./week
HN 1542	Core Course VII	Adhunik Hindi Kavya	4	4/week
HN 1543	Core Course VIII	Adhunik Hindi Katha Sahitya	2	3/week
HN 1544	Core course IX	Hindi Vyakaran	4	4/week

HN 1545	Core Course X	Bhasha vigyan v	4	4/week
HN 1551	Open Course I	Hindi Cinema	2	3/week
HN 1645	Dissertation/Essay	Dissertation laghushodh prabandh/Essay		3/week
			20	25

Semester VI

Course code	Course type	Course title	credit	lecture hrs/week
HN 1641	Core Course XI	Samkaleen Hindi katha sahitya	4	5./week
HN 1642	Core Course XII	Bharatiya Evam Paschatiya Kavya Sasthra	4	5/week
HN 1643	Core course XIII	Anuvad Sidhant tatha prayog	4	5/week
HN 1644	Core Course XIV	Hindi Vyangya Sahitya	3	4/week
HN 1645	Dissertation	Dissertation/laghu shodh prabandh	4	3/week
HN 1661	Elective Course	Jan Sanchar aurHindi Cinema	2	3/week
			21	25

Total Credits for B A Hindi
- English -21
- Common Course – 14
- Complimentary Course – 22
- Core Course - 52
- Foundation Course - 3
- Open Course - 2
- Elective -2
- Dissertation - 4
- Total -120

Syllabi in detail
Common course Hindi for BA/BSc Programmes

Semester I

Common Course I: HN1111.1

Hindi Kahani Sahitya

हिंदी कहानी साहित्य

Credits:3 **Hours/week : 4**

Aim of the Course:

- To familiarize the students with the world of stories.
- To develop their faculty of appreciation of stories.
- To develop creativity among the students

Module 1: Short stories- 7 representative short stories to be studied in detail from Premchand yug to Samkaleen yug.

Outcome of the module:

1) Remembers main works of the representative writers

2) Understands the craft of the representative writers

3) Analyzes the stories

4) Evaluates the contribution of the representative writers

5) Elucidates key sentences with reference to context.

Module 2: A long story for detailed study

Outcome :

1) Remembers the names of main works of the prescribed writer

2) Understands the craft of the prescribed writer

3) Analyses the long story on the basis of the subject of the story, its relevance, its place among Hindi long stories

4) Critically evaluates the place of the long story & the writer among Hindi stories and story writers

Prescribed text books

Katha Sansar (कथा संसार): Published by Jawahar Pustakalay , Madhurai

Edited by

Dr. Manju . A, Dr.Sreechithra.V.S, Dr.Veena.J, Dr.Reshma.P.P,

Dr.Athira.J.S

Lessons

1. मन्त्र – प्रेमचंद
2. हार की जीत – सुदर्शन
3. चीफ की दावत – भीष्म साहनी
4. पर्दा - यशपाल
5. हरी बिंदी - मृदुला गर्ग
6. नेल कटर - उदयप्रकाश
7. पैंट - विष्णु नागर
8. कोटर और कुटीर (लम्बी कहानी) – सियाराम शरण गुप्त

Outcome of the course

1) Recollect the main works of the representative story writers
2) Understand the craft of the different story writers
3) Analyze and evaluate the works of the story writers they studied
4) Understand how the resource language is used as a medium in creative writing.

Hours distribution: Lessons 1 to 7 3 hours
Lesson 8 1 hour

Reference :

1.Hindi Kahani Antharang Pahachan by Ramdaras Mishra,Vani Prakashan,New Delhi

2.Hindi Kahani ka vikas by Madhuresh ,Lokbharati Prakashan ,New Delhi

SEMESTER II

COMMON COURSE –II HN 1211.1

KATHETAR HINDI GADYA VIDHAAYEIN

कथेतर हिंदी गद्य विधाएं

Credits: 3 **Hours /Week: 4**

Aim of the course:

(1) To acquaint the students with the different forms of prose in Hindi

(2) To develop their faculty of appreciation of prose.

(3) To develop the skill of evaluating prose writing of representative prose writer in Hindi

Module1: One Essay and one Sketch to be studied in detail

Outcome: (1) Remembers the main works of the prescribed writers

(2) Understand the craft of the prescribed writers

(3) Analyses the prescribed prose and Sketch in accordance of their craft

(4) Elucidate key sentences with reference to context.

Module 2: one Satire and Auto Biography part to be studied in detail.

Outcome:

(1) Understand the different forms of prose.

(2) Recollect the main works of prescribed writers.

(3) Analyses the Satire and Autobiography in accordance with the craft

(4) Elucidate key sentences with reference to context.

Module 3: one Travelogue and one Diary to be studied in detail.

Outcome:

(1) Understand the different forms of prose.

(2) Recollect the main works of prescribed writers .

(3) Analyses the Travelogue and Diary in accordance with the craft

(4) Elucidate key sentences with reference to context.

Prescribed text book:

Gadya Samanway (गद्य समन्वय (detailed study) Published by Vani Prakashan ,New Delhi

Edited by

Dr.Veena J ,Dr .Suma S , Dr.Usha Kumari J B ,Dr.Shabana Habeeb , Smt.Ranjini.G.Nair

Lessons

1.साइकल	देवेन्द्र नाथ शर्मा
2.सोना	महादेवी वर्मा
3.बाबूराम तेली की नाक	स्वयंप्रकाश
4.जूठे पत्तल	ओमप्रकाश वात्मीकी
5.चेरापूंजी से आया हूँ	प्रदीप पंत
6.डायरी	राजेन्द्र प्रसाद

Hours Distribution : Lessons 1 to 3 -2 hours
Lessons 4 to 6 -2 hours

Outcome of the course:

i) Recollect the main works of the prescribed writers

ii) Understand the forms of various prose writing in Hindi

iii) Analyses & evaluate the prose forms prescribed, with respect to the craft and the relevance

Reference :

1.Hindi mein Nibandh saahity by Janardan swaroop Agarwal , Saahitybhavan Ltd,Prayag

2.Nibandhmala by Gulabray by E-pustakalay

3.Hindi Nibandh kaa udbhav aur vikas : hindikunj.com

Semester 3

COMMON COURSE –III HN 1311.1
HINDI KAVITA SAAHITYA
हिंदी कविता साहित्य

Credits: 4 **Hours /weeK: 5**

Aim of the course:

(1) To understand development of Hindi poetry through selected poems

(2) To develop the skill of appreciation of Hindi poems.

Module1:

Ancient Hindi poetry- collection of dhohas of Kabirdas, Tulsidas ,Rahim and Bihari

Outcome**: :** (1) Understands the aesthetics of ancient poetry through the couplets of Kabirdas, Rahim & Tulsidas

(2) Understands the History of Bhakti poetry

(3) Appreciates the creativity of ancient poets

(4) Critically evaluates the contribution of poets of Bhakti period

Module 2.Ancient Poetry- Pad of Surdas and Meerabai.

Outcome 1.To understands the aesthetics of Pad of Surdas and Meerabai.

2.Understand the contribution of Krishna Bhakti in Hindi literature.

3.To understand the various aspects of Krishna bhakti movement.

4.To understand the various aspects of Krishnabhakti.

Module 3: Modern Hindi poetry: 5 poems representing modern period before 20th Century with different styles and themes

Outcome : (1) Understands the development of modern poetry before 20^{th} century
(2) Remembers & recollects the major works of prescribed poets
(3) Appreciates the different styles of poetry
(4) Critically evaluates the contribution of prescribed poets to the development of modern Hindi poetry
(5) Elucidates given lines of poems with reference to context.

Module 4: Modern Hindi poetry: 4 poems representing after 20th century with different styles and themes.

Outcome : (1) Understands the development of modern poetry after 20^{th} century
(2) Remembers & recollects the major works of prescribed poets
(3) Appreciates the different styles of poetry

(4) Critically evaluates the contribution of prescribed poets to the development of modern Hindi poetry

(5) Elucidates given lines of poems with reference to context.

Prescribed text books : Kavya Nikash (काव्य निकष) Published by Rajkamal Prakashan , 1-B, Netaji Subhash Marg, Daryaganj, New Delhi-110002.

Edited by Dr. Asok.B, Dr. Suma. I , Dr. Jayasree.O, Dr.Ambili.T ,

Dr. Sajina .P.S

Poems :

Ancient Period

1.कबीरदास

2.सूरदास

3.तुलसीदास

4.रहीम

5.मीराबाई

6.बिहारी

Modern Period

1. निर्झर – मैथिलीशरण गुप्त
2. कवि कह गया है – सूर्यकांत त्रिपाठी निराला
3. मधुशाला (edited lines) – हरिवंश्रय बच्चन
4. हिरोशिमा – अज्ञेय
5. माँ की तस्वीर – मंगलेश डबराल
6. प्यासा कुआँ - ज्ञानेंद्रपति
7. धार - अरुण कमल
8. सात भाईयों के बीच चम्पा – कात्यायनी
9. किन्नर - यतीश कुमार

Distribution of hours:

1hour for Dhoha **and 1 hr for pad and 3 hrs for Modern poetry** .

Reference: 1. 2.Hindi saahity kaa Itihaas by Shyaam chandr kapoor ,Prabhaat prakaashan 3.Aadhunik

Hindi padya saahity kee pramukh pravruttiyaan-Youtube link uploaded by Hindi Bhashaavaani ,June 12 ,2018

Course outcome:

(1) Appreciates ancient and modern Hindi poems.

(2) Critically evaluates the contribution of Ancient & modern poets to the development of Hindi poetry

(3) Elucidates key lines of poetry with reference to context.

Semester IV

COMMON COURSE –IV HN 1411.1

HINDI EKANKI, VYAKARAN TATHA ANUVAD

हिंदी एकांकी ,व्याकरण तथा अनुवाद

Credits: 4 **Hours /week: 5**

Aim of the Course

1) To understand the development of one act plays in Hindi through the selected one act plays and to learn to appreciate the same.
2) To use Hindi language properly by understanding Hindi Grammar.

3) To facilitate the use of translation as a tool for communicating in Hindi and English and to motivate the students for a career as translator.

Module I

Hindi one act plays : Three one act Plays of eminent authors

Outcome : 1) Remember and recollect the major works of the prescribed one act playwrights.

2) Appreciate and evaluate the one act plays.

3) Elucidates key sentences of the one act plays with reference to the context.

4) Critically evaluate the contribution of prescribed one act playwrights to the development of one act plays in Hindi.

Module II

Basic grammar of Hindi –Varna, Shabd, Vikari Shabd, Sagya, Ling, Vachan, Karak

Outcome : 1) Understand and recollect all 44 varna in Hindi.

2) Understand Hindi Shabd and the classification.

3) Identify nouns in Hindi and familiar with its divisions.

4) Elaborates the changes in a noun with respect to gender, number and cases.

5) Define sagya and elaborate the sub-divisions.

Module III

Sarvnam, Visheshan, Kriya, Kal, 'Ne' ka prayog

Outcome : 1) Identify sarvnam, visheshan and kriya and their classifications.

2) Elaborate the changes in kriya.

3) Define Kal and elaborate the sub-divisions

4) Elaborate the use of 'Ne'

Module IV

Translation- meaning, definition, source language and target language. Passage translation from English to Hindi.

Outcom**e** : 1) Understand the meaning and definition of translation.

2) Translate simple passages from English to Hindi.

Prescribed Text Book

Vividha (विविधा) Published by : Aman Prakashan ,Kanpur

Edited by Dr.Gopakumar G, Dr. Jayakrishnan. J, Dr.S.Haripriya, Dr.Shaji N, Dr.Sheenujamol.H.N

Lessons :

एकांकी

1) बहु की विदा - विनोद रस्तोगी

2)रिहेर्सल - ओमप्रकाश आदित्य

3) समर्पित जीवन – सुशीला टाक्भौरे

Vyakaran Tatha Anuvad

Distribution of Hours

2 hours for Ekanki, 2 hours for vyakaran and 1 hour for Anuvad.

Reference

1) Hindi Ekanki : Udbhav aur Vikas – Ramcharan Mahendra, Sahitya Prakashan
2) Vyavaharik Hindi Vyakaran : Ek Naya Anusheelan – K.K. Krishnan Namboothiri, Lokbharathi Prakashan.
3) Manak Hindi Vyakaran – Dr. Sasisekhar Tivari, Vani Prakashan.

Outcome of the Course

1) Appreciate and evaluate one act plays with respect to craft and subject.
2) Understand the correct usages in Hindi and write grammatically correct sentences in Hindi.
3) Define parts of speech and identify the parts of speech in a given sentence.
4) Translate simple passages from English to Hindi.

Question Pattern

1) Objective type questions. Total 10 questions. No choice. 5 from ekanki, 4 from vyakaran and 1 from translation (from Ekanki – writer of any one of the plays from the prescribed text, any other major work of the writer mentioned in Lekhak Parichay, main character of one act plays, important dialogues from ekanki can be asked. From Vyakaran – simple practical level questions from the prescribed text can be asked. From Anuvad – questions from theory portion of anuvad from the prescribed text can be asked.)
2) Very Short answer type questions. Total 12 questions. 6 from ekanki, 5 from vyakaran and 1 from translation.
3) Short Answer type questions. Total 9 questions. 5 from Ekanki and 4 from Vyakaran.
4) Essay type questions. Total 4 questions. 2 from ekanki, 1 from vyakaran and 1 from translation. The passages given in the prescribed text should be asked.

Common Course Hindi for B.Com Programme

Semester I

Common Course 1 HN 1111.2

Hindi Gadya Aur Patra Lekhan

हिंदी गद्य और पत्र लेखन

Credits: 4 **Hours /Week: 4**

Aim of the course : (1) to acquaint students with different forms of prose and styles involved in prose writing

(2) To develop the faculty of appreciation of prose of the students

(3) To develop the skill of evaluating prose writing of prescribed prose writers in Hindi

(4) To make the students aware of the importance of correspondence

(5) To make them proficient in letter writing .

Module 1 : Two short stories and three other prose forms

Outcome (1) recollects all major works of the authors of the prescribed prose forms

(2) Understands the difference between the different prose forms

(3) Critically evaluates the prose forms .

Module 2: Correspondence : Types of letters ,components of letters – Personal letters , Official letters , business letters

Outcome :(1) Understands the different styles of different forms of letters

(2) Distinguishes one form of letter from the other based on their specific features

(3) Writes different types of letters.

Prescribed Text Book :

GadyaVividha (**गद्य विविधा**) Published by Bharateeya Gyanpeeth ,New Delhi

Edited by Dr . Sheela T Nair , Dr. Prakash A, Dr. Latha D , Dr. Remya L , Dr. Mini Samuel.

Lessons

खंड - क

1. परीक्षा (कहानी) -प्रेमचंद
2. गौरा (रेखाचित्र) - महादेवी वर्मा
3. पाठ (लघु कहानी) - चित्रा मुद्गल
4. मधुर भाषण (लेख) - गुलाब रॉय
5. भगत की गत (व्यंग्य) - हरिशंकर परसाई

खंड - ख

PatraLekhan

Course Outcome: (1) Appreciates prose writings in Hindi

(2) Critically evaluates the contribution of prescribed writers of prose to Hindi literature

(3) Differentiates various types of letters based on their style and components

(4) write different types of letters in Hindi

Distribution of Hours :2 hours for Prose, **2** hours for vyavasayikLekhan

Semester:II

Common Course 1 HN 1211.2

Hindi Kavitaa aur Anuvad

हिंदी कविता और अनुवाद

Credits: 4 **Hours /Week: 4**

Aim of the Course:

(1) To make students understand the development of Hindi poetry through selected poems.

(2) To develop the faculty of appreciation of Hindi poems.

(3) To make students understand the importance of translation.

(4) To facilitate the use of translation as a tool for communicating Hindi and English

(5) To motivate and equip students for a career as translator.

Module I: Poetry - Ancient Poetry: Poems of 4 Ancient Poets (8 Dohas)

Outcomes:

(1) Recollect names of major works of the prescribed poets

(2) Basic understanding of Bhakti poetry

(3) Appreciates Bhakti poetry

(4) Critically evaluates the contribution of prescribed poets

(5) Elucidates lines of the poems critically

Module II: Modern Poetry: 6 Representative poems of the Poets of the Modern Period

Outcomes:

(1) Recollects names of major works of the prescribed poets

(2) Basic understanding of the development of poetry in Hindi in the modern times

(3) Appreciates and critically evaluates poems

(4) Elucidates lines of the poems

Module III: Anuvad – 5 Passages from English to Hindi and 5 Passages from Hindi to English to be translated

Outcomes:

(1) Understands the importance of translation as a tool for communication

(2) Translates simple passages from Hindi to English and vice versa

Module IV: Technical Terminology – 20 in Hindi with English translation and 20 in English with Hindi translation

Outcomes:

(1) Recollects the common technical terms used in official language

(2) Opens a career option – that of a translator

Textbook: Naveen Sanchay (नवीन संचय) Published by Lokbharati Prakashan ,New Delhi

Edited by Dr. K.S. Beena, Dr. Gayathry N., Smt. Salini C., Dr. Lekshmy S.S., Dr. Manju K.N.

Lessons :

Ancient poems

Modern poems

1.प्रियतम - सूर्यकांत त्रिपाठी निराला

2.चींटी - सुमित्रानंदन पन्त

3.भूख - सर्वेश्वर दयाल सक्सेना

4.माँ का नमस्कार - मंगलेश डबराल

5. नए इलाके में - अरुण कमल

6. बेजगह - अनामिका

Course Outcomes:

(1) Understands the development of Hindi poetry from the Bhakti period to modern times

(2) Translates simple passages from Hindi to English and vice versa

(3) Opens a career option that of a translator

Distribution of Hrs: 2 hrs for poetry, 2 hrs for Anuvad and Technical Terminology

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Common Course Hindi for B.Com (restructured) Programme.

Semester: I

Common Course II HN1111.4

PATRA LEKHAN AUR ADHUNIK HINDI KAVITA

पत्र लेखन और हिंदी कविता

Credits: 4 **Hours /Week:** 5

Aim of Course :

1.To acquaint students with different froms of modern Hindi Poetry.

2.To develop the skill of evaluating poetry

3.To develop skills of appreciation of poetry.

Module.I 5 poems of modern age from the Modern Poetry collection

Out come 1. Understands the aesthetics of Modern Hindi Poetry.

2. Recollects the major works of the poets in the collection.

3. Critically evaluate the contribution of the poets in Hindi Literature.

Module.II 5 poems of modern age from the Modern Poetry collection

Out come 1. Appreciate the craft & creativity of poets.

2. Elucidate the lines of the poem critically.

3. Basic understanding of development of Modern Hindi poetry.

Module III Patra Vyavahar

1.What is letter?

2.Types of letters.

3.Types of Business letters & Examples.

Outcome 1. Understands the features of business letters.

2. Learn how to write Business letters in Hindi.

3. Recollects the common technical terms used in official language Hindi.

Prescribed text Book :

Abhinav Sanchay (अभिनव संचय) Published by Rajpal &Sons

Edited by : Dr.Sushmitha O.V ,Dr.Sheelaakumari .L, Dr.Manju Ramachandran ,Dr.Sheeba Sarath.S ,Dr.Roshni.R ,Dr.Sudha A S

Lessons :

1.बीती विभावरी जाग री - जयशंकर प्रसाद

2. मोह - सुमित्रानंदन पन्त

3.कोशिश करनेवालों की हार नहीं होती - सोहनलाल द्विवेदी

4.पिछड़ा आदमी - सर्वेश्वर दयाल सक्सेना

5.फिर आ गयी दिवाली - शिव मंगल सिंह सुमन

6. शोक गीत -कात्यायनी

7. बस बहुत हो चुका - ओमप्रकाश वात्मीकी

8.उलटा ज़माना - अरुण कमल

9.धृतराष्ट्र ने कहा -सुशीला टाक्भौरे

10.मैं एक चिड़िया हूँ पापा - जितेन्द्र श्रीवास्तव

Course Outcome

1.Appreciates the aesthetics of Modern Hindi Poetry.

2.Critically evaluate the contribution of Hindi Poets to Hindi Literature.

3.Elucidate key lines of poetry with reference to context.

4.Understand the development of Modern Hindi Poetry from early 20th century to 21st century.

5.Differentiate various types of business letters based on their style and components, learn to write business letters in Hindi.

Distribution of Hours

4 hours for Poetry

1 hour for Patra Vyavahar.

Reference :

1.Hindi ke Adhunik Kavi by Ramachandra Sharma, Saraswathy Prakashan, Kanpur

2.Aadhunik Hindi Kavya:Satya Narayana Singh, Viswavidyalaya Prakashan, Varanasi

Semester: II

Common Course II HN1211.4

ANUVAD TATHA ADHUNIK HINDI GADYA SAHITHYA

अनुवाद तथा आधुनिक गद्य साहित्य

Credits: 4 **Hours /Week:** 5

Aim of the course

1.To facilitate the use of translation as a tool for communicating in Hindi and English

2.To motivate students for a career as translator

3.To make them proficient in translation

4.To familiarise the students with different forms of modern Hindi prose literature.

5.To develop the sense of appreciation of prose among students.

6.Tofamiliarize the students with the world of fiction.

Module I:

Anuvad- Basic information- **6** passages from English to Hindi and vice versa for translation practice.

Outcome:

1.Understands the importance of translation as a tool for communication

2.Translates simple passages from English to Hindi and vice versa

Module II:

Collection of **4** short stories from Premchand Yug to Samkaleen Yug

Outcome:

1.Remembers main works of the representative writers

2.Understands the craft of the representative writers

3.Analyses the stories

4.Evaluates the contribution of the representative writers

Module III:

Anya Gadya Vidhayem- **1** Ekanki- **1** Vyangya rachana- **1** Nibandh- **1**

Athmakatha- **1** Sansmaran

Outcome:

1.Understands the different forms of prose

2.Recollects the main works of prescribed writers.

3.Evaluates the prose forms.

Prescribed text book: **Vidha Nidarsh** (**विधा निदर्श)** Published by Nayee Kitab Prakashan ,New Delhi

Edited by Dr. Rajan T K, Dr. Jyothi N, Dr. Sreekala K I, Dr. Sherlin, Dr. Sajith S J Sasi

Lessons

अनुवाद

कहानी

1. ईदगाह-प्रेमचंद

2. अपनी कमाई-सुदर्शन

3. डोमिन काकी- चित्रा मुद्गल

4. क्वालिटी टाइम-अर्चना राय

एकांकी

1. लक्ष्मी का स्वागत- उपेन्द्रनाथ अश्क

2. व्यंग्य- अतिथि तुम कब जाओगे ? - शरद जोशी

3. निबन्ध - खोई हुई वास्तु की खोज - लक्ष्मीकांत झा

4. आत्मकथांश- अग्नि की उड़ान - डॉ .ए .पी. जे. अब्दुल कलाम

5. संस्मरण- महात्मा गाँधी -डा. रामकुमार वर्मा

Hours distribution:

1 hr for Anuvad, **2** hrs for Kahani, **2** hrs for Anya Gadya Vidhayen.

REFERENCE

Anuvad: Sidhanth Aur Prayog- Dr. Gopinathan, Lok Bharathi Prakashan.

Hindi Sahithya ka Itihas by Dr. Nagendra.

Common Course in Hindi for BA/BSc career relatedProgramme

Semester I

Common Course I, HN 1111.3

Hindi Gadya Sahitya

हिंदी गद्य साहित्य

Credits: 4 **Hours/Week : 5**

Aim of the course: (1) To familiarize students with different prose forms

(2) To develop the faculty of appreciation of prose

(3)To develop the skill of evaluating prose literature.

Module I: Short stories, Essay

Outcome: (1) Appreciates the prose forms

(2) Understands the difference between the prose forms of the module

(3) critically evaluate the short stories and essay

(4) Elucidates lines from the short story and essay with reference to context.

Module II: One act play, satire

Outcome: (1) Appreciates the prescribed prose forms

(2) Understands the difference between the prose forms of the module

(3) Critically evaluates the prose forms

(4) Elucidates lines from the one act play and satire with reference to context

Prescribed Textbook: Gadya gagan (गद्य गगन) Published by Ananya Prakashan

Edited by -

Dr. Shamli M .M , Dr.S. Sunil Kumar, Dr. Predeepa Kumari,
Dr. Sujith. N. Tampi, Dr. Elizabeth George

Lessons

1.छोटा जादूगर (कहानी) - जयशंकर प्रसाद

2.पिकनिक (कहानी) - मीरा सीकरी

3.एम् डॉट कॉम (कहानी) - एस.आर.हरनोट

4.अहिंसा का पाठ (लेख) - विजयेन्द्र स्नातक

5.व्हील चेयर (एकांकी) - सुशीला टाक्भौरे

6.आम आदमी की पहचान (व्यंग्य) - शरद जोशी

Course Outcome (1) Understands the difference between different prose forms

(2) Appreciates prose literature

(3) Critically evaluates the prose forms (

4) Elucidates lines from prose with reference to context.

Hours distribution :3Hrs for module I

2 Hrs for module II

Semester II

Common Course I, HN 1211.3

Hindi Padya Sahitya

हिंदी पद्य साहित्य

Credits: 4 **Hours/Week : 5**

Aim of the course: (1) To make students understand the development of poetry in Hindi from the Ancient period to modern times

(2) To develop the faculty of appreciation of poetry

Module I: Ancient poetry- Collection of Ancient poetry of Kabeerdas, Soordas, Tulsidas, Biharilal

Outcome: (1) understands the aesthetics of Ancient Hindi Poetry

(2) Understands the history of Bhakti poetry

(3) Recollects the major works of the prescribed poets

(4) Appreciates the creativity of the Ancient poets

(5) Critically evaluates the contribution of the Ancient poets to Hindi literature.

Module II: Modern poetry- collection of 8 poems of modern Hindi poets

Outcome: (1) understands the aesthetics of modern Hindi poetry

(2) Recollects the major works of the poets in the collection

(3) Critically evaluates the contribution of the poets to modern Hindi poetry

(4) Elucidates lines of the poems with ref to context.

Prescribed text book: KavyaKusum (काव्य कुसुम) Published by Setu prakashan

Edited by Dr.Sreeja B R, Dr.Majida M, Dr.Sheminas T S, Dr.Anoopa Krishnan & Dr.Dhanya L

Lessons :

1.दोहे - कबीरदास

2. पद - सूरदास

3. दोहे - तुलसीदास

4. दोहे - बिहारी

5. जूठे पत्ते - बालकृष्ण शर्मा नवीन

6.पुष्प की अभिलाषा - माखनलाल चतुर्वेदी

7.ताज - सुमित्रानंदन पन्त

8.मछली - सर्वेश्वर दयाल सक्सेना

9.प्रकृति का सन्देश -सोहनलाल द्विवेदी

10. झाड़ूवाली - ओमप्रकाश वाल्मीकी

11. भरोसा -पवन करण

12. उतनी दूर मत ब्याहना बाबा - निर्मला पुतुल

Hours distribution : Lessons 1 to 4 : 2 hours

Lesson 5 to 12 : 3 hours

Outcome of the Course: (1) understands the aesthetics of Ancient and modern poetry in Hindi

(2) Appreciates the creativity of the poets

(3) Critically evaluates the contribution of the poets to Hindi literature

(4) Understands the development of poetry inHindi

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Foundation Course II

HN 1321 Soochana Praudyogiki aur Aadhunik Patrakarita

सूचना प्रौद्योगिकी और आधुनिक पत्रकारिता

Credits 3 **Hours/week :4**

Aim of the Course: (1) To update and expand basic informatics skills

(2) To give theoretical and practical knowledge in computing

(3) To make students realize the possibilities of computing in Hindi

(4) To make students ware of modern trends in Journalism.

Module I: Hindi computing ka itihaas- computer mein Hindi ke vibhin Prayog- Sabd sansadhak – Rajbhasha Hindi, Computer aur Soochana Praudyaogiki- Font, Software aur tools- Unicode aur devanagiri lipi- computer par Hindi ka anuprayog- unicode aur Hindi font mem antar- Mukt Hindi software- E governance – online sevayem

Outcome: (1) Gets comprehensive knowledge of computing in Hindi

ModuleII: PatrakaritakaUdbhavAurvikas-ViswaPatrakaritakaUday-Bharat Mein patrakaritha ka uday- Hindi patrakarita ka pehla charan- Doosra yug- Theesra charan 1947 ke baad Hindipatrakaritha

Outcome: (1) Understands development of Journalism in the world

(2) Comprehensive knowledge of development of Journalism in Hindi upto 1980.

Module III: Sanchar Kranti aur Hin di patrakarita-web patrakarita –web patrakarita: Lekhan va Bhasha – bloglekhan- web patrakarita aur blog- stingoperation- pramukh e- patrikayem aur portal.

Outcome: (1) Understands development of Journalism in the modern times

(2) gets comprehensive knowledge of development of Hindi journalism in the age of communication revolution.

Prescribed text books

(1) Hindi aur Soochana Prayojanmoolak Hindi – Dr.Poornima R Published by Vaniprakashan ,New Delhi

(2)Jansanchar aur Patrakarita - Dr.Poornima R Published by Vaniprakashan ,New Delhi

Lessons omitted from the Text 2 : विश्व पत्रकारिता का उदय और विकास

: भारत में पत्रकारिता का उदय और विकास

: हिंदी पत्रकारिता का विकास

Distribution of hrs: 2 hrs for module I, 2 hrs for module II & III.

Course outcome: (1) understands possibilities of computing in Hindi

(2) Updates and expands Basic informatics skills

(3) Understands modern trends in Journalism

Reference :

1. Information Technology (Malayalam) Cosmos publication ,Mettupalayam street ,Palakkad

2. Computer aur Hindi –Hari Mohan,Thakshashila Prakashan

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Complementary Courses for FDP in Hindi

Semester I
Complementary Course I (compulsory)
HN 1131- Samkaleen Sahityik Vimarsh
समकालीन साहित्य विमर्श

Credits: 2 **Hours/week : 3**

Aim of the course: (1) To sensitize the students about latest trends and discourses in Hindi literature like Dalit Discourse, adivasi discourse (2) To provide comprehensive knowledge about latest styles and trends of lit. and to help the students to develop their creativity.

Module I: Bhoomika Strivimarsh:- Saidhantiki: **Stri Vimarsh moolak Sahitya**

(i) Poem–'HockeyKheltiladkiyam–Katyayani(ii)

(ii) Shortstory-Kayantar-JaysreeRai

(iii) (iii)Autobiography- 'Anya Se Ananya tak' PrabhaKhaitan

Outcome: (1) Understands the theories and development related to strivimarsh

(2) Understands the salient features of strivimarshatmak literature through the representative poem, fiction and autobiography

(3) Critically evaluates stri vimarshatmak literature prescribed for study

Module II: Dalit Vimarsh – theory and revolution.
Dalit vimarsh moolak sahitya
(1) poem 'Suno Brahmin' Malkhan singh
(2) Short stories
– Nau bar- Jayaprakash Kardan
Salaam-Valmiki
(3) Essay 'Abhishapt chintan se itihas chintan kee ore' –R. Dharamveer

Outcome:(1)Understands and evaluates Dalit Literature inHindi
(2)Critically evaluates the representative Dalit literature prescribed for study.

Module III; Aadivasi vimarsh: Theory, revolution **Vimarshmoolak Sahitya**-
(1) Poems: 'Tiririri , Bansuri ke Swar mein'; - Dulam Chandra munda,
'Prateeksha- Grace kunjar
(2) Short story- Salgi, Jugnoo aur anva ganch- Alice ekka
(3) (3) geet-chering geet- Translated by Snehlatha negi

Outcome: (1) Understands and evaluates aadivasi literature
(2) Critically evaluates the representative adivasi literature

ModuleIV: Anya Vimarsh-

Kinnarvimarsh,Kisaanvimarsh,Vrdhvimarsh,Paristhitik vimarsh. **Vimarsh Moolak Sahitya-**
(1) Shortstory; 'Kabeeran' - SoorajBadatya.

Outcome: (1) understands and evaluates different discourses in modern Hindi literature.
Prescribed text: 'Asmitamoola k Vimarsh aur Hindi Sahitya'- Edited by Dr. S.R. Jayasree published by Aman Prakashan, Kanpur.

Lessons omitted :

(1) मैं कैसी औरत हूँ – सविता सिंह

(2) कितनी व्यथा – नगीना सिंह

(3) कायांतर - जयश्री रॉय

(4) प्रतीक्षा - ग्रेस कुंजर

(5)अभिशप्त चिंतन के इतिहास चिंतन की ओर -धर्मवीर

(4) किन्नौरी गीत – स्नेहलता नेगी

Extra Reading: 1 Essay, 1 poem, 1 shortstory, a few pages of a Novel for extra reading. (Not for Examination Purpose)

Parishisht –Names and major works of literatures of different discourses. [Questions will not be asked from these parts]

Courseoutcome:(1)Thestudentsunderstandthelatesttrendsinliterature
(2) critically evaluate different discourses in modern Hindiliterature.

Hour distribution: 1 hr for module I. 1 hr for Module II, 1 hr for III and IV.

Reference:

1.Samakaaleen Hindi saahitya : vividh vimarsh Edited by Prof.Shreeraam Sharma,Vanee prakashan ,New Delhi

2.Hindi sahitya mein asmitaamoolak vimarsh , www.streekaal.com

3.Samakaaleen asmitaamoolak vimarsh , online course by www.swayam.gov.in

Complementary Course II (Optional)
HN 1132 Pracheen Tatha Madhyakaleen Bharatiya Sanskriti
प्राचीन तथा मध्यकालीन भारतीय संस्कृति

Credits 2 **Hours/week: 3**

Aimofcourse:

(1)Toenrichstudent'sknowledgeofHistory

(2)Tofamiliarizewiththe important events of Indian culture from the age of the Vedas

(3) To enrich knowledge of cultural History of India through Historical development during the reign of various rulers from ancient times to medievalIndia.

Module I: Sanskriti- Swaroop evam nirdharan- Paribhasha- Sanskriti ke Kshetra; Bharateey Sanskriti kee visheshatayam

Outcome: (1) The students understand the basics of culture, its definition field.

Module II: Pracheen Sanskriti- Vaidik Samaj- Vaidic Dharam Boudh Dharm evam Sansktiri- Jain Dharm- Unki Sanskritik Dein

Outcome: (1) Understands the ancient culture

(2) Understands Budhism, Jainism, their cultural contribution.

Module III- Madhya Kaleen Bharatiya Sanskriti- Uttar Bharat evam Dakshin Bharath " Prashasan evam visheshatayem- Paal Samrajya- Prathihara- Rashtra koota- Pallav- Chola.

Outcome: (1) Understands medieval Indian culture with respect to contributions of pallavas, cholas, paal- pratiharas and Rashtra kootas.

Module IV; Bharath par Vidheshi Akraman ka Prabhav.
Rajputom ka Uday- Tarayi ki ladayi- Rajputom ka Parajay- Gulam Vansh- Delhi Sultanate- Khilji Vansh- Tuglaq vansh- lodi Vansh.

Outcome: (1) Understands the culture of medieval period
(2) Role of various dynasties in moulding the cultural History of India.

Module V: Mughalom ka Agaman- Babar- Humayun- Shershah ka Uday- Soor Samrajya- unka yogdan – Akbar –Dharmikniti- Jayangir- Shahjahan- aurongazeb Mughal Kaleen Sanskriti

Outcome: (1) Evaluates role of Mughal dynasty in influencing medieval Indian culture.

Prescribed Text: **Pracheen evam Madhyakaleen Bharatiya**

Sanskriti: Edited by Dr. Asha S Nair, Dr. Maheswari, Smt. Salini.C

Published by Vani Prakashan, New Delhi

Lessons omitted from the Text :

Chapter 5 - मध्यकालीन भारत : प्रशासनिक विशेषताएं

Chapter 6 – भारत पर विदेशियों के आक्रमण का प्रभाव

Chapter 7- विजय नगर और बहमनी वंश

Chapter 8 – भारत के धार्मिक और सांस्कृतिक विकास

Outcome of course: 1) Students understand Ancient and medieval culture of India.
2) Evaluate contribution of various dynasties to the cultural heritage of India.

Reference :

1.Bharateey sanskriti by Shivdatt Gyanee ,Rajkamal prakashan

2.Bharteey sanskriti kee rooprekhaa by Gulab Ray , Bharateey saahitya sangrah

Semester II

Complementary Course- III (Compulsory)

HN 1231 Kathakar Premchand

कथाकार प्रेमचंद

C**redits 3** **Hours/week : 3**

Aim of course: 1) To provide comprehensive knowledge about Premchand as fiction writer.
2) To make the students appreciate the theme of Premchand's fiction and to evaluate his style and craft.

Module I: Six short stories of Premchand with introduction regarding contribution of Premchand to Hindi short story (Detailed Study)

Outcome: (1) Appreciates and critically evaluates the short stories of Premchand with respect to theme, and craft
(2) Recollects the names of important short stories of Premchand
(3)Elucidateslinesfromtheprescribedshortstorieswithrespecttocontext.

Module II: One novel of Premchand.

Outcome: (1) Recollects names of all major novels of Premchand
(2) Appreciates & evaluates the theme of the prescribed novel
(3) Critically evaluates contribution of Premchand to Hindi Novel
(4) Evaluates the novel with respect to the character , craft and style.

Prescribedtexts:(1)'PremchandkeeKahaniyam(Detailedstudy) EditedbyDr.Jyothi N & Dr. K.P Ushakumari published by 'Vani Prakashan, 21 A, Daryaganj, N.Delhi
(2) 'Rangbhoomi' Premchand- abdridged students version with Bhoomika by Sudheesh Pachauri. Published by VaniPrakashan

Distribution of hrs: 2 hrs for short story 1 hr for Novel

Outcome of the course: (1) The students attain comprehensive knowledge of Premchand as fiction writer
(2) Appreciates and critically evaluates prescribed short stories and Novel of Premchand (3) Evalautes the contribution made by Premchand in the field of Hindi fiction writing.

Reference :
1.Premchand ghar mein by Shivrani Devi ,Atmaaraam and sons
2.Premchand ka rachanaa sanchayan by Nirmal varma & Kamal Kishore Goyanka,Sahitya Academy

Complementary Course IV (Optional)

HN 1232 Paristhithik Paat aur Hindi Sahitya

पारिस्थितिक पाठ और हिंदी साहित्य

Credits: 3 **Hoursweek : 3**

Aim of the course: (1) To familiarize the students with how environmental issues are depicted in Hindi literature
(2) To familiarize the students with the role of literature in tackling environmental issues.

Module I: Five short stories depicting environmental issues
Outcome: (1) Understands how environmental issues are depicted in Hindi short stories
(2) Critically evaluates the stories in the light of the issues discussed in them.

Module II: Seven poems in Hindi dealing with environmental issues (detailed study)

Outcome: (1) Understands how environmental issues are depicted in poetry (2) Critically evaluates the poems in the light of the issues discussed in them and with respect to the craft of the poems
(3) Elucidates lines of the poems with reference to context.

Prescribed text: **'Paristithik paat aur Hindi Sahitya'**-Edited by Dr. Suma.S and Dr. Jayasree S R published by 'Vani Prakashan, Daryaganj, New Delhi.

Lessons to be omitted

1.Kashinath Singh –Jangal Jatakam

2.Batrohee – Kahin door jab din dhal jay

Course outcome: (1) The students get a comprehensive knowledge of how environmental issues are depicted in literature

(2) Critically evaluates short stories & poems in the light of the environmental issue discussed in them

(3) Students are motivated to interfere in the environmental; issues around them.

Hour distribution: 1 hr for module 1 and 2 hrs for module II.

Reference :

1. Paryavaran Sanrakshan har naagarik kaa kartavya by Sudarshan Bhatia ,Saksham prakashan,New Delhi
2. Paryavaran Shikshaa by Rajeev Garg ,Aviram Prakashan ,New Delhi

Semester III

Complementary Course V (Optional)

HN 1331- Tulnatmak Adhyayan

तुलनात्मक अध्ययन

Credits: 3 **Hours/week : 3**

Aim of the course: (1) To acquaint students with how comparison of literature of two languages i.e. Hindi & Malayalam is done

(2) To familiarize students with fiction of Malayalam & Hindi with special reference to Premchand and Thakazhi

(3) To familiarize students with Hindi and Malayalam poetry esp. of Jayashankar Prasad and Kumaranasan

(4) To familiarize students with similarities of literature written in Hindi & Malayalam.

Module I: introduction to comparative studies
Outcome: (1) Understands what is comparison (2) understands what is comparison in literature (3) understands the difference between comparison in western literature & Indian literature

ModuleII:Comparison of Novels in Hindi & Malayalam with special ref.to Premchand andThakazhi.

Outcome:(1)StudentsattainbasicknowledgeofHindi&Malayalamnovelsesp ecially that of Premchand & Thakazhi
2) Understands similarity between novels ofPremchand & thakazhi especially 'Godan &'Randidangazhi'

Module III: Comparison of Hindi and Malayalam short stories

Outcome: 1) Students attain basic knowledge of Hindi & Malayalam short stories
2) Understands similarities and dissimilarities between Malayalam & Hindi short stories
3) Understands the craft of comparison of short stories in Hindi & Malayalam through comparing few stories of bothlanguages.

Module IV. Comparison of two poets – Jayashankar Prasad and Kumaranasan.

Outcome: (1) Attains basic knowledge of poems of Jayashankar Prasad & Kumaranasan
(2)Understands the similarities and dissimilarities between the two poets

(3) Understands the craft of comparison of poems in Hindi & Malayalam through the poems of Prasad andAsan.

Prescribed Text Book: 'Tulnatmak Adhyayan: Hindi-Malayalam kee Katha va kavita ke Sandarbha mein': Edited by Dr. M.S. Vinayachandran, Dr. P. Letha, Dr. Kumari Geetha.S, Dr. Jayasree O, Smt. Salini.C, Dr. Shabana Habeeb Published by Directorof publications, University of Kerala.

Lessons omitted : Module 3 Completely

Distribution of hrs: 2 hrs for module I and II, 1 hr for module IV.

Course outcome: (1) Understands the basic techniques of comparison of Hindi and Malayalam fiction and poetry
(2) Compares fiction and poem of Hindi & English.

Reference :
1.Tulanaatmak saahitya : Saiddhantik Adhyayan by Hanumaan prasaad shukla ,Rajkamal prakaashan
2. Tulanaatmak saahitya ke adhyayan kee samasyayein by Jagadeesh Chaturvedi Nayaa zamaanaa journal 18 feb 2017 (www.egyankosh.ac.in)

Complementary Course VI (Compulsory)

HN 1332 Rajbhasha Prabandhan

राजभाषा प्रबंधन

Credits: 3 **Hours/week :3**

Aim of the course: (1) To provide comprehensive knowledge about official language Hindi

(2) To understand the merits and demerits of Hindi as official language

(3) To understand the problems involved in management of Hindi as official language

(4) To understand use of Hindi for official communication in Central Govt. Offices, PSU, Banks etc. (5) to motivate students to a career as Translator/Hindiofficer.

Module I: Development of Hindi as official language

Outcome: (1) Attains comprehensive knowledge as to how Hindi became official language of India.

Module II: Acceptance of Hindi as official language- Provisions in the Constitution regarding official language-

Outcome: Understands the constitutional provisions regarding official language Hindi.

Module III- Official language management – field of official language management- role of institutions,offices in official language management- Hindi officer- problems in implementing constitutional provisions- managerial solutions.

Outcome: (1) Attains knowledge of official language management

Module IV: Official language Hindi- practical side

Types of official correspondence – Noting- drafting, in Hindi- Technical terminology- Hindi to English

Prescribed text book: Rajbhasha Prabandhan- by Dr. Julia Emmanuel – published by Rajpal & Sons, Madrasa Road, Kashmiri Gate, Delhi.

Course outcome: (1) Attains comprehensive knowledge of official language Hindi

(2) Does noting and drafting in Hindi.

(3)Understands official language Hindi management

(4) Opens a career option- that of translator/ Hindi officer in Central Govt.OfficeS /PSUS/Banks.

Distribution of hrs: 1 hr for module 1 & II, 1 hr for module III 1 hr for module IV.

Reference :

1. www.rajbhasha.gov.in
2. Rajbhasha kaaryaanwayan - dgpm website portal (www.dgicce.nic.in)

Semester IV

Complementary Course VII (Compulsory)

HN 1431 Bharatiya Sahitya

भारतीय साहित्य

Credits 3 **Hours/week :3**

Aim of the course: (1) To familiarize the students with the concept of one Indian literature

(2) To familiarize the students with renowned Indian writers through their representative works.

Module I: Definition of Indian literature: Features of Indian literature- problems of considering literature written in different Indian languages as one Indian literature – Role of Sanskrit in Indian literature.

Outcome:(1)understandstheconceptof Indianliterature
(2)Understands the concept of Unity in diversity through one Indian literature.

Module II: Representative literature of renowned Indian writers- poems of Dr. Manorama Vishval Mahapatr, Amrita preetam, Dr. J. Bapu Reddy, K.Sachidanandan, Subramonia Bharati- Short stories of Tagore, Takazhi, Pratibha Rai, Saran Kumar Limbale, M.K. Vinodhini- Travalogue by Indira Goswami.

Outcome: (1) Appreciates literary works of litterateurs of different Indian languages.
(2) Identifies the element of oneness in literature written in various Indian languages.

Prescribed Text book: 'Bharatiya Sahitya' compiled by Dr. RI. Santhi & Dr. A Prakash published by Vani Prakashan, Daryaganj New Delhi.

Omission : Lesson 4,6, and 7 from Khand 1 and Khand III completely.

Course outcome: (1) Understands the concept of one Indian literature
(2) Appreciates the works of different writers of different Indian languages.

Reference :

1. Bharateeya saahitya kee bhoomika by Ramvilas Sharma
2. Bharateeya saahitya by Nagendra Prabhaat prakaashan

Complementary Course VIII (Optional)

HN 1432 Patkatha Lekhan va vigyapan

पटकथा व विज्ञापन

Credits 3 **Hours/week : 3**

Aim of the course: (1) To know the technique and process of script writing

(2) To understand the form and procedure of Advertisement

(3)To understand the importance of Advertisement.

Module I: An introduction to Script- Basic methods and techniques of script writing- ideastory-situation-treatment,characterization,dialogue-sequence–climaxlanguage of script. The art of scriptwriting.

Outcome: (1) Understands what is script and script writing

(2) Understands techniques of script writing

(3) Elucidates the art of script writing

Module 2: Types of script

Outcome: (1) understands the different types of scripts

Module3: Meaning and definition of advertisement-Necessity, aim and importance of Advertisement- objectives of advertisement

Outcomes: (1) Understands the meaning, necessity, aim and importance of Advertisement.

Module4:Media of advertisement-press advertising, Direct mail advertising,Outdoor advertising, broadcast advertising.

Types of advertisement: language & style of advertisement

Outcome: 1) Understands the media of advertisement

2) Evaluates the types of advertisement with respect to their style.

Prescribedtext: Patkathalekhan aur vigyapan kee vyavaharik Nirdeshika'- Edited by Dr.NimmyA.A, Dr.T.Sreedevi Published by RajkamalPrakashan, Daryaganj,New Delhi.

Distribution of hrs: 1 hr for module 1& 2 , 2 hrs for module 3 &4

Course outcome: (1) Understands the techniques of script writing

(2) Understands the importance of Advertisement

(3)Enriches the creativity of the student

(4)Opens a career option in the field of script writing &advertisement.

Reference :

1.Patkatha lekhan by Manohar Shyam Joshi ,Rajkamal prakashan

2.Vyavahaarik nideshika Patkathaa lekhan by Asgar Vajaahat , Rajkamal prakashan

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Core Courses for FDP in Hindi

Semester I

Core course I

HN 1141- Hindi Kathetar Gadya Sahitya

हिंदी कथेतर गद्य साहित्य

Credits: 4 **Hours/week : 6**

Aim of the course: 1) To familiarize the students with prose forms other than fiction

2) To make the students understand the difference between different forms of prose like Biography and autobiography, Essay & Reportage

3) To enrich their aestheticsense.

Module I : Development of Essays in Hindi- 4 representative essays by Balakrishna Bhat, Mahavirprasad Dwidevi, Ramchandra Sukla & Hazari, Prasad Dwivedi

Outcome:(1)UnderstandsthedevelopmentofessaysinHindi

(2)Recollects the names of famous essayists in Hindi

(3) Recollects the names of major works of the prescribed essayists

(4) Critically evaluates the contribuition of the essayists to Hindi literature

(5)Critically evaluates the essays with respect to its style,theme & caft.

(6)Elucidates lines with reference to context.

Module II: 3 representative essays by Dinakar, Vidyanivas misr and harishankar Parsai

Outcome: (1) Recollects the names of major works of the prescribed essayists

(2) Criticallyevaluatestheessayswithrespecttoitstheme,styleandcraft

(3)Evaluates the contributions of the essayistst of Hindi literature

(4)Elucidates lines from thes eessays with reference tocontext.

Module III: Development of modern prose forms in Hindi-4 Representative modern prose forms- part of a biography of Premchand by Amrit Rai, Reminiscence by Ramkumar Varma, a part of an autobiography and a sketch.

Outcome: (1) Understands the development of modern prose forms in Hindi

(2)Recollectsthenamesoffamousauthorsofdifferentproseforms

(3) Recollects major works of the writers prescribed

(4) Critically evaluates the prose forms

(4) Analyses key sentences with reference to context.

Module IV: 3 representative prose forms: Diary, travelogue and reportage.

Outcome: (1) Recollects the major works of these writers

(2) Critically evaluates the prose forms

(3) Understands the difference between diary & reportage, Essay & reportage, Reminiscence & sketch etc.

(4) Analyses key sentences with reference to context.

Prescribed text books: (1) Gadya Sushama- edited by Dr. N. Mohanan & Dr. Deepak.K.R published by Rajpal and Sons, Madrasa Road, Delhi, (Detailed study)

(3) 'GadyaSaushthav'- Editedby Dr.N.Mohanan & Dr.Deepak K R published by Rajpal & sons, Madrasa Road, Delhi (Detailedstudy

Lessons Omitted

From Gadya Sushama –

1.कविता का भविष्य – महावीर प्रसाद द्विवेदी

2.तुलसी की भक्ति पद्धति - रामचंद्र शुक्ल

Distributionof hrs: 3 hrs for 'Gadya Sushama', 3 hrs for 'Gadya Saushthav'

Outcome of course: (1) Understands the different forms of prose other than fiction

(2) Critically evaluates and appreciates the different prose forms

(3) Enriches the aesthetic sense of students.

Reference :

1.Hindi sahitya kee kathetar vidhaayein , article on www.bharatkaitihas.com

2. Hindi kaa kathetar gadya parampara aur prayog Edited by dayanidhi Mishra ,Vaniprakashan

Semester-II
Core Course II

HN1241- Hindi Sahitya Ka Itihas' (Ritikal tak)

हिंदी साहित्य का इतिहास (रीतिकाल तक)

Credits:4 **Hours/week :6**

Aim of the course: (1) To give the students a detailed account of trends in literature in the early and Riti period

(2) To familiarize the students with the thoughts, philosophy of great poets like Kabeer, Soordas, Tulsi, Jayasi

(3) To make students understand the influence of early & Bhakti period writers on society and Hindi literature as a whole.

Module I: Hindi Sahitya ka Kaal vibhajan- uski Samagri

Outcome: (1) Students understand the basis on which Hindi literature is classified

(2) Understands the division of literature and their names & period.

Module II: Aadikal- uski peetika- Dharmik Sahitya- uski visheshatayem – Laukik Sahitya- Veergatha Sahithya- PramukhKavi- Veer gatha Sahtya kee visheshatayem- Ameerkhusro

Outcome: (1) Students gain comprehensive knowledge about aadikal.

Module III: Bhakti kaal-uski peetika- Madhya yug ka Mahatwa -Bhakti aandolan- Sagun- Nirgun- Sant Kavi- Sant Kavya kee Visheshatayem- Premkavya- uski visheshatayem- Ram kavya – Krishna Kavya. Krishna Kavya ka mahatwa

Outcome: (1) Students gain extensive knowledge of Bhakti kaal

(2) Critically evaluate the contributions of Bhakti poets

Module IV: Reetikaal- Uski peetika- Reeti Sahtya ka janam- pramukh kavi- unki rachnayem- Khadiboli Gadya- Kaal kee Visheshtayem

Outcome: (1) Students gain comprehensive knowledge of Reetikaal (2) critically evaluate contributions of the poets to Hindi literature

Prescribed text: Hindi Sahitya ka Sankshipt itihas- by Lakhsmi Sagar Varshney- Published by Lok Bharati Prakashan, M G Road, Allahabad-1

Lessons omitted : lessons 1, 2, and 6 from the text.

Course outcome: (1) The students gain comprehensive knowledge of the classification of Hindi literature from the beginning to 1800 AD

(2) Critically evaluate the contributions of poet to Hindi literature during the various periods.

Distribution of hours: 1 hr for module 1,

1 hr for module 2,

2 hrs for module 3,

2hrs for module 4.

Reference :

1.Hindi sahitya ka Itihas by dr.Nagendra

2. Hindi sahitya ka subodh Itihas by Gulab Ray Lekshminarayan Agarwal,Agra

SemesterIII

Core Course III

HN 1341 Hindi Sahitya ka itihas (Aadhunik kaal)

हिंदी साहित्य का इतिहास (आधुनिक काल)

Credits: 4 **Hours/week :5**

Aim of the course: (1) To give the students a detailed account of the trends in Hindi literature since 1800

(2) To familiarize the students with the Socio, economic political situation since 1800 and its influence on Hindi literature.

(3) To give comprehensive knowledge about the contribution of main litterateurs of the modernperiod.

Module I: British Raj kee sthapna aur Aadhunik yug- shasan sambandi tatha anya sudhar- Beeswi Shatabdi- British Kaleen Sahitya kee

rooprekha- Gadya ke prarambhik unnayak- Unneeswi Satabdi ke pramukh Shailikar- Dwivedi yug- Pramukh Shailikar

Outcome:(1)Students get extensive knowledge of literature from AD1800to1920

(2) Critically evaluate the trends in literature and also contribution of writers of this period to Hindiliterature.

Module II: Aadhunik Gadya Sahitya ke vividh Roop- Upanyas, Kahani, Upakhyan, Akhyayika, Rekhachitr, Reportage, Ekanki, Natak- Hindi meim kahani- Pramukh Kahanikar, Pramukh Ekanki kaar, Natakkar, Nibandh, Jeevani, Samalochana.

Outcome: (1) students get extensive knowledge of prose literature till 1947

(2) Critically evaluate evolution of various prose forms in Hindi literature and the contribution ofwriters.

Module III: Kavya uneeswi Shatabdi- Braj Kavya- Khadiboli Kavya – pravarthiyam- Chayavad- rahasyavad, pragativaad,

Outcome: (1) Students get extensive knowledge about development of poetry till 1947

(2) Critically evaluates the features of Hindi poetry from 19th century to middle of 20th century.

Module IV: Swatantrya kal- natak, Upanyas, kahani, kavita navageet, ageet, akavita.

Outcome: (1) Students gain knowledge of development of play, novels, short stories and poetry since 1947 to 1960.

Prescribed text book: 'Hindi Sahitya ka Sankshipt Itihas' by Lakshmi sagar Varshney- published by lokbharati, Allahabad

Distribution of hrs:

1 hr for module 1

2 hrs for module 2

2 hrs for module 3 & 4.

Reference :

1.Hindi sahitya ka Itihas by dr.Nagendra

2. Hindi sahitya ka subodh Itihas by Gulab Ray Lekshminarayan Agarwal,Agra

Courseoutcome:(1)Thes tudents get a comprehensive knowledge of History of Hindi literature from 10th century to the middle of 20th century

(2) Critically evaluates the trends in literature during this period

(3) Critically evaluate the evolution of prose in Hindi and its development till 1960.

Semester IV
Core Course IV
HN 1441-'Hindi Natak aur Rangmanch
हिंदी नाटक और रंगमंच

Credits: 4 **Hours/week :5**

Aim of the course: (1) To understand the development of plays in Hindi literature

2. To understand the development of theatre in Hindi

(3)To understand the district features of Hindi play through two representative plays

(4) To understand the trends in Hindi plays upto 1980 through a representative play

(5) To understand the changes in Hindi play since 1980 through a representative play.

Module I: Hindi natak ka udbhav aur vikas- poorva Bhartendu yug- Bhartendu yug- Dwivedi yug- Prasad yug- Prasadottar yug.

Outcome: (1) Critically evaluates the evolution and development of Hindi plays from latter half of 19th century to 21st century.

(2) Recollects names of famous playwrights and their major plays.

Module II: Rangmanch Parampara aur Hndi Rangmanch – Rangmanch- Paribhasha – Aavirbhav- Bharatiya Rangamanch. Sanskrit Rangmanch- Adim Rangmanch- Vartaman Bharatiya Rangmanch. Rangmanch ka vikas- natya sansthayem

Outcome: (1) Evaluates the evolution of theatre in India and development oftheatre in Hindi

(2) Recollects names of famous Rangkarmi and their contribution to theatre

(3) Understand the contribution of various natya institutes towards theatre in Hindi.

Module III; To study in detail a play written upto 1980.

Outcome: (1) Appreciates the play

(2) Critically evaluates the play with respect to theme, characterization and craft & style of the play

(3)Recollects names of other major plays written by the play Wright

(4) Elucidates key lines of the play with reference to context.

Module IV; To study in detail a play written after 1980

Outcome: (1) Appreciates the play

(2) Critically evaluates the play with respect to theme, characterization, style and craft of the play

(3) Recollects names of other plays written by the playwright.
(4)Elucidates key lines of the play with reference to context.

Prescribedtextbooks:

(1)RaktaKamal, Play by Lekshmi Narayan lal (detailedstudy) published by Rajkamal Prakashan

(2) 'Utto Ahalya' play by Surendra Dubey (detailed study) published by 'Vani Prakashan with introduction to development of Hindi play & Hindi Rangamanch by Dr. Manju Ramachandran & Dr. Jayasree.O. Vani Prakashan Daryaganj. New Delhi.

Course outcome: (1) Understands and evaluates development of Hindi plays

(2) Evaluates the development of theatre in Hindi

(3) Appreciates and critically evaluates the prescribed plays.

Distribution of hrs: 1 hr for modules I &II, 2 hrs for Module III 2 hrs for module IV.

Reference :

1. Hindi Natak Aaj –Kal by Jayadev Thaneja ,Takshila prakashan ,New Delhi
2. Nayee Rangchethana aur Hindi ke Natakkar By Jayadev Taneja, Takshila prakashan ,New Delhi

Semester IV

Core Course V

HN 1442 Vishesh Lekhak Agney

विशेष लेखक अज्ञेय

Credits: 3 **Hours/week :4**

Aim of the course: (1) To give comprehensive knowledge of Agney as a Hindi Writer.

(2) To make students understand the contributions Agney has made to Hindiliterature.

(3) To understand the place of Agney in Hindiliterature.

Module I: Agney- EK Parichay- unki jeevan rekha-kavi Agney- Agney ke Upanyas- Agney kee Kahaniyam.

Outcome:(1)Understands the contributions made by Agney in the field of Hindi poetry, fiction

(2) Evaluates the contribution smade by Agney towards Hindi poetry, Hindi fiction

(3) Recollects names of poetry collection, novels & short story collections of Agney.

Module II: Collection of 5 poems of Agney (detailed study)

Outcome: (1) Appreciates the poems of Agney

(2) Critically evaluates the poems with respect to theme craft & style

(3)Elucidates lines of the poemswith reference to context

(4) Evaluates the contribution of Agney to Hindi poetry through the representative poems of the syllabus.

Module III; Five prose writings of Agney.

Outcome: (1) Recollects names of prose writings of Agney

(2) Evaluates Agney as a prosewriter.

Module IV: Five short stories of Agney (detailed study)

Outcome: (1) Understands Agney as a fiction writer

(2) Critically evaluates the short stories with respect to theme, craft and style

(3) Evaluates the contribution made by Agney towards Hindi short stories

(4) Elucidates key lines of th stories with reference to context.

Prescribed Text: Lokpriya Sahityakar Agney- Edited by Dr. R.I. Santhi, Dr. Suma S , published by Vani Prakashan, Daryaganj, N.Delhi with introductory essays titled Agney Jeevan Rekha, Agney ke upanyas: Parichay by Dr. Gopal Rai, Agney kee Kahaniyam, byDr.GopalRai &Kavi Agney.

Poems& Shortstories for detaileds tudy.

Lessons Omitted :

1.साम्राज्ञी का नैवेद्य दान (poem)

2.घृणा का गान (poem)

3. अज्ञेय अपनी निगाह में (Aatmakathaa)

Distribution of hrs: 1 hr for modules I & module III,

1 hr for module II

2 hrs for module IV.

Course outcome: (1) Appreciates Agney as a poêt & fiction writer

(2) Critically evaluates Agney as a poet, as a fiction writer and prose writer

(3) Critically evaluates the contribution of Agney to Hindi literature.

Reference :

1.Agyey se sakshaatkaar by krishnadatt paleevaal ,Aryaprakashan mandal

2. Agyey kee rachanaayein by hindisahityavimarsh.blogspot.com

Semester V

Core Course VI

HN 1541. Pracheen evam Madhya Kaleen Hindi Kavya
प्राचीन एवं मध्यकालीन काव्य

Credits: 4 **Hours/week : 4**

Aim of the course: (1) To provide the best specimen of ancient and medieval poetry representing different periods trends & styles.
(2) To develop the faculty of appreciation of poetry.

Module I: Pracheen tatha Madhyakaleen kavithya ka viaks – pramukh kavi

Outcome: 1) Critically evaluates the evolution and development of ancient and medieval poetry.
(2) Recollects the names of poets representing each stream of poetry
(3) Recollects major poems of all the poets.

Module II Ancient poets- Chand bardayi, Vidya pathi, Ameer Khusro- their representative poetry.

Outcome:(1)Appreciates the poetry of Ancient poets
(2)Critically evaluates the poetry of Chandbardayi, Vidyapati and AmeerKhusro
(3)Recollects names of major works of these poets
(4) Eludicates lines from the poems of Chandbardayi &Vidyapati.

Module III: Medieval parts- Kabeer, Soordas and Tulsidas- Representative poetry of these poets.

Outcome: (1) Appreciates the poetry of these medieval poets

(2) Critically evaluates the poetry of Kabeer, Soordas & Tulsidas

(3) Evaluates the contribution of these poets to the Bhakti literature and to Hindi literature

(4) Elucidates key lines of the padas of Soordas and Tulsidas and couplets of Kabeerdas.

Module IV: Poets Meerabai, Biharilal and Bhooshan- their representative poetry.

Outcome: (1) Familiarize with the style, theme, craft of these medieval poets

(2) Critically evaluates the style, theme and craft of these poets

(3) Elucidates key lines of these poets.

Prescribedtextbooks:

Pracheen aur Madhya kaleen Hindi Kavya

(with elaborate essay on origin & development of ancient & medieval poetry) Edited by Dr. N. Jyothi, Dr. NimmyAA, Dr.Jayasree.B PublishedbyJawaharPustakalay,Mathura (detailed study)

Distribution of hrs: 1 hr for module I & II

2 hrs for Module III

1 hr for Module IV.

Courseoutcome:(1)Appreciates ancient&medievalpoetry

(2)Critically evaluatesthe poetry of representative ancient & medieval poets

(3)C ritically evaluates the contribution of these poets to Hindi literature.

(4) Elucidates key lines of the poems of Ancient & Medievalpoets.

Reference :

1.Madhyakaaleen kaavya by Sanjeev kumar jain , Kailash pustak sadan ,Bhopal

2. pracheen Hindi kavya by www.epustakalay.com

Semester V

Core Course VII

HN 1542 Adhunik Hindi Kavya

आधुनिक काव्य

Credits 4 **Hours/week :4**

Aim of the course: (1) To familiarize students with the development of modernpoetry- the different trends & styles of modern poetry

(2) To provide students with best specimens of modern poetry representing different styles

(3) To help students develop their faculty of appreciation

(4) To familiarize students with the development of long poems inHindi.

Module I: Development of modern poetry – Trends of Modern poetry - poets Maithilisharan Gupt, Jayashanakar Prasad, Bachan, Sumitra Nandan Pant and Mahadevi Varma and their representative poems.

Outcome: (1) Recollects major works of the prescribed poets

(2) Appreciates the poems

(3) Criticallyevaluatesthepoetsaswellaspoemswithrespecttostyle,craft&theme

(4) Elucidates lines of the poem with ref. to context

(5) (5) Evaluates development of modernpoetry.

Module II: Poets Nagarjun, Swapnil Shrivastawa, gyanendrapati, Anamika Madankashyap and their representative poems.

Outcome: (1) Recollects major works of the prescribed poets

(2) Appreciates the poems

(3) Critically evaluates the poets as well as poems with respect to style, craft and theme

(4) Elucidates lines of the poem with ref. tocontext.

Module III: Poets Nirmala Puthul, Niveditajha, Katyayini, Arunkamal, Mahendra Bhatnagar and their representative peoms.

Outcome: (1) Recollects major works of the poets

(2) Critically evaluates the poets as well as as their poems with respect to style, craft and theme.

(3) Elucidates lines of the poem with ref. to context.

Module IV: long poems in Hindi- Long poem of Nirala

Outcome:(1) RecollectsnamesofmajorworksofNirala

(2)Understandsmainfeatures of long poems

(3) Critically evaluates Nirala as a poet

(4) Critically evaluates thepoem

(5) Elucidates key lines of the poem with ref. tocontext.

Prescribed text: Aadhunik Hindi Kavya, edited by Dr. Suma.S Published by Vani Prakashan, Daryaganj, New Delhi.

Hours distribution: 1 hr each for each module.

Course outcome: (1) Understands and evaluates development of modern Hindipoetry

(2) Appreciates modern poetry

(3) Critically evaluates prescribed poets and their poems with respect to theme, style & craft.

Reference :

1.Aadhunik Hindi kaavya aur kavi by www.epustakalay.com

2. Hindi saahitya kaa Adhunik ithihas by Tarknaath Bali

Semester V

Core course VIII

HN 1543. Aadhunik Hindi Katha Sahitya

आधुनिक हिंदी कथा साहित्य

Credits: 2 **Hours/week : 3**

Aim of the course: (1)To familiarize students with trends in modern Hindi fiction upto 1980

(2) To develop their aesthetic sense.

ModuleI: Origin&DevelopmentofHindiNovel-famousnovelists-their majorworks.

Outcome: (1) Basic understanding of origin & development of Novel in Hindi

(2) Recollects names of popular novelist of various genre and also their majornovels

Module II: To study a novel published before 1980.

Outcome: (1) Appreciates the novel

(2) Critically evaluates the novel with respect to theme, characterization, craft and style

(3) Evaluates the contribution of the novelist towards Hindi Novels.

Module III: Origin and development of Hindi short stories till 1980-major short story writers- their major collections.

Outcome:(1) Basic understanding of origin &development of shortstories in Hindi

(2) Recollects names of famous short story writers alongwithstories

(3) Understands major trends in Hindi short stories upto1980.

Module IV: A collection of 7 short stories published prior to 1980.

Outcome: (1) appreciates the short stories

(2) Recollects names of major short stories of the prescribed writers

(3) Critically evaluates the shortstories with respect to theme, genre, style an craft

(4) Elucidates key lines with reference to context.

Prescribedtexts:

(1)‘DaakBangla’NovelbyKamleshwarpublishedbyRajpal&sons, Kashmiri Gate, Delhi,

(2) Kathakunj (collection of short stories) edited by Dr.Asha.G, Dr. Shabana Habeeb published by Jawahar Prakashan,Mathura.

Lessons to be omitted:

(1) लैटर बॉक्स - अज्ञेय

(2) मवाली - मोहन राकेश

Hour distribution: 1 hr modules I & II,

2hrs for module III & IV

Course Outcome

(1)Appreciates modern Hindi fiction

(2)Critically evaluates modern Hindi fiction upto 1980

(3) Inspires creativity in students

(4)Understands and evaluates development of fiction in Hindi (upto1980).

Reference :

1. Hindi saahitya kaa Adhunik ithihas by Tarknaath Bali

2.Aadhunik Hindi katha sahitya by gangaprasad pandey , www.epustakalay.com

Semester V

Core Course IX

HN 1544 Hindi Vyakaran

हिंदी व्याकरण

Credits: 4 **Hours/week: 4**

Aim of the course: (1) To familiarize the students with the grammar of Hindi language

(2) To make them use grammatically correct language.

Module I:Varnavichar-Dhwaniyam-Swar aur Vyanjan Samyukt Vyanjan-lekhan aur vartani- Akshar- Vartani kiSamasya.

Outcome: (1) Understands varna and its subdivisions

(2) Recollects types of varna and its subdivisions

(3) Understands correct spelling of words.

Module II: Sabda Rachana- Sandhi – types –samas – upsarg –pratyay- Sanskrit Hindi aur videshi pratyay

Outcome: (1) Recollects types of Sandhi, Samas, Upsarg, Pratyay

(2) Splits words correctly according to Sandhi and identifies the Sandhi used

(3) Splits the words correctly as per Samas and names the samas

(4) Makes new words using Upsarg & pratyay and Identifies the Upsargs & pratyays.

Module III; Vikari sabd- Sagya- Sarvanam- Visheshan-Kriya Sagya mem Roopantar- Sarvanam mem roopantar- Visheshan mem roopantar- Visheshan kee tulanavastha- Kriya mem roopanthar

Outcome:(1)Definesallfourpartsofspeech

(2)Recollectsallsubdivisions&typesof four parts of speech.

(3) Enumerates on the reasons for changes in Sagya, Sarvanam, visheshan and kriya

(4) Identifies Sagya, Sarvanam, Visheshan and Kriya in a given sentence along with their types; orsubclassification.

ModuleIV-Avikari Sabd-Kriya visheshan, Sambandh Bodhak, Samuchchya Bodhak, Vismayadi Bodhak- Unkipadavyakhya

Outcome: 1) Identifies avikari shabd in a sentence

2) Defines 4 avikari sabds along with their subdivisions.

Module V: Vakya-uske anga- Bhed

Outcome: 1) Defines vakya

2) Enumerates vakya

Prescribed text: Vyavaharik Hindi vyakaran tatha rachna by Hardev Bahari published by Lok Bharati Prakashan, Allahabad.

lessons to be omitted

1) व्याकरण और उसके अंग

2) शब्द विचार

3) From वाक्य विचार r- अध्याहार, वाक्यांतरण, वाक्य संश्लेषण , वाक्य विज्ञान , पदक्रम, अन्वय , कथन भेद , विराम , मुहावरे , लोकोक्ति , अनुस्मराणिका

Hour distribution: 1 hr for module I & II

2 hrs for module III

1 hr for module IV & V.

Course outcome:(1)Enumerates on varna and its classification (2)Enumerates4vikari sabd

(3) Does pada vyakhya

(4) Writes grammatically correct sentences.

Reference :

1. Vyakaran Pradeep – Ramdev , Lokbharathi Prakashan,Allahabad
2. Vyavaharik Hindi vyakaran Anuvad Tatha Rachana by Dr.H Parameswaran

Semester V

Core Course X

HN 1545 Bhasha Vigyan Tathaa Bhasha Ka itihas

भाषा विज्ञान तथा भाषा का इतिहास

Credits: 4 **Hours/week :4**

Aim of the course: 1) to familiarize the students with the linguistics of Hindi language and the history of Development of Hindi language and its lipi.

Module I: Bhashiki: Swaroop aur Anga- Dhwani vigyan- Swaniki- Swaniki ka Kshetra- Vag yantr Swanom ka Vargeekaran- Sruthi- Manswar- Swar vargeekaran- vyangjanvargeekaran-Dwanigun-Akshar- Swanimi-Swanim-SwanikiSwanimi-tulna Swanim nirdharan ke sidhant- Swanimom keBhed

Outcome: 1) Understands phonology and enumerates it

2) Enumerates phonotics & phonemics

Module II: Roop vigyan- Roopim- Roopimom ke prakar- Roop vaigyanik Kotiyam- Vyakaranik Kotiyam

Outcome:1)Understandsmorphologyandenumeratesit

2)Enumeratesmorphemes

(3) Classifies morphemes

(4) Enumerates morphological categories & grammatical categories.

Module III: Vakya vigyan- Vakya –Upavakya- Vakyom ke Prakar- sannihit Ghatak- Arth Vigyaan. Arth Vistaar- Arth Sankoch- Arhtadesh- Arthotkarsh- Arthopakarsh

Outcome: (1) understands vakya vigyan

(2) Enumerates vakya vigyan

(3) Enumerates Artha Vigyaan

ModuleIV:Sansar kee Bhashayem aurUnka vargeekaran– akritimoolakvargeekaran- parivarik vargeekaran. Bharat Uropeeya parivar- Bharateeya Arya Bhashavom ka Itihaas – Bharateeya Arya Bhashavom ka Samanya parichay- Hindi aur Uski Boliyam- Hindi aur Hindi ke vividh roop lipi –nagari lipi aurank.

Outcome: (1) Understands the classification of languages in the world

(2) Enumerates upon the classification of world languages

(3) Classifies Indo European languages

(4) Enumerates Hindi and its dialects.

Prescribed texts: (1) Bhashiki ke prarambhik sidhant – By Dr. H. Parameswaran published by Vani Prakashan, Darya Ganj, New Delhi.

Lessons omitted :

(1) रूपिमों का अभिनिर्धारण

(2) रूपिमों का अंकन

(3) Chapter 4- शब्द विज्ञान

(4) अंत:केन्द्रिक और बहिर्केंद्रिक वाक्य

(5) Chapter 7- रूप स्वनिमी

(6) Chapter 8. लेखन प्रणाली

(2) Hindi Bhasha aur lipi: By prof. H. Padmanabhan & Prof. G. Seethalakshmi published by Vani Prakashan, Daryaganj New Delhi.

Lessons omitted:

(1) Chapter 4

(2) Chapter 8.

Hour distribution:

2 hrs for module 1, 1 hr for modules II, III;

1 hr for module IV.

Course outcome: (1) Understands Basic theories of linguistics and History of Hindi Language

(2) Enumerates Dwani Vigyan, Roop Vigyan, Vakya Vigyan and Arth Vigyan

(3) Classifies world languages

(4) Classifies Indo European languages

(5) Enumerates Hindi language and its dialects

(6) Understands lipi.

Reference :

1.Bhasha vigyan by Shyam sundardas ,Harish prakashan mandir

2. Bhasha vigyan aur Hindi Bhasha ,Sahitya sarovar

3.Hindi Bhasha aur lipi ka itihas by Dr.Vipulkumar ,Shree natraj prakashan

Semester V

Open Course

HN 1551- Hindi Cinema

हिंदी सिनेमा

Credits 2 **Hours/week : 3**

Aim of the course: (1) To enable students to understand a brief history of world cinema

(2)To make students understand the developmentof Hindi cinema

(3)To enable students to critically evaluate classic films inHindi.

Module I: Introduction- Brief History of World Cinema

Outcome: Gets knowledge of world cinema

ModuleII: Hindi Cinema; prarambhik yug, vikas ke charan-Samkaleen Hindi cinema; Pramukh Nirdeshak aur Abhineta

Outcome: (1) Understands development of Hindi Cinema from early times to contemporary times.

Module III: Film sameeksha- To view 3 Hindi classic films and evaluate on basis of direction, acting theme, screenplay, dialogue, cinematography, editing'

Outcome: (1) Critically evaluates films in Hindi.

Prescribed text:

(1) Film safar : Kal aur Aaj Written by Dr. Suma.S,Published by Vani Prakashan ,New Delhi

(2) To view- (i) Do ankhen Barah haat (1957-V. Santharam) (ii) Do Beegha Zameen (1953: Bimal Roy)

(iii) Bawarchi (1972: HrishikeshMukherjee)

Course Outcome: (1) Understands development of world cinema & Hindi cinema

(2) Critically evaluates Hindi cinema.

Semester VI

Core Course XI

HN 1641 Samkaleen Hindi KathaSahitya

समकालीन हिंदी कथा साहित्य

Credits: 4 **Hours/week :5**

Aim of the course: (1) To familiarize students with the trends in contemporary Hindi fiction (since 1980)
(2) To develop the aesthetic sense ofstudents.

Module I: Development of contemporary Hindi novel- important novelists and their major works.
Outcome: (1) Understands development of contemporary Hindi novel
(2) Recollects names of important novelists and their novels.

Module II: To study in detail 'Giligadu' by Chitra Mudgal- published by Samayik Prakashan.
Outcome: (1) Appreciates the novel
(2) Critically evaluates the novel with respect to theme characterization style and craft of the novel.
(3) Recollects names of major novels of the author
(4) Elucidates key lines of the novel with reference to context.

Module III: Development of contemporary Hindi short story- important short story writers and their major works.
Outcomes:(1)UnderstandsthedevelopmentofcontemporaryHindishortstories(since 1980)
(2) Recollects names of important short story writers of the period along with their major works.

Module IV: Collection of 8 short stories (detailed study)

Outcome: (1) critically evaluates the contribution of the prescribed writers to contemporary Hindi short story

(2) Critically evaluates the short stories with respect to theme,styleandcraft

(3)Recollectsthemajorworksoftheprescribedshortstorywriters

(4) Elucidates key lines of shortstories.

Prescribed text: Navya Kahaniyam- Edited by Dr. Latha.D Dr. Elizabeth George published by Aman Prakashan,Kanpur

Lesson Omitted: Apradh by Udaya Prakash

Outcome of the course: (1) Kindles creativity in students

(2) Students critically evaluate contemporary fiction

(3) Appreciates contemporary fiction.

Reference :

1.Kathadesh :Khand 8 by Santosh Chaube

2.Bharateeyataa aur samakaleen Hindi kahani by www.hindisamay .com

3.Samakaleen Hindi kahanee by Dr.Narendr Mohan ,Bharateey Prakashan Sansthan

Semester VI

Core Course XII

HN 1642 Bharatiya evam Pashchatya kavya sasthra

भारतीय एवं पाश्चात्य काव्य शास्त्र

Credits: 4 **Hours/week : 5**

Aim of the course: (1) To familiarize the students with Eastern and western literary thoughts

(2) To familiarize the students with sabd sakti, selected Alankars, selected chands and nine rasas.

Module I: Bharatiy Kavya Shastra- kavya lakshan: kavita kya hai- Kavya prayojan.

Outcome: (1) Understands what is poetry

(2) Understands use of poetry as explained in Sanskrit literary thought.

Module II: Ras Sidhant, Ras sootra kee Vyaakhyaa ,Ras Nishpatti, Sadhaaraneekaran - Alankar Sidhant- Reeti Sidhant

Outcome: (1) Understands these three ancient Indian literary thoughts

(2)Evaluates the literary theories of Bharatha, Bhamaha and Vamana.

(3) Evaluates the theory of Ras Nishpatti

Module III: Dhwani Sidhant- Vakrokti Sidhant: Auchitya Sidhant,

Outcome: (1) Students understand these three Indian literary theories

(2) Evaluate the theories of Anandavardhan, Kuntak and Kshemendra

Module IV: Paschatya Kavya- plato ke Kavya sidhant- Arastu- longinus ka Audaatya Sidhant-

Outcome: (1) Students understand and evaluate these three western literary thoughts

Module V: William Wordsworth- Coleridge- Croche- I.A. Richards- T.S. Eliot

Outcome: (1) Students understand and evaluate these literary thoughts

Module VI: Sabd Sakthi, Navras, Alankar Chand

Outcome: (1) Identifies Chand & Alankar (2) understands power of word.

Prescribed text book -1) Bharatiya evam paschatya kavya shastr- by Taraknath bali Published by Vani Prakashan, New Delhi 2) Kavya pradeep-Rambahori Sukla- Lokbharati Prakasan.

Lessons to be studied

From भारतीय काव्य शास्त्र- अलंकार सम्प्रदाय ,रीति सम्प्रदाय ,वक्रोक्ति संप्रदाय ,ध्वनि संप्रदाय ,औचित्य सम्प्रदाय ,रस संप्रदाय ,रस सूत्र की व्याख्या व रस निष्पत्ति,साधारणीकरण

From पाश्चात्य काव्यशास्त्र : प्लेटो के काव्य सिद्धांत ,अरस्तु के अनुकरण तथा विरेचन सिद्धांत ,लोंजाइंस का औदात्य सिद्धांत ,इलियट के निर्वैयक्तिक्तावाद , परम्परा की परिकल्पना ,क्रोचे का अभिव्यंजना वाद,रिचर्ड का सम्प्रेषणीयता सिद्धांत , वर्ड्सवर्थ का काव्य भाषा सिद्धांत ,कोलरिज का कल्पना सिद्धांत

From काव्य प्रदीप

शब्द शक्ति, नव रस ,

अलंकार -अनुप्रास , यमक , श्लेष , वक्रोक्ति , उपमा , रूपक ,उत्प्रेक्षा

छंद - चौपाई ,रोला ,दोहा ,सोरठा , इन्द्रवज्रा ,उपेन्द्र वज्रा

CourseOutcome:1)UnderstandsvariousIndianandwesternliterarytheories.

2) Identifies prescribed chands and Alankars

3) Understands the power of words.

4) Applies the knowledge gained in their creativewriting.

Distributionofhrs:2hrs for Bharatiya Kavya Sasthra.

2 hrs for Paschatya KavyaSastra,

1 hr for moduleVI.

Reference :

1.Bharateey evam Pashchatya Kavy shaastra by Dr.Vivek Sankar ,rajasthan Hindi Granth Academy

2.Kavya ke roop by Gulab ray ,Aatmaaraam and sons , New Delhi

Semester VI

CoreCourse XIII

HN 1643 Anuvad: Sidhant Tatha Prayog

अनुवाद : सिद्धांत तथा प्रयोग

Credits 4 **Hours/week : 5**

Aimofthecourse:(1)To familiarize the students with the theory of Translation

(2)To facilitate use of Translation as a tool for communication in Hindi and English

(3) To motivate the –students for a career inTranslation.

Module I : Anuvad ka Swaroop- Anuvad kee prakriya

Outcome: (1) Defines translation

(2) Identifies fields of translation

(3) Enumerates on characteristics of good translator

(4) Understands steps involved in translation

Module II: Anuvad Ke prakar- Anuvad: Prayogikata kee seemayem

Outcome:(1)Enumerates on types of translation-literary and non literary

(2) Identifies limitations oftranslation

Module III: Translation practice- from English to Hindi and ViceVersa

Outcome: (1)Translates passages from English to Hindi and Viceversa.

Prescribed text: (1) Anuvad: Sidhant tatha prayogikata- By Dr. M.S. Vinayachandran

published by: Director of Publication, Kerala University.

Course outcome: (1) Understands theories of Translation and limitations of Translation

(2) Translates simple passages from English to Hindi and Vice Versa

(3) Opens career option- that of Translator.

Distribution of hrs:

2 hrs for module I

2 hrs for module II

1 hr for module III.

Reference :

1.Anuvad vigyan by Bholanaath Tiwari ,Kitab ghar prakashan

2.Vyavaharik Anuvad vy Dr.N E Viswanath Iyer ,Prabhat prakashan

Semester VI

Core Course XIV

HN 1644 Hindi Vyangya Sahitya

हिंदी व्यंग्य साहित्य

Credits : 3 **Hours/week :4**

Aim of the course: (1) To familiarize students with the development of satire in Hindi

(2) To make students understand the use of satire as a tool by Writers while discussing socio-political situations and issues in literature.

Module I: Vyangya- Sabdarth, Vyutpatti, Paribhasha- Vyangya kee visheshatayem- Vyangya parampara ka vikas- Bhartendu yug- Dwivedi yug- Chayavadi yug. Swatantryothar yug- Pramukh vyangyakaar aur Rachnayem

Outcome: (1) Understands the development of satire in Hindi

(2) Critically evaluates the development of satire in Hindi

(3)Recollect names of famous satirists in Hindi along with their major works.

Module II; A Collection of satires – 5 satires

Outcome:(1)Appreciatessatire

2.Understands use of satire as a tool while discussing socio economic issues in literature.

Module III- To study in detail a play

Outcome: (1) Appreciates satirical play

(2) Understands use of satire as a tool, while discussing political issues

(3)Elucidates key lines of the play with reference to context.

Prescribed texts: (1) Hindi vyangya Sahitya- Edited by Dr. Reshmikrishnan published byAmanPrakashan,Kanpur

(2)Bakri-playbySarveshwarDayalSaxenapublishedby Vani prakashan, New Delhi (Detailedstudy)

Course outcome: (1) Understands and evaluates satirical literature

(2) Understands use of satire as a tool while discussing socio-economic-political issues inliterature

Distribution of Hrs:

1 hr for module I,

1 hr for module II,

2hrs for moduleIII.

Reference :

1.Vyangy sahitya : sandarbh evam chunautiyan by Amardev Angiras , www.divyahimachal.com

2.Hindi vyangy kee avasan belaa by Omprakash Kashyap , www.hindisamay.com

Semester VI

Elective Course

HN 1661 Jan Sanchar aur Hindi Cinema

जन संचार और हिंदी सिनेमा

Credits 2 **Hours/week : 3**

Aim of the course: (1) To make students understand media both print and electronic and its merit and demerits

(2) To make students understand mass communication- its uses

(3) To enable students to understand the medium cinema & to make them awareof the significant film movements

(4) Make them aware of world renowned film makers and the art of filmmaking.

Module I: Sanchar- Sanchar Madhyamom ke prakar- Sravya Madhyam: Radio- Sravya

–Drisya Madhyam

Outcome: (1) Students understand different types of communication media its uses- cinema as a medium of communication.

Module II: Cinema- Bhoomika- Viswa Cinema ka Sanshipta Parichay- Hindi Cinema- Prarambhik yug, vikas ke charan, Samkaleen Hindi cinema pramukh nirdeshak, abhinetha

Outcome: (1) Comprehensive knowledge of world cinema and Indian cinema.

Module III- To view 3 classic Hindi films and critically evaluate it.

Outcome: (1) Evaluates film with respect to story, screen play, dialogue, cinematography- editing, acting, direction.

Text books: (1) Soochanaa,computer aur prayojanmoolak Hindi jagat – Dr.naaga lekshmi ,Jawahar Pustakalay (only jansanchar part)

(2) Film safar : Kal aur Aaj Written by Dr. Suma.S,Published by Vani Prakashan ,New Delhi

(3) To view- Do Ankhem Barah haat (1957)- V. Santharam) Do Beegha Zameen (1953 Bimal Roy)

Bawarchi (1972- Hrishikesh Mukherjee)

Course outcome: (1) Understands history of world cinema

(2) Understands development of Hindi cinema

(3) Understands mass communication and cinema as medium of mas communication

(4) Critically evaluates film

Hour distribution:

1 hr for module I,

1 hr for module II

1 hr for module III.

Reference :

1. Filmein kaise bantee hai : Kwaja Ahmed Abbas ,National Book Trust ,New Delhi
2. Cinema kal,aaj,kal –Vinod Bharadwaj
3. Media lekhan – Sumith Mohan ,Vani prakashan ,New Delhi

Semester VI

Dissertation/लघु शोध प्रबंध

HN 1645

Credits : 4 **Hours/week: 3 (each for sem 5 &6)**

The dissertation work should commence in the 5th semester and a small thesis has to be submitted for evaluation at the end of the 6th semester.

Aim of the course: (1) To apply the knowledge about language & literature gained during the programme

(2)To examine the student's ability to analyse,evaluate and think critically and to put to practice what has been gained during the programme

(3) To kindle the students Research aptitude.

Nature of work: The dissertation may be based on any piece of literature in Hindi, on Hindi language, grammar, translation, media and communication. The size of the dissertation may be between 40-50 pages. Research methodology should be followed. The dissertation should contain the following:

(1) Title (2) Introduction (3) Expansion of Title chapter (4) Summary of important findings and conclusion (5) Bibliography.

No. of chapters: 3 excluding conclusion

Evaluation points: 1. Title and introduction -15

2. Expansion and explanation of title chapter -25

3. Conclusion -15

4. Language & Grammar -15

5. Reference (Bibliography) -10

Total	80
Viva voce	20
Total marks	**100**

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UNIVERSITY OF KERALA

Scheme & Syllabi

For First Degree Programme in Hindi (Other than General English)

(Faculty of Oriental Studies)

Under the Choice based Credit and Semester system (CBCSS)

2020 admission onwards

Preface

The proposed revised syllabus to be implemented with effect from 2020 admission onwards has been prepared by Board of Studies in Hindi (Pass) of the University of Kerala as 'outcome based as per the instructions of University Grants Commission, the Kerala State Higher Education Council and Kerala University. The aim of each course is identified and the syllabus of each course is divided accordingly, into different modules. The outcome of each module and the course outcome of each of the 36 courses is outlined in the syllabus. The outcome of the programme is that the students who pass this programme (FDP in Hindi under CBCSS) will have comprehensive knowledge of Hindi literature both prose and poetry from the Ancient period to contemporary period. They will be proficient in grammer. The programme will kindle their aspiration for a career as translator/Hindi Officer/Journalist in Hindi.

I extend my sincere thanks to Prof. Dr. Devendra Kumar Chowbey, Professor of Hindi, JNU, Deshi for being the Resource person in the workshop conducted as part of revising the syllabus and for his valuable suggestions. I thank Dr. R. Jayachandran Dean, Faculty of Oriental studies and Head, Dept. of Hindi, University of Kerala, Chairman, BOS in Hindi (P.G) for his guidance. I thank all members of the Board of studies in Hindi (pass) for helping me in preparing study materials, compiling study materials, editing text books. I thank all the participants of the workshop especially Dr. K.Shaji, member academic council, Kerala University for their valuable suggestions. My special gratitude to Dr. Suma.S, Member BOS Hindi (pass) for her selfless service throughout the preparation of the syllabus. Hope the students will find the syllabus interesting and helpful.

Trivandrum
12.2.2020

Dr. R.I. Santhi
Chairman, BOS Hindi (Pass)

Board of Studies in Hindi (Pass)

Chairman

Dr. R. I.Santhi
Associate Prof. and Head (Rtd.)
Dept. of Hindi, Govt. College for Women
Trivandrum

Members

1. **Dr.Sasikala Namboothiri**
   Associate Prof. & Head, Dept. of Hindi
   SD College, Alappuzha

2 **Dr. Deepak K.R**
   Asst. Prof. of Hindi
   SDE, University of Kerala

3 **Dr. Satheesh Kumar.G**
   Associate Professor of Hindi
   FMN College, Kollam

4 **Dr. R. Sethunath**
   Associate Prof. of Hindi
   University of Calicut

5 **Dr. S.R. Jayasree**
   Asst. Prof. of Hindi
   MG College, Trivandrum

6 **Dr. T. Sheela.T. Nair**
   Asst. Prof. of Hindi,
   NSS College Pandalam

7 **Dr. Suma.S**
   Asst. Prof. of Hindi
   Govt. College for Women, Tvpm

8 **Dr. V. John Panicker**
   Asst. Prof. of Hindi
   St. Gregorios College, Kottarakara

9 **Dr. Reshmi Krishnan**
   Asst. Prof. of Hindi
   Govt. College, Ambalappuzha

10 **Dr. R. Jayachandran**
   Chairman, BOS Hindi (PG)

Resource Person

Prof. Dr. Devendra Kumar Chowbey
Professor of Hindi, JNU, Delhi

Special Invitee

Dr. K.Shaji, Member, Academic Council (Kerala University)
Asst. Prof. of Hindi
SN College, Kollam

University of Kerala

Scheme & Syllabi

For the First Degree Programme in Hindi (Other than General English)

Faculty of Oriental Studies) w.e.f. 2020 admission

General Scheme

Duration : 6 semesters of 18 weeks/ 90 working days per semester

Total Courses: 36
Total credits : 120
Total lecture hrs. : 150/week

Common course

Language course for B.Com : 2
Credits : 8
Lecture hrs./week : 8
Language course (Common course)
For restructured B.Com : 2
Credits : 8
Lecture hrs. /week : 10
Language course (common course)
For career related BA/BSc. : 2
Credits : 8
Lecture hrs/week : 10

Summary of Course in Hindi

Course Type	Name of Course	No. of Courses	Credits	Lecture Hr./week
a	Common course for BA/BSc.	4	14	18
	Common Course for B.Com	2	8	8
	Common Course for restructured B.Com	2	8	10
	Common course for career related BA/BSc	2	8	10
b	Foundation Course	1	3	4
c	Complementary courses	8	22	24
d	Core Courses	14	52	64
e	open course	1	2	3
f	elective course	1	2	3

g	Project/Dissertation	1	4	6

a) Outline of Common courses

(i) for BA/BSC Degree Programmes

Course Code	Course Type	Course title	Credit	Lecture hrs./week
HN 1111.1	Common Course I	Hindi Katha Sahitya	3	4
HN1211.1	Common Course II	Hindi Nibadh aur anya gadya Vidhayen	3	4
HN 1311.1	Common Course III	Hindi Natak, Vyakaran tatha Anuvad	4	5
HN1411.1	Common Course IV	Hindi Kavita evam Ekanki	4	5

(ii) B.Com Degree Programme

Course Code	Course Type	Course Title	Credit	Lecture hrs/week
HN1111.2	Common Course I	Hindi Gadya aur Vyavasayik lekhan	4	4
HN 1211.2	Common Course II	Hindi Kavita, Anuvad aur paribhashik sabdavali	4	4

(iii) B.Com Degree (restructured) programme

Course Code	Course Type	Course title	Credit	Lecture hrs./week
HN 1111.4	Common Course I	Adhunik Hindi Sahitya	4	5
HN 1211.4	Common Course II	Hindi Natak, Vyavasayik Lekhan aur Anuvad	4	5

(iv) BA/BSc (Career related) Programme

Course Code	Course Type	Course Title	Credit	Lecture hrs/week
HN 1111.3	Common course I	Hindi Gadya Sahitya	4	5
HN 1211.3	Common Course II	Hindi Padyasahitya	4	5

Outline of FDP in Hindi language and literature (Foundation course, Complementary Courses , Core Courses, Open Course, Elective Course & Dissertation

b. Foundation course

Course code	Course type	Course title	credit	lecture hrs/week

HN 1321	Foundation Course II	Soochana praudyogiki aur adhunik patrakarita	3	4

c. Complementary courses

Course code	**Course type**	**Course title**	**credit**	**lecture hrs/week**
HN 1131	Complementary Course I (compulsory)	Samkaleen Sahityik Vimarsh	2	3
HN 1132/ SK1131.1	Complementary Course II (Optional)	Pracheen tatha Madhyakaleen Bharateeya Sanskriti	2	3
HN 1231	Complementary Course III (Compulsory)	Kathakar Premchand	3	3
HN 1232/ SK 1231.1	Complementary Course IV (optional)	Paristhithik patt aur Hindi Sahitya	3	3
HN 1331/ SK 1331.1	Complementary Course V (optional)	Tulnatmak Adhyayan	3	3
HN 1332	Complementary Course VI (Compulsory)	Rajbhasha Prabandhan	3	3
HN 1431	Complementary Course VII (Compulsory)	Bharatiya Sahitya	3	3
HN 1432/ SK 1431.1	Complementary Course VIII (optional)	Patkatha Lekhan va vigyapan	3	3

d.Core Courses

Course code	**Course type**	**Course title**	**credit**	**lecture hrs/week**
HN 1141	Core Course I	Hindi kathethar Gadya sahitya	4	6
HN 1241	Core Course II	Hindi Sahitya ka itihas –Ritikal tak	4	6
HN 1341	Core Course III	Hindi Sahitya Ka itihas- Adhunik Kal	4	5
HN 1441	Core Course IV	Hindi Natak aur Rangmanch	4	5
HN 1442	Core Course V	Vishesh Lekhak Agney	3	4

HN 1541	Core Course VI	Pracheen evam Madhyakaleen Hindi Kavya	4	4
HN 1542	Core Course VII	Adhunik Hindi Kavya	4	4
HN 1543	Core Course VIII	Adhunik Hindi Katha Sahitya	2	3
HN 1544	Core Course IX	Hindi Vyakaran	4	4
HN 1545	Core Course X	Bhasha Vigyan va Bhasha Ka itihas	4	4
HN 1641	Core Course XI	Samkaleen Hindi Katha Sahitya	4	5
HN 1642	Core Course XII	Bharatiya evam paschatya kavya shastra	4	5
HN 1643	Core Course XIII	Anuvad: sidhant tatha prayog	4	5
HN 1644	Core Course XIV	Hindi Vyangya Sahitya	3	4
g. Project/Dissertation				
Course code	**Course type**	**Course title**	**credit**	**lecture hrs/week**
HN 1645	Dissertation/Essay	Dissertation Laghu shodh Prabhandh/Essay	4	6
e. Open Course				
Course Code	**Course type**	**Course title**	**credit**	**lecture hrs/week**
HN 1551	Open Course I	Hindi cinema	2	3
f.				
Course code	**Course type**	**Course title**	**credit**	**lecture hrs/week**
HN 1661	Elective Course	Jan Sanchar aur Hindi Cinema	2	3

Semester wise Break-up of courses

Semester-I

Course code	**Course type**	**Course title**	**credit**	**lecture hrs/week**
EN 1111.1	English Language course I		4	5./week
HN 1111.1	Common Course 1	Hindi katha Sahitya	3	4/week
EN 1123	Foundation course I (English)		2	4/week

HN 1131	Complementary course I (Compulsory)	Samkaleen Sahityik Vimarsh	2	3/week
HN 1132/ SK 1131.1	Complementary Course II (Optional)	Pracheen tatha Madhya Kaleen Bhartiya Sanskriti	2	3/week
HN 1141	Core Course I	Hindi katethar Gadya Sahitya	4	6/week
			17	25

Semester II

Course code	**Course type**	**Course title**	**credit**	**lecture hrs/week**
EN 1211	English		4	5./week
EN 1212	English		3	4/week
HN 1211.1	Common Course II	Hindi Nibandh aur anya gadya vidhyan	3	4/week
HN 1231	Complementary course III (Compulsory)	Kathakar Premchand	3	3/week
HN 1232/ SK 1231.1	Complementary Course IV (Optional)	Paristhithik patt aur Hindi Sahitya	3	3/week
HN 1241	Core Course II	Hindi Sahitya ka Itihas (Reetikal tak)	4	6/week
			20	25

Semester III

Course code	**Course type**	**Course title**	**credit**	**lecture hrs/week**
EN 1311	English		4	5./week
HN 1311.1	Common Course III	Hindi Natak, Vyakaran tatha Anuvad	4	5/week
HN 1321	Foundation course II	Soochana Praudyogiki aur adhunik patrakarita	3	4/week
HN 1331/ SK 1331.1	Complementary course V (Optional)	Tulnatmak adhyayan	3	3/week
HN 1332	Complementary Course VI (Compulsory)	Rajbhasha Prabandhan	3	3/week
HN 1341	Core Course III	Hindi Sahitya ka itihas (Adhunik kal)	4	5/week
			21	25

Semester 4

Course code	Course type	Course title	credit	lecture hrs/week
EN 1411	English		4	5./week
HN 1411.1	Common Course IV	Hindi Kavitha evam Ekanki	4	5/week
HN 1431	Complementary Course VII (compulsory)	Bharatiya Sahitya	3	3/week
HN 1432/ SK 1431.1	Complementary course VIII (optional)	Pat katha lekhan va vigyapan	3	3/week
HN 1441/	Core Course IV	Hindi Natak aur Rangamanch	4	5/week
HN 1442	Core Course V	Vishesh lekhak Agney	3	4/week
			21	25

Semester 5

Course code	Course type	Course title	credit	lecture hrs/week
EN 1541	Core Course VI	Pracheen evam Madhya Kaleen Hindi Kavya	4	4./week
HN 1542	Core Course VII	Adhunik Hindi Kavya	4	4/week
HN 1543	Core Course VIII	Adhunik Hindi Katha Sahitya	2	3/week
HN 1544	Core course IX	Hindi Vyakaran	4	4/week
HN 1545	Core Course X	Bhasha vigyan va Bhasha ka itihas	4	4/week
HN 1551	Open Course I	Hindi Cinema	2	3/week
HN 1645	Dissertation/Essay	Dissertation laghushodh prabandh/Essay		3/week
			20	25

Semester 6

Course code	Course type	Course title	credit	lecture hrs/week
HN 1641	Core Course XI	Samkaleen Hindi katha sahitya	4	5./week
HN 1642	Core Course XII	Bharatiya Evam paschatiya Kavya Sasthra	4	5/week
HN 1643	Core course XIII	Anuvad Sidhant tatha prayog	4	5/week
HN 1644	Core Course XIV	Hindi Vyangya Sahitya	3	4/week

HN 1645	Dissertation	Dissertation laghu shodh prabandh	4	3/week
HN 1661	Elective Course	Jan Sanchar aur Hindi Cinema	2	3/week
			21	25

Syllabi in detail
Common course Hindi for BA/BSc Programmes

Semester I **Contact Hrs. 4/week**
Common Course I: HN1111.1 Hindi Katha Sahitya- Credits:3

Aim of the Course:

1. To familiarize the students with the world of fiction
2. To develop their faculty of appreciation of fiction
3. To develop creativity in the students

Module 1: Short stories- 6 representative short stories to be studied in detail from Premchand yug to Samkaleen yug.
Outcome of the module: 1) Remembers main works of the representative writers 2) understands the craft of the representative writers 3) analyses the stories 4) Evaluates the contribution of the representative writers 5) Elucidates key sentences with reference to context.

Module 2: A modern novel in Hindi for nondetailed study
Outcome of the study. 1) Remembers the names of main works of the prescribed writer 2) understands the craft of the prescribed writer 3) Analyses the novel on the basis of the subject of the novel, its relevance, its place among contemporary Hindi novels 4)Critically evaluates the place of the novel & the novelist among contemporary Hindi novels & novelists.

Prescribed text books

1. **Kahani Sarovar (Eò½þÉxÉÒ ºÉ®úÉä´É®ú):** Edited by Sheela.T. Nair (Detailed study) published by Rajkamal prakashan 1-B, Netaji Subhash Marg, Daryaganj, New Delhi-110002.
   i. Sadgati-Premchand

ii. Saranagat – Jayashankar Prasad
iii. Sahaj aur Subh-Markandey
iv. Domin kaki- Chitra Mudgal
v. Panchwa Beta-Nasira Sharma
vi. Ma Rasoyi Mem rahiti hai-Kumar ambud
vii. Amrood ka ped- Gyan ranjan
viii. Salaam- OM Prakash Valmiki

Omit Lessons : 'Sahaj aur Subh'- Markandey and 'Panchwa Beta'- Nasira Sharma

2. 'Mobile' (Novel) by Kshama Sharma published by Rajkamal Prakashan, Daryaganj, New Delhi-110002.

Outcome of course±É:

1) Recollect the main works of the representative fiction writers
2) Understand the craft of the fiction writers
3) Analyse and evaluate the works of the fiction writers they studied
4) Understand how the resource language is used as a medium in creative writing.

Hours distribution: 2 hours each for each text.

Semester II

Common Course-II HN 1211.1- Hindi Nibandh aur anya Gadya Vidhayem – credits-3, lecture hrs. 4/week

Aim of the course: (1) to acquaint the students with the different forms of prose in Hindi (2) To develop their faculty of appreciation of prose. (3) to develop the skill of evaluating prose writing of representative prose writer in Hindi

Module1: Two essays to be studied in detail
Outcome: (1) Remembers the main works of the prescribed writers (2) understand the craft of the prescribed writers (3) Analyse the prescribed prose (4) Elucidate key sentences with reference to context.

Module 2: Other prose forms – Biography, Autobiography, sketch, Reportage, Satire.
Outcome: (1) understand the different forms of prose (2) Recollect the main works of prescribed writers of prose (3) Analyse the prose form in accordance with the craft (4) Elucidate key sentences with reference to context.

Prescribed text books- Gadya Garima (detailed study). Editors, Dr. N. Mohanan, Dr. Deepak.K.R. Publishers- Rajpal and Sons, 1590, Madrasa Road, Kashmiri Gate, Delhi-110006.

(i) Devdaru- Hazari Prasad Dwivedi (Essay)
(ii) Beti ka vivaah- Amrit Rai (Biography)
(iii) Badauda ka Anubhav – Ambedkar (Autobiography)
(iv) Mera Hamdum Mera Dost: Kamleshwar- Rajendra Yadav (Sketch)
(v) Sookhe Sarovar ka Bhoogol- Mani madhukar (Reportage)
(vi) Nindaras- Hari Shankar Parsayi (Satire)
(vii) Aap- Pratap narayan Misr (Essay)
(viii) Gehu banam gulaab – Ram Vrksh Beni puri (Essay)

Omit Lesson: 'Aap' Pratap Narayan Misr.

Outcome of the course:

i) Recollect the main works of the prescribed writers
ii) Understand the forms of various prose writing in Hindi
iii) Analyse & evaluate the prose forms prescribed, with respect to the craft and the relevance

Semester III

Common Course III HN 1311.1 Hindi Natak, vyakaran tatha Anuvad credits: 4, Lecture hours: 5/week

Aim of the course:

1. To familiarize the students with the development of plays in Hindi
2. To learn to appreciate play
3. To use Hindi language correctly by understanding grammar
4. To facilitate the use of translation as a tool for communicating in Hindi and English
5. To motivate the students for a career as translator

Module 1: To study a play in Hindi

Outcome: (1) Remember and recollect the major works of the playwright (2) Appreciate and evaluate the play with respect to craft, subject, relevance of it in the modern world. (3) Elucidate Key sentences with reference to context

Module 2: A text to study basic grammar of Hindi language & Translation from English to Hindi

Module1: Varna vichar, Sandhi, Sabd vichar, Sagya, Sagyamem roopantar-1, Sagya men roopantar-2

Outcome: (1) understands and recollects all 44 Hindi varnas (2) Classifies the 44 varnas (3) splits a word on the basis of Sandhi & names the sandhi (4) identifies a

noun and states the type of noun in a given sentence (5) Elaborates the changes in a noun with respect to gender, number and cases (5) Defines sagya and elaborates its Subdivisions.

Module 2: Sarvnaam, visheshan, kriya, kriyamem roopantar
Outcome: (1) Defines all three parts of speeches and elaborates upon its subdivisions (2) Identifies sarvanam, visheshan and kriya and states their type in a given sentence (3) Elaborates on the changes in kriya with respect to kaal, vachya (4) elaborates 'ne' rule

Module 3: Krident, Avyay, Sabd rachna, Vakya vichar
Outcome: (1) Defines krident and Avyay and subdivisions (2) Identifies major prefixes, suffixes and samas (3) elaborates upon the types of samas and splits a word on the basis of samas (4) Defines phrase, clause its types (5) Defines a sentence, its different types (6) understands the importance of padkram and Anvay in sentence.

Module 4: Translation – from English to Hindi, Common grammatical mistakes made while writing in Hindi.

Outcomes: (1) Translates simple passages from English to Hindi (2) identifies common grammatical mistakes made while writing in Hindi.

Prescribed text books:

1. Sakubai (Play in Hindi) – Nadira Zaheer Babbar published by Vani Prakashan, 21- a, Daryaganj, New Delhi-110002.
2. Vyavaharik Hindi vyakaran, Anuvad tatha Rachna- Dr. H. Parameswaran,

Published by Radhakrishna Prakashan, Ansari Marg, Daryaganj, New Delhi-110002.
Omit Lessons : Bhasha aur vyakaran, Hindi ucharan aur vartini, Rachna Abhyaas.
Distribution of hours- 2 hrs for play, 2 hrs for grammar 1 hr for translation.

Outcome of the course: (1) critically appreciates play (2) Understands difference between spoken Hindi and written Hindi (3) Writes grammatically correct sentences in Hindi (4) Defines different parts of speech and identifies them in a given sentence (5) Translates simple passages from English to Hindi

Semester IV
Common Course IV- HN 1411.1 Hindi Kavita Evam Ekanki credits 4, Teaching hr: 5hr/week.
Aim of the course: (1) To understand development of Hindi poetry through selected poems (2) to develop the faculty of appreciation of Hindi poems. (3) To familiarize

the students with the development to one act plays in Hindi (4) learn to appreciate Hindi-one act play.

Module1: Ancient Hindi poetry- collection of poems of Kabirdas, Soordas, tulsidas, Raheem

Outcome: (1) understands the aesthetics of ancient poetry through the couplets of Kabirdas, Raheem & Soordas (2) understands the history of Bhakti poetry (3) appreciates the creativity of ancient poets (4) critically evaluates the contribution of poets of Bhakti period.

Module 2: Modern Hindi poetry: collection of 10 poems representing modern period with different styles and themes.

Outcome: (1) understands the development of modern poetry from early 20th century to 21st century (2) remembers & recollects the major works of prescribed poets (3) appreciates the different styles of poetry (4) critically evaluates the contribution of prescribed poets to the development of modern Hindi poetry (5) Elucidates given lines of poems with reference to context.

Module 3: Collection of five one act plays
Outcome: (1) Remembers & recollects major works of the prescribed one-act play wrights (2) Appreciates and evaluates the one-act plays with respect to craft, subject (3) elucidates key sentences of the one act plays with reference to context (4) critically evaluates the contribution of prescribed one-act play wrights to the development of one-act plays.

Prescribed text books (1) kavya deepthi- Edited by Dr. Reshmi Krishnan, Dr. Shiny Mathew and Dr. Preetha Remani T.E published by Vani Prakashan, 21-A, Danyaganj, New Delhi- 110002 detailed study. 2) Saral Ekanki edited by Dr. John Panicker published by Aman Prakashan, Kanpur. Omit Ekanki 'Hari ghas par ghante Bhar' by Surendra Verma.

Omit the following portions: 7,8,9,10 dohas of Kabirdas, 7,8,9,10 dohas of Tulsidas, 7,8,9.10 dohas of Raheem, 'Samar shesh' of Dinkar, 'choolha of Pavan karan.

Distribution of hours: 3 hours for 'Kavya Deepthi' and 2 hrs for 'Saral ekanki'.

Course outcome: (1) Appreciates ancient and modern Hindi poems. (2) Critically evaluates the contribution of Ancient & modern poets to the development of Hindi

poetry (3) Elucidates key lines of poetry with reference to context (4) Appreciates and evaluates one act play with respect to craft and subject.

Common Course Hindi for B.Com Programme

Semester I – Common Course 1 HN 1111.2 Credits 4 lecture hours 4/week.

Hindi gadya aur vyavasayik lekhan

Aim of the course: (1) to acquaint students with different forms of prose and styles involved in prose writing (2) To develop the faculty of appreciation of prose of the students (3) to develop the skill of evaluating prose writing of prescribed prose writers in Hindi (4) To make the students aware of the importance of correspondence (5) To make them proficient in letter writing- both personal and official.

Module1: One short story and four other prose forms

Outcome (1) recollects all major works of the authors of the prescribed prose forms (2) understands the difference between the different prose forms (3) critically evaluates the prose forms.

Module 2: correspondence: Types of letters, components of letters- personal letters, official letters, business letters

Outcome: (1) understands the different styles of different forms of letter (2) Distinguishes one form of letter from the other based on their specific features (3) writes personal letters, official letters and business letters.

Prescribed text books: (1) Naveen Sankalan- Edited by Dr. J. Francis, Dr.S. Suma, Dr. Lekha.S Nair Dr. R. Girija Kumari. Published by Director, dept. of publications, Kerala University. Bhag-1 of the text to be studied.

Course outcome: (1) Appreciates prose writings in Hindi (2) Critically evaluates the contribution of prescribed writers of prose to Hindi literature (3) Differentiates various types of letters based on their style and components (4) writes personal, official and business letters in Hindi

Distribution of hrs: 2 hrs for prose, 2 hrs for vyavasayik lekhan

Semester II: Common Course II HN 1211.2 Hindi Kavita Anuvad aur Paribhashik Sabdavali . No. of credits: 4 Lcture hrs: 4 hr/week

Aim of the course: (1) To make students understand development of Hindi poetry through selected poems (2) to develop the faculty of appreciation of Hindi poems (3)

to make students understand the importance of translation (4) To facilitate the use of translation as a tool for communicating Hindi & English (5) To motivate & equip the students for a career as translator.

Module 1: Poetry- Ancient poetry: poems of 3 ancient poets
Outcomes: (1) Recollect names of major works of the prescribed poets (2) Basic understanding of Bhakti poetry (3) Appreciates Bhakti poetry (4) Critically evaluates the contribution of prescribed poets (5) Elucidates lines of the poem ciritically.

Module: 2: Modern poetry- 5 representative poems of the poets of modern period.
Outcome: (1) recollects names of major works of the prescribed poets (2) Basic understanding of the development of poetry in Hindi in the modern period (3) Appreciates and critically evaluates poems (5) Elucidates lines of the poems

Module 3: Anuvad- 8 passages from English to Hindi & 8 passages from Hindi to English to be translated.

Outcome: (1) understands the importance of translation as a tool for communication (2) Translates simple passages from Hindi to English and vice versa.

Module 4: Technical terminology- 50 in Hindi with English Translation and 50 in English with Hindi translation.

Outcome: (1) Recollects the common technical terms used in official language (2) opens a career, option –that of a translator

Text books (1) Naveen Sankalan- Edited by Dr. J. Francis, Dr. S. Suma, Dr. Lekha.S. Nair, Dr. R. Girija Kumari- published by Director of publications, Kerala University. Bhag II of the text book to be studied in this semester.

Course outcome: (1) understands the development of Hindi poetry from the Bhakti period to modern times (2) Translates simple passages from Hindi to English & vice versa (3) opens a career option that of a translator.

Distribution of hrs: 2 hrs for poetry 2 hrs for Anuvad & Technical Terminology.

Common Course Hindi for B.Com (restructured) Programme.
Semester:I
Common Course –I HN 1111.4 credits: 4 hrs. 5/week
Adhunik Hindi Sahitya

Aim of the course: (1) to acquaint students with different forms of modern literature from poetry to modern prose forms; and its development (2) to develop the faculty of appreciation of both prose & modern poetry (3) To develop the skill of evaluating poetry & prose

Module I: Modern Poetry A collection of 10 poems of modern Hindi Poets.
Outcomes: (1) understands the aesthetics of modern Hindi poetry (2) Recollects the major works of the poets of the collection (3) Critically evaluates the contribution of the poets to Hindi lit (4) Elucidates lines of the poems with ref. to context (5) Appreciates the craft & creativity of poets.

Module 2: Collection of 4 prose forms ie, 2 stories, 1 essay 1 sketch and a part of an autobiography.

Outcome: (1) Recollects all major works of the authors of the prescribed prose writers (2) understands the difference between different prose forms (3) critically evaluates the prose forms (4) elucidates lines of the prose with ref. to context.

Prescribed text book- 'Sanchaika' edited by Dr. Preetha Remani T.E, Dr. Pradeepa Kumari.R published by Jawahar Purthaka lay, Sadar Bazar, Mathura 281002 (detailed study) Bhag I to be studied.

Course outcome: (1) Appreciates the aesthetics of Hindi Poetry & prose (2) critically evaluates the contribution of Hindi poets to Hindi lit. (3) understands the difference between short story & essay, essay & sketch and also essay & autobiography (4) critically evaluates the contribution of prescribed short story writers, essayists to Hindi lit.

Hour distribution: 3 hrs. for poetry 2 hrs for prose.

Semester II
Common Course II- Credits: 4 hrs: 5/week
HN 1211.4 Hindi Natak, Vyavasayik Lekhan aur Anuvad
Aim of the course (1) To familiarize the students with the development of plays in Hindi (2) to learn to appreciate plays (3) To facilitate the use of translation as a tool for communicating in Hindi & English (4) To motivate students for a career as translator (5) To make them proficient in writing business letters.

Module I: A modern Hindi play (detailed study)

Outcome: (1) remembers and recollects major works of the prescribed play wright (2) Appreciates and evaluates the play with respect to its style, craft subject & relevance to the modern times (3) Elucidates key sentences with ref. to context.

Module II: Vyavasayik Lekhan, Paribhashik sabdavali

Outcome: (1) Understands the features of business letters (2) Writes business letters in Hindi (3) Recollects common technical terms used in official language Hindi.

Module III- Anuvad- 7 passages from English to Hindi, 5 passages from Hindi to English

Outcome: (1) understands the importance of translation as a tool for communication (2) Translates simple passages from English to Hindi & Vice Versa
Text book: (1) Sanchayika – Edited by Dr. Preetha Remani T.E, Dr. Predeepa kumari R published by Jawahar Pusthakalaya, Sadar Bazar, Muthura – Bhag II to be studed in this semester (2) Savithri 2007 (play) Kailash chandra- Vani prakashan, Daryaganj, New Delhi.

Course Outcome : (1) critically appreciates the play with respect to its style, craft and relevance (2) writes business letters in Hindi (3) Translates simple passages from Hindi to English and vice versa (4) opens a career option- that of a translator.

Distribution of hrs: 2 hrs for play, 3 hrs for vyavasayik lekhan and Anuvad.

Common Course in Hindi for BA/BSc (career related) Programme
Semester I
Common Course I, HN 1111.3, Hindi Gadya Sahitya credits: 4, Lecture hrs: 5/week

Aim of the course: (1) To familiarize students with different prose forms (2) To develop the faculty of appreciation of prose (3) To develop the skill of evaluating prose literature.

Module I: Short stories, one act play, Essay
Outcome: (1) Appreciates the prose forms (2) understands the difference between the prose forms of the module (3) critically evaluates the short stories, one act play & essay (4) Elucidates lines from the short story, one act play & essay with ref- to context.

Module II: Satire, autobiography, sketch
Outcome: (1) appreciates the prescribed prose forms (2) under stands the difference between the prose forms of the module (3) Critically evaluates the prose forms (4) Elucidates lines from the satire, auto biography & sketch with reference to context.

Prescribed text book: 'Gadya Madhuri'- Edited by Dr. Sunil Kumar, Dr. Jayasree.O published by Aman prakashan, Kanpur (detailed study)
Omit Lessons (1) Kunwari Dharti- Mohan Rakesh (2) Jahan Aakash dikhayi nahi deta- Vishnu Prabhakar.

Course out come: (1) Understands the difference between different prose forms (2) Appreciates prose literature (3) Critically evaluates the prose forms (4) Elucidates lines from prose with ref. to context.

Distribution of hours: 3 hrs for module I, 2hrs for module II

Semester II
Common Course II HN 1211.3
Hindi Padya Sahitya- Credits: 4, hrs: 5/week
Aim of the course: (1) To make students understand the development of poetry in Hindi from the Ancient period to modern times (2) To develop the faculty of appreciation of poetry

Module I: Ancient poetry- Collection of Ancient poetry of Kabeer, Soordas, Tulsidas, Biharital

Outcome: (1) understands the aesthetics of Ancient Hindi Poetry (2) Understands the history of Bhakti poetry (3) Recollects the major works of the prescribed poets (4) appreciates the creativity of the Ancient poets (5) Critically evaluates the contribution of the Ancient poets to Hindi literature

Module II: Modern poetry- collection of 10 poems of modern Hindi poets.
Outcome: (1) understands the aesthetics of modern Hindi poetry (2) Recollects the major works of the poets in the collection (3) critically evaluates the contribution of the poets to modern Hindi poetry (4) Elucidates lines of the poems with ref. to context.

Prescribed text books: 'Kavya Kaumudi' – edited by Dr. Shaji.N, Dr. Sheeba M.R and Dr. Manju.A published by Rajpal & Sons 1590, Madrasa Road, Kashmiri Gate, Delhi-110006 (Detailed Study)

Omit lessons: (1) Padas 5 & 6 of Soordas (2) Dohas 5 &6 of Biharilal

Course Outcome: (1) understands the aesthetics of Ancient and modern poetry in Hindi (2) appreciates the creativity of the poets (3) critically evaluates the contribution of the poets to Hindi literature (4) understands the development of poetry in Hindi

Complementary Courses for FDP in Hindi

Semester I
Complementary Course I (compulsory) HN 1131-credits: 2 lecture hrs : 3/week
Samkaleen Sahityik Vimarsh

Aim of the course: (1) To sensitize the students about latest trends and discourses in Hindi literature like Dalit Discourse, adivasi discourse (2) To provide comprehensive knowledge about latest styles and trends of lit. and to help the students to develop their creativity.

Module I: Bhoomika Strivimarsh:- Saidhantiki: **Stri Vimarsh moolak Sahitya** (i) Poem – 'Hockey Khelti ladkiyam – Katyayani (ii) Shortstory- Kayantar- Jaysree Rai (iii)Autobiography- 'Anya Se Ananya tak' Prabha Khaitan
Outcome: (1) understands the theories and development related to strivimarsh (2) understands the salient features of strivimarshatmak literature through the representative poem, fiction and autobiography (3) critically evaluates stri vimarshatmak literature prescribed for study

Module II: Dalit Vimarsh – theory and revolution.
Dalit vimarsh moolak sahitya (1) poem 'Suno Brahmin' Malkhan singh (2) Short stories – Nau bar- Jayaprakash Kardan Salaam-Valmiki (3) Essay 'Abhishapt chintan se itihas chintan kee ore' –R. Dharamveer

Outcome: (1) understands and evaluates Dalit literature in Hindi (2) critically evaluates the representative Dalit literature prescribed for study.

Module III; Aadivasi vimarsh: Theory, revolution **vimarshmoolak** Sahitya- (1) poem 'Tiririri , Bansuri ke Swar mein'; - Dulam Chandra munda, 'Prateeksha- Grace kunjar

(2) Short story- Salgi, Jugnoo aur anva ganch- Alice ekka (3) geet-chering geet- Translated by Snehlatha negi

Outcome: (1) Understands and evaluates aadivasi literature (2) critically evaluates the representative adivasi literature

Module IV: Anya Vimarsh- Kinnar vimarsh, Kisaan vimarsh, Vrdh vimarsh, Paristhitik vimarsh. **Vimarsh Moolak Sahitya-** (1) Shortstory; 'Kabeeran' Sooraj Badatya.

Outcome: (1) understands and evaluates different discourses in modern Hindi literature.
Prescribed text: 'Asmitamoola k Vimarsh aur Hindi Sahitya'- Edited by Dr. S.R. Jayasree published by Aman Prakashan, Kanpur.

Omit lessons: (1) Mei kaisi aurat hu- Savitha Singh (2) Kitni vyatha – Nageena Singh (3) Salaam- Om Prakash Valmiki (4) Prateeksha- Grace Kunjar.
Extra Reading: 1 Essay, 1 poem, 1 shortstory, a few pages of a Novel for extra reading,
Parishisht –Names and major works of literatures of different discourses.
[Questions will not be asked from these parts]

Course outcome: (1) The students understand the latest trends in literature (2) critically evaluate different discourses in modern Hindi literature.

Hour distribution: 1 hr for module I. 1 hr for Module II, 1 hr for III and IV.

Complementary Course II (Optional) HN 1132 credits 2 hrs. 3/week.
Pracheen tatha madhyakaleen Bharatiya Sanskriti

Aim of course: (1) To enrich student's knowledge of History (2) to familiarize with the important events of Indian culture from the age of the Vedas (3) to enrich knowledge of cultural History of India through Historical development during the reign of various rulers from ancient times to medieval India.

Module I: Sanskriti- Swaroop evan nirdharan- Paribhasha- Sanskriti ke Kshetr; Bharateey Sanskriti kee visheshatayam

Outcome: (1) The students understand the basics of culture, its definition field.

Module II: Pracheen Sanskriti- Vaidik Samaj- Vaidic Dharam Boudh Dharm evam Sansktiri- Jain Dharm- Unki Sanskritik Dein

Outcome: (1) understands the ancient culture (2) understands Budhism, Jainism, their cultural contribution.

Module III- Madhya Kaleen Bharatiya Sanskriti- Uttar Bharat evam Dakshin Bharath " Prashasan evam visheshatayem- Paal Samrajya- Prathihara- Rashtra koota- Pallav- Chola.

Outcome: (1) understands medieval Indian culture with respect to contributions of pallavas, cholas, paal- pratiharas and Rashtra kootas.

Module IV; Bharath par Vidheshi Akraman ka Prabhav.
Rajputom ka Uday- Tarayi ki ladayi- Rajputom ka Parajay- Gulam Vansh- Delhi Sultanate- Khilji Vansh- Tuglaq vansh- lodi Vansh.

Outcome: (1) understands the culture of medieval period (2) Role of various dynasties in moulding the cultural History of India.

Module VI: Mughalom ka Agaman- Babar- Humayun- Shershah ka Uday- Soor Samrajya- unka yogdan – Akbar –Dharmikniti- Jayangir- Shahjahan- aurongazeb Mughal Kaleen Sanskriti

Outcome: (1) Evaluates role of Mughal dynasty in influencing medieval Indian culture.

Prescribed Text: Pracheen evam Madhyakaleen Bharatiya
Sanskriti: Edited by Dr. Asha S Nair, Dr. Maheswari, Smt. Salini.C Published by Vani Prakashan, New Delhi

Outcome of course: 1) Students understand Ancient and medieval culture of India. 2) Evaluate contribution of various dynasties to the cultural heritage of India.

SECOND SEMESTER
Complementary Course- III (Compulsory)
HN 1231 'Kathakar Premchand' credits 3 hrs. 3/week

Aim of course: 1) to provide comprehensive knowledge about Premchand as fiction writer. 2) To make the students appreciate the theme of Premchand's fiction and to evaluate his style and craft.

Module I: six short stories of Premchand with introduction regarding contribution of Premchand to Hindi short story (Detailed Study)

Outcome: (1) Appreciates and critically evaluates the short stories of Premchand with respect to theme, and craft (2) Recollects the names of important short stories of Premchand (3) Elucidates lines from the prescribed short stories with respect to context.

Module II: One novel of Premchand.
Outcome: (1) Recollects names of all major novels of Premchand (2) Appreciates & evaluates the theme of the prescribed novel (3) critically evaluates contribution of Premchand to Hindi Novel (4) Evaluates the novel with respect to the character , craft and style.

Prescribed texts: (1) 'Premchand kee Kahaniyam (Detailed study) edited by Dr. Jyothi N & Dr. K.P Ushakumari published by 'Vani Prakashan, 21 A, Daryaganj, N.Delhi (2) 'Rangbhoomi' Premchand- abdridged students version with Bhoomika by Sudheesh Pachauri. Published by Vani Prakashan

Distribution of hrs: 2 hrs for short story 1 hr for Novel

Outcome of the course: (1) The students attain comprehensive knowledge of Premchand as fiction writer: (2) Appreciates and critically evaluates prescribed short stories and Novel of Premchand (3) Evalautes the contribution made by Premchand in the field of Hindi fiction writing.

Complementary Course IV (Optional)
HN 1232 'Paristhithik Paat aur Hindi Sahitya credits: 3 hrs: 3/weeks.

Aim of the course: (1) To familiarize the students with how environmental issues are depicted in Hindi literature (2) To familiarize the students with the role of literature in tackling environmental issues.

Module I: Five short stories depicting environmental issues
Outcome: (1) understands how environmental issues are depicted in Hindi short stories (2) critically evaluates the stories in the light of the issues discussed in them.

Module II: Seven poems in Hindi dealing with environmental issues (detailed study)

Outcome: (1) understands how environmental issues are depicted in poetry (2) Critically evaluates the poems in the light of the issues discussed in them and with respect to the craft of the poems (3) Elucidates lines of the poems with reference to context.

Prescribed text: 'Paristithik paat aur Hindi Sahitya'-edited by Dr. Suma.S and Dr. Jayasree S R published by 'Vani Prakashan, Daryaganj, New Delhi.

Course outcome: (1) The students get a comprehensive knowledge of how environmental issues are depicted in literature (2) critically evaluates short stories & poems in the light of the environmental issue discussed in them (3) students are motivated to interfere in the environmental; issues around them.

Hour distribution: 1 hr for module 1 and 2 hrs for module II.

Third Semester
Complementary Course V (Optional)
HN 1331- 'Tulnatmak adhyayan' Credits: 3 hrs- 3/week

Aim of the course: (1) To acquaint students with how comparison of literature of two languages i.e. Hindi & Malayalam is done (2) To familiarize students with fiction of Malayalam & Hindi with special reference to Premchand and Thakazhi (3) To familiarize students with Hindi and Malayalam poetry esp. of Jayashankar Prasad and Kumaranasan (4) To familiarize students with similarities of literature written in Hindi & Malayalam.

Module I: introduction to comparative studies
Outcome: (1) Understands what is comparison (2) understands what is comparison in literature (3) understands the difference between comparison in western literature & Indian literature

Module II: comparison of Novels in Hindi & Malayalam with special ref. to Premchand and Thakazhi.

Outcome: (1) students attain basic knowledge of Hindi & Malayalam novels especially that of Premchand & Thakazhi 2) understands similarity between novels of Premchand & thakazhi especially 'Godan & 'Randidangazhi'

Module III: Comparison of Hindi and Malayalam short stories

Outcome: 1) students attain basic knowledge of Hindi & Malayalam short stories 2) understands similarities and dissimilarities between Malayalam & Hindi short stories 3) understands the craft of comparison of short stories in Hindi & Malayalam through comparing few stories of both languages.

Module IV. Comparison of two poets – Jayashankar Prasad and Kumaranasan.

Outcome: (1) Attains basic knowledge of poems of Jayashankar Prasad & Kumaranasan (2) understands the similarities and dissimilarities between the two poets (3) understands the craft of comparison of poems in Hindi & Malayalam through the poems of Prasad and Asan.

Prescribed Text Book: 'Tulnatmak Adhyayan: Hindi-Malayalam kee Katha va kavita ke Sandarbha mein': Edited by Dr. M.S. vinayachandran, Dr. P. Letha, Dr. Kumari Geetha.S, Dr. Jayasree O, Smt. Salini.C, Dr. Shabana Habeeb Published by Director of publications, University of Kerala.

Distribution of hrs: 1 hr for module I and III, 1 hr for module II, 1 hr for module IV.

Course outcome: (1) understands the basic techniques of comparison of Hindi and Malayalam fiction and poetry (2) compares fiction and poem of Hindi & English.

Complementary Course VI (Compulsory)
HN 1332 Rajbhasha Prabandhan, credits: 3 hrs: 3/week

Aim of the course: (1) To provide comprehensive knowledge about official language Hindi (2) To understand the merits and demerits of Hindi as official language (3) To understand the problems involved in management of Hindi as official language (4) To understand use of Hindi for official communication in Central Govt. Offices, PSU, Banks etc. (5) to motivate students to a career as Translator/Hindi officer.

Module I: Development of Hindi as official language

Outcome: (1) Attains comprehensive knowledge as to how Hindi became official language of India.

Module II: Acceptance of Hindi as official language- Provisions in the Constitution regarding official language-

Outcome: understands the constitutional provisions regarding official language Hindi.

Module III- Official language management – field of official language management- role of institutions, offices in official language management- Hindi officer- problems in implementing constitutional provisions- managerial solutions.

Outcome: (1) attains knowledge of official language management
Module IV: official language Hindi- practical side
Types of official correspondence – noting- drafting, in Hindi- Technical terminology- Hindi to English

Prescribed text book: Rajbhasha Prabandhan- by Dr. Julia Emmanuel –published by Rajpal & Sons, Madrasa Road, Kashmiri Gate, Delhi.

Course outcome: (1) Attains comprehensive knowledge of official language Hindi (2) Does noting and drafting in Hindi./ (3) understands official language Hindi management (4) opens a career option- that of translator/Hindi officer in Central Govt. Officers /PSUS/Banks.

Distribution of hrs: 1 hr for module 1 & II, 1 hr for module III 1 hr for module IV.

IVth Semester-Complementary Course VII (Compulsory)
HN 1431 'Bharatiya Sahitya' credits 3 hrs: 3/week

Aim of the course: (1) To familiarize the students with the concept of one Indian literature (2) To familiarize the students with renowned Indian writers through their representative works.

Module I: Definition of Indian literature: Features of Indian literature- problems of considering literature written in different Indian languages as one Indian literature –Role of Sanskrit in Indian literature.

Outcome: (1) understands the concept of 'Indian literature' (2) understands the concept of Unity in diversity through one Indian literature.

Module II: Representative literature of renowned Indian writers- poems of Dr. Manorama Vishval Mahapatr, Amrita preetam, Dr. J. Bapu Reddy, K.Sachidanandan, Subramonia Bharati- Short stories of Tagore, Takazhi, Pratibha Rai, Saran Kumar Limbale, M.K. Vinodhini- Travalogue by Indira Goswami.

Outcome: (1) Appreciates literary works of litterateurs of different Indian languages. (2) Identifies the element of oneness in literature written in various Indian languages.

Prescribed Text book: 'Bharatiya Sahitya' compiled by Dr. RI. Santhi & Dr. A Prakash published by Vani Prakashan, Daryaganj New Delhi.

Omit lessons: 4,6, and 7 from Khand 1 and Khand II completely
Course outcome: (1) understands the concept of one Indian literature (2) Appreciates the works of different writers of different Indian languages.

Complementary Course VIII (Optional) credits 3 hrs: 3/weekl
HN 1432 'Patkatha Lekhan va vigyapan

Aim of the course: (1) to know the technique and process of script writing (2) To understand the form and procedure of Advertisement (3) To understand the importance of Advertisement.

Module I: An introduction to Script- Basic methods and techniques of script writing- idea story- situation- treatment, characterization, dialogue- sequence – climax language of script. The art of script writing.

Outcome: (1) understands what script and script writing is (2) understands techniques of script writing (3) elucidates the art of script writing

Module 2: Types of script
Outcome: (1) understands the different types of scripts

Module 3: Meaning and definition of advertisement- Necessity, aim and importance of Advertisement- objectives of advertisement
Outcomes: (1) understands the meaning, necessity, aim and importance of Advertisement.

Module 4: Media of advertisement- press advertising, Direct mail advertising, Out door advertising, broadcast advertising.

Types of advertisement: language & style of advertisement

Outcome: 1) understands the media of advertisement – 2) evaluates the types of advertisement with respect to their style.

Prescribed text: 1) 'patkatha lekhan- aur vigyapan kee vyavaharik Nirdeshika'- edited by Dr. Nimmy A.A, Dr. T. Sreedevi published by Rajkamal Prakashan, Daryaganj, New Delhi.
Distribution of hrs: 1 hr for module 1& 2 , 2 hrs for module 3 &4

Course outcome: (1) understands the techniques of script writing (2) understands the importance of Advertisement (3) enriches the creativity of the student (4) opens a career option in the field of script writing & advertisement.

Core Courses for FDP in Hindi
Semester I Core course I credits: 4 hrs : 6/week
HN 1141- Hindi kathetar Gadya Sahitya

Aim of the course: 1) to familiarize the students with prose forms other than fiction 2) To make the students understand the difference between different forms of prose like Biography and autobiography, Essay & Reportage 3) to enrich their aesthetic sense.

Module I : Development of Essays in Hindi- 4 representative essays by Balakrishna Bhat, Mahavirprasad Dwidevi, Ramchandra Sukla & Hazari, Prasad Dwivedi

Outcome: (1) understands the development of essays in Hindi (2) Recollects the names of famous essayists in Hindi (3) Recollects the names of major works of the prescribed essayists (4) critically evaluates the contribuition of the essayists to Hindi literature (5) critically evaluates the essays with respect to its style, theme & caft. (6) elucidates lines with reference to context.

Module II: 3 representative essays by Dinakar, Vidyanivas misr and harishankar Parsai

Outcome: (1) Recollects the names of major works of the prescribed essayists (2) critically evaluates the essays with respect to its theme, style and craft (3) evaluates the contributions of these essayists to Hindi literature (4) Elucidates lines from these essays with reference to context.

Module III: Development of modern prose forms in Hindi-4 Representative modern prose forms- part of a biography of Premchand by Amrit Rai, Reminiscence by Ramkumar Varma, a part of an autobiography and a sketch.

Outcome: (1) Understands the development of modern prose forms in Hindi (2 Recollects the names of famous authors of different prose forms (3) Recollects

major works of the writers prescribed (4) critically evaluates the prose forms (4) Analyses key sentences with reference to context.

Module IV: 3 representative prose forms: Diary, travelogue and reportage.

Outcome: (1) Recollects the major works of these writers (2) critically evaluates the prose forms (3) understands the difference between diary & reportage, Essay & reportage, Reminiscence & sketch etc. (4) Analyses key sentences with reference to context.
Prescribed text books: (1) Gadya Sushama- edited by Dr. N. Mohanan & Dr. Deepak.K.R published by Rajpal and Sons, Madrasa Road, Delhi, (Detailed study) (2) 'Gadya Saushthav'- Edited by Dr. N. Mohanan & Dr. Deepak K R published by Rajpal & sons, Madrasa Road, Delhi (Detailed study)

Distributionof hrs: 2 hrs for 'Gadya Sushama', 3 hrs for 'Gadya Saushthav'

Outcome of course: (1) understands the different forms of prose other than fiction (2) critically evaluates and appreciates the different prose forms (3) enriches the aesthetic sense of students.

Second Semester- Core Course II- Credits: 4 hrs. 6/week
HN 1241-'Hindi Sahitya Ka ithihas' (Ritikal tak)
Aim of the course: (1) To give the students a detailed account of trends in literature in the early and Riti period (2) To familiarize the students with the thoughts, philosophy of great poets like Kabeer, Soordas, Tulsi, Jayasi (3) to make students understand the influence of early & Bhakti period writers on society and Hindi literature as a whole.

Module I: Hindi Sahitya ka Kaal vibhajan- uski Samagri
Outcome: (1) students understand the basis on which Hindi literature is classified (2) understands the division of literature and their names & period.

Module II: Aadikal- uski peetika- Dharmik Sahitya- uski visheshatayem – Laukik Sahitya- Veergatha Sahithya- PramukhKavi- Veer gatha Sahtya kee visheshatayem- Ameerkhusro
Outcome: (1) Students gain comprehensive knowledge about aadikal.

Module III: Bhakti kaal-uski peetika- Madhya yug ka Mahatwa -Bhakti aandolan- Sagun- Nirgun- Sant Kavi- Sant Kavya kee Visheshatayem- Premkavya- uski visheshatayem- Ram kavya – Krishna Kavya. Krishna Kavya ka mahatwa

Outcome: (1) students gain extensive knowledge of Bhakti kaal (2) critically evaluate the contributions of Bhakti poets

Module IV: Reetikaal- Uski peetika- Reeti Sahtya ka janam- pramukh kavi- unki rachnayem- Khadiboli Gadya- Kaal kee Visheshtayem
Outcome: (1) Students gain comprehensive knowledge of Reetikaal (2) critically evaluate contributions of the poets to Hindi literature

Prescribed text: Hindi Sahitya ka Sanshipt itihas- by Lakhsmi Sagar Varshney- Published by Lok Bharati Prakashan, M G Road, Allahabad-1

Omit lessons: lessons 1, 2, and 6 from the text.
Course outcome: (1) the students gain comprehensive knowledge of the classification of Hindi literature from the beginning to 1800 AD (2) critically evaluate the contributions of poet to Hindi literature during the various periods.

Distribution of hours: 1 hr for module 1, 1 hr for module 2, 2 hrs for module 3, 2 hrs for module 4.

Third Semester- Core Course III Credits: 4
HN 1341 Hindi Sahitya ka itihas (Aadhunik kaal) hrs 5/week

Aim of the course: (1) To give the students a detailed account of the trends in Hindi literature since 1800 (2) To familiarize the students with the Socio, economic political situation since 1800 and its influence on Hindi literature. (3) To give comprehensive knowledge about the contribution of main litterateurs of the modern period.

Module I: British Raj kee sthapna aur Aadhunik yug- shasan sambandi tatha anya sudhar- Beeswi Shatabdi- British Kaleen Sahitya kee roop rekha- Gadya ke prarambhik unnayak- Unneswi Satabdi ke pramukh Shailikar- Dwivedi yug- Pramukh Shailikar
Outcome: (1) Students get extensive knowledge of literature from AD 1800 to 1920 (2) critically evaluate the trends in literature and also contributionof writers of this period to Hindi literature.

Module II: Aadhunik Gadya Sahitya ke vividh Roop- Upanyas, Kahani, Upakhyan, Akhyayika, Rekhachitr, Reportage, Ekanki, Natak- Hindi meim kahani- Pramukh Kahanikar, Pramukh Ekanki kaar, Natakkar, Nibandh, Jeevani, Samalochana.

Outcome: (1) students get extensive knowledge of prose literature till 1947 (2) critically evaluate evolution of various prose forms in Hindi literature and the contribution of writers.

Module III: kavya uneeswi Shatabdi- Braj Kavya- Khadiboli Kavya –pravarthiyam- Chayavad- rahasyavad, pragativaad,

Outcome: (1) Students get extensive knowledge about development of poetry till 1947 (2) critically evaluates the features of Hindi poetry from 19th century to middle of 20th century.

Module IV: Swatantrya kal- natak, upanyas, kahani, kavita navageet, ageet, akavita.
Outcome: (1) students gain knowledge of development of play, novels, short stories and poetry since 1947 to 1960.

Prescribed text book: 'Hindi Sahitya ka Sanshipt itihas' by Lakshmi sagar varshney- published by lokbharati, Allahabad

Distribution of hrs: 1 hr for module 1 2 hrs for module 2 2 hrs for module 3 & 4.

Course outcome: (1) The students get a comprehensive knowledge of History of Hindi literature from 10th century to the middle of 20th century (2) critically evaluates the trends in literature during this period (3) critically evaluate the evolution of prose in Hindi and its development till 1960.

IVth semester- Core Course IV- credits: 4 hrs: 5/week
HN 1441-'Hindi Natak aur Rangmanch

Aim of the course: (1) To understand the development of plays in Hindi literature (2) to understand the development of theatre in Hindi (3) To understand the district features of Hindi play through two representative plays (4) To understand the trends in Hindi plays upto 1980 through a representative play (5) To understand the changes in Hindi play since 1980 through a representative play.

Module I: Hindi natak ka udbhav aur vikas- poorva Bhartendu yug- Bhartendu yug- Dwivedi yug- Prasad yug- Prasadottar yug.

Outcome: (1) critically evaluates the evolution and development of Hindi plays from latter half of 19th century to 21st century. (2) Recollects names of famous playwrights and their major plays.

Module II: Rangmanch Parampara aur Hndi Rangmanch – Rangmanch- Paribhasha – Aavirbhav- Bharatiya Rangamanch. Sanskrit Rangmanch- Adim Rangmanch-Vartaman Bharatiya Rangmanch. Rangmanch ka vikas- natya sansthayem
Outcome: (1) Evaluates the evolution of theatre in India and development of theatre in Hindi (2) Recollects names of famous Rangkarmi and their contribution to theatre (3) understand the contribution of various natya institutes towards theatre in Hindi.

Module III; To study in detail a play written upto 1980.
Outcome: (1) Appreciates the play (2) critically evaluates the play with respect to theme, characterization and craft & style of the play (3) Recollects names of other major plays written by the play Wright (4) Elucidates key lines of the play with reference to context.

Module IV; To study in detail a play written after 1980
Outcome: (1) Appreciates the play (2) critically evaluates the –play with respect to theme, characterization, style and craft of the play (3) Recollects names of other plays written by the play wright. (4) Elucidates key lines of the play with reference to context.

Prescribed text books: (1) Rakta Kamal- Play by Lekshmi Narayan lal (detailed study) published by Rajkamal Prakashan (2) 'Utto ahalya' play by Surendra Dubey (detailed study) published by 'Vani Prakasham with introduction to development of Hindi play & Hindi Rangamanch by Dr. Manju Ramachandran & Dr. Jayasree.O. Vani Prakashan Daryaganj. New Delhi.

Course outcome: (1) understands and evaluates development of Hindi plays (2) Evaluates the development of theatre in Hindi (3) Appreciates and critically evaluates the prescribed plays.

Distribution of hrs: 1 hr for modules I &II, 2 hrs for Module III 2 hrs for module IV.

Core Course V- Credits: 3 lecture hrs: 4
HN 1442 'Vishesh Lekhak Agney'

Aim of the course: (1) To give comprehensive knowledge of Agney as a Hindi Writer. (2) To make students understand the contributions Agney has made to Hindi literature. (3) To understand the place of Agney in Hindi literature.

Module I: Agney- EK Parichay- unki jeevan rekha-kavi Agney- Agney ke Upanyas- Agney kee Kahaniyam.
Outcome: (1) understands the contributions made by Agney in the field of Hindi poetry, fiction (2) Evaluates the contribution smade by Agney towards Hindi poetry, Hindi fiction (3) Recollects names of poetry collection, novels & short story collections of Agney.

Module II: Collection of 5 poems of Agney (detailed study)
Outcome: (1) Appreciates the poems of Agney (2) critically evaluates the poems with respect to theme craft & style (3) Elucidates lines of the poems with reference to context (4) evaluates the contribution of Agney to Hindi poetry through the representative poems of the syllabus.
Module II; Five prose writings of Agney.
Outcome: (1) Recollects names of prose writings of Agney (2) Evaluates Agney as a prose writer.

Module IV: Five short stories of Agney (detailed study)
Outcome: (1) understands Agney as a fiction writer (2) Critically evaluates the short stories with respect to theme, craft and style (3) evaluates the contribution made by Agney towards Hindi short stories (4) Elucidates key lines of th stories with reference to context.

Prescribed Text: 'Lokpriya Sahityakar Agney'- edited by Dr. R.I. Santhi, Dr. s. Suma and published by Vani Prakashan, Daryaganj, N.Delhi with introductory essays titled Agney Jeevan Rekha, Agney ke upanyas: Parichay by Dr. Gopal Rai, Agney kee Kahaniyam, by Dr. Gopal Rai & Kavi Agney. Poems & Short stories for detailed study.

Distribution of hrs: 1 hr for modules I & module III, 1 hr for module II and 2 hrs for module IV.

Course outcome: (1) appreciates Agney as a poêt & fiction writer (2) critically evaluates Agney as a poet, as a fiction writer and prose writer (3) critically evaluates the contribution of Agney to Hindi literature.

Fifth Semester Core Course VI. Credits: 4 hrs. 4/wk
HN 1541. 'pracheen evam Madhya Kaleen Hindi Kavya'

Aim of the course: (1) to provide the best specimen of ancient and medieval poetry representing different periods trends & styles. (2) To develop the faculty of appreciation of poetry.

Module I: Pracheen tatha Madhyakaleen kavithya ka viaks – pramukh kavi
Outcome: 1) Critically evaluates the evolution and development of ancient and medieval poetry. (2) Recollects the names of poets representing each stream of poetry (3) Recollects major poems of all the poets.

Module II Ancient poets- Chand bardayi, Vidya pathi, Ameer Khusro- their representative poetry.
Outcome: (1) Appreciates the poetry of Ancient poets (2) Critically evaluates the poetry of Chandbardayi, Vidyapati and Ameer Khusro (3) Recollects names of major works of these poets (4) Eludicates lines from the poems of Chandbardayi & Vidyapati.

Module III: Medieval parts- Kabeer, Soordas and Tulsidas- Representative poetry of these poets.
Outcome: (1) Appreciates the poetry of these medieval poets (2) critically evaluates the poetry of Kabeer, Soordas & Tulsidas (3) evaluates the contribution of these poets to the Bhakti literature and to Hindi literature (4) Elucidates key lines of the padas of Soordas and Tulsidas and couplets of Kabeerdas.

Module IV: Poets Meerabai, Biharilal and Bhooshan- their representative poetry.
Outcome: (1) Familiarize with the style, theme, craft of these medieval poets (2) critically evaluates the style, theme and craft of these poets (3) Elucidates key lines of these poets.

Prescribed text books: Pracheen aur Madhyakaleen Hindi Kavya (with elaborate essay on origin & development of ancient & medieval poetry) edited by Dr. N. Jyothi, Dr. Nimmy AA, Dr. Jayasree.B, published by Jawahar Pustakalay, Mathura (detailed study)

Distribution of hrs: 1 hr for module I & II, 2 hrs for Module III and 1 hr for Module IV.

Course outcome: (1) appreciates ancient & medieval poetry (2) critically evaluates the poetry of representative ancient & medieval poets (3) critically evaluates the contribution of these poets to Hindi literature. (4) Elucidates key lines of the poems of Ancient & Medieval poets.

Core Course VII Credits 4, hrs- 4/week
HN 1542 Adhunik Hindi Kavya

Aim of the course: (1) to familiarize students with the development of modern poetry- the different trends & styles of modern poetry (2) To provide students with best specimens of modern poetry representing different styles (3) To help students develop their faculty of appreciation (4) To familiarize students with the development of long poems in Hindi.

Module I: Development of modern poetry – Trends of Modern poetry -poets Maithilisharan Gupt, Jayashanakar Prasad, Bachan, Sumitra Nandan Pant and Mahadevi Varma and their representative poems.
Outcome: (1) recollects major works of the prescribed poets (2) Appreciates the poems (3) critically evaluates the poets as well as poems with respect to style, craft & theme (4) Elucidates lines of the poem with ref. to context (5) Evaluates development of modern poetry.

Module II: Poets Nagarjun, Swapnil Shrivastawa, gyanendrapati, Anamika Madankashyap and their representative poems.
Outcome: (1) Recollects major works of the prescribed poets (2) Appreciates the poems (3) critically evaluates the poets as well as poems with respect to style, craft and theme (4) elucidates lines of the poem with ref. to context.

Module III: Poets Nirmala Puthul, Niveditajha, Katyayini, Arunkamal, Mahendra Bhatnagar and their representative peoms.
Outcome: (1) Recollects major works of the poets (2) critically evaluates the poets as well as as their poems with respect to style, craft and theme. (3) Elucidates lines of the poem with ref. to context.

Module IV: long poems in Hindi- Long poem of Nirala
Outcome: (1) Recollects names of major works of Nirala (2) Understands main features of long poems (3) critically evaluates Nirala as a poet (4) critically evaluates the poem (5) Elucidates key lines of the poem with ref. to context.
Prescribed text: Aadhunik Hindi Kavya, edited by Dr. Suma.S Published by Vani Prakashan, Daryaganj, New Delhi.
Hours distribution: 1 hr each for each module.
Course outcome: (1) understands and evaluates development of modern Hindi poetry (2) Appreciates modern poetry (3) critically evaluates prescribed poets and their poems with respect to theme, style & craft.

Core course VIII credits: 2 hrs: 3/week
HN 1543. Aadhunik Hindi Katha Sahitya

Aim of the course: (1) To familiarize students with trends in modern Hindi fiction upto 1980 (2) To develop their aesthetic sense.
Module I: Origin & Development of Hindi Novel- famous novelists- their major works.
Outcome: (1) Basic understanding of origin & development of Novel in Hindi (2) Recollects names of popular novelist of various genre and also their major novels

Module II: To study a novel published before 1980.
Outcome: (1) Appreciates the novel (2) critically evaluates the novel with respect to theme, characterization, craft and style (3) evaluates the contribution of the novelist towards Hindi Novels.

Module III: Origin and development of Hindi short stories till 1980-major short story writers- their major collections.
Outcome: (1) basic understanding of origin & development of short stories in Hindi (2) Recollects names of famous short story writers along with stories (3) understands major trends in Hindi short stories upto 1980.

Module IV: A collection of 7 short stories published prior to 1980.
Outcome: (1) appreciates the short stories (2) recollects names of major short stories of the prescribed writers (3) critically evaluates the shortstories with respect to theme, genre, style an craft (4) elucidates key lines with reference to context.

Prescribed texts: (1) 'Daak Bangla' Novel by Kamleshwar published by Rajpal & sons, Kashmiri Gate, Delhi, (2) Kathakunj (collection of short stories) edited by Dr. Asha.G, Dr. Shabana Habeeb published by Jawahar Prakashan, Mathura.

Omit lessons: (1) Letterbox- Agney (2) Mavali- Mohan Rakesh
Hour distribution: 1 hr modules I & II, 2hrs for module III & IV

Course Outcome: (1) Appreciates modern Hindi fiction (2) critically evaluates modern Hindi fiction upto 1980 (3) inspires creativity in students (4) understands and evaluates development of fiction in Hindi (upto 1980).

Core Course IX credits: 4 hrs: 4/weeks
HN 1544 Hindi Vyakaran
Aim of the course: (1) To familiarize the students with the grammar of Hindi language (2) To make them use grammatically correct language.

Module I: Varna vichar- Dhwaniyam- Swar aur Vyanjan Samyukt Vyanjan- lekhan aur vartini- Akshar- Vartani ki Samasya.
Outcome: (1) understands varna and its subdivisions (2) recollects types of varna and its subdivisions (3) understands correct spelling of words.

Module II: Sabda Rachana- Sandhi – types –samas – upsarg –pratyay- Sanskrit Hindi aur videshi pratyay
Outcome: (1) Recollects types of Sandhi, Samas, Upsarg, Pratyay (2) Splits words correctly according to Sandhi and identifies the Sandhi used (3) Splits the words correctly as per Samas and names the samas (4) Makes new words using Upsarg & pratyay and Identifies the Upsargs & pratyays.

Module III; vikari sabd- Sagya- Sarvanam- Visheshan-Kriya Sagya mem Roopantar- Sarvanam mem roopantar- Visheshan mem roopantar- Visheshan kee tulanavastha- Kriya mem roopanthar
Outcome: (1) defines all four parts of speech (2) Recollects all subdivisions & types of four parts of speech. (3) enumerates on the reasons for changes in Sagya, Sarvanam, visheshan and kriya (4) Identifies Sagya, Sarvanam, Visheshan and Kriya in a given sentence along with their types; or subclassification.

Module IV- Avikari Sabd- Kriya visheshan, Sambandh Bodhak, Samuchchya Bodhak, Vismayadi Bodhak- Unki padavyakhya
Outcome: 1) identifies avikari shabd in a sentence 2) Defines 4 avikari sabds along with their subdivisions.

Module V: Vakya-uske anga- Bhed
Outcome: 1) Defines vakya 2) enumerates vakya
Prescribed text: vyavaharik Hindi vyakaran tatha rachna by Hardev Bahari published by Lok Bharati Prakashan, Allahabad.

Omit: lessons 1) vyakaran aur uske anga 2) sabd vichar 3) From vakya vichar- adhyahaar, Vakyantaran, Vakya Sansleshan, Vakya vinyas, Padkram, Anvay, Kathan Bhed, Biraam, Muhavre, Lokokti, Anusmaranika.

Hour distribution: 1 hr for module I & II- 2 hrs for module III- 1 hr for module IV & V.
Course outcome: (1) Enumerates on varna and its classification (2) Enumerates 4 vikari sabd (3) Does pada vyakhya (4) Writes grammatically correct sentences.

Core Course X Credits: 4 hours: 4/week
HN 1545 Bhasha Vigyan va Bhasha Ka itihas
Aim of the course: 1) to familiarize the students with the linguistics of Hindi language and the history of Development of Hindi language and its lipi.

Module I: Bhashiki: Swaroop aur Anga- Dhwani vigyan- Swaniki- Swaniki ka Kshetra- Vag yantr Swanom ka Vargeekaran- Sruthi- Manswar- Swar vargeekaran-vyangjan vargeekaran- Dwani gun-Akshar- Swanimi- Swanim- Swaniki Swanimi-tulna Swanim nirdharan ke sidhant- Swanimom ke Bhed
Outcome: 1) understands phonology and enumerates it 2) enumerates phonotics & phonemics

Module II: Roop vigyan- Roopim- Roopimom ke prakar- Roop vaigyanik KOtiyam- Vyakaranik Kotiyam
Outcome: 1) understands morphology and enumerates it 2) enumerates morphemes (3) classifies morphemes (4) enumerates morphological categories & grammatical categories.

Module III: Vakya vigyan- Vakya –Upavakya- Vakyom ke Prakar- sannihit Ghatak- Arth Vigyaan. Arth Vistaar- Arth Sankoch- Arhtadesh- Arthotkarsh- Arthopakarsh
Outcome: (1) understands vakya vigyan (2) enumerates vakya vigyan (3) Enumerates Artha Vigyaan

Module IV: Sansar kee Bhashayem aur Unka vargeekaran – akriti moolak vargeekaran- parivarik vargeekaran. Bharat Uropeeya parivar- Bharateeya Arya Bhashavom ka Itihaas – Bharateeya Arya Bhashavom ka Samanya parichay- Hindi aur Uski Boliyam- Hindi aur Hindi ke vividh roop lipi –nagari lipi aur ank.
Outcome: (1) understands the classification of languages in the world (2) enumerates upon the classification of world languages (3) classifies Indo European languages (4) enumerates Hindi and its dialects.

Prescribed texts: (1) Bhashiki ke prarambhik sidhant – By Dr. H. Parameswaran published by Vani Prakashan, Darya Ganj, New Delhi.

Omit lessons: (1) Roopimom ka Abhi nirhdaran (2) Roopimom ka ankan (3) Chapter 4- Sabda vigyan (4) Anta Kendrik aur Bahir Kendrik vakya (5) Chapter 7- Roop Swanini (6) Chapter 8. Lekhan pranali.

(2) Hindi Bhasha aur lipi: By prof. H. Padmanabhan & Prof. G. Seethalakshmi published by Vani Prakashan, Daryaganj New Delhi.
Omit lessons: (1) Chapter 4 (2) Chapter 8.
Hour distribution: 2 hrs for module 1, 1 hr for modules II, III; 1 hr for module IV.

Course outcome: (1) understands Basic theories of linguistics and History of Hindi Language (2) Enumerates Dwani Vigyan, Roop Vigyan, Vakya Vigyan and Arth Vigyan (3) Classifies world languages (4) classifies Indo European languages (5) Enumerates Hindi language and its dialects (6) understands lipi.

Sixth Semester
Core Course XI Credits: 4 hours: 5/week
HN 1641 Samkaleen Hindi Katha Sahitya

Aim of the course: (1) to familiarize students with the trends in contemporary Hindi fiction (since 1980) (2) to develop the aesthetic sense of students.

Module I: Development of contemporary Hindi novel- important novelists and their major works.
Outcome: (1) understands development of contemporary Hindi novel (2) Recollects names of important novelists and their novels.

Module II: to study in detail 'Giligadu' by Chitra Mudgal- published by Samayik Prakashan.
Outcome: (1) Appreciates the novel (2) critically evaluates the novel with respect to theme characterization style and craft of the novel. (3) Recollects names of major novels of the author (4) Elucidates key lines of the novel with reference to context.

Module III: Development of contemporary Hindi short story- important short story writers and their major works.
Outcomes: (1) understands the development of contemporary Hindi short stories (since 1980) (2) Recollects names of important short story writers of the period along with their major works.

Module IV: Collection of 8 short stories (detailed study)
Outcome: (1) critically evaluates the contribution of the prescribed writers to contemporary Hindi short story (2) critically evaluates the short stories with respect to

theme, style and craft (3) recollects the major works of the prescribed short story writers (4) elucidates key lines of short stories.

Prescribed text: Navya Kahaniyam- Edited by Dr. Latha.D Dr. Elizabeth George published by Aman Prakashan, Kanpur

Omit short story: Apradh by Udaya Prakash

Outcome of the course: (1) kindles creativity in students (2) students critically evaluate contemporary fiction (3) appreciates contemporary fiction.

Core Course XII credits: 4 hrs: 5/week
HN 1642 bharatiya evam paschatya kavya sasthr

Aim of the course: (1) To familiarize the students with Eastern and western literary thoughts (2) To familiarize the students with sabd sakti, selected Alankars, selected chands and nine rasas.

Module I: Bharatiy Kavya Shastr- kavya lakshan: kavita kya hai- Kavya prayojan.
Outcome: (1) understands what is poetry (2) understands use of poetry as explained in Sanskrit literary thought.

Module II: Ras Sidhant- Alankar Sidhant- Reeti Sidhant
Outcome: (1) understands these three ancient Indian literary thoughts (2) Evaluates the literary theories of Bharatha, Bhamaha and Vamana.

Module III: Dhwani Sidhant- Vakrokti Sidhant: Auchitya Sidhant
Outcome: (1) students understand these three Indian literary theories (2) Evaluate the theories of Anandavardhan, Kuntak and Kshemendra

Module IV: Paschatya Kavya- plato ke Kavya sidhant- Arastu- longinus ka udaat Sidhant-
Outcome: (1) students understand and evaluate these three western literary thoughts

Module V: William Wordsworth- Coleridge- Croche- I.A. Richards- T.S. Eliot
Outcome: (1) Students understand and evaluate these literary thoughts

Module VI: Sabd Sakthi, Navras, Alankar Chand
Outcome: (1) identifies Chand & Alankar (2) understands power of word.

Prescribed text book -1) Bharatiya evam paschatya kavya shastr- by Taraknath bali Published by Vani Prakashan, New Delhi 2) Kavya pradeep-Rambahori Sukla- Lokbharati Prakasan.

Course Outcome: 1) understands various Indian and western literary theories. 2) Identifies prescribed chands and Alankars 3) understands the power of words. 4) Applies the knowledge gained in their creative writing.

Distributionof hrs: 2 hrs for Bharatiya Kavya Sasthr. 2 hrs for Paschatya Kavya Sastr, 1 hr for module VI.

Core Course XIII Credits 4L hours 5/week
HN 1643 Anuvad: Sidhant tatha Prayog
Aim of the course: (1) To familiarize the students with the theory of Translation (2) To facilitate use of Translation as a tool for communication in Hindi and English (3) To motivate the –students for a career in Translation.

Module I : Anuvad ka Swaroop- Anuvad kee prakriya
Outcome: (1) Defines translation (2) identifies fields of translation (3) enumerates on characteristics of good translator (4) understands steps involved in translation

Module II: anuvad Ke prakar- Anuvad: Prayogikata kee seemayem
Outcome: (1) Enumerates on types of translation- literary and non literary (2) identifies limitations of translation

Module III: Translation practice- from English to Hindi and Vice Versa
Outcome: (1)Translates passages from English to Hindi and Vice versa.

Prescribed text: (1) Anuvad: Sidhant tatha prayogikata- By Dr. M.S. vinayachandran **published by**: Director of Publication, Kerala University.

Course outcome: (1) understands theories of Translation and limitations of Translation (2) Translates simple passages from English to Hindi and Vice Versa (3) opens career option- that of Translator.
Distribution of hrs: 2 hrs for module I, 2 hrs for module II, and 1 hr for module III.

Core Course XIV: Credits : 3 Hours: 4/week

HN 1644 Hindi Vyangya Sahitya

Aim of the course: (1) To familiarize students with the development of satire in Hindi (2) to make students understand the use of satire as a tool by Writers while discussing socio-political situations and issues in literature.

Module I: Vyangya- Sabdarth, Vyutpatti, Paribhasha- Vyangya kee visheshatayem- Vyangya parampara ka vikas- Bhartendu yug- Dwivedi yug- Chayavadi yug. Swatantryothar yug- Pramukh vyangyakaar aur Rachnayem

Outcome: (1) understands the development of satire in Hindi (2) critically evaluates the development of satire in Hindi (3) Recollect names of famous satirists in Hindi along with their major works.

Module II; A collection of satires – 5 satires

Outcome: (1) Appreciates satire (2) understands use of satire as a tool while discussing socio economic issues in literature.

Module III- To study in detail a play

Outcome: (1) Appreciates satirical play (2) understands use of satire as a tool, while discussing political issues (3) Elucidates key lines of the play with reference to context.

Prescribed texts: (1) Hindi vyangya Sahitya- edited by Dr. Reshmikrishnan published by Aman Prakashan, Kanpur (2) Bakri- play by Sarveshwar Dayal Saxena published by Vani prakashan, New Delhi (Detailed study)

Course outcome: (1) understands and evaluates satirical literature (2) understands use of satire as a tool while discussing socio-economic-political issues in literature

Distribution of Hrs: 1 hr for module I, 1 hr for module II, 2hrs for module III.

Elective Course: credits 2 lecture hrs: 3/week

HN 1661 Jan Sanchar aur Hindi Cinema

Aim of the course: (1) To make students understand media both print and electronic and its merit and demerits (2) To make students understand mass communication- its uses (3) to enable students to understand the medium cinema & to make them aware of the significant film movements (4) make them aware of world renowned film makers and the art of film making.

Module I: Sanchar- Sanchar Madhyamom ke prakar- Sravya Madhyam: Radio-Sravya –Drsya Madhyam
Outcome: (1) students understand different types of communication media its uses- cinema as a medium of communication.

Module II: cinema- Bhoomika- Viswa Cinema ka Sanshipta Parichay- Hindi Cinema- Prarambhik yug, vikas ke charan, Samkaleen Hindi cinema pramukh nirdeshak, abhinetha
Outcome: (1) comprehensive knowledge of world cinema and Indian cinema.

Module III- to view 3 classic Hindi films and critically evaluate it.
Outcome: (1) Evaluates film with respect to story, screen play, dialogue, cinematography- editing, acting, direction.
Text books: (1) Jan Sanchar aur Patrakarita- edited by Dr. Poornima R (only chapters 1,2,3,4) (2) Hindi cinema ka safar- edited by Dr. S. Suma (3) To view- Do Ankhem Barah haat (1957)- V. Santharam) Do Beegha Zameen (1953 Bimal Roy)
Bawarchi (1972- Hrishikesh Mukherjee)

Course outcome: (1) understands history of world cinema (2) understands development of Hindi cinema (3) understands mass communication and cinema as medium of mas communication (4) critically evaluates film
Hour distribution: 1 hr for module I, 1 hr for module II 1 hr for module III.

Fifth Semester
Open Course Credits 2 hrs. 3/week
HN 1551- Hindi Cinema

Aim of the course: (1) to enable students to understand a brief history of world cinema (2) to make students understand the development of Hindi cinema (3) to enable students to critically evaluate classic films in Hindi.

Module I: Introduction- Brief History of World Cinema
Outcome: gets knowledge of world cinema

Module II: Hindi Cinema; prarambhik yug, vikas ke charan- Samkaleen Hindi cinema; Pramukh rirdeshak aur abhineta
Outcome: (1) understands development of Hindi Cinema from early times to contemporary times.

Module III: Film sameeksha- To view 3 Hindi classic films and evaluate on basis of direction, acting theme, screenplay, dialogue, cinematography, editing'

Outcome: (1) critically evaluates films in Hindi.

Prescribed text: (1) Hindi cinema ka safr' edited by Dr. S. Suma. (2) To view- (i) Do ankhen Barah haat (1957-V. Santharam) (ii) Do Beegha Zameen (1953: Bimal Roy) (iii) Bawarchi (1972: Hrishikesh Mukherjee)

Course Outcome: (1) understands development of world cinema & Hindi cinema (2) critically evaluates Hindi cinema.

Foundation Course II credits 2 hrs: 4/week
HN 1321 Soochana Praudyogiki aur Aadhunik Patrakarita

Aim of the Course: (1) to update and expand basic informatics skills (2) to give theoretical and practical knowledge in computing (3) To make students realize the possibilities of computing in Hindi (4) To make students ware of modern trends in Journalism.

Module I: Hindi computing ka itihaas- computer mein Hindi ke vibhin Prayog- Sabd sansadhak – Rajbhasha Hindi, Computer aur Soochana Praudyaogiki- Font, Software aur tools- Unicode aur devanagiri lipi- computer par Hindi ka anuprayog- unicode aur Hindi font mem antar- Mukt Hindi software- E governance – online sevayem
Outcome: (1) Gets comprehensive knowledge of computing in Hindi

Module II: Patrakarita ka Udbhav Aur vikas- Viswa Patrakarita ka Uday- Bharat Meim patrakaritha ka uday- Hindi patrakarita ka pehla charan- Doosra yug- Theesra charan 1947 ke baad Hindi patrakaritha
Outcome: (1) understands development of Journalism in the world (2) comprehensive knowledge of development of Journalism in Hindi upto 1980.

Module III: Sanchar Kranti aur Hin di patrakarita-web patrakarita –web patrakarita : Lekhan va Bhasha – bloglekhan- web patrakarita aur blog- stingoperation- pramukh e-patrikayem aur portal.
Outcome: (1) understands development of Journalism in the modern times (2) gets comprehensive knowledge of development of Hindi journalism in the age of communication revolution.

Prescribed text books (1) Hindi aur Soochna praudyogiki- Dr. Poornima. R published by Vani Prakashan, N.Delhi (2) Jan Sanchar aur Patrakarita- Dr. Poornima.R. published by Vani Prakashan, New Delhi.

Omit lessons: From 'Hindi aur soochna praudyogiki' (1) computer aur Bharatiya Bhashayem (2) Font ka Itihaas (3) Hindi ke vikas mein Unicode kee Bhoomika (4) search engine (5) C-DAAC (6) Rajbhasha Hindi aur computer (7) Social media aur Hindi. From the text 'Jan sanchar aur patrakarita'- First four lessons and 6th lesson.

Distribution of hrs: 2 hrs for module I, 2 hrs for module II & III.
Course outcome: (1) understands possibilities of computing in Hindi (2) updates and expands Basic informatics skills (3) understands modern trends in Journalism

Dissertation/Essay credits: 4, Hours: 6/week
HN 1645

The dissertation work should commence in the 5th semester and a small thesis has to be submitted for evaluation at the end of the 6th semester.

Aim of the course: (1) to apply the knowledge about language & literature gained during the programme (2) to examine the student's ability to analyse, evaluate and think critically and to put to practice what has been gained during the programme (3) To kindle the students Research aptitude.

Nature of work: The dissertation may be based on any piece of literature in Hindi, on Hindi language, grammar, translation, media and communication. The size of the dissertation may be between 40-50 pages. Research methodology should be followed. The dissertation should contain the following: (1) Title (2) Introduction (3) Expansion of Title chapter (4) Summary of important findings and conclusion (5) Bibliography.

No. of chapters: 3 excluding conclusion

Evaluation points:	1. Title and introduction	-15
	2. Expansion and explanation of title chapter	-25
	3. Conclusion	-15
	4. Language & Grammar	-15
	5. Reference (Bibliography)	-5
	Total	75
	Viva voce	25
	Total marks	**100**

Essay: Essays of 20 marks each- 5 tobe attempted- Total marks- 100. Eight essays from 'Sahitya ka itihaas' may be given; out of which 5 have to be attempted. The exam will be of 3 hrs duration.

Outcome: (1) Develops skill of enumeration (2) Develops critical evaluation

List of Text Books and Portions to be studied in detail
Common Course in Hindi for BA/BSc students -4hrs /week

HN1111.1 (Common Course I) Name of course- **Ê½þxnùÒ EòlÉÉ ºÉÉÊ½þiªÉ**

Name of the text books

1. Eò½þÉxÉÒ ºÉ®úÉä´É®ú- ºÉÆ{ÉÉnùEò ¹ÉÒ±ÉÉ.]õÒ. xÉÉªÉ®ú (Detailed Study)

Omit

ºÉ½þVÉ +Éè®ú ¶ÉÖ¦É -- ¨ÉÉEÇòhbä÷ªÉ, {ÉÉÄSÉ´ÉÉ ¤Éä]õÉ- xÉÉÊºÉ®úÉ ¶É¨ÉÉÇ

2. ¨ÉÉä¤ÉÉ<Ç±É- IÉ¨ÉÉ ¶É¨ÉÉÇ (Non detailed study)

HN1211.1 (Common course II) Second Semester) 4hrs/week

Ê½þxnùÒ ÊxÉ¤ÉÆvÉ +Éè®ú +xªÉ MÉnÂùªÉ Ê´ÉvÉÉBÄ

Name of the text books

1. MÉnÂùªÉ MÉÊ®ú¨ÉÉ (Detailed study) ºÉÆ{ÉÉnùEò: b÷Éì. BxÉ. ¨ÉÉä½þxÉxÉ, b÷Éì. nùÒ{ÉEò Eäò +É®ú

Omit

‘+É{É’- |ÉiÉÉ{ÉxÉÉ®úÉªÉhÉ Ê¨É¸É

HN 1311.1. (Common Course III) Third Semester 5hrs/week

‘Ê½þxnùÒ xÉÉ]õEò, ´ªÉÉEò®úhÉ iÉlÉÉ +xÉÖ´ÉÉnù’

Name of the text books

1. ºÉEÖò¤ÉÉ<Ç- xÉÉÊn®úÉ VÉ½þÒ®ú ¤É¤¤É®ú (Detailed study)
2. ´ªÉ´É½þÉÊ®úEò Ê½þxnùÒ ´ªÉÉEò®úhÉ, +xÉÖ´ÉÉnù iÉlÉÉ ®úSÉxÉÉ - b÷Éì. BSÉ {É®¨Éä·É®úxÉ

HN 1411.1 (Common Course IV) Fourth Semester 5hrs/week

Ê½þxnùÒ EòÊ´ÉiÉÉ B´ÉÆ BEòÉÆEòÒ

Name of the text books

1. EòÉ´ªÉ nùÒÎ{iÉ- ºÉÆ{ÉÉnùEò b÷Éì. ®úÎ¶¨É EÞò¹hÉxÉ, b÷Éì. ¶ÉèxÉÒ ¨ÉèlªÉÚ, b÷Éì. |ÉÒiÉÉ ®ú¨ÉhÉÒ]õÒ.<Ç (detailed study)

Omit the following portions

1)7,8,9,10 nùÉä½äþ Eò¤ÉÒ®ú Eäò, (2) 7,8,9,10 iÉÖ±ÉºÉÒ Eäò nùÉä½äþ (3) 7,8,9,10 ®ú½þÒ¨É Eäò nùÉä½äþ (4) ºÉ¨É®ú ¶Éä¹É : ÊnùxÉEò®ú (5) SÉÚ±½þÉ- {É´ÉxÉ Eò®úhÉ

2. ºÉ®ú±É BEòÉÆEòÒ- ºÉÆ{ÉÉnùEòò b÷Éì. VÉÉäxÉ {ÉÊxÉCEò®ú

Omit

BEòÉÆEòÒ- ½þ®úÒ PÉÉºÉ {É®ú PÉÆ]äõ ¦É®ú

Common Course in Hindi for B.Com students 4hrs/week
HN 1111.2 Common Course I 1st Semester.

Ê½þxnùÒ MÉt +Éè®ú ´ªÉÉ´ÉºÉÉÊªÉEò ±ÉäJÉxÉ

Name of the text book

xÉ´ÉÒxÉ ºÉÆEò±ÉxÉ - ¦ÉÉMÉ 1 -ºÉÆ{ÉÉnùEò b÷Éì. VÉä £òÉÆÊºÉºÉ, b÷Éì. BºÉ.ºÉÖ¨ÉÉ, b÷Éì. ±ÉäJÉÉ.BºÉ.xÉÉªÉ®ú, b÷Éì.+É®ú ÊMÉÊ®úVÉÉEÖò¨ÉÉ®úÒ |ÉEòÉ¶ÉEò- Eäò®ú±É Ê´É·É Ê´ÉnÂùªÉÉ±ÉªÉ

HN 1211.2 Common Course II 2nd Semester 4hrs/week

Ê½þxnùÒ EòÊ´ÉiÉÉ, +xÉÖ´ÉÉnù +Éè®ú {ÉÉÊ®ú¦ÉÉÊ¹ÉEò ¶É¤nùÉ´É±ÉÒ

Name of the text book

xÉ´ÉÒxÉ ºÉÆEò±ÉxÉ ¦ÉÉMÉ-2- ºÉÆ{ÉÉnùEò b÷Éì.VÉä. £òÉÆÊºÉºÉ b÷Éì. BºÉ.ºÉÖ¨ÉÉ, b÷Éì. ±ÉäJÉÉ BºÉ. xÉÉªÉ®ú- Eäò®ú±É Ê´É·É Ê´ÉtÉ±ÉªÉ

Common Course in Hindi for B.Com (Restructured) Programme
HN 1111.4 Common Course I 1st Semester 5hrs/wk)

+ÉvÉÖÊxÉEò Ê½þxnùÒ ºÉÉÊ½þiªÉ

Name of Text

1. ºÉÆSÉÉÊªÉEòÉ- ºÉÆ{ÉÉnùEò b÷Éì |ÉÒiÉÉ ®ú¨ÉhÉÒ]õÒ-<Ç, b÷Éì. |ÉnùÒ{É EÖò¨ÉÉ®úÒ |ÉEòÉ¶ÉEò- VÉ´ÉÉ½þ®ú {ÉÖºiÉEòÉ±ÉªÉ ¦ÉÉMÉ-1

HN 1211.4 Common Course II 2nd Semester 5hrs/week

Ê½þxnùÒ xÉÉ]õEò, ´ªÉÉ´ÉºÉÉÊªÉEò ±ÉäJÉxÉ +Éè®ú +xÉÖ´ÉÉnù

Name of texts

1. ºÉÉÊ´ÉjÉÒ 2007 (xÉÉ]õEò)- Eèò±ÉÉ¶ÉSÉÆpù-´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ (Detailed study)
2. ºÉÆSÉÉÊªÉEòÉ- ¦ÉÉMÉ -2

Common Course in Hindi for BA/BSc Career related programme
HN 1111.3 Common Course II 1st Semester 5hrs/wek

Ê½þxnùÒ MÉt ºÉÉÊ½þiªÉ

Name of the text book (Detailed study)

MÉnÂùªÉ ¨ÉÉvÉÖ®úÒ - ºÉÆ{ÉÉnùEò b÷Éì. ºÉÖÊxÉ±ÉEÖò¨ÉÉ®ú, b÷Éì. VÉªÉ¸ÉÒ.+Éä. +¨ÉxÉ |ÉEòÉ¶ÉxÉ

Omit lessons: (1)EÖò´ÉÆ®úÒ vÉ®úiÉÒ- ¨ÉÉä½þxÉ ®úÉEäò¶É (2) VÉ½þÉÄ +ÉEòÉ¶É ÊnùJÉÉ<Ç xÉ½þÓ näùiÉÉ - Ê´É¹hÉÖ |É¦ÉÉEò®ú

HN 1211.3 Common Course II 2nd Semester 5hrs/week

Ê½þxnùÒ {Ét ºÉÉÊ½þiªÉ

Name of the text (Detailed study)

EòÉ´ªÉ EòÉè¨ÉÖnùÒ- ºÉÆ{ÉÉnùEò b÷Éì. ¹ÉÉVÉÒ Eäò. b÷Éì. ¹ÉÒ¤ÉÉ, b÷Éì. ¨ÉÆVÉÖ- ®úÉVÉ{ÉÉ±É Bxb÷ ºÉxºÉ

Omit Lessons – 1) 5,6 ºÉÚ®ú Eäò {Énù 2) 5,6, Ê¤É½þÉ®úÒ Eäò nùÉä½äþ

Complementary Courses for FDP in Hindi
Semester I Complementary Course I (Compulsory) 3hrs/week

HN 1131 ºÉ¨ÉEòÉ±ÉÒxÉ ºÉÉÊ½ÎiªÉEò Ê´É¨É¶ÉÇ

Name of the text

+ÉÎº¨ÉiÉÉ¨ÉÚ±ÉEò Ê´É¨É¶ÉÇ +Éè®ú Ê½þxnùÒ ºÉÉÊ½þiªÉ- ºÉÆ{ÉÉnùEò b÷Éì. VÉªÉ¸ÉÒ. BºÉ.+É®ú- +¨ÉxÉ |ÉEòÉ¶ÉxÉ

Omit Lessons

(1) ¨Éé EèòºÉÒ +Éè®úiÉ ½ÚÄþ- ºÉÊ´ÉiÉÉ ËºÉ½þ 2) ÊEòiÉxÉÒ ´ªÉlÉÉ xÉMÉÒxÉÉ ËºÉ½þ (3) ºÉ±ÉÉ¨É - +Éä¨É|ÉEòÉ¶É ´ÉÉ±¨ÉÒÊEò (4) |ÉÊiÉYÉÉ - OÉäºÉ EÖÆòVÉÉ®ú

Semester I Complementary Course II (Optional) 3hrs/week

HN 1132 |ÉÉSÉÒxÉ iÉlÉÉ ¨ÉvªÉEòÉ±ÉÒxÉ ¦ÉÉ®úiÉÒªÉ ºÉÆºEÞòÊiÉ

Name of text book

|ÉÉSÉÒxÉ B´ÉÆ ¨ÉvªÉEòÉ±ÉÒxÉ ¦ÉÉ®úiÉÒªÉ ºÉÆºEÞòÊiÉ- ºÉÆ{ÉÉnùEò +É¶ÉÉ BºÉ. xÉÉªÉ®ú, b÷Éì. ¨É½äþ·É®úÒ, ¶ÉÉ±ÉÒÊxÉ.ºÉÒ-´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ, Ênù±±ÉÒ

Semester II Complementary Course III (Compuslory) 3hrs/week

HN 1231 EòlÉÉEòÉ®ú |Éä¨ÉSÉÆnù

Name of text book

(1) |Éä¨ÉSÉÆnù EòÒ Eò½þÉÊxÉªÉÉÄ ºÉÆ{ÉÉnùEò b÷Éì. VªÉÉäÊiÉ.BxÉ b÷Éì. =¹ÉÉEÖò¨ÉÉ®úÒ Eäò.{ÉÒ- ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ- Detailed study

(2) ®ÆúMÉ¦ÉÚÊ¨É -|Éä¨ÉSÉÆnù UôÉjÉ
ºÉÆºEò®úhÉ ¦ÉÚÊ¨ÉEòÉ- ºÉÖvÉÒ¶É
{ÉSÉÉè®úÒ- ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ

Complementary Course IV (Optional) 3hrs/week

HN1232 {ÉÉÊ®úÎºlÉÊiÉEò {ÉÉ`ö +Éè®ú Ê½þxnùÒ ºÉÉÊ½þiªÉ

Name of text book

{ÉÉÊ®úÎºlÉÊiÉEò {ÉÉ`ö +Éè®ú Ê½þxnùÒ ºÉÉÊ½þiªÉ-ºÉÆ{ÉÉnùEò b÷Éì. ºÉÖ¨ÉÉ.BàºÉ, b÷Éì. VÉªÉ¸ÉÒ BºÉ.+É®ú- ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ

Semester III Complementary Course V (Optional)

HN 1331 iÉÖ±ÉxÉÉi¨ÉEò +vªÉªÉxÉ

Name of text books

iÉÖ±ÉxÉÉi¨ÉEò +vªÉªÉxÉ- Ê½þxnùÒ ¨É±ÉªÉÉ±É¨É EòÒ EòlÉÉ ´É EòÊ´ÉiÉÉ Eäò ºÉÆnù¦ÉÇ ¨Éå- ºÉÆ{ÉÉnùEò b÷Éì. B¨É.BºÉ. Ê´ÉxÉªÉ SÉÆpùxÉ, b÷Éì. {ÉÒ ±ÉiÉÉ, b÷Éì. EÖò¨ÉÉ®úÒ MÉùÒiÉÉ BºÉ, b÷Éì. VÉªÉ¸ÉÒ +Éä, ¸ÉÒ¨ÉÊiÉ ¶ÉÉÊ±ÉxÉÒ.ºÉÒ b÷Éì. ¶É´ÉÉxÉÉ ½þ¤ÉÒ¤É- University publications

Complementary Course VI (Compulsory)

HN 1332 ®úÉVÉ¦ÉÉ¹ÉÉ |É¤ÉÆvÉxÉ

Name of the text book

®úÉVÉ¦ÉÉ¹ÉÉ |É¤ÉÆvÉxÉ- b÷Éì. VÉÚÊ±ÉªÉÉ <¨ÉÉxÉÖB±É- ®úÉVÉ{ÉÉ±É Bhb÷ ºÉxºÉ

Semester IV Complementary Course VII (Compulsory) 3hrs/week

HN 1431 ¦ÉÉ®úiÉÒªÉ ºÉÉÊ½þiªÉ

Name of text book

¦ÉÉ®úiÉÒªÉ ºÉÉÊ½þiªÉ- ºÉÆEò±ÉxÉEòiÉÉÇÇ b÷Éì. ¶ÉÉxiÉÒ. +É®ú.+É<, b÷Éì. |ÉEòÉ¶É.B

Omit lessons: 4,6,7, from JÉÆhb÷ 1 and JÉhb÷ 3 Completely

Complementary Course VIII (Optional) 3hrs/week

HN 1432 {É]õEòlÉÉ ±ÉäJÉxÉ ´É Ê´ÉYÉÉ{ÉxÉ

Name of text book

{É]õEòlÉÉ ±ÉäJÉxÉ +Éè®ú Ê´ÉYÉÉ{ÉxÉ EòÒ ´ªÉ´É½þÉÊ®úEò ÊxÉnæùÊ¶ÉEòÉ - ºÉÆ{ÉÉnùEò b÷Éì. ÊxÉ¨¨ÉÒ.B.B b÷Éì.]õÒ. ¸ÉÒnäù´ÉÒ-®úÉVÉEò¨É±É |ÉEòÉ¶ÉxÉ

Core Courses for FDP in Hindi

Semester I core course I 6hrs/week

HN 1141 Ê½þxnùÒ EòlÉäiÉ®úMÉt ºÉÉÊ½þiªÉ

1. MÉt ºÉÖ¹É¨ÉÉ (Detailed study) b÷Éì. BxÉ ¨ÉÉä½þxÉxÉ, b÷Éì. nùÒ{ÉEò Eäò.+É®ú ®úÉVÉ{ÉÉ±É Bhb÷ ºÉxºÉ

2. MÉt ºÉÉè¹`ö´É (Detailed study) b÷Éì. BxÉ ¨ÉÉä½þxÉxÉ, b÷Éì. nùÒ{ÉEò Eäò.+É®ú ®úÉVÉ{ÉÉ±É Bhb÷ ºÉxºÉ

Semester II Core Course II 6hrs/week

HN 1241 Ê½þxnùÒ ºÉÉÊ½þiªÉ EòÉ <ÊiÉ½þÉºÉ (®úÒÊiÉEòÉ±É iÉEò)

Name of text book

Ê½þxnùÒ ºÉÉÊ½þiªÉ EòÉ ºÉÆÊIÉ{iÉ <ÊiÉ½þÉºÉ - b÷Éì. ±ÉI¨ÉÒ ºÉÉMÉ®ú ´ÉÉ¥ÉÉäªÉ ±ÉÉäEò ¦ÉÉ®úiÉÒ |ÉEòÉ¶ÉxÉ

Omit lessons- Lesson 1,2 and 6 from the text

Semester III Core Course III 5hrs/week

HN 1341 Ê½þxnùÒ ºÉÉÊ½þiªÉ EòÉ <ÊiÉ½þÉºÉ (+ÉvÉÖÊxÉEò EòÉ±É)

Name of the text

Ê½þxnùÒ ºÉÉÊ½þiªÉ EòÉ ºÉÆÊIÉ{iÉ <ÊiÉ½þÉºÉ .b÷Éì. ºÉI¨ÉÒ ºÉÉMÉ®ú ´ÉÉ¥ÉÉäªÉ

Semester IV Core Course IV 5hrs/week

HN 1441 Ê½þxnùÒ xÉÉ]õEò +Éè®ú ®ÆúMÉ ¨ÉÆSÉ

Name of the text books

1. ®úHò Eò¨É±É- ±ÉI¨ÉÒ xÉÉ®úÉªÉhÉ ±ÉÉ±É (Detailed study) ®úÉVÉ Eò¨É±É |ÉEòÉ¶ÉxÉ
2. =`öÉä +½þ±ªÉÉ - ºÉÖ®äúxpù nÚù¤Éä (Detailed study) ¦ÉÚÊ¨ÉEòÉ - b÷Éì. ¨ÉÆVÉÖ ®úÉ¨ÉSÉÆxpùxÉ b÷Éì. VÉªÉ¸ÉÒ.+Éä ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ

Core Course V- Lecture hrs 4/week

HN 1442 Ê´É¶Éä¹É ±ÉäJÉEò +YÉäªÉ

Name of text books

1)±ÉÉäEòÊ|ÉªÉ ºÉÉÊ½þiªÉEòÉ®ú +YÉäªÉ -ºÉÆ{ÉÉnùEò b÷Éì. +É®ú. +É<. ¶ÉÉxiÉÒ b÷Éì. BºÉ. ºÉÖ¨ÉÉ- ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ (With introductory essays)

EòÊ´ÉiÉÉBÄ Detailed study
Omit: ºÉÉ©ÉÉYÉÒ EòÉ xÉè´ÉätnùÉxÉ, PÉÞhÉÉ EòÉ MÉÉxÉ
ÊxÉ¤ÉÆvÉ- Nondetailed
Eò½þÉÊxÉªÉÉÄ- detailed

Fifth Semester –Core Course VI- 4hrs/week

HN 1541 |ÉÉSÉÒxÉ B´ÉÆ ¨ÉPªÉEòÉ±ÉÒxÉ Ê½þxnùÒ EòÉ´ªÉ

Name of the text books

|ÉÉSÉÒxÉ B´ÉÆ ¨ÉvªÉEòÉ±ÉÒxÉ Ê½þxnùÒ EòÉ´ªÉ- ºÉÆ{ÉÉnùEò b÷Éì. ¤ÉÒ. VÉªÉ¸ÉÒ, b÷Éì VªÉÉäÊiÉ-BxÉ.b÷Éì. ÊxÉ¨ÉÒ.B.B VÉ´ÉÉ½þ®ú |ÉEòÉ¶ÉxÉ -Detailed study

Core Course VII- 4hrs/week

HN 1542 +ÉvÉÖÊxÉEò Ê½þxnùÒ EòÉ´ªÉ

Name of text

+ÉvÉÖÊxÉEò Ê½þxnùÒ EòÉ´ªÉ- ºÉÆ{ÉÉnùEò ºÉÖ¨ÉÉ.BºÉ. ´ÉÉhÉÒ (Detailed study)

Core Course VIII- 3hrs/week

HN 1543 +ÉvÉÖÊxÉEò Ê½þxnùÒ EòlÉÉ ºÉÉÊ½þiªÉ

Name of the text books

1. b÷ÉEò ¤ÉÆMÉ±ÉÉ- Eò¨É±Éä·É®ú- ®úÉVÉ{ÉÉ±É Bhb÷ ºÉxºÉ
2. EòlÉÉ EÖÆòVÉ -ºÉÆ{ÉÉnùEò b÷Éì +É¶ÉÉ.VÉÒ b÷Éì. ¶É¤ÉÉxÉÉ ½þ¤ÉÒ¤É- VÉ´ÉÉ½þ®ú |ÉEòÉ¶ÉxÉ (Detailed study)

Omit lessons (1) ±Éä]õ®ú ¤ÉCºÉ- +YÉäªÉ (2) ¨É´ÉÉ±ÉÒ-¨ÉÉä½þxÉ ±ÉÉEäò¶É

Core Course IX- 4hrs/week

HN 1544 Ê½þxnùÒ ´ªÉÉEò®úhÉ

Name of the text

´ªÉÉ´É½þÉÊ®úEò Ê½þxnùÒ ´ªÉÉEò®úhÉ iÉlÉÉ ®úSÉxÉÉ - b÷Éì. ½þ®únäù´É ¤ÉÉ½þ®úÒ(±ÉÉäEò¦ÉÉ®úiÉÒ)

Omit following lessons

1. ´ªÉÉEò®úhÉ +Éè®ú =ºÉEäò +ÆMÉ 2) ¶É¤nù Ê´ÉSÉÉ®ú 3) +vªÉÉ½þÉ®ú, 4) ´ÉÉCªÉÉxiÉ®úhÉ 5) ´ÉÉCªÉ ºÉÆ¶±Éä¹ÉhÉ 6) ´ÉÉCªÉ Ê´ÉxªÉÉºÉ 7) {ÉnùGò¨É 8) +x´ÉªÉ, 9) EòlÉxÉ ¦Énù 10) Ê´É®úÉ¨É 11) ¨ÉÖ½þÉ´É®äú 12) ±ÉÉäEòÉäÊHò 13) +xÉÖº¨É®ÊhÉEòÉ {Énù

Core Course 4hrs/week

HN 1545 ¦ÉÉ¹ÉÉ Ê´ÉYÉÉxÉ ´É ¦ÉÉ¹ÉÉ EòÉ <ÊiÉ½þÉºÉ

Name of texts

1. ¦ÉÉÊ¹ÉEòÒ Eäò |ÉÉ®ÆúÊ¦ÉEò ÊºÉrùÉxiÉ -b÷Éì. BSÉ {É®ú¨Éä·É®úxÉ- ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ

Omit lessons: (1) °üÊ{É¨ÉÉå EòÉ +Ê¦ÉÊxÉvÉÇ®úhÉ (2) °üÊ{É¨ÉÉå EòÉ +ÆEòxÉ (3) ¶É¤nù Ê´ÉYÉÉxÉ (4) +ÆiÉ; EäòxpùÒEò +Éè®ú ¤ÉÉÊ½þ. EäòÎxpùEò ´ÉÉCªÉ (5) °ü{É º´ÉÉÊxÉÊ¨É (6) ±ÉäJÉxÉ |ÉhÉÉ±ÉÒ

2. Ê½þxnùÒ ¦ÉÉ¹ÉÉ +Éè®ú Ê±ÉÊ{É b÷Éì. VÉÒ. ºÉÒiÉÉ±ÉI¨ÉÒ- ´ÉÉhÉÒ

Omit lessons (1) Chapter 4 (2) chapter 8

Semester VI Core Course Xi hrs: 5 /week

HN 1641 ºÉ¨ÉEòÉ±ÉÒxÉ Ê½þxnùÒ EòlÉÉ ºÉÉÊ½þiªÉ

Name of text books

1. ÊMÉÊ±ÉMÉbÚ÷- ÊSÉjÉ ¨ÉÖnÂùMÉ±É-
ºÉÉ¨ÉÊªÉEò |ÉEòÉ¶ÉxÉ (Detailed Study)
2. xÉ´ªÉ Eò½þÉÊxÉªÉÉÄ- ºÉÆ{ÉÉnùEò b÷Éì
±ÉiÉÉ b÷Ò, BÊ±ÉºÉ¤ÉIÉ VÉÉäVÉÇ- +¨ÉxÉ
|ÉEòÉ¶ÉxÉ
Omit 1. +{É®úÉvÉ- =nùªÉ |ÉEòÉ¶É

Core course XII 5hrs/week

HN 1642 ¦ÉÉ®úiÉÒªÉ B´ÉÆ {ÉÉ¶SÉÉiªÉ EòÉ´ªÉ ¶ÉÉºjÉ

Text Books

1. ¦ÉÉ®úiÉÒªÉ B´ÉÆ {ÉÉ¶SÉÉiªÉ EòÉ´ªÉ ¶ÉÉºjÉ-
iÉÉ®úEòxÉÉIÉ¤ÉÉ±ÉÒ- ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ

Omit lessons

From ¦ÉÉ®úiÉÒªÉ EòÉ´ªÉ¶ÉÉºjÉ- EòÉ´ªÉ ½äþiÉÖ, ®úºÉ ÊºÉrùÉxiÉ EòÒ +ÉvÉÖÊxÉEò |ÉÉºÉÆÊMÉEòiÉÉ, ®úºÉ ÊºÉqùÉxiÉ: +ÉvÉÖÊxÉEò ºÉÆnù¦ÉÇ ¨Éå, ºÉÉvÉÉ®úhÉÒEò®úhÉ +Éè®ú +ÉvÉÖÊxÉEò ºÉ¨ÉÒYÉÉ, +±ÉÆEòÉ®úÉå EòÉ ´ÉMÉÔEò®úhÉ, +±ÉÆEòÉ®ú ÊºÉqùÉxiÉ EòÒ +ÉvÉÖÊxÉEò |ÉÉºÉÆÊMÉEòiÉÉ, ¶É¤nù ¶ÉÊHò, v´ÉÊxÉ ÊºÉrùÉxiÉ EòÒ +ÉvÉÖÊxÉEò |ÉÉºÉÆÊMÉEòiÉÉ ´ÉGòÉäÊHò ÊºÉrùÉxiÉ +Éè®ú +Ê¦É´ªÉÆVÉxÉÉ´ÉÉnù* From {ÉÉ¶SÉÉiªÉ EòÉ´ªÉ¶ÉÉºjÉ- +®úºiÉÚ- jÉÉºÉnùÒ EòÉ Ê´É´ÉäSÉxÉ, EòIÉÉ´ÉºiÉÖ, SÉÊ®újÉ ÊSÉjÉhÉ, Ê´ÉSÉÉ®ú iÉi´É ´ÉbÇ÷ºÉC®ÂúlÉ -EòÉìÊ±É®úVÉ EòÉ EòÉ´ªÉ ºÉÆ¤ÉÆvÉÒ ¨ÉiÉ, UÆôônù EòÉ ¨É½þi´É, EòÊ´ÉiÉÉ EòÒ {ÉÉÊ®ú¦ÉÉ¹ÉÉ, ¦ÉÉ´É ¨ÉÚ±ÉEò ¨ÉÉxÉ´ÉiÉÉ´ÉÉnù, |ÉEÞòÊiÉ ÊSÉjÉhÉ

2. EòÉ´ªÉ |ÉnùÒ{É- ®úÉ¨É ¤É½þÉä®úÒ ¶ÉÖC±É-±ÉÉäEò ¦ÉÉ®úiÉÒ |ÉEòÉ¶ÉxÉ

To study- ¶É¤nù ¶ÉÊHò, xÉÉè ®úºÉ, +±ÉÆEòÉ®ú-+xÉÖ|ÉÉºÉ, ªÉ¨ÉEò, ¶±Éä¹É, ´ÉGòÉäÊHò, ={É¨ÉÉ, °ü{ÉEò =i|ÉäIÉÉ

Uôxnù- SÉÉè{ÉÉ<Ç, ®úÉä±ÉÉ, nùÉä½þÉ, ºÉÉä®ú`öÉ, <xpù´ÉXÉÉ, ={Éäxpù ´ÉXÉÉ

Core course XIII 5hrs/week

HN 1643 +xÉÖ´ÉÉnù: ÊºÉrùÉxiÉ iÉIÉÉ |ÉªÉÉäMÉ

Name of the text

+xÉÖ´ÉÉnù: ºÉèrùÉÎxiÉEòiÉÉ iÉIÉÉ |ÉÉªÉÉäÊMÉEòiÉÉ - b÷Éì. B¨É.BºÉ. Ê´ÉxÉªÉ SÉÆpùxÉ- University Publications

Core Course XIV 4hrs/week

HN 1644 Ê½þxnùÒ ´ªÉÆMªÉ ºÉÉÊ½þiªÉ

Name of the text

1) Ê½þxnùÒ ´ªÉÆMªÉ ºÉÉÊ½þiªÉ - ºÉÆ{ÉÉnùEò b÷Éì. ®úÎ¶¨É EÞò¹hÉxÉ- +¨ÉxÉ |ÉEòÉ¶ÉxÉ

2. ¤ÉEò®úÒ (xÉÉ]õEò) ºÉ´Éê·É®ú nùªÉÉ±É ºÉCºÉäxÉÉ (Detailed study) ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ

Elective Course 3hrs/week

HN 1661 VÉxÉ ºÉÆSÉÉ®ú +Éè®ú Ê½þxnùÒ ÊºÉxÉä¨ÉÉ

Text Books

1. VÉxÉºÉÆSÉÉ®ú +Éè®ú {ÉjÉEòÉÊ®úiÉÉ ºÉÆ{ÉÉnùEò b÷É {ÉÚÌhÉ¨ÉÉ-+É®ú ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ- only chapters 1,2,3,4 to be studied
2. Ê½þxnùÒ ÊºÉxÉä¨ÉÉ EòÉ ºÉ¢ò®ú ºÉÆ{ÉÉnùEò b÷Éì. BºÉ.ºÉÖ¨ÉÉ

3. To view cinemas (i) nùÉä +ÉÄJÉå ¤ÉÉ®ú½þ ½þÉIÉ-´ÉÒ. ¶ÉÉÆiÉÉ®úÉ¨É

(ii) nùÉä ¤ÉÒPÉä WÉ¨ÉÒxÉ- Ê¤É¨É±É ®úÉªÉ

(iii) ¤ÉÉ´ÉÉSÉÔ -¾þÊ¹ÉEäò¶É ¨ÉÖJÉVÉÔ

Open Course –Semester V 3hrs/week

HN 1551 Ê½þxnùÒ ÊºÉxÉä¨ÉÉ

Text Book

Ê½þxnùÒ ÊºÉxÉä¨ÉÉ EòÉ ºÉ¡ò®ú- ºÉÆ{ÉÉnùEò b÷Éì. ºÉÖ¨ÉÉ.BºÉ.

To view cinemas: (1) nùÉä +ÉÄJÉå ¤ÉÉ®ú½þ ½þÉIÉ-´ÉÒ. ¶ÉÉxiÉÉ®úÉ¨É

(2) nùÉä ¤ÉÒPÉä WÉ÷¨ÉÒxÉ- Ê´É¨É±É ®úÉªÉ

(3) ¤ÉÉ´ÉSÉÔ- ¾þÊ¹ÉEäò¶É ¨ÉÖJÉVÉÔ

Foundation Course II 3hrs/week Third Semester

HN 1321 ºÉÚSÉxÉÉ |ÉÉètÉäÊMÉEòÒ +Éè®ú +ÉvÉÖÊxÉEò {ÉjÉEòÉÊ®úiÉÉ

Text Books

(1) Ê½þxnùÒ +Éè®ú ºÉÚSÉxÉÉ |ÉÉètÉäÊMÉEòÒ -b÷Éì. {ÉÚÌhÉ¨ÉÉ +É®ú ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ

Omit Lessons 1. Eò¨{ÉÚ]õ®ú +Éè®ú ¦ÉÉ®úiÉÒªÉ ¦ÉÉ¹ÉÉBÄ 2) ¡òÉx]õ EòÉ <ÊiÉ½þÉºÉ 3) Ê½þxnùÒ Eäò Ê´ÉEòÉºÉ ¨Éå ªÉÚÊxÉEòÉäb÷ EòÒ ¦ÉÚÊ¨ÉEòÉ 4) ºÉSÉÇ <ÆVÉxÉ 5) ºÉÒ b÷ÉEò 6) ®úÉVÉ¦ÉÉ¹ÉÉ

Ê½þxnùÒ +Éè®ú Eò¨{ÉÚ]õ®ú 7) ºÉÉäºaÉ±É ¨ÉÒÊb÷ªÉÉ +Éè®ú Ê½þxnùÒ

2) ‘VÉxÉ ºÉÆSÉÉ®ú +Éè®ú {ÉjÉEòÉÊ®úiÉÉ’: ºÉÆ{ÉÉnùEò b÷Éì. {ÉÚÌhÉ¨ÉÉ +É®ú- ´ÉÉhÉÒ |ÉEòÉ¶ÉxÉ

Omit lessons: 1) First four lessons 2) 6th lesson

University of Kerala

Revised Syllabus for

M.A. Degree Programme

in

English Language and Literature

(2022 Admission Onwards)

Prepared by

The P.G English Board of Studies 2020-23

The P.G English Board of Studies 2020-23

Members:

Dr B. Hariharan (Chairperson)

Dr Meena T. Pillai

Dr Suja Kurup P.L.

Dr Bindu Nair

Dr Vidya Rajagopal

Dr Vishnu Narayanan

Dr Kavitha B.K.

Dr J. Anjana

Dr Mini Babu

Contents

Paper XII- EL.234

Paper XIII- EL.235

Paper XVII- EL.244

INTRODUCTION

The PG Degree Programme in English Language and Literature would equip students to understand and appreciate literatures and cultures worldwide, and to attain the human values necessary for living in the world. The course also aims at enhancing their communication skills in English, and equipping them to enter the teaching profession, especially in the Higher Education sector, or to take up other employment.

Programme Objectives

The objectives of this Programme are

- to enable students to engage critically and creatively with a wide range of selected texts from literatures all over the world
- to develop in them an understanding of the structureandfunctions oflanguage, and an appreciation of the nuances of literary language
- to help them comprehend the relationship between art and life in order to comprehend the social, political, historical, emotional, psychological, literary and cultural values reflected in literary texts
- to equip students with the critical skills and theoretical knowledge necessary to work towards a research degree in any area of their choice and in any university of their preference
- to familiarize them with the ongoing and emerging trends in literary research
- to give them insight into basic pedagogical principles and praxis relating to the teaching of both the English Language and Literature in English
- to develop their communication skills in English, both written and spoken, in a wide range of professional and practical contexts.

Programme Outcomes

The student will be able

- to demonstrate the ability to engage critically with a wide range of selected texts by offering interpretations and evaluations from multiple theoretical perspectives
- to develop awareness about pertinent socio-cultural issues related to gender discrimination, environmental awawreness, human rights and so on through the discussion of texts
- to demonstrate an understanding of the formal structure of the various genres of literature
- to show an awareness of the literariness of literary language
- to demonstrate the ability to analyze and explain the complexities and subtleties of human experience as reflected in literary and cultural texts
- to be able to relate the socio-politico-historical context to the evolution of the

forms, styles, and themes of texts

- to demonstrate the academic and language skills necessary to do independent, innovative research
- to show they have understood contemporary pedagogic principles and practices in teaching both language and literature
- to demonstrate an ability to communicate effectively in a variety of language situations

COURSE STRUCTURE

Semester 1	Core / Elective	Course Code	Name of Paper	Instructional hours/ week	Marks		Min Marks	
					ESE	CA	ESE	CA
Paper 1	Core	EL..511	British Literature I	6	75	25	30	10
Paper 2	Core	EL.512	British Literature II	6	75	25	30	10
Paper 3	Core	EL.513	Shakespeare Studies	6	75	25	30	10
Paper 4	Core	EL.514	Language Studies	7	75	25	30	10
Semester 2								
Paper 5	Core	EL.521	World Literatures I	6	75	25	30	10
Paper 6	Core	EL.522	Literatures of India	6	75	25	30	10
Paper 7	Core	EL.523	Gender Studies	6	75	25	30	10
Paper 8	Core	EL.524	Critical Studies 1	7	75	25	30	10
Semester 3								
Paper 9	Core	EL.531	World Literatures II	6	75	25	30	10
Paper 10	Core	EL.532	Critical Studies 2	7	75	25	30	10
Paper 11	Elective 1	EL.533		4	75	25	30	10
Paper 12	Elective 2	EL.534		4	75	25	30	10
Paper 13	Elective 3	EL.535		4	75	25	30	10
Semester 4								
Paper 14	Core	EL.541	Kerala Culture and Literature	6	75	25	30	10
Paper 15	Core	EL.542	English Language Teaching : Theory and Practice	7	75	25	30	10
Paper 16	Core	EL.543	Cultural Studies	6	75	25	30	10
Paper 17	Elective 4	EL.544		4	75	25	30	10
Paper 18	Project	EL.545	Project & Project based Viva Voce	2	80*	20*		
Grand Total = 1800								
*Project (out of 80 marks) *Project based External Viva –voce (out of 20 marks)								

ELECTIVES: SELECTION OPTIONS
Any ONE from each group SEMESTERS III & IV

SEMESTER III

Paper XI: EL.533 (4 hours / week)

1. **EL.533.1 : European Drama**
2. **EL.533.2 : Canadian and Australian Literature**
3. **EL.533.3 : Film Studies**
4. **EL.533.4 : American Literature**
5. **EL.533.5 : Women's Writing**

Paper XII: EL.534 (4 hours / week)

6. **EL.534.1 : European Fiction**
7. **EL.534.2 : African and Caribbean Literature**
8. **EL.534.3 : Fiction and Film**
9. **EL.534.4 : Folklore Studies**
10. **EL.534.5 : Writing Lives, Performing Gender**

Paper XIII: EL.535 (4 hours / week)

11. **EL.535.1 : Indian Writing in English**
12. **EL.535.2 : South Asian Literature**
13. **EL.535.3 : Screen Writing**
14. **EL.535.4 : Environment, Ecology and Literature**
15. **EL.535.5 : Travel Writing**
16. **EL.535.6 : Content Writing**

Paper XVII: EL.544 (4 hours / week)

17. **EL.544.1 : Translation Studies**
18. **EL.544.2 : Regional Literatures in English Translation**
19. **EL.544.3 : Media Studies**
20. **EL.544.4 : Dalit Writing**
21. **EL.544.5 : Theorizing Sexualities**
22. **EL.544.6 : Introducing Comics Studies**

[4] The Selection Options have been categorized to enable Colleges to select specialities across the two semesters. For example, a College can specialize in World Literatures by choosing Canadian and

Australian Literature and African and Caribbean Literature in Semester III and South Asian Literature and Regional Literatures in English Translation in Semester IV. Similarly, another specialization could be Film and Media Studies. Specialisation in Writing Communication can be achieved by selecting Content Writing and Media Studies. New areas of research like Environmental Studies and Comics Studies has also been introduced.

QUESTION PAPER PATTERN

For Core Courses

(Except Shakespeare Studies, Linguistics and Structure of the English Language, English Language Teaching, Critical Studies 1 and 2, and Cultural Studies)**:**

The question paper shall be divided into 4 parts.

Part I

Very Short Answers (50 words)

- Choice 5 out of 8
- 2 marks for each question (5 x 2 = 10 marks)
- Questions to be based on all modules, fairly direct questions

Part II

Short Notes to be answered in 150 words. Can incorporate Direct Questions progressing towards questions requiring Critical Readings, to be based on all texts prescribed for study.

- Choice 5 out of 8
- 5 marks for each question (5 x 5 = 25 marks)

Part III

Essay Questions- 40 marks

Two Essays of 500 words, carrying 15 marks each

One Critical Essay, of 150 – 200 words, carrying 10 marks.

- Choice 3 out of 9
- 15 marks for two questions (2 x 15 = 30 marks)
- 10 marks for one question (1 x 10 =10)
- This part shall have **three** sections. Each section shall have **three** questions. To answer **one** from each section.
    - Section A and B to be based on prescribed texts, either based on genres or period, incorporating the critical ideas of the texts prescribed for Critical Reading

- Section C is to be a shorter essay (10 mars) requiring the student to **critically comment on** any text prescribed, or any text of their choice. The options can be to hypothesize the main argument / critically comment on / agree or disagree with the ideas from a given passage (either prescribed or a related text)

Difficulty levels of the questions:

- There are to be three levels of difficulty: EASY, AVERAGE and DIFFICULT.
- Part I: Very short answers (2 marks each; 5 questions to be answered out of 8): Difficulty level: EASY, for all 8 questions (10 marks)
- Part II: Critical Comments/ Short notes (5 marks each; 5 questions to be answered out of 8): Difficulty level: EASY and AVERAGE, (25 marks)
- Part III: Essay questions (three sets of questions with each set having three questions): Difficulty level: Any one set of three questions – EASY (15 marks); any one set of three questions – AVERAGE (15 marks); any one set of three questions – DIFFICULT (10 marks)
    - Total marks: 75
    - EASY questions: 25 marks (33%)
    - AVERAGE questions: 40 marks (53%)
    - DIFFICULT questions: 10 marks (13%)

Shakespeare Studies Paper

- Part I (10 marks; 2 mark questions; to answer 5 out of 8)
- Part II (25 marks; Critical Comments / Short notes; to answer 5 out of 8).
- Part IV: Essay (40 marks; 3 out of 9):
    - Section A (15 marks; 3 questions): THREE questions from the drama texts prescribed in Module II;
    - Section B (15 marks; 3 questions): TWO questions from the adaptations of Shakespeare's plays, and ONE from Poetry;
    - Section C (10 marks; 3 questions): Critical Question
    - Difficulty level: As in the core papers

Critical Studies Paper

- **PART 1. Answer in 50 words (2x5 =10 marks)**

  2 marks (5 out of 8). Questions from all modules with at least one from each module.

- **PART 2. Answer in 100 words (5x5 =25 marks)**

  5 marks (5 out of 8). Questions from all modules with at least one from each module.

- **PART 3. Answer in 300 words (40 marks)**

  Section A: (1 out of 3) Three essay questions from the required reading list **15 marks**

  Section B: (1 out of 3) Three essay questions from the modules to evaluate the students understanding of the theoretical paradigms and concepts **15 marks**

Section C: (1 out of 3) Questions based on critical analysis of a known or unknown text provided from three different critical perspectives **10 marks**

NOTE TO TEACHERS/QUESTION PAPER SETTERS

The text for methodological application is included to help students understand how literary/cultural texts can be analysed using the theoretical tools discussed in each module. The text(s) prescribed for methodological application is only for classroom discussion. **Questions from this section should not be included in the final examination.**

Gender Studies

- **PART 1. Answer in 50 words (2x5 =10 marks)**
  2 marks (5 out of 8). Include questions from all modules.
- **PART 2. Answer in 100 words (5x5 =25 marks)**
  5 marks (5 out of 8). Include questions from all modules.
- **PART 3. Answer in 300 words (45 marks)**
  Section A: (1 out of 3) Three essay questions from **module I & II** (**15 marks)**
  Section B: (1 out of 3) Three essay questions from **module III & IV (15 marks)**
  Section C: (1 out of 3) Three essay questions from the modules to evaluate the students general understanding of concepts discussed in all modules **(10 marks)**

NOTE TO TEACHERS/QUESTION PAPER SETTERS

The text for methodological application is included to help students understand the concepts discussed in each module. The text(s) prescribed for methodological application is only for classroom discussion. **Questions from this section should not be included in the final examination.**

Language Studies

- Part I (10 marks; 2 mark questions; to answer 5 out of 8;): At least one question from ALL FIVE modules.
- Part II (20 marks: Short notes; 4 out of 8). TWO questions each from FIRST FOUR modules.
- Part III (5 marks) ONE transcription passage, without choice

- Part IV (15 x 2= 30 marks)
    - Essay question: To answer 2 out of 4 questions. ONE question to be asked from the first FOUR modules
- Part V : Practical Application: (10 marks, 4 + 6)
    - To resolve TWO ambiguities out of FOUR (through IC analysis or TG grammar) (2 marks each, 2x2= 4)
    - To derive PS and T Rules for TWO singulary transformation out of THREE choices (passivisation/ interrogation/ negation) (3 marks each; 3x2= 6)
- Difficulty level:
    - Part I: 8 EASY questions (to answer 5) (10 marks)
    - Part II: 8 AVERAGE questions (to answer 4) (20 marks)
    - Part III: AVERAGE (Transcription, to answer ONE ; (5 marks)
    - Part IV: EASY and AVARAGE (Essays, to answer 2 out of 4; 30 marks)
    - Part V: DIFFICULT questions (10 marks)

English Language Teaching : Theory and Practice

- Part I (2 mark questions; to answer 5 out of 8): At least ONE question from each of the FIVE modules.
- Part II (5 marks: Short notes; 4 out of 8). At least ONE question from each of the FIVE modules.
- Part III (15 marks)
    - Section A: Essay question: To answer 2 out of 4 questions. The fours questions to be from the FIVE modules (with not more than ONE question from any one module).

    Section B: Lesson Plan: To answer one out of two questions. To be based on i) a given poem or ii) a given passage to teach a grammar point.
- Difficulty level:
    - Part I: 8 EASY questions (to answer 5) (10 marks)
    - Part II: 8 AVERAGE questions (to answer 5) (25 marks)
    - Part III:
        - Section A: EASY (direct) questions (to answer 2) (30 marks)
        - Section B: DIFFICULT questions (10 marks)

For Electives

Part I

- The same pattern as for core papers - very short answers of 50 words - 8 questions - 5 to be answered.
- FOUR questions each shall be asked only from Modules 2 and 3. Otherwise TWO questions each may be asked from all four modules.

Part II

- No annotations/critical comments to be asked in the elective papers. Instead, Part II of the question

paper should contain **8** questions for short notes of which **5** have to be answered. , with questions form all THREE MODULES EQUALLY

Part III

- Essay questions- The same pattern as for core papers Difficulty level:

Part I: EASY; Part II: AVERAGE; Part III: One section EASY; one section AVERAGE; one section DIFFICULT

NOTE ON INTERNAL TEST QUESTION PAPER PATTERN

- The same pattern in the 2017 syllabus may be followed.

NOTE ON PROJECT GUIDELINES

- The Project Guidelines for the 2017 syllabus shall continue. **MLA 8th edition is to be followed for citations.**

SEMESTER 1

Paper I- EL.511: British Literature I

(Core Course 1: 6 hours/week)

Aim:

To acquaint the students with the origin and development of English literature from Anglo- Saxon period to the age of Transition in the 18th century.

Course Objectives:

The objectives of this Course are to

- familiarize the students with the socio-political background of English literature
- develop in students a historical awareness of the evolution of poetry, drama, prose, fiction, and literary criticism through these ages.
- help them examine critically the contributions of poets, dramatists, prose writers, and critics during the period.
- Teach them the structural/formal and stylistic features of various representative texts of the period.

Course Outcomes

The students would have

CO 1: Comprehended the various socio-political and literary movements from the Anglo-Saxon to the age of Transition.

CO 2: Identified the writers and their works of the period from Anglo-Saxon to the age of Transition.

CO 3: Analysed the characteristic literary styles of the essayists, dramatists, and writers from Anglo-Saxon to the age of Transition.

COURSE OUTLINE

Module I :Old English Literature to the Renaissance

Module outcomes:

Students would have

MO 1: understood the socio-political and literary movements in the Anglo- Saxon, Norman and th Renaissance periods.

MO 2: appreciated the poetry of Bede, Chaucer, and other works of the Anglo - Saxon, Norman and the Renaissance periods.

MO 3: analysed the literary style of the writers in the Anglo-Saxon, Norman and the Renaissance periods.

Unit 1

Anglo-Saxon literature—Christianity and Old English Poetry- Bede, Beowulf, Caedmon, Cynewulf, Anglo- Saxon Prose- King Alfred, Norman Conquest- Romances- Chaucer, William Langland, John Gower, Travels of Sir John Mandeiville, John Wycliff- the English Chaucerians- Scottish Chaucerians- Ballads- Printing Press and Caxton-Tyndale- Bible Translations- Mystery plays- Moralities and Interludes-Sir Thomas Wyatt- Surrey-Thomas More

Venerable Bede- "Death Song" https://rpo.library.utoronto.ca/content/bedes-death-song-0

Chaucer: "The Legend of Cleopatra" (Excerpt from The Legend of Good women) http://public-library.uk/ebooks/41/3.pdf

https://www.poetryintranslation.com/PITBR/English/GoodWomen.php

Thomas More- *Utopia*

Ballads- "Sir Patrick Spens."

Sir Thomas Wyatt- "Farewell Love"

Module II :The Elizabethan Age and the Age of Miton

Module outcome:

Students would have

MO 1: Related to the socio-political and literary movements from the era of Queen Elizabeth to Milton

MO 2: critically read the poets, writers and major works from the Elizabethan age to Milton's age

MO 3. Analysed the literary style of the writers from the Elizabethan age to Milton's age.

Unit 2

Golden Age of Literature- Elizabethan poetry- Jacobean Poetry-Sir Philip Sydney, Edmund Spenser, Sonnets, Shakespeare, Ben Jonson, John Donne, Francis Bacon, Prose Romances- The University Wits, John Webster

Sir Philip Sidney: Astrophil and Stella 3: "Let dainty wits cry on the sisters nine"

https://www.poetryfoundation.org/poems/45153/astrophil-and-stella-3-let-dainty-wits-cry-on-the-sisters-nine

Spenser- *Prothalamion*

Francis Bacon- "Of Truth", "Of Marriage and Single Life"

Thomas Kyd- *The Spanish Tragedy*

Unit 3

The Stuart Age- Puritanism- John Milton- John Donne- Metaphysical Poetry-Cavalier Poets- Sir Thomas Browne

John Milton- *Paradise Lost,* "Book X" lines 1-228. (Meanwhile….intercession sweet)

https://resources.saylor.org/wwwresources/archived/site/wp-content/uploads/2012/08/ENGL402-Milton-Paradise-Lost-Book-10.pdf

John Donne- "Batter my Heart"

Andrew Marvell- "To His Coy Mistress"

Critical Reading:

H. W. Peck. "The Theme of Paradise Lost." PMLA 29.2 (1914): 256-69. JSTOR. Web.

http://www.jstor.org/stable/pdf/457078.pdf

Module III :Restoration to the 18th century

Module outcome:

Students would have

MO 1: Understood the socio-political and literary movements from the Restoration age to the 18th century.

MO 2: Distinguished the poets, writers and major works from the Restoration age to the 18th century.

MO 3. Evaluated the literary style of the writers from the Restoration age to the 18th century.

.**Unit 4**

The Restoration- Neo Classicism- Dryden- Rise of Prose-John Bunyan -Restoration Drama- Comedy of Manners- Rise of Political Parties- Clubs and Coffee Houses- Alexander Pope- Periodical essay- Daniel Defoe- Jonathan Swift- Steele- Addison- Dr.Johnson-

John Dryden "Macflecknoe"

Alexander Pope- "Rape of the Lock"

Jonathan Swift- "A Vindication of Sir Issac Bickerstaff"

Module IV: The Age of Transition

Module outcome:

Students would have

MO 1: Comprehended the literary changes during the Transition age.

MO 2: Distinguished the poets, writers and major changes that happened with the rise of novel in the mid 18th century.

MO 3. Evaluated the literary style of the writers in the transitional 18th century.

Unit 5

Transitional Poets- Robert Burns- William Blake-Thomas Gray-Oliver Goldsmith- Sentimental Comedy- Colley Cibber – Richard Steele — Anti-Sentimental Comedy– Oliver Goldsmith - R B Sheridan

Robert Burns- "A Red Red Rose", "Halloween"

Thomas Gray- "Elegy Written in a Country Churchyard".

R B Sheridan- *The School for Scandal*

Unit 6

The Four Wheels of the Novel- Realism- Gothic Romance- Miss Fanny Burney- Mrs. Anne Radcliffe- Mary Wollstonecraft- Mary Shelley

Samuel Richardson- *Pamela*

Mary Shelley - *Frankenstein*

Critical Reading

Watt, Ian. "Realism and the Novel Form." *The Rise of the Novel*. 1957. 2nd American ed. California: U of California P, 2001. 9-30.

Reading List

Alden, Raymond M. *Elizabethan Humours and the Comedy of Ben Jonson*. archive.org. Web. <https://archive.org/stream/elizabethanhumo01clubgoog#page/n9/mode/2up>.

Boitani, Piero and Jill Mann, ed. *The Cambridge Companion to Chaucer*. UK: Cambridge UP, 2003.

Caudle, Mildred Witt. "Sir Thomas More's Utopia: Origins and Purposes." *Social Science* 45.3 (1970): 163-69. JSTOR. Web. <http://www.jstor.org/stable/41959507>.

Coursen, Jr, Herbert R. "The Unity of The Spanish Tragedy." *Studies in Philology* 65.5 (1968): 768-82. JSTOR. Web. <http://www.jstor.org/stable/4173620>.

Eliot, T.S. "The Metaphysical Poets." *T.S. Eliot: Selected Essays* 1917-1932. New York: Harcourt, Brace and Company, 1932. 241-50.

Ellis-Fermor, Una. *Jacobean Drama: An Interpretation*. London: Methuen, 1936.

Engeman, Thomas S. "Hythloday's Utopia and More's England: An Interpretation of Thomas More's Utopia." The Journal of Politics 44.1 (1982): 131-49. JSTOR. Web. <http://www.jstor.org/stable/2130287>.

Ford, Boris, ed. *The Age of Chaucer. The Pelican Guide to English Literature*. Vol.1. Harmondsworth: Penguin, 1972.

Grierson, Herbert J.C., ed. *Metaphysical Lyrics and Poems of the 17th Century*. Revised by Alastair Fowler. London: Oxford UP, 1995.

Kamholtz, Jonathan Z. “Thomas Wyatt’s Poetry: The Politics of Love.” Criticism 20.4 (1978): 349-65. JSTOR. Web. < http://www.jstor.org/stable/23102683>.

Kay, Carol McGinnis. “Deception through Words: A Reading of The Spanish Tragedy.” *Studies in Philology* 74.1 (1977): 20-38. JSTOR. Web. <http://www.jstor.org/stable/4173925>.

Sampson, George. *The Concise Cambridge History of English Literature*. 3rd ed. Cambridge: Cambridge UP, 1970.

The Cambridge History of English and American Literature. Bartelby.com. Web. <http://www.bartleby.com/cambridge/>

SEMESTER I

Paper II: EL.512 : British Literature II

(Core Course 2: 6 hours/ week)

Aim

To acquaint students with the origin and development of English literature from Romantic Age to 20th century.

Course Objectives

The objectives of this Course are to

- familiarize the students with the socio-political background of English literature
- develop in students a historical awareness of the evolution of poetry, drama, prose, fiction, and literary criticism through these ages.
- help them to examine critically the contributions of poets, dramatists, prose writers, and critics during the period.
- Teach them to explore the structural/formal and stylistic features of various representative texts of the period.

Course Outcome

The students would have

CO 1: comprehended the various socio-political and literary movements from the Romantic Age period to 20th century.

CO 2: identified the writers and their works of the period from Romantic Age period to 20th century.

CO 3: analysed the characteristic literary styles of the essayists, dramatists, and writers from Romantic Age period to 20th century.

COURSE OUTLINE

Module I :The Romantic Age

Module Outcome:

The students would have

MO 1: understood the socio-political, historical and literary movements in the Romantic age

MO 2: become familiar with the major the poets, essayists, and dramatists of the Romantic Age

MO 3. analysed the literary style of the writers in the Romantic Age.

Unit 1

The Beginnings of Romanticism- influence of French Revolution- *Preface to the Lyrical Ballads*- William Wordsworth- Coleridge-Walter Scott -Byron- Shelley- Keats- Lamb-Hazlitt-Thomas De Quincey-Sir Walter Scott-Historical novel- Jane Austen

William Wordsworth- "Tintern Abbey Lines"

Coleridge- "Frost at Midnight".

Keats- "Ode to a Nightingale"

P B Shelley- "Ozymandias"

Charles Lamb- "Oxford in the Vacation"

Jane Austen- *Emma*

Critical Response

Bloom, Harold. "Prometheus Rising: The Backgrounds of Romantic Poetry". *The Visionary Company. A Reading of English Romantic Poetry.* 1961. Rev. and enl. ed. Ithaca: Cornell UP, 1971. xiii-xxv.

Module II :The Victorian Age

Module outcome:

Students would have

MO 1: understood the socio-political and literary movements in the Victorian age.

MO 2: become familiar with the poets, essayists, and dramatists during the reign of Queen Victoria.

MO 3. analysed the literary style of the writers in the Victorian Age.

Unit 2

Victorian era- Spread of Science and Technology- Conflict between Science and Religion-Utilitarianism-Victorian Compromise-Tennyson-Browning-Dramatic Monologues- Arnold - Elizabeth Barret Browning-Fitzgerald- Pre Raphaelite poetry- D G Rossetti- William Morris-Swinburne-Decadent poetry-Carlyle- Ruskin-Macaulay-Cardinal Newman and The Oxford Movement- R L Stevenson-Charles Dickens-William Thackeray- Thomas Hardy-Wessex novels-George Eliot-Mrs Elizabeth Gazkell-Bronte sisters-Oscar Wilde

Tennyson- "The Lotus Eaters"

Browning- "Porphyria's Lover"

Christina Rossetti- "Dreamland"

Charles Dickens- *David Copperfield*

Charlotte Bronte- *Jane Eyre*

Matthew Arnold - "Sweetness and Light" (from *Culture and Anarchy* p:13-18 upto.. fault of over-valuing machinery) http://public-library.uk/ebooks/25/79.pdf

Module III : Early Twentieth Century Literature

Module outcome:-

Students would have

MO 1: familiarized themselves with the socio-political and literary movements in early 20th century English literature

MO 2: critically read the poets, essayists, and dramatists of the early 20th century.

MO 3: distinguished the literary style of the writers in the early 20th century.

Unit 3

Georgian and Edwardian Poets- Robert Bridges -W. B Yeats- Symbolist Movement- Irish Literary Revival-World Wars I & II and the inter-war years-I WW poetry- Wilfred Owen-

Seigfred Sassoon-Rupert Brooke-Imagism-Modernist Poetry- T S Eliot - Prose criticism- T S Eliot--I A Richards-F R Leavis- Psychological novel- D H Lawrence-Stream of Consciousness-Virginia Woolf-James Joyce-Joseph Conrad- E. M. Forster-Somerset Maugham-Detective novel-

W.B.Yeats- "Adam's Curse"

Rupert Brooke- "Peace"

D.H.Lawrence- "Bat"

T S Eliot- "The Wasteland"

Virginia Woolf- *Mrs Dalloway*

James Joyce- "After the Race"

https://theshortstory.co.uk/devsitegkl/wp-content/uploads/2015/07/Joyce-James-After-the-Race-short-stories.pdf

Unit 4

Poets of the thirties-W.H Auden- Stephen Spender- Louise MacNeice- surrealism- Apocalyptic poetry- Dylan Thomas- Prose criticsm- Raymond Williams- Terry Eagleton-New Drama-Influence of Ibsen-Problem play-Shaw-Abbey Theatre-

W.H.Auden - " Stop all the Clocks…"

Dylan Thomas- "Poem in October"

G B Shaw- *Pygmalion*

Terry Eagleton – "Versions of Culture" (from *The Idea of Culture* p.7-12 upto ….embodies our common humanity.) https://edisciplinas.usp.br/mod/resource/view.php?id=2672164

Module IV: Post War Literature

Module outcome:

Students would have

MO 1: understood the literary movements during the Post-war English literature

MO 2: familiarized with the poets, essayists, and dramatists of the post-war scenario.

MO 3: distinguished the literary style of the writers in the of the post-war English literature.

Unit 5

Movement Poetry-Philip Larkin-Confessional poetry-Sylvia Plath- Poets of the 50's- Ted Hughes-Mavericks- Seamus Heaney- Andrew Motion-1980's- Benjamin Zephaniah- The Essay- G K Chesterton- Max Beerbohm- Bertrand Russell- A G Gardiner- Aldous Huxley- George Orwell- E V Lucas- Biography-Lytton Stratchey-Periodicals- Little Magazine-

Ted Hughes - "Hawk Roosting"

Seamus Heaney- "Casualty"

Alice Oswald- "Body"

Carol Ann Duffy- "War Photographer"

George Orwell - "Reflections on Gandhi"

Unit 6

Modernist theatre- Angry Young Man- Theatre of the Absurd-Samuel Beckett-Theatre of Cruelty- Kitchen sink drama- Comedy of Menace- Harold Pinter-Tom Stoppard -Caryl Churchill-Charlotte Keatley- In-Yer-face- theatre- Post War Fiction-Graham Greene- William Golding-Campus novel-Evelyn Waugh-C P Snow- Kingsley Amis-Lawrence Durrell-Christopher Isherwood- Doris Lessing-Muriel Spark-Angela Carter- J K Rowling

John Osborne - *Look Back in Anger*

Samuel Beckett- *Waiting for Godot*

Angela Carter- *Nights at the Circus*

Reading List

Alexander, Michael. *A History of English Literature*. Chennai: Palgrave Macmillian, 2007.

Bloom, Harold. *The Visionary Company: A Reading of English Romantic Poetry*. 1961.

Rev. and enl.ed. Ithaca: Cornell UP, 1971.

Bowra, Cecil Maurice. *The Romantic Imagination*. 1949. London: Oxford UP, 1964.

Bradbury, Malcolm. *The Social Context of Modern English Literature*. New York: Schocken, 1971.

Brantlinger, Patrick. *Victorian Literature and Postcolonial Studies*. Edinburgh: Edinburgh UP, 2009.

Bush, Douglas. *Mythology and Romantic Traditions*. 1937. New York: Pageant, 1957.

Cordery, Gareth. "Foucault, Dickens, and David Copperfield." *Victorian Literature and Culture* 26.1 (1998): 71-85. JSTOR. Web. <http://www.jstor.org/stable/25058404>.

Evans, Ifor. *A Short History of English Literature*. New York: Penguin, 1990.

Frye, Northrop. *A Study of English Romanticism*. New York: Random House, 1968.

Grierson, Sir Herbert John and James Cruickshanks Smith. *A Critical History of English Poetry*. 1946. London: Bloomsbury Academic, 2013.

Head, Dominic. *The Cambridge Introduction to Modern British Fiction*. Cambridge: Cambridge UP, 2002.

Hoerner, Fred. "Nostalgia's Freight in Wordsworth's "Intimations Ode"" ELH 62.3 (1995): 631-61. JSTOR. Web. <http://www.jstor.org/stable/30030094>.

Leavis, F.R. *New Bearings in English Poetry*. Harmondsworth: Penguin, 1963.

Levenson, Michael, ed. *The Cambridge Companion to Modernism*. 1999. Cambridge: Cambridge UP, 2003.

Perkins, David. *A History of Modern Poetry: From the 1890s to the High Modernist Mode*. Cambridge: Harvard UP, 1976.

Watt, Ian, ed. *The Victorian Novel: Modern Essays in Criticism*. London: Oxford UP, 1971.

Williams, Raymond. *Drama from Ibsen to Brecht*. 1965. Rev. ed. London: Penguin, 1973.

SEMESTER I

Paper III: EL.513: Shakespeare Studies

(Core Course 3: 6 hours/week)

Aim

To enable students to read Shakespeare's plays in the context of Elizabethan literature as well as in the post-colonial contexts, and to appreciate the language, themes and transcultural appeal of Shakespeare's works.

Course Objectives

The objectives of this Course are to

- give students an overview of the political, cultural, and social milieu of Shakespeare.
- introduce students to the works of Shakespeare i.e., his plays and sonnets and place them within the context of Elizabethan literature.
- enable students to understand plot, characterization, and stagecraft.
- give students an understanding of Shakespeare's diverse contributions to language and literature.
- develop in students insights into contemporary adaptations of Shakespeare, with special emphasis on the transcultural appeal of Shakespearean works.

Course Outcomes

The students would have

CO 1: gained competence to critically analyse the selected plays and sonnets of Shakespeare.
CO 2: gained an understanding of the critical perspectives on Shakespeare.
CO 3: developed an overview of Shakespeare performances and adaptations and their influence on English language and literature through the ages.

Course Description

Module 1: The Proscenium Arch

Module Outcomes

The students would have

MO1: understood the socio – political climate of the Elizabethan age

MO 2: analysed the structure of the Shakespearean theatre and performances in them

MO 3: gained an insight into the influences on Shakespeare and the sources of his plays

MO 4: developed and understanding of the plays and their classification as well as the major themes explored

Unit 1

Social, political, and literary background of Elizabethan England and its reflection in Shakespeare's plays – life of Shakespeare – Elizabethan stage - the production of the plays – sources, actors, theatres, collaborators, and audience — classification of the plays – editions – the quartos and folios – Hemmings and Condell – later editions – major Shakespearean criticism- major themes, relevant discourses and interpretations

Critical Reading

1. Samuel Johnson: "Preface to Shakespeare" (Macmillan Edition, Paragraphs 1- 60)
2. Jonathan Dollimore: "Introduction: Shakespeare, Cultural Materialism and the New Historicism"

Concepts for Unit 2 and 3

Basic structure of the Shakespearean plot - literary elements in the plays – Senecan influence – characters – women in Shakespearean plays – use of supernatural elements, Shakespeare's use of language- blank verse, imagery, quibbles, soliloquy and aside, kinds of irony employed, disguise – discourses encountered in Shakespearean plays like imperialism, humanism, feudalism, homosexuality, and patriarchal dominance

Unit 2

1. *Hamlet*

Unit 3

2. *Twelfth Night*

Module 2: The Bard's Quill

Module Outcome

Students would have

MO 1: understood the structure and the form of the Shakespearean sonnet

MO 2: appreciated the socio historical significance of the sonnets with reference to the Elizabethan and later periods

MO 3: explored the language and themes of the sonnets

Unit 4

Concepts

Structure of the Shakespearean sonnet – classification – dedication of the sonnets – major themes

Sonnets

1. Sonnet 17 – "Who will believe my verse in time to come"
2. Sonnet 78- "So oft have I invoked thee for my muse"
3. Sonnet 147- "My love is as a fever longing still"
4. Sonnet 152- "In loving thee thou know'st I am forsworn"

Critical Reading

- *Shakespeare's Sonnets and the History of Sexuality: A Reception History*
  Bruce R. Smith

http://www.blackwellpublishing.com/content/BPL_Images/Content_store/Sample_Chapter/0631226354/001.pdf

Module 3: From Stage to Screen and Back

Module Outcome:

Students would have

MO 1: gained an understanding of the adaptations of Shakespeare with particular reference to modern theatre and film

MO 2: understood the difference in reception towards drama and film

MO 3: analysed the use of technology to enhance Shakespeare

Unit 5

Concepts

Shakespearean film adaptations- Shakespeare in modern theatre - technics of adaptation-cultural differences – differences in the reception of drama and film- film audiences - use of technology – adapting tragedy for screen

1. BazLuhrmann - *Romeo+Juliet*
2. Akira Kurasawa - *Throne of Blood*
3. Peter Brook - *King Lear*

Critical Reading

Anthony Davies- Peter Brook's *King Lear* and Akira Kurosawa's *Throne of Blood*
https://www.cambridge.org/core/books/abs/filming-shakespeares-plays/peter-brooks-king-lear-and-akira-kurosawas-throne-of-blood/97BD57B6A225BC021559788FFA7752E7

Module 4: Contemporary Shakespeare(s)

Module Outcome:

Students would have

MO 1: understood how Shakespeare has influenced 21st fiction

MO 2: analysed the retellings of Shakespeare with special reference to adaptations portraying different endings and perspectives

Unit 6
Concepts

Shakespeare and the 21st Century Novel- popular fictional adaptions of Shakespeare – feminist and postcolonial retellings – adaptations with alternative endings and perspectives

1. Margaret Atwood- *Hag-Seed*
2. Ian McEwan- *Nutshell*

Critical Reading

Ania Loomba - "Shakespeare and the Post-Colonial Question"
https://www.taylorfrancis.com/chapters/mono/10.4324/9780203708767-7/introduction-shakespeare-post-colonial-question-ania-loomba-martin-orkin-ania-loomba-martin-orkin

Question Paper Pattern

Part I (10 marks; 2 mark questions; to answer 5 out of 8)

- Part II (25 marks; Critical Comments / Short notes; to answer 5 out of 8).
- Part IV: Essay (40 marks; 3 out of 9):
  - Section A (15 marks; 3 questions): THREE questions from the drama texts prescribed in Module II;
  - Section B (15 marks; 3 questions): TWO questions from the adaptations of Shakespeare's plays, and ONE from Poetry;
  - Section C (10 marks; 3 questions): Critical Question
  - Difficulty level: As in the core papers

Reading List

1. Daniel Fischlin, Mark Fortier(eds), *Adaptations of Shakespeare: An Anthology of Plays from the 17th Century to the Present*. United States, Taylor & Francis, 2014.
2. Bloom, Harold. *Shakespeare: The Invention of the Human*. New York: Riverhead Books, 1998.
3. Barber, Cesar Lombardi. *Shakespeare's Festive Comedy: A Study of Dramatic Form and its Relation to Social Custom.* Princeton: Princeton UP, 1972.
4. Bate, Jonathan, and Dora Thornton (eds), *Shakespeare: Staging the World.* London: British Museum, 2012.
5. Bradley, A.C. Introduction. *Shakespearean Tragedy*. London: Penguin 1991.
6. Briggs, Julia, *This Stage-Play World: English Literature and its Background, 1580-1625*. Oxford: Oxford University Press, 1983.
7. Bryson, Bill. *Shakespeare: The World as Stage*. London: Harper Collins. 2007
8. Crystal, David and Ben Crystal. *Shakespeare's Words: A Glossary and Language Companion*. New York: Penguin Group, 2002.
9. Dollimore, Jonathan and Alan Sinfield ed. *Political Shakespeare: New Essays in Cultural Materialism*. Ithaca: Cornell UP 1985

10. Eastman, Arthur M. *A Short History of Shakespearean Criticism*. New York: Random, 1968
11. Eliot, T.S. *Selected Essays*, 1917-1932. San Diego: Harcourt, Brace and Company, 1932
12. Greenblatt, Stephen. *Will in the World: How Shakespeare Became Shakespeare*. New York: W.W. Norton & Co., 2004.
13. --. *Shakespearean Negotiations: The Circulation of Social Energy in Renaissance England*. Berkeley: University of California Press, 1988.
14. Green MacDonald, Joyce. *Shakespearean Adaptation, Race and Memory in the New World. Germany*, Springer International Publishing, 2020.
15. Greer, Germaine. *Shakespeare's Wife*. New York: Harper Perennial, 2009
16. Gurr, Andrew. *The Shakespearean Stage, 1574-1642*. Cambridge: Cambridge University Press, 1980.
17. Hoenselaars, Ton, ed., *The Cambridge Companion to Shakespeare and Contemporary Dramatists*. Cambridge: Cambridge University Press, 2010.
18. Jones, Ernest. *Hamlet and Oedipus*. New York: Norton, 1976.
19. Kermode, Frank. *Shakespeare's Language*. New York: Farrar, Straus and Giroux, 1998.
20. Loomba, Ania. *Shakespeare, Race, and Colonialism*. United Kingdom, OUP Oxford, 2002.
21. Rosenthal, Daniel. *100 Shakespeare Films*. United Kingdom, Bloomsbury Publishing, 2019.
22. Spurgeon, Caroline F.*E Shakespeare's Imagery and What it Tells Us*, Cambridge: Cambridge UP, 2004.
23. *The Cambridge Companion to Shakespeare on Film*. United Kingdom, Cambridge University Press, 2007.
24. Wells, Stanley and Lena Cowen, eds *Shakespeare:An Oxford Guide*. Indian ed. New Delhi: Oxford UP, 2007
25. Wilson, John Dover. *What Happens in Hamlet*. 1935. Cambridge: Cambridge UP, 2003

SEMESTER I

Paper IV: EL.514 : Language Studies

(Core Course 4: 7 hours/week)

Aim

This course aims to help the students to study the paradigms of language and linguistics and to help the students to learn and articulate language at the phonological, morphological and syntactic levels

Course Objectives

The objectives of this Course are to

- familiarize the students with the various disciplines of language studies and linguistics
- give them an insight into the features of language units at the phonological, morphological and syntactic level
- enable the students to produce and comprehend spoken and written language structures
- teach the students to examine the linguistic concepts of the western and eastern theorists and the current theories of language

Course Outcomes

The students would have

CO 1: understood the basic concepts, branches and history of linguistics.
CO 2: learned to describe and analyze language units based on their phonological, morphological and syntactical features
CO 3: learned to explain the transformation of sentences based on TG grammar
CO 4: gained competence to use language effectively with a conscious understanding of its features, syntactic structures and uses

Course Description

Module 1: Introducing Linguistics

The students would have
MO 1: developed an awareness of the basic nature of language and the different terms related to it.
MO 2: become familiar with the various branches of linguistics and the history of linguistics.

Unit 1

Introduction- Nature and scope- Branches of Linguistics- Sociolinguistics, Historical linguistics, Psycholinguistics, Neuro-linguistics

Linguistics in West and East-Indian Linguistics- Panini, Patanjali, Bhartrhari- Western Linguists- Saussure, Bloomfield, Noam Chomsky

Approaches to the study of language- Diachronic and Synchronic- Prescriptive and Descriptive- Traditional Grammar and its fallacies- Features of Modern Grammar - Language as a system of signs- Sign, Signifier, Signified-Langue, Parole, Competence and Performance, Syntagmatic and Paradigmatic

Module 2: Phonetics and Phonology

Module Outcomes

The students would have
MO 1: gained an understanding of the basics of English phonology and phonetics
MO 2: aquired good pronunciation and transcription skills

Unit 2

Phonetics- definition-types – Articulatory, Acoustic and Auditory- Speech mechanism- Organs of speech- Speech sounds- classification- Vowels- Cardinal Vowels, Consonants, three part

labeling- Phonology- suprasegmental features- word stress, stress shift- primary and secondary stress- Phonemes- allophones and their distribution

Unit 3

Transcription- Syllable structure- word stress and sentence stress- strong and weak forms- Rhythm, Juncture, Intonation, Assimilation- Elision

Varieties of language- Dialect, Register, Pidgin, Creole- RP- IPA- GIE

Module 3: Morphology, Semantics and Pragmatics

Module Outcomes

The students would have
MO1: analysed language units based on their phonological, morphological and syntactic features.
MO 2: distinguished the different levels of meanings of words

Unit 4

Morphology- Morphemes- classification- Free and Bound- Roots and Affixes- Lexical and Grammatical- Inflectional and Derivational- allomorphs and their distribution- Morpho-phonemics

Word classes- Form class and Function class- Nouns- Verbs- Adjectives, adverbs, prepositions, pronouns, determiners, modifiers, conjunctions, auxiliary verbs

Unit 5

Semantics: Meaning, conceptual meaning, associative meaning- Lexical semantics: antonymy, synonymy, hyponymy, homonymy and polysemy

Pragmatics: Content and meaning, invisible meaning

Module 4: Syntactic Theories

Module Outcomes

The students would have

MO 1: developed an awareness of the principles and limitations of ICA and PSG

MO 2: become aware of new research areas in the field of linguistics.

Unit 6

Syntax-theories and analysis- ambiguity and limitations- PS grammar- PS rules- limitations- TG grammar-transformational and generative – deep and surface structure- Aspect Model of Chomsky- Transformations: a) Singularly- Interrogation, Negation, Passivisation, Tag Questions, b) Double based- relativisation, complementation, adverbalisation, co-ordination

Module 5 : Recent Developemnts

Module Outcomes

The students would have
MO 1: gained an insight into the recent trends in Linguistics
MO 2: identified new areas of research

Unit 7

Tagmemics - Chomsky's Trace Theory(1980) Model- Case, government and binding- Discourse analysis, Speech Act theory- Applied Linguistics - Contrastive Linguistics - Neurolinguistics - Forensic Linguistics

Question Paper pattern

- Part I (10 marks; 2 mark questions; to answer 5 out of 8;): At least one question from ALL FIVE modules.
- Part II (20 marks: Short notes; 4 out of 8). TWO questions each from FIRST FOUR modules.
- Part III (5 marks) ONE transcription passage, without choice
- Part IV (15 x 2= 30 marks)
    - Essay question: To answer 2 out of 4 questions. ONE question to be asked from the first FOUR modules
- Part V : Practical Application: (10 marks, 4 + 6)
    - To resolve TWO ambiguities out of FOUR (through IC analysis or TG grammar) (2 marks each, 2x2= 4)

        - To derive PS and T Rules for TWO singulary transformation out of THREE choices (passivisation/ interrogation/ negation) (3 marks each; 3x2= 6)
- Difficulty level:
    - Part I: 8 EASY questions (to answer 5) (10 marks)
    - Part II: 8 AVERAGE questions (to answer 4) (20 marks)
        - Part III: AVERAGE (Transcription, to answer ONE ; (5 marks)
        - Part IV: EASY and AVARAGE (Essays, to answer 2 out of 4; 30 marks)
        - Part V: DIFFICULT questions (10 marks)

Reading List

Balasubramaniam, T. *A Textbook on Phonetics for Indian Students*. Macmillan. 1981.

Caplan, David. *Neurolinguistics and Linguistic Aphasiology: An Introduction*. Cambridge University Press. 1987.

Chomsky, Noam. *Aspects of the Theory of Syntax*. MIT Press, 1965.
Coulthard, Malcolm and Alison Johnson. *An Introduction to Forensic Linguistics: Language in Evidence*. London and New York: Routledge.2010.

Coulthard, Malcolm and Alison Johnson (eds.)_The Routledge Handbook of Forensic Linguistics._ London and New York: Routledge. 2013.

Crystal, David. *Introducing Linguistics*. Penguin. 1992.

Fabb, Nigel. *Linguistics and Literature*. Wiley-Blackwell. 1997.

Finch, Geoffrey. *How to Study Linguistics*. New York: St.Martin's Press. 1999.

Fries, C.C. *The Structure of English*. Prentice Hall Press (New Edition).1977.

Ingram, John C.L. *Neurolinguistics: An Introduction to Spoken Language Processing and Its Disorders*. Cambridge University Press. 2007.

Leach, Geoffrey N. *Semantics*. Penguin. 1976.

Palmer, Frank. *Grammar*. Penguin. 1972.

Quirk, Randolf and Sydney Greenbaum. *A University Grammar of English*. Pearson. 2002

Robins, R.H. *General Linguistics: An Introductory Survey*. Longman. 1971.

Saussure, Ferdinand de. *Course in General Linguistics*. Mc Graw- Hill. 1966.

Verma, S.K. and N.Krishnaswamy. *Modern Linguistics*. Oxford UP.198

SEMESTER II

Paper V: EL.521 : X World Literatures I

(Core Course 5 :6 hours /week)

Aim: To read, understand and reflect on texts from different socio-cultural and historical perspectives

Course Objectives

The objectives of this Course are to

- introduce students to world literature
- provide knowledge about cultural nationalism, multiculturalism and transnationalism in the postcolonial world
- develop intellectual flexibility, inclusivity, creativity and cultural literacy
- contextualize the unique traditions of the world, including aspects of time and space
- critically discuss the subtleties involved in regional aesthetics
- familiarise students with the concepts of plurality in global voices

Course Outcome

The students would have

CO 1: Recognised the various socio-cultural and political experiences and expressions seen in world literatures
CO 2: Learned the theoretical grounding to read literatures in English from different regions
CO 3: Recognised the ways in which transcultural flows affect the readings of texts across social and historical borders
CO 4: Analysed the discursive reach of English in shaping imaginative journeys across continents
CO 5: gained an understanding through reading, discussion and writing about literatures in different genres

Course Description

Module I : The Middle East

Module Outcome:

Students would have

MO 1: understood the socio-cultural background of Middle Eastern literature as well as place space and borders as a method of critical inquiry.
MO 2: identified the poets, dramatist and novelist of the region

MO 3: acquired a theoretical grounding to read literatures in English from different region.

Unit -1

Dalya Cohen-Mor (Editor). "Arab women writers: A Brief Sketch".
(*Arab Women Writers: An Anthology of Short Stories*. New York State UP. 2005. Pp 3-7)

Al-Khansaa – "Sleepless I Kept the Night's Vigil" (poem)

https://www.poemhunter.com/poem/sleepless-i-kept-the-night-vigil/

Maram al Massi – (14) "Women Like Me…" (from A Red Cherry on a White Tiled Floor) (poem)

https://www.narrativemagazine.com/issues/poems-week-2008-2009/poem-week/red-cherry-white-tiled-floor-maram-al-massri

Tawfiq al-Hakim – *The Sultan's Dilemma* (play).

(from Denys Johnson-Davies (Editor). *The Essential Tawfiq Al-Hakim: Great Egyptian Writers* (Modern Arabic Literature). The American University in Cairo Press; Reprint edition, 2013.

Raja Alem – *Dove's Necklace* (novel) Abrams & Chronicle Books, Reprint edition, 2018.

Khaled Khalifa - *Death is Hard Work* (novel). Hachette – Antoine, 2016.

Module II: South Asia

Module Outcome:

Students will be able to

MO 1: understand the literatures of South Asia, the impact of colonialism, the trauma of partition and its socio-political impacts in the area.
MO 2: Identify the poets, dramatist and novelist of the region

MO 3: understand the concepts of Post-colonialism, neo-colonialism, transculturation, power dialogism, identity crisis, gender disparity and suppression.

Unit -2
Imtiaz Dharker – "Purdah I" (poem)

https://www.poetryinternational.org/pi/poem/2823/auto/0/0/Imtiaz-Dharker/PURDAH-1/en/tile

Tsering Wangmo Dhompa – "She Is" (poem)

https://www.poetryfoundation.org/poems/54718/she-is

Ko Ko Thett – "Political Science" (poem)

https://chajournal.blog/2021/03/09/ko-ko-thett/

Urvashi Butalia – "Honour" (from *The Other Side of Silence: Voices from the Partition of India*) Penguin, 2007.

Mahmud Rahman – "Kerosene" (from *Killing the Water*) (short story). Penguin, 2010.

Mohammed Hanif – *A Case of Exploding Mangoes* (novel). Vintage Books, 2011.

Nayoni Munaweera – *Island of a Thousand Mirrors* (novel). St.Martins Press, 2014

Module III : Australia and New Zealand

Module Outcome:

Students would have

MO 1: understood the literatures of Australia and New Zealand, the aboriginal cultures and their narratives
MO 2: learned about the impact of colonial settlements, the repression of the indigenous population and their struggle for survival MO 3: evaluate the literary texts from a postcolonial perspective.

Unit - 3

Judith Wright – “Bullocky” (poem)

https://allpoetry.com/Bullocky

Banjo Paterson – “Waltzing Matilda” (poem)

https://allpoetry.com/Waltzing-Matilda

At the city pound by VIncent O'Sullivan (poem)

https://www.poetryfoundation.org/poetrymagazine/poems/145477/at-the-city-pound

Attitudes for a New Zealand Poet by Allen Curnow (poem)

https://www.poetryfoundation.org/poetrymagazine/browse?contentId=23694

Yellow Brick Road by Witi Ihimaera (Short Story)

https://englishwithhume.weebly.com/uploads/1/0/7/2/10723048/yellow_brick_road_by_witi_ihimaera.pdf

David Malouf - *Remembering Babylon* (novel)

https://urpdf.net/remembering-babylon-pdf/

Patricia Grace - *Potiki* (novel). University of Hawaii Press, 1995.

Module IV: European, UK and Ireland

Module Outcome:

Students would have

MO 1: understood and identified key concepts in European Literature-Realism, Naturalism, Expressionism, Symbolism, Surrealism etc
MO 2: learned about movements like Irish Literary Renaissance

MO 3: evaluated the social, political and cultural dimensions of the texts prescribed

Unit -4- European

Karin Boyes – Of Course It Hurts

https://www.karinboye.se/verk/dikter/dikter-engelska/of-course-it-hurts.shtml

Yehuda Amichai – Jews in the Land of Israel

https://www.poetryfoundation.org/poems/58629/jews-in-the-land-of-israel

Zofia Romanowics "To my little girl"

https://www.worldliteraturetoday.org/blog/poetry/four-poems-polish-holocaust-survivor-zofia-romanowicz

Fyodor Dostoyevsky – "The Heavenly Christmas Tree" (short story)

Italo Calvino – "Mushrooms in the City" from *Marcovaldo* (short story)

Wislawa Szymborska – "Utopia" (poem)

https://www.poemhunter.com/poem/utopia-27/

Unit -5- UK and Ireland

Philip Larkin - "Faith Healing"

https://www.poetryfoundation.org/poems/48413/faith-healing

Benjamin Zephania "People will always needeople"

https://www.best-poems.net/poem/people-will-always-need-people-by-benjamin-zephaniah.html

JM Synge – *The Tinker's Wedding* (play)

https://www.gutenberg.org/files/1328/1328-h/1328-h.htm

Stephen Baxter – "Last Contact" (short story)

https://epdf.tips/last-contact.html

Monica Ali – *In the Kitchen* (novel). Doubleday Publishers, 2009.

Reading List:

Boehmer, Elleke. Stories *of Women: Gender and Narrative in the Postcolonial Nation*.

Manchester UP. 2005.

Bondanella, Peter. "Italo Calvino and Umberto Eco: Postmodern Masters." *The Cambridge Companion to the Italian Novel*. Ed. Peter Bondanella and Andrea Ciccarelli. Cambridge UP. 2003. pp. 168 - 181.

Calder, Alex. *The Writing of New Zealand: Inventions and Identities.* Auckland UP. 2011.

Chomsky, Noam. "U.S Foreign Policy in the Middle East." *Power and Terror: Conflict, Hegemony, and the Rule of Terror.* Ed. John Junkerman and Takei Masakazu. Pluto. 2011. pp.169 - 196.

Cohen-Mor, Dalya (Editor). "Introduction" *Arab Women Writers: An Anthology of Short Stories*. New York State UP. 2005.

Datta, Nonica. Violence, Martyrdom and Partition: A Daughter's Testimony. Oxford India, 2012.

Flip, Sahim and Tahiti Uluc. " Contemporary Turkish Thought" in *The Blackwell Companion to Contemporary Islamic Thought.* Ed. Ibrahim M. Abu-Rabi. Blackwell. 2006.

Frye, Northrop: "Conclusion to *A Literary History of Canada*" *The Bush Garden: Essays on the Canadian Imagination*. Anansi. 1971.

Goldie, Terry. *Fear and temptation: the image of the indigene in Canadian, Australian, and New Zealand literatures*. McGill-Queen's Press-MQUP, 1993.

Klooss, Wolfgang. Ed. *Across the Lines: Intertextuality and Transcultural Communication in the New Literatures in English.* Rodopi. 1998.

Laachir, Karima, and Saeed Talajooy, eds. Resistance in contemporary Middle Eastern cultures: Literature, cinema and music. Vol. 44. Routledge, 2013.

Luckhurst, Mary, ed. *A Companion to Modern British and Irish Drama 1880-2005*. Blackwell. 2006

Mikhail, Mona N. "Middle Eastern Literature and the Conditions of Modernity: An Introduction." World Literature Today 60.2 (1986): 197-199.

Parrinder, Patrick. "On Englishness and the Twenty first Century Novel" *The Nation and Novel: The English Novels from its Origins to the Present Day.* Oxford UP. 2006.

https://in.1947partitionarchive.org/

SEMESTER II

Paper VI: EL.522 : Literatures of India

(Core Course 6: 6 hours/week)

Aim

To develop an understanding of history of the different ages and movements related to the growth of literatures of India, and to discover the significant authors, styles and traditions of the literatures of India.

Course Objectives:

The objectives of this Course are to

- develop in students an extensive insight into the different ages, movements, literary figures and traditions of the literatures of India
- build in them literary sensibility and linguistic competency through the reading of literary works
- develop competency in critical thinking and aesthetic analysis of literary works

Course Outcomes

The students would have

CO1: learned to distinguish the theoretical positions that present Indian literature as an essentialist category

CO2: identified the category of ' Literatures of India' in relation to the emerging discourses of nation, marginality, region, and resistance

CO3**:** learned to interpret the reading of literatures of India in vernacular ways through insightful critical perceptions

CO4**:** understood the role of translation in the making and unmaking of literary traditions

Course Description

Module 1

Theorising Indian Literature

Students would have

MO 1: understood the theoretical inroads to Indian English writings

MO 2:distinguished the differences in theoretical frameworks that can produce multiple readings of a text

MO 3: analysed the processes by which literatures of India become visible and available to the West

MO 4: evaluated the role of nationalism in Postcolonial Studies and of the novel as a privileged genre of the literary study of nationalism

Unit I

Concepts

The complex Indian literary traditions - possibilities and limits- theoretical positions that present literatures of India as an essentialist category- the disciplinary lens of genre and period- the role of journals, magazines, and publishing industry in popularising the novel - the colonial factor and English- the dialect and region - provincializing literatures of India - new approach to the study of texts and traditions - literatures of India in relation to the emerging discourses of marginality, region, and resistance –the pluralistic and performative elements of literatures in India –the role of translation in the making and unmaking of literary traditions—the role of translation in cultural and political mediations.

1. Raveendran, P.P. "Genealogies of Indian Literature." *Economic and Political Weekly.* vol. 41, no. 25, June 24-26, 2006, pp. 2558-563.
2. Ahmad, Aijaz:"'Indian Literature': Notes towards the Definition of a Category" in *In Theory: Nations, Classes, Literatures.* Oxford UP, 1992. P.256-265

Suggested Reading:

Das, Sisir Kumar. *A History of Indian Literature 1911-1956, Struggle for*

Freedom: Triumph and Tragedy. Sahitya Akademi, 1993.

Module 2

Indian Narrative Tradition

Students would have

MO1: understood the variety of narrative modes that existed in India from Vedic to pre -modern times, their exclusive features and narratives produced in other cultures

MO2: classified various forms of Indian narrative literature and analyse its content and nature

MO3: distinguished various forms of narration, including oral traditions which emerged in the literary circles of India

MO4: evaluated the art of narration as an important and independent genre of literature in ancient times

Unit 2 : Poetry, Drama, Prose

Concepts

Narrative tradition in India- Earliest works - Ancient Epics and folk narratives - Vedic, Puranic, Itihasa, Srinkhala, Anyapadesha, Mahakavya, Dravidian, Folk-Tribal, Mishra - Oral Literatures - Sanskrit literature – Tamil Sangam Literature- Prakrit Literature- Pali Canon- The Buddhist and the Jain narratives- Fables- Moral Stories - religious story telling-– Bhakti and Sufi Movements – origin and development of Indian Drama and theatre- Natya and Kavya - Performance and art - the relation between narrative and narratology

1.Kalidasa: “Meghadutam” Stanzas 1- 16. (Kalidasa. *The Loom of Time. A Selection of His Plays and Poems*, Translated and Introduced by Chandra Rajan, Penguin, 1989. pp.137-140.)

3. Kabir: *Poems:* “If caste was what the Creator had in mind?” (From *Songs of the Saints of India*, Trans. J.S. Hawley and Mark Juergensmeyer , OUP, 2004, pp.50-61)

4.Mirabai: “I saw the dark clouds burst” (From *Songs of the Saints of India*, Trans. J.S. Hawley and Mark Juergensmeyer , OUP, 2004, pp. 134-40.)

5.Ilanko Atikal: “The First Performance”, Canto 3, lines 1-37. (From *The Cilappatikaram:The Tale of an Anklet*, Trans. R. Parthasarathy, Columbia U P, 1993.)

6. Bhasa: “The Envoy” (Bhasa. *The Shattered Thigh and Other Plays*. Trans. A.N.D Haksar, Penguin, 2008.)

7.“The Gambler’s Lament.” (from *The Rig Veda: An Anthology*.Transl. and Ed. Wendy Doniger O’ Flahertt: Penguin, 2000.pp. 239-41.)

8. Mushraf Ali Farrooqi: “Introduction” (Muhammad Husain Jah. *Hoshruba: The Land and the Tilism*, *Tilism-e-Hoshruba*. Book One, Translated by Mushraf Ali Farrooqi, Random House, 2011.
https://minds.wisconsin.edu/bitstream/handle/1793/38014/07MusharrafHoshruba.pdf?sequence=1&isAllowed=y)

Suggested Reading

A.K. Ramanujan: “Is There an Indian Way of Thinking?: An Informal Essay,” *Contributions to Indian Sociology*, vol. 23, no.1, 1989, pp. 41-58.

Module 3 : Theorising the Nation

Module Outcomes

Students would have

MO1: understood the key themes, and images in literatures and cultures of India

MO2: distinguished the major issues shaping literary production within the larger framework of regional, social, political, and cultural contexts

MO3:learned to critique and interpret diverse forms of anti-colonial resistance, the power and limits of anti-colonial nationalisms and the exclusions of nationalist discourse

Concepts

Peasants Movements in India- The Revolt of 1857- notions of nationalism and nation in Indian English literature- the role of press- modalities with which nation- State evolved in Indian English writings - Gandhi - iconographies of nation- Modernist departures in Indian writing– Progressive Writers Movement- Partition literature - Discourses on Nationalism - Subalternity- – Dalit Aesthetics- India and globalisation- Decolonisation and Decanonization of English; Writings of Indian Diaspora- Post - partition literature- Post liberalization Indian novels and Dramatic Traditions- Role of IPTA (Indian People Theatre Association)- Millennial Indian writing

Unit 3 : Poetry and Drama

1. Kashiprasad Ghose: "To a Dead Crow" (From *The Golden Treasury of Indo-Anglian Poetry 1828-1965*, ed. Vinayak Kristna Gokak, Sahitya Akademi, 1970, p. 59.)
2. Agha Shahid Ali- "Postcard from Kashmir" (*India International Centre Quarterly* ,vol. 29, no. 2 (MONSOON 2002), pp. 73-80, https://www.jstor.org/stable/23005779)
3. Mamang Dai: "The Voice of the Mountain" (*India International Centre Quarterly* ,vol. 32, no. 2/3, Where the Sun Rises When Shadows Fall: The North-east (MONSOON-WINTER 2005), pp. 45-48. https://www.jstor.org/stable/23006007)
4. Vijay Nambisan: "Madras Central" (From Vijay Nambisan. *These Were My Homes*: *Collected Poems*. Speaking Tiger, 2018. https://1lib.in/book/18520141/344f58)
5. Badal Sircar. *Evam Indrajith.* Transl Girish Karnad. OUP 1975.

Suggested Reading

Harish Trivedi. "Theorizing the Nation: Constructions of "India" and "Indian Literature." *Indian Literature* vol.37, no.2, 1994. pp. 31-45.

Unit 4: Prose and Fiction

1. Vikram Chandra: “Dharma” (From Vikram Chandra. *Love and Longing in Bombay*, Penguin, 1997)
2. Saadat Hasan Manto: “The Price of Freedom” (From *Mottled Dawn: Fifty Sketches and Stories of Partition*.Trans.Khalid Hasan and Introduction. Daniyal Mueenuddin, Penguin, 2011.)
3. Ambai: “A Kitchen in the Corner of the House.” (From *Inner Line :The Zuban Anthology of Stories by Indian Women.* Trans. Lakshmi Holmstorm. Ed. Urvashi Butalia. Zuban an imprint of Kali for women, 2006.)
4. R.K Narayan: ‘Toasted English” (R.K Narayan: ‘Toasted English.” *Reluctant Guru*, Orient Paperbacks,1974, p.57)
5. Bankimchandra Chatterjee: *Rajmohan’s Wife* (Bankimchandra Chatterjee: *Rajmohan’s Wife*. R. Chatterjee, 1935.https://1lib.in/book/18429981/aa6a25)
6. Siddhartha Sarma: *Year of the Weeds* (Siddhartha Sarma: *Year of the Weeds.* Penguin Random House,2020.)

Suggested Reading

U. R. Ananthamurthy : “Towards the Concept of a New Nationhood: Languages and Literatures in India” (Talk delivered at Institute of Physics, Bhubaneswar, India on 3 September, 2006. https://www.iopb.res.in/~mukherji/jhap/URA/ura.pdf)

Module 4

Theorising Vernacular/Bhasha Literature

Students would have

MO1:learned to read literary texts from a range of regional, cultural, social, and political locations within India

MO2: interpreted the role of translation in the making and unmaking of literary traditions and how the juxtaposition of English and translations set up a dialogue with the original language and between themselves.

MO3: learned to explain what it means for a translator to mediate between languages and cultures

Concepts

Concept of 'Indianness'- cultural politics of Indian representations- English and Bhasha representations- Vernacularisation of English- The politics and poetics of translation- translation of Indian narratives into English giving voice and visibility to cultures - appropriation, nativisation and indigenisation of English- How Indian identities are constructed in translated texts- Regional (bhasha) literatures- articulating the local- Rewriting, Rereading history- translation as a site of resistance and transformation.

Unit 5: Poetry

1. Subramania Bharati: "Freedom', Trans. C. Rajagopalachari
(*Subramania Bharati: Chosen Poems and Prose*. Edited by K. Swaminathan, All India Subramania Bharati Centenary Celebrations Committee, 1984. pp. 44-5)
2.Sitanshu Yashaschandra: "Language" Trans. Roomy Naqvi and the author.
(*The Tree of Tongues:An Anthology of Modern Indian Poetry.*Edited by E.V.Ramakrishnan. Indian Institute of Advanced Study,1999. P.124)
3.Vinod Kumar Shukla : "One should See One's Own Home" (Trans. Dilip Chitre and Daniel Weissbort, from *The Tree of Tongues:An Anthology of Modern Indian Poetry.*Edited by E.V.Ramakrishnan. Indian Institute of Advanced Study,1999.p.205)
4. Kadammanitta Ramakrishnan, "The *Cat* is *My Grief Today"* (Trans. P.P. Raveendran, from *The Cat is My Grief Today and other Poems*, Sahitya Akademi,2009. p.112)
5. Vaidehi: "An Afternoon with Shakuntala" Trans. Jaswant Jadav
(*Women Writing in India*: *The Twentieth Century,* Book II, Edited by *Susie* Tharu and K. Lalita, The Feminist Press,1993. p.535)

Suggested Reading

Makarand R. Paranjape: "Vernacularising the 'Master' Tongue: Indian English and Its Con-Texts" (*Indian English and 'Vernacular' India*. Edited by Makarand R. Paranjape and G.J.V. Prasad. Pearson, 2010. pp.91 - 108.)

Unit 6: Fiction

1.Premchand, "The Shroud", (Trans. Madan Gopal, *Premchand*: *Twenty Four Stories.*Translated by Nandini Nopany and *P. Lal*, Vikas, 1980.)

2.Mahasweta Devi: "Kunti and the Nishadin" (from *After Kurukshetra*, Seagull. 2005)

3.Yeshe Dorjee Thongchi: "The Journey" Trans. D.P Nath (From *Silent Lips and Murmuring Hearts*, Sahitya Akademi, 2010.)

4.Sachin Kundalkar*: Cobalt Blue*.Trans. Jerry Pinto, The New Press, 2016.

5.Na. D'Souza: *Dweepa/Island.* Trans. Susheela Punith, OUP,2013.

Suggested Reading

Tejaswini Niranjana: "Translation, Colonialism and Rise of English"

Economic and Political Weekly, vol. 25, no. 15 (Apr. 14, 1990), pp. 773-79.

Suggested Further Reading:

Aysha Iqbal Viswamohan. *Post liberalization Indian Novels in English:Politics of Global Reception and Awards.* Anthem Press,2014.

Bharucha, N.E. and Vrinda Nabar, Eds. *Mapping Cultural Spaces: Postcolonial Indian Literature in English*. Vision Books, 1998.

Bhatnagar, M.K., Ed. *Commonwealth English Literature*. Atlantic, 1999.

Bhatnagar, Vinita, Dhondiyal. *Readings in Indian English Literature: Nation, Culture and Identity*. Harman Publishing, 2001.

Chakladar, Arnab. "The Postcolonial Bazaar: Marketing/Teaching Indian Literature." *ARIEL* vol. 31, no. 1-2, 2000, pp. 183-201.

Chatterjee, Partha. *Nation and its Fragments: Colonial and Postcolonial Histories*. Princeton U P, 1993.

Chaudhuri, Maitrayee. "Gender in the Making of the Indian Nation-State". *Sociological Bulletin*. vol. 48, no. ½, 1999. pp.113-33.

Das, Sisir Kumar. *A History of Indian Literature 1911-1956, Struggle forFreedom: Triumph and Tragedy*. Sahitya Akademi, 2006.

Deleuze, Gilles and Félix Guattari. *Kafka; Toward a Minor Literature*. U of Minnesota P, 1986.

Desai, A.R. *Social Background of Indian Nationalism*. Popular Prakashan, 2000.

Dimock, Edward C. *The Literatures of India: An Introduction.*U of Chicago P,1978.

Ghosh, Bishnupriya. *When Borne Across: Literary Cosmopolitics in the Contemporary Indian Novel*. Rutgers UP, 2004.

Iyengar, K.R. Srinivasa and Prema Nandakumar. *Indian Writing in English. Sterling,1983.*

Iyengar, K.R. Srinivasa. *Indian Writing in English*. Sterling, 2012.

Kalidasa. "Introduction." *The Loom of Time. A Selection of His Plays and Poems*, Translated and Introduced by Chandra Rajan, Penguin, 1989.

King, Bruce. *Modern Indian Poetry in English.* OUP India, 2005.

Mehrotra, A.K. *A Concise History of Indian Literature in English.* Palgrave Macmillan, 2009.

Mukherjee, Sujit. A Dictionary of Indian Literature. Vol 1. Beginnings to 1850. Orient Longman, 2004.

Naik, M.K. *A History of Indian English Literature.* Sahitya Akademi, 2009.

Nalini Ramachandran. *Lore of the land: Storytelling Traditions of India.* Penguin, 2017.

Nanavati, U.M. and Prafulla C. Kar, Eds. *Rethinking Indian English Literature*. Pencraft International, 2000.

Narasimhaiah, C.D. "Indian Writing in English: An Introduction." *The Journal of Commonwealth Literature.* Vol.5,1968.

Niranjana, Tejaswini. *Siting Translation: History, Post-Structuralism and the Colonial Context*. California UP, 1992.

Paniker, Ayyappa. "The Asian Narrative Tradition," *Indian Narratology*. Indira Gandhi Centre for the Arts, 2003.pp. 160-68.

Paranjape, Makarand R. "Indianness: Essence or Construct? Critiquing a Seminar on 'Indian Literature: Concept and Problems.'" *New Quest* 105 (May-June 1994), pp.155-61.

---. *Indian English Poetry,* Macmillan,1993.

Ramakrishnan, E. V. and UdayaKumar. "Modernism in Indian Literature" *Routledge Encyclopedia of Literary Modernism*, Taylor &Francis, 2016.

Ramakrishnan, E. V. ed. *Narrating India: The Novel in Search of the Nation*. Sahitya Akademi, 2005.

Raveendran, P. P. "Genealogies of Indian Literature." *Economic and Political Weekly*. vol. 41.no. 25. June 24-26, 2006, pp. 2558-563.

Rushdie, Salman. *Imaginary Homelands: Essays and Criticism 1981-1991*. Granta, 1992.

Satchidanandan, K. ed. *Signatures : One Hundred Indian Poets*. National Book Trust ,2003.

Spivak, Gayatri. "The Politics of Translation." *Outside in the Teaching Machine*. Routledge, 1993, pp.179-200.

Trivedi, Harish. "Theorizing the Nation: Constructions of "India" and "Indian Literature." *Indian Literature, vol.* 37, no.2 ,1994, pp.31-45.

---. *Colonial Transactions: English Literature and India*. Calcutta, 1993.

Varughese, Dawson E. *Reading New India:Post-Millennial Indian Fiction in English*. Bloomsbury, 2013.

Vinay Dharwadkar. "Orientalism and the Study of Indian Literature." In *Orientalism and Postcolonial Predicament: Perspectives on South Asia*. ed. Carol A Breckenridge and Peter van der Veer. OUP, 1994, pp. 158-95.

Walsh, William. *Indian Literature in English*. Longman, 1990.

SEMESTER II

Paper VII- EL.523 : GENDER STUDIES

(Core Course 7 : 6 hours/week)

Aim

To enable students to interrogate and analyze socio-political-historic structures and representations underlying the politics and sociology of gender- related positions on evolving identities, on activism, legal rights and gender related development.

Course Objectives

The objectives of this Course are to

- Introduce students to the key areas in Gender Studies as a discipline
- Teach them to interrogate and analyze socio-political-historic structures and cultural representations and discourses to uncover the politics of gender and the positioning of gender identities
- Lead them to explore and deepen gender-related perspectives on legal rights, activism, policy/advocacy, and research.
- Inculcate an awareness of evolving gender perspectives and identities
- Arrive at critically informed readings of process of gender related development.

Course Outcomes

The students would have

CO 1: Interrogated and analyzed gendered performance and power in a range of social spheres.

CO2: analyzed patriarchal socio-political-historic structures and cultural representations and discourses

Co 3: Explored and deepened their gender-related perspectives on gender laws, activism, policy/advocacy.

CO 4: Arrived at critically informed readings of literary texts and cultural practices with an understanding of the politics of gender

Co 5: understood the positioning of intersectional gender identities in the process of development.

Course Description

Module I : Historicising Gender

Module Outcomes

The students would have

MO 1: comprehended the historical contexts of gender hierarchies

MO 2: understood the relationship between gender, power, ideology

MO 3: been introduced to the important feminist struggles and movements

MO 4: discussed the ideas of the major theorists in the field

Unit 1

Concepts

Sex and gender- power structures- ideology- critique of patriarchy- notions of equality- feminist movements- women's suffrage- first, second, third waves- gender politics- language, representations, culture, identity- objectification- phallocentrism – Second Sex-Vindication of rights - Personal is Political-Patriarchy in India

Simone de Beauvoir "Introduction", *The Second Sex*. Vintage. 2015. p.1-15

Bhasin, Kamla. *What Is Patriarchy?* Women Unlimited, New Delhi, 2004, pp. 1–20.

Recommended Reading

"The Primacy of the Mother." *Of Woman Born: Motherhood as Experience and Institution*, by Adrienne Rich, W.W. Norton and Company, New York, 1995, pp. 85–109.

https://literariness.org/wp-content/uploads/2020/04/Adrienne-Rich-Of-Woman-Born_-Motherhood-as-Experience-and-Institution-1995-W.-W.-Norton-Company.pdf

Text for Methodological Analysis

Joe Baby. Dir. *The Great Indian Kitchen.* 2021

Module II : Theories of Gender and Sexuality

Module Outcomes

The student would have
MO 1: discussed the different theories of Feminisms
MO 2: understood them in relation to socio-cultural structures and practices
MO 3: evolved a strategy of feminist textual analysis
MO 4: Raised questions related to gendered bodies where body is one of the most significant sites for the enactment of power relations

Unit 2

Feminisms- Liberal, Radical and Marxist Feminisms- Black and Postcolonial Feminisms - aphasia – transcendence – psychosomatic - frigidity - post feminism – Indian feminism -écriture féminine – gynocriticism - male gaze - objectification – ideal feminine- phallocentrism Gender – Performativity –Identity- Body and Desire - Sexuality Studies- LGBTQ- Queer

Butler, Judith. "Subjects of Sex/Gender/Desire." *Gender Trouble: Feminism and theSubversion of Identity*. Routledge. 2010. pp. 1–25.

T. Muraleedharan "Gender and Queer Theories: Possibilities and Pitfalls"

https://youtu.be/V0rGCqw0s3M

Recommended Reading

Cixous, Hélène. "The Laugh of the Medusa." *Feminisms*. 1991. pp. 334–349.doi:10.1007/978-1-349-22098-4_19.

Text for Methodological Analysis

Rituparna Ghosh. Dir. *Chitrangada. 2*012.

Module III : Gender and Culture

Module Outcomes

The student would have

MO 1: identified the ways gender, power, modernity, and hegemony play out across a range of cultures and human experiences.

MO 2: identified the gendered representations of art, culture and literature

MO 3: learned to critically read the texts prescribed in through the lens of gender

MO 4: understood women's and LGBTQ+ people's experience in cultural contexts

Concepts

Gender and representation- gender and nation- gender and modernity- hegemonic masculinity gender and popular culture-

Unit 3

1. Devaki Nilayangode. *Antharjanam: Memoirs of a Namboodiri Woman*. Trans. Indira Menonand Radhika P. Menon. Oxford University Press. 2012.
2. Kandaswamy, Meena. *When I Hit You: Or, A Portrait of the Writer as a Young Wife*. Atlantic. 2017

3. Krishna Sobti. *Listen Girl*. Transl. Shivanath. Katha. 2002. (novella)

4. A Litany for Survival (Poem)- Audre Lorde
   https://www.poetryfoundation.org/poems/147275/a-litany-for-survival
5. "The Thing around your Neck" (Short Story)- Chimamanda Ngozi Adichie. (from *The Thing around your Neck*. Fourth Estate.2009.)
6. Danez Smith: "Tonight, in Oakland"
   https://www.poetryfoundation.org/poems/58027/tonight-in-oakland

Recommended Reading

Velayudhan, Meera. "Changing Roles and Women's Narratives." *Social Scientist* 22.1/2. 1994.pp. 64. doi:10.2307/3517852.

Text for Methodological Analysis

Kamala Das *My Story*

Unit 4

Mulvey, Laura. "Visual Pleasure and Narrative Cinema." *Feminisms*. 1975. pp. 438–448.doi:10.1007/978-1-349-14428-0_27.

Gibson, Mel. "Comics and Gender." *The Routledge Companion to Comics*, by Frank Bramlett et al., Routledge, Taylor Et Francis Group, New York; London, 2017, pp. 285–291.

Recommended Reading

Thomas, Rosie. “Indian Cinema: Pleasures and Popularity.” *Screen*, 26.3-4. 1985.pp. 116–131.doi:10.1093/screen/26.3-4.116.

Text for Methodological Application

Shaji Kailas. Dir. *Narasimham*. 2000.

Module IV: Gender, Rights and Development

Module Outcomes

The student would have
MO 1: recognized the intersections between gender and other social and cultural identities, including race, ethnicity, national origin, religion, class, caste, disability and sexuality.
MO 2: addressed the issue of legal empowerment to fight against violations of the body and to question all forms of violence against women

MO 3 : become familiar with legal definitions of sexual harassment at workplace, anti-dowry laws, domestic violence and rape
MO 4: explored the paradigms of interventions and activism in the digital age

Unit 5

Concepts

Intersections -gender and other social and cultural identities- including race, ethnicity, national origin, religion, class caste, tribe, disabilities and sexualities

Kodoth, Praveena. “Gender, Caste and Matchmaking in Kerala: A Rationale for Dowry.” *Development and Change* 39.2. 2008. pp. 263–283. doi:10.1111/j.1467-7660.2008.00479.x.

Anand, Shilpaa. “Historicising Disability in India; Questions of Subject and Method.” *Disability Studies in India: Global Discourses, Local Realities*, by Renu Addlakha, Routledge India, New Delhi, 2016, pp. 35–50.

Recommended Reading

Atwal, Jyoti. "Embodiment of Untouchability: Cinematic Representations of the 'Low' Caste Women in India." *Open Cultural Studies* 2.1. 2018. pp. 735–745. doi:10.1515/culture-2018-0066.

Text for Methodological Analysis

Shonali Bose. Dir. *Margarita with a Straw*. 2015.

Unit 6

Concepts

Violence, Agency, Domestic Violence, Marital Rape, Sexual Harassment, Rape, Workplace Harassment, Me Too – Legal rights-cyber laws- laws on rape, child abuse- POCSO laws- sexual harassment, dowry, domestic violence-

1.Vishaka guidelines against sexual harassment at the workplace

http://www.nitc.ac.in/app/webroot/img/upload/546896605.pdf

2.Anti- Dowry Laws in India

https://wcd.nic.in/act/dowry-prohibition-act-1961

Reccommended Reading

Dey, Adrija. " Nirbhaya and Beyond- Role of Social Media and ICTs in Gender Activism in India." *Nirbhaya, New Media and Digital Gender Activism*. Ed. Adrija Dey. Emerald Publishing. 2018.

QUESTION PAPER PATTERN

- **PART 1. Answer in 50 words (2x5 =10 marks)**

  2 marks (5 out of 8). Include questions from all modules.

- **PART 2. Answer in 100 words (5x5 =25 marks)**

  5 marks (5 out of 8). Include questions from all modules.

- **PART 3. Answer in 300 words (45 marks)**

  Section A: (1 out of 3) Three essay questions from **module I & II** (**15 marks)**

Section B: (1 out of 3) Three essay questions from **module III & IV (15 marks)**

Section C: (1 out of 3) Three essay questions from the modules to evaluate the students general understanding of concepts discussed in all modules **(10 marks)**

NOTE TO TEACHERS/QUESTION PAPER SETTERS

The text for methodological application is included to help students understand the concepts discussed in each module. **The text(s) prescribed for Recommended Reading and Methodological Application is only for classroom discussion**. **Questions from this section should not be included in the final examination.**

Reading List

Agnes, Flavia. " Protecting Women against Violence? Review of a Decade of legislation 1980-89." *EPW*, 25 April 1992.

---. *Law and Gender Equality: The Politics of Women's Rights in India*. OUP, 1999.

Aravumudan, Gita. *Unbound: Indian Women@Workplace.* Penguin Books India. 2010.

Basu, Srimati. *The Trouble with Marriage: Feminists Confront Law and Violence in India*. University of California Press. 2015.

Bhat, M., & Ullman, S. E. "Examining Marital Violence in India: Review and Recommendationsfor Future Research and Practice." *Trauma, Violence, & Abuse* 15.1 (2014). pp. 57–74.

Bhasin, Kamla. *What Is Patriarchy?* Women Unlimited, New Delhi, 2004.

---. *What Is Patriarchy?* Kali for Women. 1993.

Bordo, Susan. *Unbearable Weight: Feminism, Western Culture, and the Body*. University ofCalifornia Press. 1994.

Butler, Judith. *Gender Trouble*. Routledge, 1990.

Chakravarti, Uma. *Gendering Caste*. Sage, 2018.

Chaudhari, Maitrayee. Ed. *Feminism in India*. Kali for Women, 2005.

de Beauvoir, Simone. *The Second Sex*. Vintage. 2015.

Desai, Bharat H, et al. “Quest for Women’s Right to Bodily Integrity: Reflections on Recent Judicial inroads in India.” <https://www.epw.in/engage/article/quest-womens-right- bodily-integrity-judicial-inroads>
Foucault, Michel. *The History of Sexuality, Volume 1*. Pantheon Books.
1978.Glover, David, and Cora Kaplan. *Genders*. Routledge. 2009.

Freedman, Estelle B., ed. *The Essential Feminist Reader*. Modern Library. 2007.
Gamble, Sarah,ed. *The Routledge Companion to Feminism and Postfeminism*. Routledge, 2010.

Ghosh, Shohini. “Bollywood Cinema and Queer Sexualities.” *Queer Theory: Law, Culture,Empire*. Eds. Robert Leckey and Kim Brooks. Routledge. 2011. pp. 55–68.
Gupta, Charu. "Writing Sex and Sexuality: Archives of Colonial North India." *Journal ofWomen's History* 23. 4. 2011. pp.12-35.

Halberstam, Judith. *In a Queer Time and Place: Transgender Bodies, Subcultural Lives*. NewYork University Press. 2005.

International Labour Organisation. “Preventing and Responding to Sexual Harassment at Work:Guide to the Sexual Harassment of Women at Workplace(Prevention, Prohibition and Redressal)Act,2013,India.”<https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---sro-new_delhi/documents/publication/wcms_630227.pdf> Web.

Thomas, Rosie. “Indian Cinema: Pleasures and Popularity.” *Screen*, 26.3-4. 1985.pp. 116–131.doi:10.1093/screen/26.3-4.116.

Jha, Sonora, and Alka Kurian, eds. *New Feminisms in South Asian Social Media, Film,and Literature: Disrupting the Discourse*. Routledge. 2017.

Kakar, Sudhir. *Intimate Relations: Exploring Indian Sexuality*. Penguin, 1989.

Kumari, A. Krishna *Samarapadhangalile Pen Peruma*, Thrissur: Samatha: A Collective of Gender Justice, 2012.
Nilayamgode, Devaki. *Antharjanam: Memoirs of a Namboodiri Woman*. Trans. Indira Menonand Radhika P. Menon. Oxford University Press. 2012.

Mandal, Saptarshi. “The Impossibility of Marital Rape: Contestations Around Marriage,

Sex,Violence and the Law in Contemporary India." *Australian Feminist Studies* 29:81 (2014). pp.255-272.

Mathur, Kanchan. "Body as Space, Body as Site: Bodily Integrity and Women's Empowermentin India." *Economic and Political Weekly* 43.17. Apr. 26 - May 2, 2008. pp. 54-63.

Menon, Nivedita. *Sexualities*. Women Unlimited. 2007.
… *Seeing Like a Feminist*. Penguin Books, 2012.

---. Gender and Politics in India. OUP, 1999.

Mohanty, Chandra T. "Under Western Eyes: Feminist Scholarship and Colonial Discourses."*Feminism without Borders: Decolonizing Theory, Practicing Solidarity*. Duke University Press, 2003.

https://www.sfu.ca/~decaste/OISE/page2/files/MohantyWesternEyes.pdf

Narrain, Aravind. *Queer: "Despised Sexuality", Law, and Social Change*. Books for Change. 2004.

Narayan, Uma. "Contesting Cultures: 'Westernization', Respect for Cultures and Third-World Feminists ."*Dislocating Cultures: Identities, Traditions, and Third-World Feminism*.
Routledge.1997. pp. 1–40.

Patel, Tulsi. "Experiencing Abortion Rights in India Through Issues of Autonomy and Legality:A Few Controversies." *Global Public Health* 13:6 (2018). pp.702-710.
Pracher, Maria. "The Marital Rape Exemption: A Violation of a Woman's Right of Privacy." *Golden Gate University Law Review* 11.3 (1981). Web.

Rubin, Gayle. "Thinking Sex: Notes for a Radical Theory of the Politics of Sexuality." *Pleasure and Danger: Exploring Female Sexuality*. Ed. Carole S. Vance. Pandora.1992.pp. 267–293.

Radhakrishnan, Ratheesh. "Soft Porn and the Anxieties of the Family." *Women in Malayalam Cinema: Naturalising Gender Hierarchies*. Ed. Meena T. Pillai. rient BlackSwan. 2010.

Richardson, Diane. "Sexuality and Citizenship." *Sociology* 32.1. 1998. Pp.83–100.
Ramachandran, T. K. "Notes on the Making of Feminine Identity in Contemporary KeralaSociety." *Social Scientist* 23.1/3. 1995. pp. 109-123. doi:10.2307/3517894.

Rich, Adrienne. *Of Woman Born: Motherhood as Experience and Institution,* , W.W. Norton and Company, New York, 1995.

https://literariness.org/wp-content/uploads/2020/04/Adrienne-Rich-Of-Woman-Born_-Motherhood-as-Experience-and-Institution-1995-W.-W.-Norton-Company.pdf

Sahgal, Punam and Aashta Dang. "Sexual Harassment at Workplace: Experiences of Women Managers and Organisations." *Economic and Political Weekly* Vol. LII No .22. 03 June2017. pp.49-57.

Sangari, Kumkum, and Sudesh Vaid. Eds. *Recasting Women: Essays in Indian Colonial History*.

Kali for Women, 1990.

Smart, Carol. "Law, Power and Women's Bodies." *Feminism and Power of Law*. Routledge. 2002. pp. 90-113.

The Oxford India Anthology of Modern Malayalam Literature. Eds. P. P. Raveendran and G. S. Jayasree, Oxford University Press. 2017.

Usha Kumari, T.A. Ed. *ThozhilKendrathilekku*,Thrissur: Samatha: A Collective of Gender Justice, 2014.

Vidya, Living Smile. *I am Vidya: A Transgender's Journey*. Rupa Publications, 2014.

Virani, Pinki. *Bitter Chocolate*. Penguin Boos. 2000.

Young, Andrew J. Dustin Kidd. "Women, Gender and Popular Culture." *Companion to*

Women's and Gender Studies. Ed. Nancy A. Naples. New York: Wiley &Son's, 2020.

271- 284.

https://ur.booksc.eu/book/82122317/a41faf

SEMESTER II

Paper VIII- EL.524: CRITICAL STUDIES I

(Core Course 8: 7 hours/week)

Aim

The paper aims to introduce the students to some of the important thinkers, foundational concepts and seminal texts that brought in a paradigm shift to our understanding of literature, culture and society in the 20th century.

Course Objectives

The objectives of this Course are to

- familiarize students with the major theoretical paradigms that informed critical thought during the 20th Century
- acquaint students with the complex openings between literature, culture and society that structure texts, practices and power relations.
- equip students to arrive at critically informed readings of literary and cultural texts.

Course Outcome

The students would have

CO 1: critically analysed literary and cultural texts using the foundational concepts explored in this course.

CO 2: gained the critical acumen to negotiate contested knowledge systems.

CO 3: learned to steer the theoretical paradigms and unsettle disciplinary boundaries.

Course Description

MODULE 1

Theories of Language - New Criticism, Russian Formalism, Structuralism

Module Outcome

Students would have

MO 1: explored and analyse the theories of language - its contribution to the understanding of structure, craft and deliberation in literary theory.

MO 2: discussed the theorists of New Criticism, Russian Formalism and Structuralism.

MO 3: learned to apply theories of language in textual reading.

Unit 1

Concepts

Metaphor, Irony, Tension, Paradox, Ambiguity, Intentional Fallacy, Affective Fallacy, Literariness, Defamiliarisation, Foregrounding,

"Art as Technique"- Victor Shklovsky in Newton K.M (eds) *Twentieth Century Literary Theory*. New York. St Martin's Press, 1997. pp 3-6

Unit 2

Concepts

Langue/Parole, Signifier/ Signified, Structural Anthropology, Mytheme, Bricolage, Readerly/Writerly text, Polyphony

"The Nature of the Linguistic Sign"- Ferdinand de Saussure. *Course in General Linguistics.* Columbia University Press. 2011. pp 65-70

Text for Methodological Application

William Blake. **"**Tyger"

MODULE II

Post Structuralism

Module Outcome

Students would have

MO 1: understood the dynamic and ambiguous nature of language which permits an endless process of signification.

MO 2: learned to critique existing structures of knowledge and understand the power relations inherent in them.

MO 3: analyzed literature using the theoretical tool provided.

Unit 3

Concepts

Phenomenology, Deconstruction (French and American/Yale), Derrida- Metaphysics of Presence, Logocentrism, Differance, Transcendental Signified, Trace, Supplementarity, Aporia, Alterity, Dissemination, Discourse, Textuality, Intertextuality, Metanarrative, Rhizome, Simulacra

Derrida, Jacques. "Structure, Sign and Play in the Discourse of the Humanities." *Modern Criticism and Theory: A Reader*. David Lodge and Nigel Wood. Ed. Routledge. 2013. pp. 89 – 103.

Text for Methodological Application

Robert Frost. "The Road Not Taken".

MODULE III

Psychoanalysis

Module Outcome

Students would have

MO 1: examined Freudian, Jungian and Lacanian psychoanalytical principles -their contribution to the understanding of structure, craft and deliberation in literary theory.

MO 2: comprehended the complex workings of the human mind and the implications of the same on the world.

MO3: learned to apply these theories to textual readings.

Unit 4

Concepts

Libido, Pleasure Principle, Reality Principle, Oedipus Complex, Penis Envy, Freudian Slips, Archetypes, Collective Unconscious, the Persona, the Self, Shadow

Freud, Sigmund. "The Conscious and the Unconscious", "The Ego and the Id", "The Ego and

the Super-Ego". *Beyond the Pleasure Principle and Other Writings.* Trans. John Reddick. Penguin 2003. 105-29. Print.

Unit 5

Concepts

Signified and Signifier, Symbolic Order, Imaginary Order, The Real, Mirror Stage, Jouissance, Desire, Transference

Lacan, Jacques. "The Insistence of the Letter in the Unconscious". *Modern Criticism and Theory : A Reader*. Ed. David Lodge and Nigel Wood. Routledge,2013. 186-209.

Texts for Methodological Application

Sylvia Plath. " Daddy"

MODULE IV

Marxism

Module Outcome

Students would have

MO 1: acquired a critical understanding of the major tenets of Marxism

MO 2: located Marxism as a pivotal stream of thought in political, social, economic and cultural networks

MO 3: understood class divisions, socioeconomic status and power relations among various sections of the society.

Unit 6

Concepts

Class, Base, Superstructure, Classical Marxism, Historical Materialism, Dialectical Materialism, Commodities, Commodification, Theory of Production, Commodity Fetishism, Capital, Capitalism, Labour, Bourgeoisie, Proletariat, Alienation, Socialism, Class Struggle, Ideology, ISA, RSA, Division of Labour, False Consciousness, Means of Production, Mode of Production, Hegemony, Interpellation, Political Economy, Sublation

Williams, Raymond. “Introduction”. *Marxism and Literature*. OUP,1997. pp.1-7.

Text for Methodological Application

Thomas Gray. “Elegy Written In A Country Church Yard”.

MODULE V

New Historicism

Module Outcome

Students would have

MO 1: learned to look at literature from a historical context and understand the textuality of history.

MO 2: examined how events are interpreted and presented in literary texts.

MO 3: understood that reality is constructed and is multiple.

Unit 7

Concepts

Foucault - Non- Discursive and Discursive Practices, Contextualism, Thick Description, Apparatus, Archaeology, Genealogy, Historiography, Historicity, Arts of Existence, Discontinuity, Episteme, Non- Reductionism, Circulation, Panopticon, Regimes of Truth, Textuality, Textuality of History, Historicity of Texts, Anecdote, Archival Continuum, Cultural Materialism, Symbolic Anthropology

Foucault, Michel. “Introduction.” *The Archaeology of Knowledge*. Routledge. 2002. pp. 3–19.

Text for Methodological Application

W.B. Yeats. “Easter 1916”

Question Paper Pattern

- **PART 1. Answer in 50 words (2x5 =10 marks)**

2 marks (5 out of 8). Questions from all modules with at least one from each module.

- **PART 2. Answer in 100 words (5x5 =25 marks)**

5 marks (5 out of 8). Questions from all modules with at least one from each module.

- **PART 3. Answer in 300 words (40 marks)**

Section A: (1 out of 3) Three essay questions from the required reading list **15 marks**

Section B: (1 out of 3) Three essay questions from the modules to evaluate the students understanding of the theoretical paradigms and concepts **15 marks**

Section C: (1 out of 3) Questions based on critical analysis of a known or unknown text provided from three different critical perspectives **10 marks**

NOTE TO TEACHERS/QUESTION PAPER SETTERS

The text for methodological application is included to help students understand how literary/cultural texts can be analysed using the theoretical tools discussed in each module. The text(s) prescribed for **recommended reading and methodological application is only for classroom discussion. Questions from this section should not be included in the final examination.**

Reading List

Atkins, C. Douglas. *Reading Deconstruction/Deconstructive Reading*. U of Kentucky P,1983.

Barthes, Roland. "Death of the Author". *Modern Criticism and Theory: A Reader*, by David Lodge and Nigel Wood. Routledge.2013. pp. 145-150.

Baudrillard, Jean. Simulacra and Simulation. 1981. Trans. Sheila Faria Glaser. U of Michigan P, 1994.

Belsey, Catherine. *Poststructuralism: A Very Short Introduction*. OUP, 2002.

BLACK, Jack. **"**I Am (big) M(Other)': Lacan's big Other and the Role of Cynicism in Grant Sputore's I Am Mother". Free Associations: Psychoanalysis and Culture, Media, Groups, Politics (80) 2020. 121-131. Sheffield Hallam University Research Archive (SHURA) at: http://shura.shu.ac.uk/27745/

Bloom, Harold, et al. *Deconstruction and Criticism.* Seabury, 1979.

Chodorow, Nancy J. *Feminism and Psychoanalytic Theory*. Yale U P, 1992.

Culler, Jonathan- *Structuralist Poetics: Structuralism, Linguistics and the Study of Literature*. London: Routledge and Kegan Paul, 1975.

Chakrabarty, Dipesh. "Post Coloniality and the Artifice of History". *Representations37 Special Issue: Fantasies and Postcolonial Histories* (1992): 1-26. JSTOR Web. 16 Aug 2005.

Dagerman, Stig. “To Kill a Child**”**. *Sleet.* 1947. Translated by Steven Hartman.2013. . www.nybooks.com/blogs/nyrblog/2014/jan/31/to-kill-a-child/

Deleuze, Gilles and Felix Guattari. Anti- Oedipus : Capitalism and Schizophrenia. Penguin Classics, 2009.

Deleuze, Gilles and Felix Guattari. “A Thousand Plateaus”. *Literary Theory: An Anthology.* 2nd ed. Julie Rivkin and Michael Ryan Ed. Blackwell, 2004. pp. 378 -386.

Derrida, Jacques. *Of Grammatology*. Trans. Gayatri Chakravorty Spivak. John Hopkins UP, 1976.

Derrida, Jacques. *Writing and Difference*. Trans. Gayatri Chakravorty Spivak. John Hopkins UP, 1976.

Eagleton, Terry. *Criticism and Ideology*. Schocken, 1978.

---. (ed.), *Raymond Williams: Critical Perspectives*. Oxford, 1989.

---. *Heathcliff and the Great Hunger*. London, 1995.

---. *Marxism and Literary Criticism*. Routledge, 2006.

Elam, Diane. *Feminism and Deconstruction*. Routledge, 1994.

Foucault, Michel. *The Foucault Reader*. Ed. Paul Rainbow. Pantheon,1984.

Foucault, Michel. “Introduction.” *The Archaeology of Knowledge*. Routledge. 2002. pp. 3–19.

Geertz Clifford. "Deep Play: Notes on the Balinese Cockfight." *The Interpretation of Cultures*. 1992.

Greenblatt, Stephen. *Renaissance Self-Fashioning: From More to Shakespeare*, Princeton UP, 1980.

Greenblatt, Stephen. *Hamlet in Purgatory*. Princeton UP, 2001.

Hawkes, Terence. *Structuralism and Semiotics*. London: Methuen, 1977.

Jacobson, Roman. “The Dominant.” In Ladislav Matekka and Krystyna Promosca, eds., *Readings in Russian Poetics: Formalist and Structuralist Views*. Normal, IL: Dalkey Archive Press. 2002. pp 82-7.

Jacobson, Roman. “Closing Statement: Linguistics and Poetics” in Thomas A. Sebeok, ed., *Style in Language*. Cambridge, MA: MIT Press.1960. pp 350-77

Jameson, Fredric. *Marxism and Form: Twentieth-Century Dialectical Theories of Literature.* Princeton UP, 1971.

Jameson, Frederic. *The Prison-House of Language: A Critical Account of*

Structuralism and Russian Formalism. Princeton, New Jersey: Princeton U P, 1972.

Koopman, Colin. *Genealogy as Critique: Foucault and the Problems of Modernity*. Indiana U P. 2013.

Kristeva, Julia. *Desire in Language: A Semiotic Approach to Literature and Art.* Rev. ed. Columbia UP, 1982.

Ladislav, Matejka and Krystyna Promoska, eds. *Readings in Russian Poetics: Formalist and Structuralist Views*. 1971. Normal, IL: Dalkey Archive Press, 2002.

Laplanche, J., Pontalis, J.-B., & Lagache, D. (1967). *The Language of Psycho-Analysis*. (D. Nicholson-Smith, Trans.; 1st ed.). Routledge. https://doi.org/10.4324/9780429482243

Lentricchia, Frank- *After the New Criticism*. Chicago: University of Chicago Press, 1980.

Levi- Strauss, Claude. *Structural Anthropology*. Trans. C. Jacobson and B.G. Schoepf. London.:Allen Lane, 1968.

Lodge, David. *The Modes of Modern Writing: Metaphor, Metonymy and the Typology of Modern Literature*. London. Edward Arnold, 1977.

Lodge, David. *Working with Structuralism*. London: Routledge,1986.

Marx, Karl. (with Friedrich Engels) *The Communist Manifesto*, 1848; *Das Kapital*, 1867; "Consciousness Derived from Material Conditions" from *The German Ideology*, 1932; "On Greek Art in Its Time" from *A Contribution to the Critique of Political Economy*, 1859.

Marx, Karl. "The Fetishism of Commodities and the Secret Thereof', *Classical Sociology Theory, Ed. I. McIntosh*. New York UP. 68-71.

---. "The German Ideology" *Classical Sociology Theory*, Ed. I. McIntosh. New York UP. 26-38.

Mclellan, D. *The Thought of Karl Marx*. Macmillan Press, London, 1971.

Moi, Toril, ed. *The Kristeva Reader*. Blackwell, 2002.

Mukarovsky, Jan. "On Poetic Language". *The Word and the Verbal Art: Selected Essays by Jan Mukarovsky.* Translated and edited by J. Burbank and Peter Steiner. New Haven. Yale U P, 1977. pp 1-64.

Propp, Vladimir- *The Morphology of the Folktale*. University of Texas Press,

1968.

Rae, Gavin. *Poststructuralist Agency: The Subject in the Twentieth Century Theory*. Edinburgh UP, 2020.

Scholes, Robert. *Structuralism in Literature: An Introduction* . New Haven. Yale UP, 1974.

Thompson ,Eva M -*Russian Formalism and Anglo- American New Criticism.* De Gruyter Mouton, 1971.

Todorov,Tzvetan. *Literature and its Theories*. Routledge, 1988.

Veeser, ed. *The New Historicism*. Routledge, 1989.

Williams, Raymond. *Marxism and Literature*. Oxford UP, 1977.

Williams, Raymond. *Culture and Society* 1780–1950. Chatto & Windus, 1958.

Wimsatt W.K, Jr- *The Verbal Icon: Studies in the Meaning of Poetry.* 1954.

Weedon, Chris. *Feminist Practice and Poststructuralist Theory*. Wiley, 1996.

Zizek, Slavoj. *How to Read Lacan*. Granta Books, 2006.

SEMESTER III

Paper IX: EL.531 : World Literatures II

(Core Course 9 : 6 hours/week)

Aim: To read, understand and reflect on texts from different socio-cultural and historical perspectives

Course Objectives:

The objectives of this Course are to

- introduce students to world literature
- provide knowledge about cultural nationalism, multiculturalism and transnationalism in the postcolonial world
- develop intellectual flexibility, inclusivity, creativity and cultural literacy in students
- contextualize the unique traditions of the world, including aspects of time and space
- critically discuss the subtleties involved in regional aesthetics
- familiarise students with the concepts of plurality in global voices

Course Outcomes

The students would have

CO 1: Recognised the various socio-cultural and political experiences and expressions seen in world literatures

CO 2: Learned the theoretical grounding to read literatures in English from different regions

CO 3: Recognised the ways in which transcultural flows affect the readings of texts across social and historical borders

CO 4: Analysed the discursive reach of English in shaping imaginative journeys across continents

CO 5: gained an understanding through reading, discussion and writing about literatures in different genres by writers who have significantly influenced World Literatures

Course Description

Module I

East & South East Asia

Module Outcomes:

The students would have

MO 1: been introduced to the literature of East and South East Asia

MO 2: learned how the historical and mythical past of the region continues to influence the present

MO 3: explored issues such as diasporic identity, exile and belonging, linguistic choice, race and gender politics.

Rin Ishigaki – "Cliff" (poem) (https://www.poetryinternational.org/pi/poem/3779/auto/0/0/Rin-Ishigaki/CLIFF/en/tile)

Catherine Lim – "The Taximan's Story" (from *Little Ironies – Stories of Singapore*, Heinemann Asia, 1989) (https://studylib.net/doc/25459644/the-taximan-s-story)

Rattawut Lapcharoensap – "Sightseeing" (from *Sightseeing*, Grove Press, 2005)

Elena Paulma – "Three Kisses" (https://journals.upd.edu.ph/index.php/lik/article/download/2626/2463)

Haruki Murakami – "Where I'm Likely to Find It" (from *Blind Willow, Sleeping Woman*, Random House UK, 2007)

Yuan Qiongqiong – “Rice” (https://www.wordswithoutborders.org/article/rice)

Wu Cheng’en – Extracts from *Journey to the West* (Monkey) (Chapter 1. Monkey, trans, Arthur Waley, Evergreen Books, 1994) (https://www.learner.org/series/invitation-to-world-literature/journey-to-the-west/journey-to-the-west-read-the-text/)

Shin Kyung-Sook – *Please Look After Mom* (novel) (Vintage Books, 2012)

Gene Luen Yang – *American Born Chinese* (graphic novel) (Square Fish, 2008)

Module II

Africa and the Caribbean

Module Outcomes:

The students would have

MO 1: appreciated the origin of the concepts related to colonialism and post-colonialism

MO 2: examined the development of tradition alongside post-colonial thought in the African and Caribbean geo-political spheres.

Edward Kamau Braithwaite – “Bermudas” (https://www.poetryfoundation.org/poems/52757/bermudas-56d2317c9465f)

Gabriel Okara – “Once Upon a Time” (https://thehenrybrothers.wordpress.com/2011/06/04/once-upon-a-time-gabriel-okara/)

Olive Senior – “Colonial Girl’s School” (https://poetryarchive.org/poem/colonial-girls-school/)

Nadine Gordimer – “The Ultimate Safari” (https://granta.com/the-ultimate-safari/)

Ata Ama Aidoo – *Anowa* (from *Postcolonial Plays: An Anthology*, ed. Helen Gilbert, Routledge, 2001) (http://guffordsenglishclasses.weebly.com/uploads/1/2/5/8/12589236/anowa_text.pdf)

Chigozie Obioma – *Orchestra of Minorities* (Little Brown and Company, 2019)

Module III

America and Canada

Module Outcomes:

The students would have

MO 1: Familiarized themselves with tendencies and trends that embody North American writing.

MO 2: Learned about major thoughts within American and Canadian literatures with specific focus on literatures of the minorities and disenfranchised

F R Scott – "The Canadian Authors' Meet" (https://rory911.pressbooks.com/chapter/the-canadian-authors-meet)

Rita Joe – "I Lost My Talk" (https://www.poetryinvoice.com/poems/i-lost-my-talk)

Ernest Hemingway - "Fathers and Sons" (*The Complete Short Stories of Ernest Hemingway* pp 369-378)

Tomson Highway – *The Rez Sisters*. Saskatoon: Fifth House Publishers, 1992.

Solomon Northup - *Twelve Years a Slave.* Norton Critical Editions. W. W. Norton & Company, 2016.

Module IV

Latin America

Module Outcomes:

The students would have

MO 1: been introduced students to the immense contribution of Latin America to the scope of world literatures.

MO 2: understood the historical, social and literary impacts that have helped those countries to evolve their own literary tradition and identity.

Gabriela Mistral – "God Wills It"
(https://www.poetryfoundation.org/poetrymagazine/browse?contentId=23104)

Angélica Gorodischer – "Absit"
(http://necessaryfiction.com/stories/AngelicaGorodischerAbsit)

Jorge Luis Borges – "The Argentine Writer and Tradition"
(http://tadubois.com/Volumetwohomepage/Borges.pdf)

Gabriel Garcia Marquez – "The Solitude of Latin America", Nobel Prize Acceptance Speech
(https://www.nobelprize.org/prizes/literature/1982/marquez/lecture)

Tony Mason - "Introduction", *Passion of the People? Football in South America*. London: Verso, 1995

Reading List

Ashcroft, Bill, et al., editors. *The Post-Colonial Studies Reader*. 2nd ed., Routledge, 2005.

Atwood, Margaret. *Strange things: the malevolent north in Canadian literature*. Hachette UK, 2009.

Bar-On, Tamir. "The ambiguities of football, politics, culture, and social transformation in Latin America." *Sociological Research Online* 2.4 (1997): 15-31.

Batts, Michael S. "Multiculturalism and Canadian Literature." *Us/Them*. Brill, 1992. 41-46.

Bhabha, Homi K. “Introduction”. In: Homi K. Bhabha. *The Location of Culture.*London/New York: Routledge. 1–28. 1994.

Cheah, Pheng. *What is a World? On Postcolonial Literature as World Literature.* Durham, NC: Duke University Press. 2016.

D’haen, Theo. *The Routledge Concise History of World Literature.* New York: Routledge. 2012.

Dathorne, Oscar Ronald. *African literature in the twentieth century*. U of Minnesota Press, 1975.

Echevarría, Roberto González. *Modern Latin American Literature: A Very Short Introduction*. Oxford University Press, 2012.

Echevarría, Roberto González. *The voice of the masters: writing and authority in modern latin american literature*. Vol. 64. University of Texas Press, 2010.

Fee, Margery. "Reading aboriginal lives." *Canadian Literature* 167 (2000): 5-7.

Gilbert, Helen. *Postcolonial Plays: An Anthology*. London: Routledge, 2001.

Hart, Stephen M. *A companion to Latin American literature*. Vol. 243. Tamesis Books, 2007.

Lapcharoensap, Rattawut. *Sightseeing*, Grove Press, 2005.

Lamming, George. “The Occasion for Speaking”. *The Post-Colonial Studies Reader*

Li, Ping. “Canonization of Chinese Literature in the English- Speaking World: Construction, Restrictions and Measures.” International Journal of English and Literature Vol. 5 (x). November 2014. pp.257 - 265.

Li, Tingting Elle, and Eric Tak Hin Chan. "Connotations of ancestral home: An exploration of place attachment by multiple generations of Chinese diaspora." *Population, space and place* 24.8 (2018): e2147.

Lim, Catherine. *Little Ironies: Stories of Singapore*. Singapore : Pearson Education South Asia Pte Ltd 2014

Mason, Tony. *Passion of the People? Football in South America.* New York: Verso. 1995.

Mostow, Joshua S ed. The Columbia Companion to East Asian Literature. New York: Columbia University Press. 2003.

Murakami, Haruki. *Blind Willow, Sleeping Woman*, Random House UK, 2007

Neumann, Birgit and Rippl, Gabriele. "Anglophone World Literatures: Introduction" *Anglia*, vol. 135, no. 1, 2017, pp. 1-20. https://doi.org/10.1515/ang-2017-0001

Olney, James. "" I Was Born": Slave Narratives, Their Status as Autobiography and as Literature." *Callaloo* 20 (1984): 46-73.

Patke, R.S., & Holden, P. (2009). The Routledge Concise History of Southeast Asian Writing in English (1st ed.). Routledge.

Smith, Verity. *Encyclopedia of Latin American Literature*. Routledge, 1997.

Taiwo, Oladele. "An Introduction to West African Literature." (1967).

Wu Cheng'en. *Journey to the West* (Monkey), trans. Arthur Waley, Evergreen Books, 1994

SEMESTER III

PAPER X: EL.532 : Critical Studies II

(Core Course 9 : 7 hours/week)

Aim

This Course aims to familiarize students to the developments in literary theory since post-structuralism, engaging with the work of important thinkers and understanding concepts emerging from the re-articulations of foundational theories.

Course Objectives

The objectives of this Course are to

- introduce new directions in contemporary critical theory.
- engage with theoretical re-articulations after the post-structuralist turn.
- develop an understanding of the future of theory.

Course Outcome

The students would have

CO 1: understood new directions that inform the terrain of contemporary critical theory.

CO 2: attained the reflexivity to engage with theory and critical practices

CO 3: gained critical acumen to pursue interdisciplinary academic interests.

Course Description

MODULE I

Postmodernism

Module Outcome

The students would have

MO 1: become familiar with the concepts of Postmodernism.

MO 2: **c**omprehended and learned to critique the tenets of Lyotard and Baudrillard.

MO 3: learned to apply the concepts discussed in textual analysis- explore multiple meanings of a text.

Unit 1

Concepts

Discontinuity, Parody, Pastiche, Black Humour, Intertextuality, Metafiction, Historiographic Metafiction, Temporal Distortion, Magic Realism, Fabulation, Schizophrenia, Maximalism, Minimalism, Advanced Capitalism, Liquid Modernity

Lyotard, Jean Francois. "Answering the Question: What is Postmodernism". *Postmodern Debates.* Palgrave. 2001. pp 53-62

Text for Methodological application

William Carlos Williams. "Red Wheel Barrow"

Unit 2

Concepts

Simulation, Simulacra, Virtual Reality, Hyperreal, Reification

Baudrillard, Jean. "Simulacra and Simulations" in *Modern Criticism and Theory- A Reader.* Eds. David Lodge and Nigel Wood. Noida, Dorling Kindersley Publishing Inc. 2011.pp 422-430.

Text for Methodological application

Emily Dickinson. "I Heard a Fly Buzz When I Died"

MODULE II

Postcolonialism

Module Outcome

The students would have

MO 1: acquired an understanding of colonial, postcolonial and neo-colonial discourses

MO 2: developed an understanding of how the politics of imperialism/colonialism continues to shape the contemporary order

MO 3: learned to apply the concepts in textual analysis

Unit 3

Concepts

Colony and Colonialism, Settler, Empire, Orient and Occident, Centre/Margin, Decolonisation, Nativism, Anticolonialism, Neo Colonialiam, Eurocentricism, Third World, Ambivalence, Diaspora, Ethinicity, Hybridity, Mapping, Mimicry

Said, W. "Introduction to Orientalism." *Orientalism*. London. Penguin, 1-28.

Text for Methodological Application

Gabriel Okara. "Once Upon a Time"

Unit 4

Concepts

Nation/Nation State, Subaltern, Post Imperial Societies, Antiessentialism, Negritude, Apartheid, Other, Dislocation, Imagined Communities, Third World, Fourth World, Narratives of Subversion, Nationalism, Post Nationalism, Common Cultural Past, Culture Concept, Dalit Studies, Subaltern Studies, Minority Ethnic Community

Chatterjee, Partha. "Whose Imagined Community?" *Empire and Nation: Selected Essays*. Columbia University Press, 23-36. Print.

Text for Methodological Application

Derek Walcott. "Ruins of a Great House"

MODULE III

The Anthropocene and its Impact

Module Outcomes:

The students would have

MO 1: learned to ask critical questions regarding the role played by human beings as geological and biological agents.

MO 2: Understood the critical role played by modernity in the trajectories of ecological ontologies.

MO 3: Interrogated universalizing narratives of development and comprehend the impact of the same on lives and livelihoods.

Unit 5

Concepts

The Holocene Age- Causality- Anthropogenic- Climate Justice- Deep Ecology- Dark Ecology- Geo-Logics- Afro-Futurisms- Political Ecology

Chakrabarty, Dipesh. "The Climate of History: Four Theses." *Critical Inquiry*, vol. 35, no. 2, The University of Chicago Press, 2009, pp. 197–222, https://doi.org/10.1086/596640.

Text for Methodological Application:

Moana: https://www.youtube.com/watch?v=GmUDEiY1h-4

MODULE IV

Posthumanism

Module Outcomes:

The students would have

MO 1: Comprehended the complexities of human-non-human interconnectedness.

MO 2: Considered the ethical implications of socio-political interactions with sentient non-human, non-biological entities.

MO 3: Acknowledged discourses of rights, intellectual property and personhood within the matrices of bio-politics and genetics.

Unit 6

Concepts

Humanism, Non-Human, Transhumanism, Weird, Uncanny, Cyborg, Zombie Apocalypse, Artificial Intelligence, Rhizome, Assemblages, Biopolitics, Bio-geopolitics.

Francesca Ferrando: *Posthumanism, Transhumanism, Antihumanism, Metahumanism, and New Materialisms Differences and Relations*. https://existenz.us/volumes/Vol.8-2Ferrando.pdf

Text for Methodological Application:

Wall-E: https://www.youtube.com/watch?v=3JC8iD-smPg

MODULE V

New Directions

Module Outcome

The students would have

MO 1: Known the emerging areas in contemporary critical theory.

MO 2: Examined the emotional, material and spatial dimensions of human life as manifested in discourses/texts.

Mo 3: Critically analysed texts and experiences using the concepts explored in this module.

Unit 7

Concepts

Theories of affect- Autonomy of Affect - Affective Economies- Theories of Space – Spatial Triad - Third Space- Theories of Everyday – Thing Theory -Agency of Objects

References for Module V

Ahamed, Sara. "Affective Economies". *Social Text* (2004) 22 (2(79)): 117-139. doi: 10.1215/01642472-22-2_79-117

Brown, Bill. "Thing Theory." *Critical Inquiry* 28.1. 2001. pp. 1–22. doi:10.1086/449030.

Lefebvre, Henri. *The Production of Space*. Trans. Donald Nicholson-Smith. Massachusetts: Blackwell, 1991.

Soja, Edward. Thirdspace. Blackwell, 1996.

Massumi, Brian. "The Autonomy of Affect." *Cultural Critique* 31. 1995. p. 83., doi:10.2307/1354446.

Hoskins, Janet. "Agency, Biography and Objects". *Handbook of Material Culture*, 2006. doi:10.4135/9781848607972.n6

Question Paper Pattern

- **PART 1. Answer in 50 words (2x5 =10 marks)**

2 marks (5 out of 8). Questions from all modules with at least one from each module.

- **PART 2. Answer in 100 words (5x5 =25 marks)**

5 marks (5 out of 8). Questions from all modules with at least one from each module.

- **PART 3. Answer in 300 words (40 marks)**

Section A: (1 out of 3) Three essay questions from the required reading list **15 marks**

Section B: (1 out of 3) Three essay questions from the modules to evaluate the students understanding of the theoretical paradigms and concepts **15 marks**

Section C: (1 out of 3) Questions based on critical analysis of a known or unknown text provided from three different critical perspectives **10 marks**

NOTE TO TEACHERS/QUESTION PAPER SETTERS

The text for methodological application is included to help students understand how literary/cultural texts can be analysed using the theoretical tools discussed in each module. The text(s) prescribed for **recommended reading and methodological application is only for classroom discussion. Questions from this section should not be included in the final examination.**

Reading List

Ashcroft, Bill, Griffiths, Gareth and Tiffin, Helen (eds), *The Post-Colonial Studies Reader*. London and New York: Routledge, 1995.

Agamben, Giorgio. Remnants of Auschwitz: The Witness and the Archive, trans, Daniel Heller-Roazen, New York: Zone Books. 2002.

Bauman, Zygmunt. *Liquid Modernity*. Polity, 2000.

Baldick, Chris. "Literary Theory and Textual Politics: Since 1968*." In Criticism and Literary Theory, 1890 to the Present*. Longman, 1996.

Bell, Alice. *The Possible Worlds of Hypertext Fiction*. Macmillan, 2010.

Bertens, Hans. *The Idea of the Postmodern :A Histor.y* Routledge, 1995.

Bhabha, Homi K. (ed.), *Nation and Narration*. Routledge, 1990.

Bhabha, Homi K. *The Location of Culture* [1994]. Routledge, 2004.

Braidotti, R. "The Poshuman". Polity: Cambridge (MA). 2014.

Calinescu, Matei. *Five Faces of Modernity: Modernism, Avant Garde, Decadence, Kitsch, Postmodernism*. Duke University Press, 1987.

Cruikshank, Julie. "Glaciers and Climate Change: Perspectives from Oral Tradition." *Arctic*, vol. 54, no. 4, Arctic Institute of North America, 2001, pp. 377–93, http://www.jstor.org/stable/40512394.

Deleuze,Gilles and Felix Guattari. "Introduction: Rhizome" from *A Thousand Plateaus*: *Capitalism and Schizophrenia* , trans. Brian Massumi .University of Minnesota Press, 1987.

D'haen, Theo. "Magic Realism and Postmodernism: Decentering Privileged Centers." In Lois Parkinson Zamora and Wendy B. Faris, eds., *Magical Realism; Theory, History, Community*. Duke University Press, 1995.

Dusinberre, Juliet. *Alice to the Lighthouse: Children's Books and Radical Experiments in Art.* Basing stoke: Macmillan, 1987.

Eagleton, Terry. "Capitalism, Modernism and Postmodernism". *Modern Criticism and Theory- A Reader*,eds., David Lodge and Nigel Wood. Noida, Dorling Kindersley Publishing Inc. 2011.pp 378-389.

Fanon, Frantz. *Black Skin, White Masks* [1952], trans. by C. L. Markmann, with Foreword by Homi Bhabha. Pluto, 1986.

Fanon, Frantz. *The Wretched of the Earth* [1961], trans. by Constance Farrington, with Preface by Jean-Paul Sartre. London: Penguin, 2001.

Fukuyama, F. "Our Posthuman Future". 2002.

Harvey, David. *A Brief History of Neoliberalism*. New York: Oxford University Press, 2005.

Haraway, D. "A Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980s". 1985.

Heidegger, Martin. 'The Word of Nietzsche: ''God is Dead''' in (1977) The Question Concerning Technology and Other Essays, trans. William Lovitt, New York: Harper Torchbooks. 1943.

Hall, E. F., & Sanders, T. (2015). Accountability and the academy: Producing knowledge about the human dimensions of climate change. *Journal of the Royal Anthropologica*

Institute, **21**(2), 438–461. https://doi.org/10.1111/1467-9655.12162,

Haraway, D. (2019). It matters what stories tell stories; it matters whose stories tell stories. *a/b: Auto/Biography Studies*, **34**(3), 565–575. https://doi.org/10.1080/08989575.2019.1664163

Howe, C. (2014). Anthropocenic ecoauthority: The winds of oaxaca. *Anthropological Quarterly*, **87**(2), 381–404. https://doi.org/10.1353/anq.2014.0029

Said, Edward. *Culture and Imperialism*. London: Chatto & Windus, 1993.

Shiva, V. "Biotechnological Development and the Conservation of Biodiversity" pp. 193-213. 1995.

Spivak, Gayatri Chakravorty. *In Other Worlds: Essays in Cultural Politics*. London: Routledge, 1987.

Paper XI: Elective 1

Paper XII: Electives 2

Paper XII: Elective 3

SEMESTER IV

Paper XIV: EL.541 : Kerala Culture and Literature

(Core Course 11 : 6 Hours/week)

Aim

This course aims to familiarize students with the social /political /historical formations of the culture and literature of Kerala, and equip them to make creative, theoretical and socio-political interventions in this area.

Course Objectives

- Introduce the politics of socio-cultural formations within Kerala
- Make students realize the sense of plurality and its contradictions within Kerala
- Shift the focus of academic exercises to empirical everyday
- Form a critique of the patterns of power that shaped the knowledge/culture/social systems
- Mark resistance as a key to the formation of histories.

Course Outcome

The student would have

CO1: Understood the socio-cultural specificities and nuances that shaped Kerala

CO2: Understood the inherent ironies and contradictions within Kerala and imbibe a sense of everyday critique

CO3: Learned from lived everyday experiences

CO4: Developed a sense of creative and critical thinking

CO5: Understood the socio-cultural plurality that defines Kerala through divergent historical/cultural formations.

Module I: History and Historiography

Module Outcomes

The student would have

MO1: Comprehended the multiple formations of History.

MO2: Comprehended the historical narratives of resistance to dominant historiography.

MO3: Comprehended the pluralistic formation of history, society and culture

Unit 1

Kesavan Veluthat: 'The Keralolpathi as History' *The Early Medieval in South India*. OUP 2009. (129- 146)

Unit 2

Satheesh Chandra Bose: 'Re construction of 'the Social' for Making Modern Kerala: Reflections on Narnarayana Guru's Social Philosophy.' *Kerala Modernity, Idea, Spaces and Practices in Transition.* Ed. Satheesh Chandra Bose and Siju Sam Varughese, Orient Blackswan, 2015 (59-73)

Pradeepan Pampirikunnu: 'Nationalism, Modernity, Keralaness: A Subaltern Critique' *No Alphabet in Sight.* Ed. K. Satyanarayana and Susie Tharu, Penguin Books. 2011 (557-569)

Module II: Contemporary Interventions

Module Outcomes

The student would have

MO1: learned to critique the socio-cultural narratives of power.

MO2: Equiped oneself so as to resist patriarchy, caste, neo-liberal policies and other similar contemporary hegemonies in the socio cultural everyday.

MO3: Comprehended the need to assert a sense of plurality in the understanding and formation of history, culture amd knowledge.

Unit 3

Rekharaj; 'Rajani's Suicide' *No Alphabet in Sight*, Ed. K. Satyanarayana and Susie Tharu, Penguin Books. 2011 (572-574)

Nitheesh Kumar K.P: 'Historical view of Tribal Land Alienation in Kerala'

Module III: Poetry and Drama

Module Outcomes

The student would have

MO1: Read literary Narratives as Historical Commentaries

MO2: Understood regional poetry in its relation to socio-cultural history.

MO3: Conveyed the importance of translations and re-telling in the vernacular.

Unit 4

Poykayil Appachan: ‘The Song’

Sree Narayana Guru: ‘Casteism’ https://www.poemhunter.com/poem/casteism/

Edasseri Govindan Nair: ‘Kuttippuram Bridge’

Kadamanitta Ramakrishna Pillai: ‘Shanta’

Satchidanandan: ‘Gandhi and Poetry’

https://www.poemhunter.com/i/ebooks/pdf/koyamparambath_satchidanandan_2012_9.pdf

Balachandran Chullikkad: ‘Where is John?’

M. R Renukumar: ‘Will go on Hugging’

https://www.modernliterature.org/malayalam-poetry-m-r-renukumars-poems/

V.M Girija: ‘Marital Life’

https://www.modernliterature.org/malayalam-poetry-m-girijas-poems/

Ashalatha: ‘Please Come, Oh Flood’

https://www.modernliterature.org/panopticon-poems-by-ashalatha/

Aleena: ‘Transplorers’

https://www.modernliterature.org/three-poems-by-aleena-translated-by-ra-sh/

G.Sankara Pillai: *Wings Flapping, Somewhere* (Play)

Module IV: Prose and Fiction

Module Outcomes

MO1: Read literary Narratives as Historical Commentaries

MO2: Comprehend the narrative development of Short Fiction

MO3: Comprehend the paradigm shifts in form, content and narrative in literary history

Unit 5

Karoor Neelakanda Pillai: 'A Packet of Rice'

Lalithambika Antharjanam: 'The Goddess of Revenge'

Basheer: 'Poovan Banana'

Kamala Das: 'Scent of the Bird'

Paul Zacharia: 'Bhaskara Pattelar and My Life

Priya A.S: 'Onion Curry and the Table of Nine'

E.Santhosh Kumar: 'Hills Stars'

K R Meera :' Yellow is the Colour of Longing'

Unit 6

Narayan: *Kocharethi: The Araya Woman*

O.V.Vijayan : *The Legends of Khasak*

Sara Joseph : *Othappu: The Scent of the Other Side*

Benyamin: *Goat Days*

Recommended Reading

Antharjanam, Lalithambika. *Agnisakhi*. VasanthiSankaranarayanan (Trans) Delhi: OUP, 2015.

Asher, R.E. and V. Abdulla *Wind Flowers* Penguin. 2004

Bahuaddin, K.M. *Kerala Muslim History*: A Revisit, Other Books: Calicut,2012.

Basheer, Vaikom Muhammed, *Poovan Banana and Other Stories*, Orient Black Swan 1994.

Bhattathirippad, V.T. *My Tears, My Dreams*. Sindu V. Nair (Trans) Delhi: OUP, 2013.

Bose, Satheesh Chandra and Siju Sam Varughese. *Kerala Modernity: Ideas, Spaces and Practices in Transition.* New Delhi:Orient Black Swan. Pvt Ltd. 2015.

Brown, Lesley W. "The Christian of St' Thomas in the sixteenth Century", *The Indian Christians of St' Thomas,* St Thomas Service and Community Center OUP.1982.

Das, Kamala. *The Kept Woman and Other Stories*, Om Books International, 2010.

Devika, J. *Kulasthreeyum Chandapennum Undaayathengane*, CDS, Thiruvananthapuram, 2010

Ganesh, K N. *Keralathinte Innalekal*, Trivandrum: The State Institute of Languages: 1990.

Ganesh, K.N *Exercises in Modern Kerala History*, Kottayam: Sahithya Pravarthaka Co-operative Society, 2012

George, K.M. *A Survey of Malayalam Literature,* Asia Publishing House, 1968.

---, *Western Influence on Malayalam Language and Literature,* Sahitya Academy. 1972.

Guru, Nataraja. *The Word of the Guru: Life and Times of Guru Narayana,* New Delhi: D.K. Print world, 2008.

Gurukkal, Rajan. *Social Formation of Early South India*, OUP, 2010.

Jayasree G.S and Sreedevi K.Nair, *Onion Curry and the Nine Times Table*: The Samyukta Anthology of Malayalam Stories 2006.

Jeffrey, Robin. *The Decline of Nair Dominance Society and Politics in Travancore 1847-1908,* Manohar Publishers and Distributors New Delhi, 1976.

Joseph,Sara : *Othappu: The Scent of the Other Side*, OUP, 2012.

Kesavan Veluthatt, *Brahman Settlement in Kerala*. Historical Studies, Cosmo Books, 2013

Kumari, A. Krishna *Samarapadhangalile Pen Peruma*, Thrissur: Samatha: A Collective of Gender Justice, 2012.

Kuroor, Manoj. *Nilam Poothu Malarnna Naal,* Kottayam: DC Books, 2015.

Kurup, K.K.N. *Aspects of Kerala History and Culture*, College Book House: Vadakara, 1977.

Meera, K.R. *Yellow is the Colour of Longing*, Penguin, 2016.

Menon, O. Chandu. *Indulekh*a. Delhi: OUP, 2005.

Mohan, Sanal. “Searching for Old Histories: Social Movements and the Project of Writing History in Twentieth Century Kerala” *History in the Vernacular* Ed. Raziuddin Aquil and Partha Chatterjee. New Delhi: Permanent Black, 2008: 357-390.

Nair, Sreedevi. K. *Women Writers of Kerala*. SSS Publications, 2012.

Nair, Vasudevan M.T. *Naalukettu*, Delhi: OUP, 2007.

Narayan, *Kocharethi: The Araya Woman*, OUP 2012.

Narayanan, M.G.S. *Perumals of Kerala*, Cosmo Books, 1996.

Nisar M. and Meena Kandasamy, “Ayyankali and his Movement” *Ayyankali Dalit Leader of Organic Protest*, Other Books: Calicut, 2007.

Padmanabhan K.P. *History of Kerala* (4 Volumes)

Paniker, K Ayyappa. *A Short History of Malayalam Literature*. Dept of Public Relations, Govt of

Kerala, 1977.

---, *I Can’t Help Blossoming* Current Books, 2002.

Panikkar, K. N. *Essays on the History and Society of Kerala*. Trivandrum: Kerala Council for Historical Research, 2015.

Ramanujan A.K. *Poems of Love and War*. New York: Columbia University Press, 1985.

Raveendran, P.P and G.S. Jayasree *The Oxford India Anthology of Malayalam Literature* VOL1&2, OUP,2017.

Santhosh Kumar. E*, A Fistful of Mustard Seeds* (trans) P.N.Venugopal

Usha Kumari, T.A. Ed. *ThozhilKendrathilekku*,Thrissur: Samatha: A Collective of Gender Justice, 2014.

Variyar, M.R. Raghava and RajanGurukkal.Ed. *Cultural History of Kerala Vol 1&2*, Department of Cultural Publications, Government of Kerala 1999.

Vielle, Christophe. “How did Parasurama come to rise Kerala”? *Irreverent History, Essays for M.G.S Narayanan.* KesavanVeluthatans Donald. R. Davis. Jr. Ed. New Delhi: Primus Books, 2015.

Vijayan, ,O.V, *The Legends of Khasak*, Penguin Random House, 2008.

SEMESTER IV

Paper XV: EL.542 : English Language Teaching: Theory and Practice

(Core Course 12 : 7 Hours/week)

Aim

This course aims to familiarize the students with the various theories and methods of English Language Teaching, especially as a second language in India, and to inculcate competence both as students and future teachers.

Course Objectives

The objectives of this course are to:

- examine the theories of language learning and acquisition.
- create awareness of various approaches and methods of teaching English.
- develop skills and impart practical experience in teaching English.
- introduce current trends in ELT techniques and evaluation.
- give an awareness on the areas of research in ELT.

Course Outcomes

The students would have:

CO 1: acquired knowledge of the evolution of ELT as a discipline, especially in India.
CO 2: gained knowledge of the theoretical frameworks that inform ELT practices.
CO 3: learned to assess critically the implications of the various approaches, methods and techniques.
CO 4: developed the ability to critically evaluate syllabi, teaching materials and evaluation procedures.

Course Description

Module 1: Introduction to English Language Teaching

Module Outcomes

The students would have:

MO 1: understood the history and evolution of ELT in India.

MO 2: familiarized themselves with the contexts of ELT.

Unit 1

ELT in India – History – Macaulay's Minutes – Status of English after Independence – English as a medium of instruction – difficulties in the teaching of English – crowded classrooms-- lack of exposure-culture gap - mother tongue interference etc.

Contexts of ELT – Native and non-native – ESL, EFL, TESOL, ESP, EAP, EOP – defining standards – proficiency frameworks – CEFR – testing agencies and certifications – IELTS, TOEFL, APTIS, BEC – teacher training programmes and certification - programmes by EFLU, IGNOU - CELTA

Module 2: Learning Theories, Approaches and Methods

Module Outcomes

The students would have:

MO 1: Learned the key concepts, theories and principles of language learning.

MO 2: Learned the diferent methods of teaching English.

Unit 2

Key Concepts in ELT – Acquisition/learning - bilingualism/multilingualism - linguistic competence/communicative competence.

Learning Theories and Principles – Behaviorism, Cognitivism, Constructivism, Acculturation, Krashen's Monitor Model, Multiple Intelligences

Unit 3

Traditional Methods of Teaching English – Grammar Translation Method, Direct Method, Audiolingual Method, Communicative Language Teaching, Community Language Learning, Suggestopedia, TPR, Silent Way

New Perspectives – Eclectic Methods, Postmethod Pedagogy

Module 3 :Teaching Language

Module Outcomes

The students would have:

MO1: Acquired the necessary skills to teach language.

MO 2: learned to use teaching aids in the classroom.

Unit 4

Teaching Language Skills – aims, objectives, outcomes – macro and micro skills – LSRW - grammar and vocabulary in context - enhancement of oral-aural skills – role plays, discussions, debates, translanguaging – reading and writing - reading comprehension, composition.

Instructional Aids – Textbooks, blackboard, authentic materials, audiovisual input – podcasts, videos, power point, comics, cartoons, films, language lab - appropriate and practical use of e-resources.

Module 4: **Teaching Literature, Lesson Planning and Evaluation**

Module Outcomes

The students would have:

MO 1: learned the basics of literature teaching and lesson planning.

MO 2: learned to write lesson plans.

Unit 5

Teaching of Literary Texts (prose, poetry, drama, fiction) – aims, objectives and outcomes – classroom techniques – creative writing.

Lesson planning - Curriculum, syllabus – modules and lessons – Lesson planning – purpose and advantages – Practicals – three column lesson plans for prose, poetry, grammar and skill teaching – microteaching (theory and practice).

Unit 6

Evaluation – purposes, types – formative and summative - norm referenced and criterion referenced – measurement vs. evaluation – tools of evaluation – qualities of a good evaluation

tool – validity, reliability etc. – types of tests – achievement tests, diagnostic tests, proficiency tests – question paper design – types of questions – remedial teaching.

Module 5: Current Trends in ELT Practice and Research

Module Outcomes

The students would have:

MO 1: Learned to use the latest teaching- learning strategies.

MO 2: Become aware of the latest trends in ELT research.

Unit 7

Teaching Learning Strategies - TBLT and CBLT – Blended Learning – Embodied Learning – Inquiry Based Learning – Flipped Classrooms – Teaching and Learning Management Platforms – Moodle, Edmodo, Google Classroom, Course Era, Swayam, MOOCs, EdX, Udemy, Blackboard Learn

Areas of Research – Educational Linguistics - Curriculum Designing – methods and materials design – blended learning modules - ESP - catering to specific learner needs, need analysis – employability skills – proficiency testing – skill gap analyses.

Question Paper Pattern

1. Part I (2 mark questions; to answer 5 out of 8): At least ONE question from each of the FIVE modules.
2. Part II (5 marks: Short notes; 4 out of 8). At least ONE question from each of the FIVE modules.
3. Part III (15 marks)
    a. Section A: Essay question: To answer 2 out of 4 questions. The four questions to be from the FIVE modules (with not more than ONE question from any one module).
    b. Section B: Lesson Plan: To answer one out of two questions. To be based on i) a given poem or ii) a given passage to teach a grammar point.
4. Difficulty level:

c. Part I: 8 EASY questions (to answer 5) (10 marks)

d. Part II: 8 AVERAGE questions (to answer 5) (25 marks)

e. Part III:

    i. Section A: EASY (direct) questions (to answer 2) (30 marks)

    ii. Section B: DIFFICULT questions (10 marks)

Reading List

Allen, French. *Techniques in Teaching Vocabulary*. Cambridge UP. 1983

Brumfit, Christopher, and Keith Johnson, editors. *The Communicative Approach to Language Teaching*. 1979. Oxford UP, 1987.

Byrne, Donn. *Teaching Oral English*. Longman, 1976.

Byram, Michael editor. *Routledge Encyclopedia of Language Teaching and Learning*. Routledge, 2000.

Cook, Vivian. *Second Language Learning and Language Teaching*. 5th ed., Routledge, 2016.

Grellet, F. *Developing Reading Skills*. Cambridge UP.1981.

Heaton, J.B. *Writing English Language Tests*. Longman. 1975.

Howatt A.P.R. *A History of English Language Teaching*. Oxford UP, 1984.

Krishnaswamy, Natesan, and T. Sriraman. *English Teaching in India*. T.R.Publications, 1994.

Kumaravadivelu B. *Understanding Language Teaching: From Method to Postmethod*. Lawrence Erlbaum, 2006.

Larsen-Freeman, Diane, and Marti Anderson. *Techniques and Principles in Language Teaching*. 3rd ed., Oxford, 2013.

Madson, Herald S. *Techniques in Testing*. Oxford UP. 1983.

Mohan, Radha. *Measurement, Evaluation and Assessment in Education*. PHI Learning, 2016.

Nunan, D. *Syllabus Design*. Oxford UP. 1987.

Prabhu, N.S. *Second Language Pedagogy*. Oxford UP, 1987.

Stern, H.H. *Fundamental Concepts of Language Teaching*. Oxford UP, 1983.

Richards, Jack C., and Theodore S. Rodgers. *Approaches and Methods in Language Teaching*. Cambridge UP, 1986.

Tickoo, M.L. *Teaching and Learning English: A Source Book*. Orient Longman, 2003.

https://www.britishcouncil.in/teach/online-teaching-resources

https://www.britishcouncil.in/teach/teacher-training

https://www.britishcouncil.org/school-resources

https://www.teachingenglish.org.uk/

SEMESTER IV

Paper XVI : EL.543 : Cultural Studies

(Core Course 13 : 6 Hours/week)

Aim

This Course aims to familiarise students with the theory and practice of Culture Studies, its intersections with class, gender, ethnicity, nationalism and so on, and to analyze different forms of cultural production.

Course Objectives

The objectives of this Course are to

- introduce the theory and practice of culture studies,
- familiarize students with some of the most important thinkers and methodologies in the field.
- help analyse the development of British Cultural Studies with a special focus on the contributions of the CCCS, Birmingham, and later developments in other parts of the world.
- assess the multidisciplinarity of the field as they navigate encounters of cultural studies with class, gender, ethnicity, nationalism and so on
- use some of the tools of critical analysis to analyze different forms of cultural production, including literature, popular culture, and print and electronic media.

Course Outcomes

The students would have

CO 1: developed a thorough understanding of the origin and evolution of Cultural Studies, major theorists and their contributions

CO 2: Gained sufficient knowledge about methodology and praxis of cultural studies

C O 3: Gained competence to analyse and valuate cultural texts and practices critically

Course Description

Module I :What is Cultural Studies

Module Outcome

The students would have

MO: been introduced to the primary concepts of cultural studies

Unit 1

Concepts

Frankfurt School- False Consciousness- Culture industry- Birmingham School- Culture as Ordinary- popular Culture – mass culture

Adorno, T. & Horkheimer, M., 1944. "The Culture Industry: Enlightenment as Mass Deception". In T. Adorno and M. Horkheimer. Dialectics of Enlightenment. Translated by John Cumming. New York: Herder and Herder, 1972. (paragraphs 1- 9)

Text for methodological application

Any Malayalam series/Advertisement

Module II: Doing Cultural Studies

Module Outcome

The students would have

MO: seen how Cultural Studies has played a significant role in comprehending power structures and locate points of resistance within culture

Unit 2

Concepts

Discourse- Agency- Cultural Consumption- Stereotyping- Subjectivity- Representation- interpellation- circuit of culture- ideology- hegemony

1.Hall, Stuart ([1973] 1980): 'Encoding/decoding'. In Centre for Contemporary Cultural Studies (Ed.): *Culture, Media, Language: Working Papers in Cultural Studies*, 1972-79 London: Hutchinson, pp.128-38.

Unit 3

2.Fiske, John. "Shopping for Pleasure: Malls, Power and Resistance". *Reading Culture.* 4th ed. Ed. Diana George and John Trimbur. New York: Longman, 2001. 283-286.

Text for methodological application

Shopping Mall

Module III: Popular Culture and Subcultures

Module Outcome

The students would have

MO: understood the concept of the popular in the realm of cultural studies, seen how culture is not monolithic but consists of sub and countercultures

Unit 4

Concepts

Visual cultures, Counter culture, sub culture, soap operas, comic books, shopping and space, celebrity cultures

Story, John. "What is Popular Culture?" *Cultural theory and popular culture: An introduction,* Routledge New York 2015. (pp 1-16)

Text for methodological application

Subhash Ghai. Dir. *Khalnayak*. 1993

Unit 5

Punathambekar, Aswin. “Between rowdies and rasikas: rethinking fan activity in Indian film culture” Harrington, C. Lee, et al. Fandom, Second Edition: Identities and Communities in a Mediated World. 2017 (pp. 285-298)

Text for methodological application

Fan pages/Fan associations/ wikifandoms

Module IV: Culture and Nation

Module Outcome

The students would have

MO: leaned the interactions of nation and culture

MO 2: discussed the relationships between religion and culture

Unit 6

Concepts

Nation and culture- popular culture- national popular- religion and culture- moral anxieties

John, Mary E. and Tejaswini Niranjana. “Mirror Politics: Fire, Hindutva and Indian Culture"

Economic and Political Weekly XXXIV (Mar. 1999). 6-13.

Text for methodological application

Fire by Deepa Mehta

Question Paper Pattern

Same as for the other Core papers. Questions need not be asked from texts for methodological applicaition.

Reading List

Appadurai, A. (ed.) *The Social Life of Things: Commodities in Cultural Perspective.*

Attali, J. Noise: *The Political Economy of Music*, trans. Brian Massumi. Minneapolis: University of Minnesota Press. 1985.

Azmi, Shabana, Nandita Das, Ranjit Chowdhry, Kulbushan Kharbanda, and Deepa Mehta. *Fire*. Canada: Trial by Fire Films, 1996.

Bakhtin, M. *The Dialogic Imagination.* Austin: University of Texas Press. 1981.

Bhabha, H. K. *The Location of Culture*. New York: Routledge. 1994.

Du Gay, P. *Consumption and Identity at Work*. London: Sage, 1996.

During, Simon. *The Cultural Studies Reader*. New York: Routledge, 1999.

Grossberg, Lawrence and Cary Nelson and Paula A Treichler eds. *Cultural Studies*. London: Routledge. 1992.

Storey, J. (ed). *Cultural Theory and Popular Culture*: A Reader, 2nd edn. London: Prentice Hall. 1998.

Young, R. Colonial Desire: *Hybridity in Theory, Culture, and Race.* London: Routledge, 1995.

Paper XVII: Elective 4

ELECTIVES: SELECTION OPTIONS

Any ONE from each group SEMESTERS III & IV

SEMESTER III

Paper XI: EL.533 (4 hours / week)

1. **EL.533.1 : European Drama**
2. **EL.533.2 : Canadian and Australian Literature**
3. **EL.533.3 : Film Studies**
4. **EL.533.4 : American Literature**
5. **EL.533.5 : Women's Writing**

Paper XII: EL.534 (4 hours / week)

6. **EL.534.1 : European Fiction**
7. **EL.534.2 : African and Caribbean Literature**
8. **EL.534.3 : Fiction and Film**
9. **EL.534.4 : Folklore Studies**
10. **EL.534.5 : Writing Lives, Performing Gender**

Paper XIII: EL.535 (4 hours / week)

11. **EL.535.1 : Indian Writing in English**
12. **EL.535.2 : South Asian Literature**
13. **EL.535.3 : Screen Writing**
14. **EL.535.4 : Theatre Studies**
15. **EL.535.5 : Travel Writing**
16. **EL.535.6 : Content Writing**

SEMESTER IV

Paper XVII: EL.544 (4 hours / week)

17. **EL.544.1 : Translation Studies**
18. **EL.544.2 : Regional Literatures in English Translation**
20. **EL.544.3 : Media Studies**
21. **EL.544.4 : Dalit Writing**
22. **EL.544.5 : Theorizing Sexualities**
23. **EL.544.6 : Introducing Comics Studies**

EL.545 : Project & Project based Viva Voce

Question Paper Pattern for Electives

Part I

- The same pattern as for core papers - very short answers of 50 words - 8 questions - 5 to be answered.
- FOUR questions each shall be asked only from Modules 2 and 3. Otherwise TWO questions each may be asked from all four modules.

Part II

- No annotations/critical comments to be asked in the elective papers. Instead, Part II of the question paper should contain **8** questions for short notes of which **5** have to be answered. , with questions form all THREE MODULES EQUALLY

Part III

- Essay questions- The same pattern as for core papers Difficulty level:

Part I: EASY; Part II: AVERAGE; Part III: One section EASY; one section AVERAGE; one section DIFFICULT

SEMESTER III

PAPER XI:EL.533- Choice 1

EL.533.1 – Elective Course: European Drama [4 hours/week]

Aim

The aim of this Course is to acquaint students with the social and historical contexts which inform European drama and provide them the reading skills to correlate and critique dramatic works in the light of the history of European drama.

Course Objectives

The objectives of this paper are to:

- acquaint the conditions that facilitated the origin and evolution of drama as a literary genre in Europe.
- identify the social and historical contexts which inform European drama.
- enable the students to correlate and critique dramatic works in the light of the understanding of the history of European drama.
- aid the students empathize with historical, geographic, and cultural diversity by reading plays written across time and space that deal with social issues, political problems, and the depths of human emotions.
- create in the students an aesthetic appreciation of the formal and thematic innovations as introduced and practiced by major dramatists.
- use appropriate critical insights for the reading of dramatic literature

Course outcomes

At the end of the course the students will be able to:

CO 1: trace the socio cultural and historical conditions that facilitated the evolution of European drama.

CO 2: differentiate the different schools of European drama.

CO 3: demonstrate a comprehensive awareness of the aesthetic principles that governed the art of dramaturgy in Europe.

CO 4: interpret texts with due sensitivity to both textual and contextual cues.

CO 4: apply the critical insights to read dramatic works.

CO 5: synthesise the art of dramaturgy in attempts of dramatical composition.

Course Description

Module 1

Classical Drama

Module Outcomes

The students would have

MO1: Traced the early beginnings and tenets of classical drama.

MO 2: Identified the important classical dramatists and their works.

MO 3: Analysed the style and art of dramatic composition as seen in classical drama.

Unit 1

1. Sophocles: *Oedipus Rex*

   http://johnstoniatexts.x10host.com/sophocles/oedipusthekinghtml.html

2. Euripides: *Andromache*

   http://classics.mit.edu/Euripides/andromache.html

Unit 2

3. Aristophanes : *Frogs*

   http://classics.mit.edu/Aristophanes/frogs.html

4. Seneca: *Medea*
   https://archive.org/stream/twotragediesofse00seneuoft/twotragediesofse00seneuoft_djvu.txt

Module 2

Continental Drama

Module Outcomes

The students would have

MO 1: Traced the development of continental drama.

MO 2: Identified the influential factors which led to the emergence of continental drama

MO 3: Understood the contribution of key dramatists belonging to the school of continental drama.

Unit 3

1. Henrik Ibsen: *Hedda Gabler*

https://www.gutenberg.org/files/4093/4093-h/4093-h.htm

2. Eugene Ionesco : *The Bald Soprano*

https://www.kingauthor.net/books/Eugene%20Ionesco/The%20Bald%20Soprano%20And%20Other%20Plays/The%20Bald%20Soprano%20And%20Other%20Plays%20-%20Eugene%20Ionesco.pdf

3. Luigi Pirandello: *Henry IV*

https://gutenberg.net.au/ebooks07/0700071h.html

Module 3

Critical Responses

Module Outcomes

The students would have

MO 1: Understood the major critical responses to the art of dramaturgy.

MO 2: Analysed the production and reception of drama through different ages

MO 3: Developed a taste for critical analysis of dramatic composition.

Unit 4

1. Aristotle: *Poetics* (Chapters 1-6)

https://www.gutenberg.org/files/1974/1974-h/1974-h.htm#link2H_4_0007

2. Friedrich Nietzsche: *The Birth of Tragedy* (Sections 1 -5)

https://www.gutenberg.org/files/51356/51356-h/51356-h.htm

3. History – Drama – Mythology by Kirsten Dickhaut pp. 96-100 (from the book. History and Drama: The Pan-European Tradition. (Küpper, Joachim, et al.,) 1st ed., De Gruyter, 2019)

http://www.jstor.org/stable/j.ctvbkjx1b

Recommended reading.

Banham E. Martin. *The Cambridge Guide to the Theatre*. Cambridge: Cambridge UP,1993.

Gascoigne, Bamber. *Twentieth-Century Drama*. London: Hutchinson, 1974. Print. Lyman, Jane. Ed. *Perspectives on Plays. London:* Routledge & Kegan Paul, 1976. Print. McGuire, Susan Bassnett. *Luigi Pirandello*. London, Macmillan, 1983.

Nicoll, Allardyce. *World Drama: From Aeschylus to Anouilh*. London, Harrap, 1949, 1976.

Trussler, Simon. *20th Century Drama*. London: Macmillan,1983.

Williams Raymond. *Drama from Ibsen to Brecht: A Critical Account and Revaluation.*

London: Penguin, 1983.

Howatson M.C. *The Oxford Companion to Classical Literature*. New Delhi: Oxford UP 2011.

Bloom, Harold., Ed. *Greek Drama*. Philadelphia: Chelsea House, 2009.

Barr, Allan P. Ed. *Modern Women Playwrights of Europe*. Oxford: Oxford UP, 2001. Print. Orr, John. *Tragic Drama and Modern Society*. London: Macmillan, 1981.

Donaldson, Ian. *Transformations in Modern European Drama*. London:Macmillan, 1983.

SEMESTER III

PAPER XI: EL.533 - Choice 2

EL 533.2 - Elective Course: Canadian and Australian Literatures [4 hours/week]

Aim

The aim of this Course is to make them understand the ethnic and cultural diversity of Canada and Australia and to interrogate the idea of multiculturalism and national culture

Course Objectives

The objectives of this course are to:

- introduce the students to Canadian and Australian Literature
- help students understand the socio-cultural contexts that nourish the emergence of these literatures
- make them understand the ethnic and cultural diversity of Canada and Australia
- interrogate the idea of multiculturalism and national culture
- contextualise the emergence of 'Englishes'

Course Outcome

At the end of the course students will be able to:

CO 1: demonstrate an awareness of the spread and reach of literatures from Canada and Australia

CO 2: explain the politics and ideology in canon formation

CO 3: display an awareness of how socio-cultural contexts shape literary experiences

CO 4: conceptualize concepts like ethnicity, diversity, national culture, and multiculturalism

CO 5: engage critically with decolonization

Course Description

Module I - Socio-political and Literary Background

Module Outcome

The students would have

MO 1: understood the socio-political history of Canada and Australia

Unit 1

The founding of the colonies of Canada and Australia – compulsions - the ties with Europe - native cultures during contact with Europeans - the effects of European contact – colonization effects – revolts - Canadian and Australian allegiance to the British crown - political fallout - confederation - social and cultural issues like alcoholism - genocide – immigration – settlement – diaspora - transnationalism – multiculturalism – melting pot – migration studies – first natives – aboriginals – life in the reserves in Canada – French and English sides of Canada

Required Reading

Elizabeth Webby, "The beginings of literature in colonial Australia." Pierce, Peter. Ed *The Cambridge History of Australian Literature*. Melbourne: Cambridge UP, 2009 (p. 34-51)

Howells, Coral Ann and Eva Marie Kroeller, eds. "Introduction". *Cambridge History of Canadian Literature*. London: Cambridge UP, 2009. 1 – 24.

Module II – Poetry

Module Outcome

The students would have

MO 1: gained an understanding of the poetry and poetic traditions of Canadian and Autralian poets

Unit 2

Required Reading

First Nations Blackfoot "Song of the Great Spirit"

Margaret Atwood "Notes Towards a Poem that Can Never be Written"

Claire Harris "Framed"

Himani Bannerji "Wife"

Judith Wright "Woman to Man"

David Malouf "The Year of the Foxes"

Critical Reading

Buckridge, Patrick. "Allusive Rhetoric of Nationality: Development of Australian Literature from 1890s to 1980s" *Reading Down Under: Australian Literary Studies Reader*. Ed. Amit Sarwal and Reema Sarwal. New Delhi: SSS, 2009. 1-6.

Module III - Drama and Fiction

Module Outcome

The students would have

MO 1: crtically read the drama and fiction of Canada and Australia

Unit 3

Critical Reading

Drama

George Ryga : *The Ecstasy of Rita Joe*

Ray Lawler Summer : *Summer of the Seventeenth Doll*

Jack Davis : *No Sugar*

Unit 4

Fiction

Gabrielle Roy : *Enchantment and Sorrow*

Patrick White : *Voss*

Sally Morgan : *My Place*

Critical Reading

Kortenaar, Neil Ten. "Multiculturalism and Globalization". *Cambridge History of Canadian Literature*. Ed.Carol Ann Howells & Eve Marie Kroeller. London: Cambridge UP, 2003. 556-579.

Reading List

Brown, Russell M and Donna Bennett. Ed. *An Anthology of Canadian Literature in English*.

2 Vols. Toronto: Oxford UP, 1982.

Carl F. Klinck et al. Ed. *A Literary History of Canada*. Toronto: U of Toronto P, 1977. Edelson, Phyllis F. Ed. *An Anthology of Writing from the Land Down Under*. New York: Random House, 1993.

Kinsella, John. *The Penguin Anthology of Australian Poetry.* 2008.

Kramer, Leonie and AdrainMitchell.*The Oxford Anthology of Australian Literature.*

Melbourne & Sydney: Oxford UP, 1985.

New, W.H.1989.*A History of Canadian Literature*.2nd Ed. Montreal: McGill UP, 2003.

Pierce, Peter. *The Cambridge History of Australian Literature*. Melbourne: Cambridge UP,

2009.

Sarwal, Amit and ReemaSarwal, eds. *Reading Down Under: Australian Literary Studies Reader*. New Delhi: SSS. 2009.

Webby, Elizabeth. *The Cambridge Companion to Australian Literature.* Cambridge University Press, 2000.

SEMESTER III

PAPER XI: EL.533 - Choice 3

EL 533.3 – Elective Course: Film Studies [4 Hours/week]

Aim

The aimof this course is to introduce teach them how to ‘read’ and analyze a film, to understand various aspects of film studies and appreciate filmas an art form.

:

Course Objectives

The objectives of this Course are to students to the language of cinema

- introduce students to the language of cinema
- teach them how to ‘read’ and analyze a film
- familiarize students with various aspects of film studies including film analysis, film
- history and film theory
- evaluate the contributions of the director, actors, writers, and other technical crew
- understand the function of narrative in film and the social, cultural, and political implications of the film text
- look at the dynamics of adaptation

Course outcomes

At the end of this Course, the students will be able to:

CO 1: appreciate films from the angles of both a critic and a spectator

CO 2: interpret various cinematic as well as socio cultural aspects of films

CO 3: analyze movies as major ideological tools

CO 4: explicate and do research on the filmography of the master directors

CO 5: critically analyze the dynamics of adaptation of texts selected for study

Course Description

Module I – History and Technology of Cinema

Module Outcome

The students would have

MO 1: understood the history and evolution of world cinema

Unit 1

What is Cinema? – language of cinema, technical aspects of cinema, and narrative logic in Cinema – a general overview of the history of cinema especially British, American, Japanese, Korean, Iranian and Indian – a short history of Malayalam cinema – theoretical approaches to cinema – Feminism and cinema, Formalist theory, Psychoanalysis – ideology and cinema – representation and cinema

Required Reading

Bazin, André. "The Evolution of the Language of Cinema." *What is Cinema?* Volume1. Tr. Hugh Gray. Berkley: U of California P, 1967. 23-40.

Laura Mulvey. "Afterthoughts on Visual Pleasure and Narrative Cinema." *Visual and Other Pleasures*. London: Palgrave, 1989. 29-38.

Module II – Film Movements and Genres

Module Outcomes

The students would have

MO 1: studied film movements and film sub genres worldwide

Unit 2

Soviet Cinema and Montage – Kuleshov, Eisenstein, Pudovkin and Vertov – German Expressionism – Fritz Lang, F. W. Murnau, Robert Wiene – Poetic Realism – Jean Renoir, Pierre Chenal, Jean Vigo – Italian Neo-Realism — Roberto Rossellini, Luchino Visconti, Vittorio de Sica – French New Wave – Auteur Theory and Mise-en-scene – Cahiers du Cinema – François Truffaut, Jean-Luc Godard, Eric Rohmer, Claude Chabrol, and Jacques Rivette –

Films for Study

Sergei Eisenstein	*Battleship Potemkin*
F. W. Murnau	*Nosferatu*
Vittorio de Sica	*Bicycle Thieves*
Jean-Luc Godard	*Breathless*

Unit 3

Indian New Wave — Satyajit Ray, Ritwik Ghatak, Mrinal Sen, G. Aravindan, Adoor Gopalakrishnan – Iranian cinema – Post-revolutionary cinema — the New Wave —Abbas Kiarostami, Jafar Panahi, Mohsen Makhmalbaf, Majid Majidi – Genres of Cinema – Family drama, Horror films, Sci-fi, Comedy films, Romantic, Thrillers, Musical, Western, Documentaries, etc.

Films for Study

Satyajit Ray	*Nayak*
Adoor Gopalakrishnan	*Elippathayam*
Majid Majidi	*The Color of Paradise*

Module III – Critical Response

Module Outcome

The students would have

MO 1: critically read the film prescribed in the light of critical theories

Unit 4

These are critical texts that respond to general issues or particular film texts; they are to be included for discussion along with the prescribed films.

Required Reading

Bhaskar, Ira. “The Indian New Wave.” Routledge Handbook of Indian Cinemas. India: Routledge, 2018. 19 – 33.

Eisenstein, Sergei. “Word and Image.” Film Sense. Tr. Jay Leyda. New York: Meridian, 1955. 3 – 65.

Tomasulo, Frank P. “Bicycle Thieves: A Re-Reading.” Cinema Journal, Vol. 21, No. 2. (Spring, 1982), pp. 2 – 13.

Films Recommended for Further Viewing

Jean Renoir	The Rules of the Game
Charlie Chaplin	Modern Times
Bert Haanstra	Glass
Alfred Hitchcock	Vertigo
Robert Wise	The Sound of Music
Ingmar Bergman	Wild Strawberries
Ritwik Ghatak	Meghe Dhaka Tara
K. G. George	Adaminte Vaariyellu

Kim Ki Duk Spring, Summer, Fall, Winter... and Spring

Asghar Farhadi The Salesman

Reading List

Barnow, Eric and S. Krishnaswamy. *Indian Film*. Delhi: OUP, 1980.

Braudy, Leo and Marshall Cohen, eds. *Film Theory and Criticism*. New York and Oxford: Oxford UP, 1999.

Butler, Andrew M. *Film Studies: Pocket Essential Series.* Harpenden: Pocket Essentials, 2005.

Dix, Andrew. *Beginning Film Studies*. Manchester: Manchester University Press, 2008.

Geiger, Jeffrey & R. L. Rutsky, eds. *Film Analysis: A Norton Reader*. New York: Norton, 2005.

Hill, John, and Gibson Pamela Church. *The Oxford Guide to Film Studies*. Oxford: Oxford UP, 1998.

Kuhn, Annette, and Guy Westwell. *A Dictionary of Film Studies*. Oxford: Oxford UP, 2012. Oxford Quick Reference Series.

Monaco, James. *How to Read a Film: Movies, Media and Beyond.* Oxford: OUP, 2009.

Mulvey, Laura. *Visual and Other Pleasures*. London: Palgrave, 1989.

Nelmes, Jill. *Introduction to Film Studies.* London: Routledge, 2012.

Nowell-Smith, Geoffrey. *The Oxford History of World Cinema*. Oxford: Oxford UP, 1996. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.474.5157&rep= rep1&type=pdf

Rajadhyaksha, Ashish and Paul Willemen, Eds. *Encyclopedia of Indian Cinema.* London & New Delhi, BFI and Oxford, 1994.

Villarejo, Amy. *Film Studies: The Basics.* London: Routledge, 2007.

SEMESTER III

PAPER XI: EL.533 - Choice 4

EL 533.4 – Elective Course: American Literature [4 hours/week]

Aim

This Course aims to help students to study works of American prose, poetry, drama and fiction in relation to their historical and cultural contexts

Course Objectives:

The objectives of the course are to:

- Examine the influence of the socio-political factors in shaping the American literary scene. American Dream. Expansion of the Western Frontier and closing of the Western Frontier. Native Identity.
- Study works of prose, poetry, drama and fiction in relation to their historical and cultural contexts
- Identify the Black experience as articulated in African American literature. Segregation. American Civil War. Harlem Renaissance.
- Develop a deep awareness of the evolving American experience and character.
- Transnationalism and 20th Century American Literature.

Course Outcomes

Upon completion of this course, the students will be able to:

CO 1: Develop an awareness of the socio-political and cultural history of America

CO 2: Identify key ideas and characteristic perspectives or attitudes as expressed in American literature

CO 3: Demonstrate knowledge of the contributions of major literary periods, works and persons in American literature and recognize their continuing significance.

CO 4: Reflect the thoughts, beliefs, customs, struggles, and visions of African American writers.

CO 5: Compare/contrast literary works through an analysis of genre, theme, character, and other literary devices

Course Description

Module 1: Socio-political and literary background

Module Outcomes

The students would have

MO 1: understood the history of American civilization

MO2: understood major philosophical and literary movements in America

Unit 1

Historical background – colonization – European heritage - Puritanism – American Revolution, American Dream. Americanness of American literature – 19th century – American Romanticism - Transcendentalism – the period of the world wars - Harlem Renaissance Modernism – Postmodernism

Required reading

Paul Elmer More : "The Origins of Hawthorne and Poe" Shelburne Essays:

First Series, pg 51-71

Amiri Baraka : "Black is a Country", Home- Social essays, pg 101-106

Module 2: Poetry and Drama

Poetry

Module Outcomes

The students would have

MO 1: understood the important poets and poetic movements and techniques in American literature

MO 2: understood the important dramatists and dramatic trends and techniques in American literature

Unit 2

Poetry of the colonial period – Edward Taylor – postcolonial poetry – Bryant – Longfellow – poetry of the 19th century – Emerson, Poe, Thoreau, Whitman, Dickinson – Frost – Carl Sandberg – Modernism – Ezra pound, Eliot – Gertrude Stein- Wallace Stevens, Williams Carlos Williams, e. e. cummings – 20th century – Langston Hughes – Robert Lowell – Confessional Movement – Sylvia Plath, Anne Sexton – Beat Poets – Allen Ginsberg – Jack Kerouac

Poems prescribed

Walt Whitman	:	"Out of the Cradle Endlessly Rocking"
Emily Dickinson	:	"There is Something Quieter than Sleep",
Robert Frost	:	"Birches"
Amiri Baraka	:	"An Agony. As Now" **
Maya Angelou	:	"Equality"
William Carlos Williams	:	"The Red Wheel Barrow"
Gertrude Stein	:	"Daughter"

Unit 3

Drama:

The beginnings – Lewis Hallam, Jr., Thomas Godfrey- Post independence – Royall Tyler- William Dunlap – 19th century – "The Walnut" – William Henry Brown – Minstrel Show – Post war theatre – Theatrical Syndicate – Realism in Drama – David Belasco – 20 th century – Modern American Theatre – Provincetown Players – O'Neill, Miller, Tennessee Williams, Sam Shepard August Wilson & Lorraine Hansberry.

Plays prescribed

Eugene O'Neill : *Emperor Jones*

Tennessee Williams : *The Glass Menagerie*

Arthur Miller: *Death of a Salesman*

Module 3: Prose and Fiction

Module Outcomes

The students would have

MO1: understood the importance of the socio-political, historical, philosophical writings

MO 2: critically read major American fiction writers and writing

Unit 4

Prose:

Writings of pre-colonial times – Exploration narratives – Sir Walter Raleigh – Historical writings – Captain John Smith – William Bradford – Religious Writings – John Winthorp – Political prose – Jefferson, Franklin – Slave Narratives – Frederick Douglass – American Romanticism – Transcendentalism – Emerson, Thoreau – 20th century – Margaret Fuller – Amiri Baraka, Kate Millet, Elaine Showalter, Lionel Trilling

Fiction

First American fiction- 1900s – Washington Irving – Historical novels- Cooper, – Puritanism – Hawthorne . Melville, Poe – Realism and Naturalism – Twain, Crane – Modernism – Henry James – The Lost Generation – Hemingway, Fitzgerald – Harlem Renaissance – DuBois, Ellison, Richard Wright, Faulkner – Experimental Novels – Pynchon, Nabokov, Salinger, Saul Bellow, John Updike , Thomas Berger, Philip Roth, Joseph Heller. Women's writing – Toni Morrison, Alice Walker

Required Reading

Prose

Ralph Waldo Emerson : "Self-Reliance"

Fiction

Ralph Ellison : *Invisible Man*

Ernest Hemingway : *The Old Man and the Sea*

Toni Morrison : *The Bluest Eye*

Reading List

Bell, Bernard W. *The Afro-American Novel, and its Tradition*. Amherst: University of Massachusetts Press, 1987.

Bercovitch, Sacvan Ed. *The Cambridge History of American literature*. Cambridge: Cambridge University Press, 1994-. 8 vols.

Bradbury, Malcolm.. & Richard Ruland*: From Puritanism to Postmodernism: A History of American Literature.* New York: Penguin, 1992.

Bordman, Gerald Martin. *The Oxford Companion to American Theatre. 2nd ed.* New York: Oxford University Press, 1992.

Elliot, Emory. Ed *The Columbia History of the American Novel*. New York: Columbia University Press, 1991.

Gardner, Thomas. *Jorie Graham: Essays on the Poetry* .Wisconsin: The U of Wisconsin P, 2005.

Kolin, Philip C Ed. *American Playwrights Since 1945*: *A Guide to Scholarship, Criticism, and Performance*. New York: Greenwood Press, 1989.

Leary, Lewis Gaston. *Articles on American Literature* 1900-1950. Durham, NC: Duke University Press, 1954.

Leary, Lewis Gaston. *Articles on American Literature*, 1950-1967. Durham, NC: Duke University Press, 1970.

Malkoff, Karl. Crowell's *Handbook of Contemporary American Poetry*. New York: Crowell, 1973.

Matthiessen, F.O. *American Renaissance*: Art and Expression in the Age of Emerson and Whitman. Oxford:OUP, 1968.

Mish, Charles Carroll. *English Prose Fiction.* Charlottesville, VA: Bibliographical Society of the University of Virginia, 1952.

Perkins, David. *A History of Modern Poetry*. 2nd Vol. Cambridge, MA: Belknap Press of Harvard University Press, 1976-1987.

Saunders, John,. *The Tenth of December.* New York: Random House. 2013, Print. Spiller, Robert E.. *Literary History of the United States.* London: Mcmillan, 1948.

White, Barbara Anne. American *Women Writers: an Annotated Bibliography of Criticism.*

New York: Garland Pub. Co., 1977

SEMESTER III

PAPER XI: EL.533 - Choice 5

EL 533.5 – Elective Course: Women's Writing [4 hours/week]

Aim

This course aims introduce students to the different genres and literary themes presented by women writers especially Indian women writers

Course Objectives

The objectives of this course are to:

- introduce students to the different genres and literary themes presented by women writers especially Indian women writers
- help students to understand the historical and social context in which literary expression by Indian women have developed
- help students appreciate the richness and variety of literary production by women

Course Outcomes

At the end of this course, students will be able to:

CO 1: describe and evaluate the roles of such categories as race, gender and sexuality, disability, class, ethnicity, and religion

CO 2: demonstrate an advanced critical understanding of the cultural history of women's writing

CO 3: demonstrate the ability to use and respond to historicist, feminist and other critical approaches to women writers

Course Description

Module I- Introduction to Women's Writing

Module Outcomes

The students would have

MO 1: Gained an introduction to women's writing, the major women writers and the aesthetics of women's writing

MO 2: - Understood the politics of women's writing and the diferent kinds of feminisms

Unit 1

Introduction- definition of women's writing-emergence as a genre-major women writers-aesthetics of women's writing-politics of women's writing-black feminism-Indian feminism-multiracial feminism- post colonial feminism- eco feminism – misogynist writings-MaryWollstonecraft and her circle- first wave of feminism-second wave- third wave – pro-feminism- new feminism – scripture feminine

Required Reading

Eagleton, Mary. "Introduction". *Feminist Literary Theory: A Reader*. Oxford: Blackwell Publisher, 1999.

Irigaray, Luce, Catherine Porter and Carolyne Burke. "Introduction." *This Sex which is Not One*. New York: Cornell University Press, 1985.

Module II: Poetry and Drama

Module Outcome

The students would have

MO 1: Read and analysed the major women poets worldwide

MO 2: Read and analysed the major women dramatists worldwide

Unit 2

Kamala Das "Too Late for Making Up"

Vijila "A Place for Me"

Judith Wright : "Naked Girl and Mirror"

Sylvia Plath : "Balloons"

Alice Walker : "Before I leave the Stage"

Pratibha Nandakumar : "Poem"

Sugatha Kumari : "Devadasi"

Carol Ann Duffy : "Eurydice"

Vijayalekshmi : "Thachante Makal"

Drama

Caryl Churchill : *Top Girls*

Vinodini : *Thirst*

Module III - Prose and Fiction

Module Outcomes

The students would have

MO 1: Understood the concerns of women writers in world literature

MO 2: Critically read the major novels in the genre

Unit 3

Prose

Required Reading

Sen, Nabaneeta Dev. “Women Writing in India at the Turn of the Century”. *Growing Up as a Woman Writer*

Adichi, Chimamanda Ngozi. “We should All Be Feminists”

Unit 4

Fiction

Mahasweta Devi : “The Five Women”

P.Vatsala : “The Nectar of Panguru Flower”

Penelope Fitzgerald : “The Axe”

Mrinal Pande : “A Woman’s Farewell Song”

Sarah Orne Jewett : “A White Heron”

Reading List:

Adichi, Chimamanda Ngozi. *We should All Be Feminists*. Fourth Estate. 2014.

Eagleton, Mary. *Feminist Literary Theory: A Reader*. Oxford: Blackwell Publisher, 1999.

Devi, Mahasweta. *After Kurukshetra*. Kolkatta: Seagull Books. 2005.

Irigaray, Luce, Catherine Porter and Carolyne Burke. *This Sex which is Not One*. New York: Cornell University Press, 1985.

Kristeva, Julia. *Desire in Language: A Semiotic Approach to Literature and Art.* Oxford: Blackwell Publisher, 1980.

Mitchell, Juliet. *Psychoanalysis and Feminism: Freud, Reich, Laing and Women.* USA: Penguin, 2000.

Moi, Toril. *Sexual/Textual Politics: Feminist Literary Theory*. New York: Routledge, 2002.

Sen, Nabaneetha Deb. *Growing up as a Woman Writer*. New Delhi: Sahitya Akademi, 2007.

Showalter, Elaine. *A Literature of Their Own: British Women Novelists from Bronte to Lessing*. Princeton, NJ: Princeton University Press, 1977.

Swindells, Julia. *The Uses of Autobiography (Feminist Perspectives on the Past and Present).*

UK: Taylor and Francis, 1995.

Tharu, Susie and K. Lalita, eds. *Women Writing in India: 600 BC to the Present*. Vols. I & II. Delhi: OUP, 1993.

Weeden, Chris, J. Batsleer, T. Davies and R. O'Rourke. *Rewriting English: Cultural Politics of Gender and Class*. London: Routledge, 2003.

SEMESTER III

PAPER XII: EL.534 - Choice 1

EL.534.1 - Elective Course: European Fiction (4 hours/week)

Aim

This Course aims to broaden and deepen the understanding of European fiction and its various trends.

Course Objectives

The objectives of this paper are to:

- introduce the students to European fiction
- broaden and deepen the understanding of European fiction and its various trends
- introduce the students to some of the classical and modern fictions

Course Outcomes

At the end of the course students will be able to:

CO 1: identify the main themes of the texts and examine them from a different perspective

CO 2: display their understanding of the historical, cultural, political, religious, stylistic,structural outlooks that shaped European fiction

CO 3: demonstrate the ability to read, enjoy, think about, and respond to European fiction in critical and meaningful ways

Module I – Socio-political and Literary Background

Module Outcomes

The students would have

MO 1: Traced the various stages through which European fiction evolved.

MO 2: Identified the important European writers and their works.

MO 3: Analysed the style and art of various writers in European fiction.

Unit 1

Renaissance – Cervantes, Niccolo Machiavelli, Giovanni Boccaccio, Petrarch – Age of Enlightenment – Voltaire, Jean-Jacques Rousseau, Denis Diderot – Romanticism – Victor Hugo, Goethe, Faust, Hegel – Realism - Gustave Flaubert, Claude Bernard, Emile Zola, Fyodor Dostoyevsky, Leo Tolstoy –

Recommended Reading

Bell, Michael, ed. *The Cambridge Companion to European Novelists*. London: Cambridge UP, 2012. (Relevant sections)

Unit 2

Modernism – Immanuel Kant, Clement Greenberg, Baudelaire, Manet, Flaubert, Nietzsche, Wassily Kandinsky – Stream of Consciousness – Dadaism – Cubism – German Expressionism – Futurism – Surrealism – Pop – Minimalism – Postmodernism – Metafiction, Black Humour, Subversion.

Recommended Reading

Childs, Peter. *Modernism.* Critical Idiom Series. 2000. 2nd ed. London: Routledge, 2007.

Module 2: Realism and Naturalism

Module Outcomes

The students would have

MO 1: traced the origins of realism and naturalism, and its influence on literature and art.

MO 2: had a better comprehension of the different types of realism and its effect on the European Society

MO 3: understood the perspectives of Realism and Naturalism in European fiction

Unit 3

Novel

Cervantes : *Don Quixote*

Gustave Flaubert : *Madame Bovary*

Fyodor Dostoyevsky : *Crime and Punishment*

Short Story

Honore de Balzac : "A Passion in the Desert"

Guy de Maupassant : "A Dead Woman's Secret"

Module 3: Modernism and Postmodernism

Module Outcomes

The students would have

MO 1: identified the elements that influenced Modernism and Postmodernism through literature.

MO 2: conceptualized experimentation in art forms pertaining to literature.

MO 3: identified the philosophical decentering in humanity through the medium of literature.

Unit 4

Novel

Gunter Grass : *Tin Drum*

Italo Calvino : *If on a Winter's Night a Traveller*

Franz Kafka : *The Trial*

Short story

Orhan Pamuk : "Distant Relations"

Jose Saramago : "The Chair"

Joseph Conrad : "The Secret Sharer"

Reading List

Bell, Michael, ed. *The Cambridge Companion to European Novelists*. London: Cambridge UP, 2012.

Cascardi, Anthony J. *The Cambridge Companion to Cervantes*. London: Cambridge UP, 2002.

Ferber, Michael. *A Companion to European Romanticism.* Victoria: Blackwell, 2005.

Gay, Peter. "A Climate for Modernism." *Modernism: The Lure of Heresy*. London: W. W. Norton & Company, 2010.

Hutcheon, Linda. *A Poetics of Postmodernism: History, Theory and Fiction.* London: Routledge, 1988

Konzett, Matthias Piccolruaz and Margarete Lamb-Faffelberger, eds. Elfriede Jelinek: *Writing Woman, Nation, and Identity: A Critical Anthology*. New Jersey: Associated UP, 2007.

Lehan, Richard Daniel. "Realism and Naturalism as the Expression of an Era." *Realism and Naturalism: Love in an Age of Transition*. London: The U of Wisconsin P, 2005.

Polhemus, Robert M. and Roger B. Henkle, eds. *Critical Reconstructions: The Relationship of Fiction and Life.* Stanford: Stanford UP, 1994.

Samarago, Jose. *The Lives of Things*. London: Verso, 1978.

Taberner, Stuart. *The Cambridge Companion to Gunter Grass.* Cambridge: Cambridge UP, 2009.

Unwin, Timothy, ed. *The Cambridge Companion to Flaubert.* London: Cambridge UP, 2004.

Woods, Tim. *Beginning Postmodernism.* Manchester: Manchester UP, 1999.

SEMESTER III

PAPER XII: EL.534 - Choice 2

EL 534.2 - Elective Course: African and Caribbean Literature [4 Hours/week]

Aim

This Course aims to enable students to gain a broad knowledge of the major texts and major concerns of African and Caribbean literatures

Course Objectives

The objectives of this paper are to:

- introduce the students to different literary genres from African and Caribbean literature
- familiarize them with the historical and cultural context of literary works
- help students understand the impact of colonialism, race, class, ethnicity and gender
- enable them to gain a broad knowledge of the major texts and major concerns of African and Caribbean literatures

Course Outcomes:

At the end of this course, students will be able to:

CO 1: appreciate the diversity of literary voices from Africa and the Caribbean and to enable them to read texts in relation to the historical and cultural contexts

CO 2: understand the debates and concepts emerging from the field of African-Caribbean Studies

CO 3: develop the ability to think critically about African Caribbean Diaspora

Course Description

Module I – Socio-political and Literary Background

Module Outcomes

The students would have

MO 1: Understood African and Carribean history and mythology

MO 2: Understood the historical context of colonialism and its impact

Unit 1

Impact of colonialism/colonial encounters - race and ethnicity – oral literature- African mythology and worldview - negritude movement - themes of colonialism, liberation- nationalism - Indentureship and migration - displacement and rootlessness in African and Caribbean literature - creolization – post-colonial literature in Africa – decolonization - humour and satire in African & Caribbean literature – African diaspora - post-apartheid literature - Anglo-Caribbean & West Indian literature - recent trends in African and Caribbean literatures

Required Reading

William, Patrick. “Colonial Discourse and Post Colonial Theory: An Introduction”, *Colonial Discourse and Post-Colonial Theory: A Reader*. London: Routledge 2015.

Spivak, Gayathri. “Can the Subaltern Speak?” *Colonial Discourse and Post-Colonial Theory, A Reader.* Part 1, Sec 4.

Module II: Poetry, Drama and Fiction

Module Outcomes

The students would have

MO 1: Critically read the major poets of African and Carribean literature

MO 2: Critically read the major dramatists of African and Carribean literature

MO 3: Critically read the major prose and fiction writers of African and Carribean literature

Unit 2

Poetry and Drama

Poetry

Lorna Goodison : "Lioness"

Leopold Sedar Senghor : "Black Woman""

David Diop : "Africa/ The Vultures"

Micere Githae Mugo : "Where are those Songs"

Derek Walcott : "Ruins of a Great House"'

Wole Soyinka : "Hamlet"

Kofi Awoonor : "Songs of Sorrow"

Drama

Wole Soyinka : Death and the King's Horseman

Unit 3

Prose and Fiction

Prose

Nelson Mandela : "Birth of a Freedom Fighter"

Jamaica Kincaid : "A Small Place"

Fiction

Chinua Achebe : *Things Fall Apart*

V. S. Naipaul : *A House for Mr Biswas*

Module III – Critical Responses

The students would have

MO 1: Critically read the texts prescribed in the light of the critical essays

Unit 4

Required Reading

Frantz Fanon : "The Fact of Blackness"

EK Brathwaite : "Nation Language"

Ngugi wa Thiong'o. : "Decolonising the Mind"

Reading List

Cesaire, Aime. *Discourse on Colonialism.* Tr. Joan Pinkham. New York: Monthly Review Press, 2000.

Chrisman, Laura and Patrick Williams. *Colonial Discourse and Post-Colonial Theory: A Reader*. London: Routledge 2015.

Falola, Toyin. *African World Series. Contemporary African Literature*: New Approaches.

N.C.2012. http://www.cap-press.com/pdf/2296.pdf Fanon, Frantz. Wretched of the Earth. Grove Press, 1968.

Fanon, Frantz. *Black Skin, White Masks*. Pluto Press, 2017.

Kelley, Robin D.G. . "A Poetics of Anticolonialism". Monthly Review Press, 2000.

Mandela, Nelson. *Long Walk to Freedom*. UK: Hachette Press, 1994.

Olaniyan, Tejumola and Ato Quayson. *African Literature: An Anthology of Criticism and Theory*. Blackwell, 2010.

Ricard, Alain. *The Languages and Literatures of Africa*. James Currey, 2004.

Soyinka, Wole. *Myth, Literature, and the African World*. Cambridge University Press, 2005.

The Cambridge History of African and Caribbean Literature Vol.1 & 2. Cambridge University Press, 2004.

SEMESTER III

PAPER XII : EL.534 - Choice 3

EL.534.3 - Elective Course: Fiction and Film [4 Hours/week]

Aim

This Course aims to help students examine the relationship between fiction and cinema by focusing on film adaptations of various literary genres such as the novel, short story, novella and graphic novels.

Course Objectives

The objectives of this paper are to:

- examine the relationship between fiction and cinema by focusing on film adaptations of various literary genres such as the novel, short story, novella and graphic novels
- initiate critical and theoretical debates regarding issues like race, ethnicity, gender, etc.
- to identify the formal aspects of fiction and film adaptations and its various trends
- consider classic and contemporary theories of film adaptation

Course Outcomes

At the end of the course students will be able to:

CO 1: demonstrate an understanding of the evolving relation between literature and cinema through adaptations and its history

CO 2: apply adaptation theories to read films

CO 3: read and critically analyze film adaptations with reference to the medium

Course Description

Module I – Fiction to Film – Theory

Module Outcomes

The students would have

MO 1: Understood the history of film adaptations

MO 2: Understood the major techniques and strategies of adaptation

Unit 1

History of Film adaptations – Notion of fidelity – Medium specificity and codes – Literary language and Film language - Techniques and Narrative Strategies – Modes/Styles of Adaptation – Borrowing – Intersecting – Mise en Scene – Intertextuality – Authorship and Auteur concept – Ideological and Political Implications – Analogy Aesthetics of Adaptation Fiction – Films, Television Series, Fairy Tales, Animations, Graphic novels – recent trends in Adaptations

Required Reading

Andrew Dudley. “Adaptation” from Concepts in Film Theory. London: OUP, 1984. 96 – 106.

Wald, Jerry. “Foreword: Fiction versus Film”. Fiction, Film and Faulkner: The Art of Adaptation. Gene D. Philips Ed. Knoxville: The University of Tennessee Press. 1988.

Module II – Adaptations

Module Outcomes

The students would have

MO 1: Critically studied the adaptations of novels and short fiction to films

Unit 2

Novels to Films

Author	Novel	Director	Film
Emily Bronte	*Wuthering Heights*	Peter Kosminsky	*Wuthering Heights*
Yann Martel	*Life of Pi*	Ang Lee	*Life of Pi*

Unit 3

Short Fiction to Films

Author	Short Fiction	Director	Film
Munshi Premchand	"Shatranj Ke Khilari" (The Chess Players)	Satyajit Ray	*Shatranj Ke Khilari (The Chess Players)*
Malayattoor Ramakrishnan	"Yakshi"	K.S.Sethumadhavan	*Yakshi*

Module III – Graphic Novels and Fairy Tales to Films

Module Outcomes

The students would have

MO 1: Critically studied the adaptations of graphic novels and fairy tales to films

Unit 4

Author	Novel	Director	Film
Alan Moore	*From Hell*	Albert Hughes, Allen Hughes	*From Hell*
William Steig	*Shrek*	Andrew Adamson, Vicky Jenson	*Shrek*

Recommended Reading

Cohan, Keith. *Film and Fiction: The Dynamics of Exchange*. London: Yale University Press, 1979.

Hutcheon, Linda, and Siobhan O'Flynn. *A Theory of Adaptation*. New York: Routledge, 2013.

McFarlane, Brian. *Novel to Film: An Introduction to the Theory of Adaptation.* Oxford: OUP, 1996.

Roberge, Gaston. *The Subject of Cinema*. Calcutta: Seagull, 1990.

Stam, Robert and Alessandra Raengo, eds. *Literature and Film: A Guide to theory and Practice of Film Adaptation.* UK: Blackwell Publishing, 2005.

SEMESTER III

PAPER XII: EL.534 - Choice 4

EL.534.4 - Elective Course: Folklore Studies [4 Hours/week]

Aim

This Course aims to introduce students to folklore, its different forms and functions in different cultures, and their continuing relevance.

Objectives

The objectives of this paper are to:

- look at folklore and its different forms with specific reference to the cultures in which they are determined
- arrive at methods of analysing folklore with a view to understanding their function within their cultures
- give an idea of early cultural formations including oral culture in founding and sustaining modern societies
- develop an understanding of early cultures and their expressions.

Course Outcomes

At the end of this course, the students will be able to:

CO 1: display an awareness of the nature and form of folklore and its significance in the cultural formations of a people

CO 2: gather and identify different types of folklore and discuss them in the context of the cultures that inform them and are informed by them in turn

CO 3: critically analyse and understand folklore using different methodologies available

CO 4: think about folklore as a living tradition with contemporary relevance

CO 5: conduct fieldwork to collect and analyse folklore and study them in connection with the past and present culture

Course Description

Module I—Fundamentals of Folklore Studies: Definitions and Forms

Module Outcomes

The students would have

MO 1: Learned to define folklore as a genre

MO 2: Gained an undersanding of folk groups, folk culture and folk narratives

Unit 1

Definitions of folklore - folklore studies — a historical overview - folk groups and folk culture - the question of what constitutes a folk group - folklore and tradition - Folklore as history of the oppressed classes

Folktales — folk narratives - folk songs, peasants and their imagination - folk performances

— theatre, rituals - folklore in everyday life — food, clothing, superstitions

Required Reading

Sim, Martha C. and Martine Stephens. “Chapters 1-6.” *Living Folklore: An Introduction to the Study of People and Their Tradition*. 2nd edn. Logan, Utah: Utah State UP, 2011.

Bendix, Regina F, and Galit Hasan-Rokem.“Introduction and Part 1.” *Wiley-Blackwell Companion to Anthropology: Companion to Folklore 1*. Hoboken: Wiley-Blackwell, 2012.

Module II - Methodologies for Analysis

Module Outcomes

The students would have

MO 1: gained a comparative perspective of folklore studies the world over

Unit 2

Comparative theory — Finnish historical-geographic method - national folklore theories – Russian — Hungarian — American - anthropological theory — Franz Boas - psychoanalytic theory — Freud —*Dreams and Myth* - structural theory — Propp - Levi-Strauss - the contextual theory — Milman Parry and Albert B. Lord - field work and methodology of folklore research.

Required Reading

Dorson, Richard M. "Current Folklore Theories." *Current Anthropology* 4.1 (1963): 93-112.

Martha C. Sims, Martine Stephens. "Chapter 7." *Living Folklore: An Introduction to the Study of People and Their Tradition*. 2nd edn. Logan, Utah: Utah State UP, 2011.

Module III —Folklore of Kerala

Module Outcomes

The students would have

MO 1: gained an understanding of the folklore theory and practices of Kerala

Unit 3

Description of different forms of Kerala folk art performances — theyyam, mudiyettu, padayani, thira, thottam, chavittunatakam, pavakkoothu, kakkarassinatakam, vellarinatakam- Songs and oral performances — vadakkan and thekkanpattu, brahmanipattu, koythupattu, kuthiyottapattu, vallappattu - Folktales of Kerala, *Aithihyamala*

Required Reading

Namboodiri, Vishnu M.V. *Folklore: Identity of Culture*. Thiruvananthapuram: Department of Information and Public Relations, Government of Kerala, 2012.

Unit 4

Texts prescribed

"A Story in Search of an Audience" (Telugu)

"Tenali Rama's Dream"

"A Flowering Tree" (Kannada)

"In the Kingdom of Fools"

"The Clay Mother-in-Law" (Tamil)

"Crossing a River, Losing a Self"

Kottarathil Sankunni (Malayalam)

"The Market Place of Kozhikode"

"The Martial Arts Master of Kallanthattil"

Reading List

Bendix, Regina F, and Galit Hasan-Rokem.*Wiley-Blackwell Companion to Anthropology: Companion to Folklore 1*. Hoboken: Wiley-Blackwell, 2012.

Dorson, Richard M. (ed.). : *Folklore and Folk Life : An Introduction.*Chicago and London: The Universityof ChicagoPress, 1972.

Dundes, A. (ed.). *The Study of Folklore*. London: Prentice Hall, 1965.

Handoo, Jawaharlal. *Folklore : An Introduction.* Hyderabad: CIEFL Press, 1989.

-----. *Theoretical Essays in Folklore.* New Delhi: Zooni Publications, 2000.

Leach, Maria (ed.). *The Standard Dictionary of Folklore, Mythology and Legend*. New York: Funk & Wagnalls, 1972.

Martha C. Sims, and Martine Stephens. *Living Folklore: An Introduction to the Study of People and Their Tradition*. 2nd edn. Logan, Utah: Utah State UP, 2011.

Ramanujan, A.K . Selection from *Folktales from India*. Gurgaon: Penguin, 2009.

Sankunni, Kottarathil. Selections from *Aithihyamala*.Tr. Leela James. Gurgaon: Hachette,

2015.

SEMESTER III

PAPER XII : EL.534 - Choice 5

EL.534.5– Elective Course: Writing Lives, Performing Gender [4 hours/week]

Aim

This Course aims to help the students to understand how dancing bodies in performance may open up enquiries into the behaviours of gendered, raced and sexed bodies within the cultural space.

Course Objectives:

The objectives of this paper are to:

- focus on dancing bodies in performance which may open up enquiries into the behaviours of gendered, raced and sexed bodies within the cultural space.
- open up multiple ways of thinking about bodies in performance, beyond the normalized ways of embodying selves.
- guide the students towards a concrete understanding of how the performers have dealt with gendered roles

Course outcomes:

At the end of this course, students will be able to:

CO 1: display informed ways of understanding lives and bodies in performance.

CO 2: describe and explain the agonies of lives that were devoted to experimenting with the self, body and the other

CO 3: evaluate critically the relationship between performance and gender

Course Description

Module I - Isadora Duncan

Module Otcomes

The students would have

MO 1: Understood the life and times of Isadora Duncan

MO 2: Become aware of her contribtion to modern dance

Unit 1

The extract from the life of Isadora Duncan shall acquaint the students with the persistent struggle of an iconoclastic performer, considered the creator of modern dance in the west, to extend the grammar of female dancing body beyond the codified rigidities of classical ballet. Duncan wanted to restore dance to a high art form instead of entertainment and for this she continually sought to redefine the connection between emotions and movement. Her autobiography tries to capture the agonies of a life that was devoted to experimenting with the self, body and the other.

Required Reading

Isadora Duncan: *My Life*

Module II – Chandralekha

Module Outcomes

The students would have

MO 1: Understood the life and times of Chandralekha

MO 2: Understood and appreciated her contribution to Indian dance

Unit 2

Chandralekha is in many ways an epochal eastern counterpart of Isadora Duncan and hence elaborates the enquiries of the students begun in the first extract to a more familiar cultural

scenario. Chandralekha's incessant experiments to widen the idiom of bharatanatyam to encompass the powerfully fluid movements of limbs in kalaripayattu and yoga, to tap multiple ways of erotic expression, her quests to bring out the feminine within the male, and her own postulations of the seamless body shall incite further critical thinking in these directions.

Required Reading

Rustom Barucha: *Chandralekha: Woman, Dance, Resistance*

Module III - Sarah Caldwell's Study of *mudiyettu*

Module Outcomes

The students would have

MO 1: Understood the significance and nuances of Sarah Claudwell's study of "mudiyettu" and its importance in Kerala culture

Unit 3

The extract from Sarah Caldwell's study of *mudiyettu* in many ways consolidates the explorations incited by the other selections in this paper. The remarkable power of this book's analysis of sexualities in performances in a ritual space in Kerala comes from the position of an involved participant that Caldwell takes, as against any supposed objective scholarship on the same. The mix of insight in the form of entries in her journal and letters that generously peppers her academic analysis enables her to pour forth the frustrations within her person as she encounters conventions of female behaviour and gender performance in Kerala. The vividly examined psychological dynamics working behind ritual structures, the conflicts between genders it reflects and the way the same are negotiated through ritual, all narrated with empathy shall encourage students further in their own experiential assessments.

Required Reading

Sarah Caldwell : *Oh Terrifying Mother: Sexuality, Violence and Worship of the Goddess Kali*

Unit 4

Recommended Reading

Mahesh Dattani: *Dance Like a Man*, Penguin. 2006.

Perry, E. M., and Rosemary Joyce. "Providing a Past for Bodies that Matter: Judith Butler's *Impact on the Archaeology of Gender*." *International Journal of Sexuality and Gender Studies. 6: 63-76.*

Reading List

Bahrani, Zainab. "Metaphorics of the Body: Nudity, the Goddess and the Gaze." *Women of Babylon: Gender and Representation in Mesopotamia*. London: Routledge, 2001.

Brewer, Carolyn. "'Good' and 'Bad' Women: The Virgin and the Whore." *Shamanism, Catholicism and Gender Relations in Colonial Philippines, 1521-1685.* London: Ashgate, 2004.

Burt, Ramsay. "Dissolving in Pleasure: The Threat of the Queer Male Dancing Body." *Dancing Desires: Choreographing Sexualities on and off the Stage.* Ed. Jane Desmond. Wisconsin: UWP, 2001.

Chatterjee, Ananya. "Chandralekha: Negotiating the Female Body and Movement in Cultural/Political Signification." *Moving History, Dancing Cultures: A Dance History Reader.* Ed. Dils Ann and Ann Cooper Albright. New York: WUP, 2001.

Coorlawala, Uttara. "Ananya and Chandralekha – A Response to Chandralekha: Negotiating the Female Body and Movement in Cultural/Political Signification." *Moving History, Dancing Cultures: A Dance History Reader.* Ed. Dils Ann and Ann Cooper Albright. New York: WUP, 2001.

Franko, Mark. "The Invention of Modern Dance." *Dancing Modernism: Performing Politics.*

New York: IUP, 1995.

Foster, Susan Leigh. "The Ballerina's Phallic Pointe." *Corporealities: Dancing Knowledge, Culture and Power.* New York: Routledge, 1996.

Hanna, Lynne Judith. “The Sense and Symbol of Sexuality and Gender in Dance Images.” *Dance, Sex and Gender: Signs of Identity, Dominance, Defiance and Desire*. Chicago: UCP, 1998.

Hodson, Millicent. “Searching for Nijinsky’s Sacre” *Moving History, Dancing Cultures: A Dance History Reader*. Ed. Ann Dils and Ann Cooper Albright. New York: WUP, 2001.

Joyce, Rosemary. “Goddesses, Matriarchs and Manly-Hearted Women: Troubling Categorical Approaches to Gender.” *Ancient Bodies, Ancient Lives: Sex, Gender and Archaeology*. New York: Thames and Hudson, 2008.

Kopelson, Kevin. “Nijinsky’s Golden Slave.” *Dancing Desires: Choreographing Sexualities on and off the Stage*. Ed. Jane Desmond. Wisconsin: UWP, 2001.

Phelan, Peggy. “Dance and the History of Hysteria.” *Corporealities:Dancing Knowledge, Culture and Power*. New York:Routledge, 1996.

Perry, E. M., and Rosemary Joyce. “Providing a Past for Bodies that Matter: Judith Butler’s *Impact on the Archaeology of Gender*.” *International Journal of Sexuality and Gender Studies. 6: 63-76.*

Bharucha, Rustom. *Chandralekha: Woman, Dance, Resistance.* New Delhi: Harper Collins, 1999.

Caldwell, Sarah. *Oh Terrifying Mother: Sexuality, Violence and Worship of the Goddess Kali.* New Delhi: Oxford UP, 1999.

Duncan, Isadora. *My Life*. New York: Liveright, 1995.

Nijinsky, Vaslav. *The Diary of Vaslav Nijinsky*. Ed. Romola Nijinsky. London: UCP, 1971.

SEMESTER III

PAPER III : EL.535- Choice 1

EL.535.1– Elective Course: Indian Writing in English
(4 hours/week)

Aim

This Course aims to enable students to understand the historical and socio-cultural contexts for the emergence of literary expression in English in India and to give them a perspective on the diverse aspects of Indian Writing in English

Course Objectives

The objectives of this paper are to:

- enable students to understand the historical and socio-cultural contexts for the emergence of English as a medium for communication and literary expression in India
- provide students a perspective on the diverse aspects of Indian Writing in English
- enable students to trace the evolution of Indian Writing in English
- enable students to get an overview of Indian English poetry, prose, drama, novel and short story
- help students to develop a general understanding of Indian aesthetics
- enable an understanding of the recent trends in Indian Writing in English

Course Outcomes

At the end of the course, the students will be able to:

CO 1: display a deep awareness of the major historical events and the socio-cultural contexts which moulded the various genres in Indian Writing in English

CO 2: analyze how the sociological, historical, cultural and political context impacted the texts selected for study

CO 3: evaluate critically the contributions of major Indian English poets, dramatists, prose writers, novelists and short story writers

CO 4: develop a literary sensibility and display an emotional response to the literary texts and cultivate a sense of appreciation for them

CO 5: apply the ideas encapsulated in Indian Aesthetics to literary texts

Module I - Socio-political and Literary Background & Prose

Module Outcomes

The students would have

MO 1: Understood the historical context of the rise of Indian Writing in English

MO 2: Understood socio-cultural movements, social reformers

MO 3: Learned about the rise of Indian nationalism, secularism and Indian democracy

MO 4: Learned about subaltern voices through the literature prescribed

MO 5: Understood the prose writings of India written in English

Unit 1

Colonialism and Macaulay's Minutes - historical context for the rise of Indian Writing in English – Indian Renaissance - socio-cultural movements - social reformers – rise of Indian nationalism - Nehruvian socialism- secularism - crisis in Indian democracy – Emergency – Postcolonialism - Indian feminist thought - dalit consciousness - subaltern voices - advent of globalization – diaspora - popular literature

Prose

Prose: Impact of modernity in nineteenth century - Impact of Nationalism in twentieth century-Vivekananda, Mahatma Gandhi, Jawaharlal Nehru, S. Radhakrishnan, Nirad. C. Chaudhury- Contemporary Indian prose -Cho Ramaswamy, C.S. Lakshmi, Kancha Illaiyah, P.Sainath, Arundhati Roy, Ramachandra Guha

Required reading

1.Shashi Tharoor, "A Myth and an Idea." India: From Midnight to the Millennium and Beyond. Arcade, 1997.pp.7- 22.

Recommended Reading

Iyengar, K.R.S. *Indian Writing in English*. Sterling, 1988.

Mehrotra, Arvind Krishna. *A Concise History of Indian Literature in English*. Permanent Black, 2008.

Naik, M.K. *A History of Indian English Literature.* Sahitya

Akademy, 1982. Seturaman, V.S. *Indian Aesthetics.* Macmillan,

2000.

Module II –Poetry and Drama

Module Outcomes
The students would have

MO 1: Understood the poetry of India written in English

MO 2: Understood the drama of India written in English

Unit 2

Poetry: Influence of Romanticism - emergence of epics – lyrics – sonnets - impact of nationalism on Indian English poetry -Michael Madhusudan Dutt, Aurobindo Ghose, Rabindranath Tagore, Toru Dutt, Sarojini Naidu – Modernism –Nissim Ezekiel, A.K. Ramanujan, Jayanta Mahapatra, R. Parthasarathy, Gieve Patel, Keki. N. Daruwalla, Shiv. K. Kumar, Eunice De Souza, Adil Jussawala, Kamala Das, Arun Kolatkar, Vikram Seth, Meena Alexander, Tabish Khair, Vijay Sheshadri, Mamang Dai. Jeet Thayil

Prescribed Texts

Poetry

Tagore :"Geetanjali" Songs 1, 50,130

Sarojini Naidu : "Coromandel Fishers"

Kamala Das : "My Grandmother's House"

Jayanta Mahapatra : "Grandfather"

Nissim Ezekiel : "Background Casually"

Jeet Thayil : "Life Sentence"

Critical Response

Ayyappa Panicker: "Indian Poetry in English and the Indian Aesthetic Tradition" from *The Indian Journal of English Studies.*

Unit 3

Drama: Indian Classical Drama -Bharatamuni, Patanjali, Bhasa, Kalidasa, Bhavabhuti - Loknatya in seventeenth century - modern drama - social drama, historical drama, artistic drama, amateur theatre,Indian Peoples' theatre, street theatre -Bharatendu Harishchandra, Krishna Mohan Banerjee, Michael Madhusudan Dutt, Aurobindo Ghose, Rabindranath Tagore, Harindranath Chattopadhyay, Girish Karnad, Vijay Tendulkar, Badal Sircar - Safdar Hashmi, Pritish Nandi, Alyque Padamsee, Mahesh Dattani, Shanta Gokhale, Manjula Padmanabhan, Mahashweta Devi .

Prescribed Texts

Girish Karnad : *The Fire and the Rain*

Mahesh Dattani : *Tara*

Module III- Fiction

Module Outcomes
The students would have

MO 1: Understood the fiction of India written in English

MO 2: knowledge about the style of writing fiction in English.

Unit 4

Prescribed Texts

Fiction

R.K Narayan *The English Teacher*

Salman Rushdie *The Ground Beneath her Feet*

Amitav Ghosh *Sea of Poppies*

Jhumpa Lahiri *The Namesake*

Short Story

Ruskin Bond "The Kite Maker"

Arjun Dangle "Promotion"

Reading List

Bruce, King. *Modern Indian English Poetry*. New Delhi: Oxford University Press,1989.

Chaudhuri, Amit. *Clearing a Space: Reflections on India, Literature and Culture.*
Oxfordshire: Peter Lang, 2008.

Chaudhuri,Asha Kuthari. *Contemporary Indian Writers in English: Mahesh Dattani, An Introduction* . Delhi: Foundation. 2005.

Dharwadker Vinay: *The Collected Esays of A.K. Ramanujan.* London: OUP 199/2004.

Dangle, Arjun. *Poisoned Bread: Translations from Modern Marathi Dalit Literature*. New Delhi: Orient Blackswan, 2009. p. 191-196.

Gosh, Amitav. “Opium Financed British Rule in India.” Interview by Soutik Biswas.
BBC.com. 23 June 2008. Web. 30 June 2010.

Ghosh, Amitav. *Sea of Poppies*. London: Penguin, 2008.

Lin, Lidan. “The Rhetoric of Posthumanism in Four Twentieth Century International Novels.” Diss., U of North Texas, 1998. Ann Arbor: UMI, 1998.

Iyengar, K.R.S. *Indian Writing in English*. New Delhi: Sterling,1985.

Lakshmi, Vijay. *In Search of Sita: Revisiting Mythology*. Ed. Malashri Lal & Namita Gokhale. p. 209-217.

Mehrotra, Arvind Krishna, Ed. *A Concise History of Indian Literature in English*. New Delhi: Permanent Black, 2008.

Mukherjee, Meenakshi. *The Twice Born Fiction*. New Delhi:Arnold Heinemann,1971.

Naik, M.K. *A History of Indian English Literature.* New Delhi 1982.

---.*Twentieth Century Indian English Fiction*. New Delhi: Pencraft International,2004.Print

--- *Indian English Poetry*: from the Beginnings up to 2000.New Delhi: Pencraft International, 2006.

Parthasarathy, R. *Ten Twentieth Century Indian Poets*, New Delhi: Oxford University Press, 1976.

--- , Tandon, Neeru, Ed. *Perspectives and Challenges in Indian English Drama*. New Delhi: Atlantic, 2006.

Thampi, G.B. Mohan: “Rasa as Aesthetic Experience”.

Panicker , Ayappa. “ Indian Poetry in English and the Indian Aesthetic Tradiiton”, *The Indian Journal of English Studies. Vol 23 1983 pages 137-151*

Sethuraman, V.S. *Indian Aesthetics*. New Delhi: Macmillan Ltd,

2000.

Susan Nisha. *The Woman who Forgot to Invent Facebook and*

Other Stories. Context. 2021.

Thieme, John. *Literary Review*.
http://www.penguinbooksindia.com/amitavghosh/sea_of_poppies.html. Web. 29 June 2010.

SEMESTER III

PAPER III: Choice 2

EL.535.2– Elective Course: South Asian Literatures [4 hours/ week]

Aim

This Course aims to explore the writings of the national literatures of South Asian countries like India, Pakistan, Bangladesh and SriLanka.

Objectives

The objectives of this paper are to:

- introduce South Asian Literatures as a discipline
- introduce the history, culture and literature of South Asia
- explore the writings of the national literatures of India, Pakistan, Bangladesh etc.

Course Outcomes

At the end of the course, the students will be able to:

CO 1: demonstrate an analytical awareness of the experiences of immigration and diaspora, and the history of European imperialism as reflected in South Asian literatures

CO 2: identify and differentiate between the distinguishing factors such as culture, class, religion, and other differences amongst South Asians

CO 3: explain critically themes of identity, memory, alienation, assimilation, solidarity, and resistance

Course Description

Module I – Socio-political and Literary Background

Module Outcomes

The students would have

MO 1: Understood the socio- political background and growth of national literatures in South Asian countries

MO 2: Become aware of the impact of colonization

MO 3: Understood the different national cultures discussed in the course

Unit 1

Socio- political background and growth of national literatures in South Asian countries- impact of national cultures- classical literatures- regional writings – decolonization - nationalistic fervour in literature - freedom struggle - colonial rule - partition literature - features and characterization (India, Pakistan, Bangladesh) - trauma in partition literature - Sri Lankan diasporic literatures - conflict literature

Required Reading

Baba, Homi.K. "The Other Question: Stereotype, discrimination and the discourse of colonialism". *The Location of Culture*. London: Routledge, 1994. p. 94-120.

Chatterjee, Partha. *The Nation and its Fragments: Colonial and Postcolonial Histories*. New Jersey: Princeton University Press. 1993. Print. Chapters 1 and 2 only; pp. 3-34

Module II – Poetry and Drama

Module Outcomes

The students would have

MO 1: Critically read the major poets of South Asian literatures

MO 2: Critically read the major dramatists of South Asian literatures

Unit 2

Poetry

Alamgir Hashmi : "Sun and Moon"

Kaiser Haq : "Ode on a Lungi"

Yasmine Gooneratne : "The Big Match"

Suman Pokhrel : "You are as You are"

Maki Khureishi : "Curfew Summer"

Drama

Ayed Akhtar : *Disgraced*

Module III – Prose and Fiction

Module Outcomes

The students would have

MO 1: Critically read the major prose writers of South Asian literatures

MO 2: Critically read the major fiction writers of South Asian literatures

Unit 3

Prose

Mohsin Hamid : "Why Migration is a fundamental human right"

Aung San- Suu- Kyi : "Freedom from Fear"

Unit 4

Fiction

Romesh Gunashekhara : *Reef*

Taslima Nasreen : *The Homecoming*

Bapsi Sidhwa : *Cracking India*

Required Reading

Sheldon Pollock. "Introduction" in *Literary Cultures in History: Reconstructions from South Asia*. Berkeley: U of California P, 2003. 1-38.

Lal, Malashri and Sukrita Paul Kumar. "Part I: Partition: Questioning Borders". *Interpreting Homes in South Asian Literature*. New Delhi: Pearson, 2007. 3 – 44.

Reading List

Appadurai, Arjun. *Modernity at Large: Cultural Dimensions of Globalization*. London: University of Minenesota Press, 1996.

Bhabha, Homi. K. *The Location of Culture*. London: Routledge, 1994.

Chatterjie, Partha. *The Nation and its Fragments: Colonial and Postcolonial Histories*. New Jersey: Princeton University Press. 1993.

Didur, Jill. *Unsettling Partition: Literature, Gender, Memory*. New Delhi: Pearson, 2007.

Lal, Malashri and Sukrita Paul Kumar, eds. *Interpreting Homes in South Asian Literature*.

New Delhi: Pearson, 2007.

Hall, Stuart, Paul du Gay. *Questions of Cultural Identity*. Sage Publications, 1996.

Goonetilleke, D.C.R.A. "Sri Lankan Poetry in English: Getting Beyond the Colonial

Heritage". *ARIEL: A Review of International English Literature*, 21.3: (1990). 39-53.

Hamid, Mohsin. "Why Migration is a fundamental human right" *Discontent and Its Civilizations*. London: Hamish Hamilton, 2014.

Pollock, Sheldon. "Introduction". *Literary Cultures in History: Reconstructions from South Asia*. Sheldon Pollock. Los Angles: University of California Press, 2003: 1-37.

SEMESTER III

PAPER III: Choice 3

EL.535.3- Elective Course: Screen Writing [4 Hours/week]

Aim

This course aims to introduce students to the art and craft of riting for the screen

Course Objectives

The objectives of this Course are to:

- examine screenplays as literary texts
- understand how a narrative is transformed into a screenplay
- become familiar with ways of “reading” screenplays as texts
- broaden and deepen the understanding of film adaptations and its emerging trends

Course Outcomes

At the end of the course students will be able to:

CO 1: demonstrate an understanding of the elements involved in the construction of screenplays

CO 2: understand the elements involved in the creation of adapted screenplays and original screenplays

CO 3: review film history and the various theoretical and technical notions associated with screenwriting

Course Description

Module I – Screenplay as Literature – Theory

Module Outcomes

The students would have

MO 1: Learned about Screenplays, Screenwriting and Screenwriters

MO 2: Learned about different types of scripts and script writing

MO 3: Learned the important theories of Auteurism

Unit 1

Screenplays, Screenwriting and Screenwriter – Adapted screenplay and Original screenplay – Spec scriptwriting, Commissioned scriptwriting and Script doctoring – Structure of Screenplays – Three-act structure in Screenwriting – Syd Field and his theory of paradigm – Non-linear narrative and Plot points – Inciting incident in plot -Pinch points – The Sequence Approach – Storyboard – Beat Sheet – Logline – Treatment – Prelap – Tweak – Freeze frame – Voiceover – Flash forward – Flash back - Background - Slugline – Intercut – Montage – Issues of authorship – Copyright law -Auteurism – Auteur – Structuralism – Reconstructed auteurism – Continuity script – Silent film script – Master scene screenplays – Screenwriting manuals – George Polti's 36 dramatic situations

Required Reading

Price, Steven. "Introduction". *A History of Screenplay*. London: Palgrave Macmillan, 2013. 1 – 10.

Monaco, James. "The Language of Film: Signs and Syntax." *How to Read a Film*. London: OUP, 2009. 170 – 251.

Module II

Adapted and Original Screenplays

Module Outcomes

The students would have

MO 1: Critically read the screenplays, both original and adapted

Unit 2

Mario Puzo and Francis Ford Coppola – *The Godfather*

Ted Tally – *The Silence of the Lambs*

Quentin Tarantino – *Pulp Fiction*

Unit 3

Shyam Benegal – Netaji Subhash Chandra Bose: *The Forgotten Hero*

Michel Hazanavicius – *The Artist*

P. Padmarajan - *Thakara*

Module III

Module Outcome

The students would have

MO 1: Critically read the texts prescribed in the light of the critical essays

Unit 4

Critical Responses

Tropp, Martin. "Recreating the Monster: Frankenstein and Film". *Mary Shelley's Monster: The story of Frankenstein.* London: Houghton Mifflin. 1976.

Jenkins, Greg. "Lolita". *Stanly Kubrick and the Art of Adaptation*. London: McFarland & Company, 1952. Print. 31 – 63.

Recommended Reading

Field, Syd. Screenplay: *The Foundations of Screenwriting*. New York: Bantam Dell, 2005.

Lupus, Barbara Tepa. *Nineteenth-Century Women at the Movies: Adapting Classic Women's Fiction to Film.* Ohio: Univ. of Popular Press. 1981.

Maras, Stephen. *Screenwriting: History, Theory and Practice*. Wallflower Press, 2009. Print.

Wollen, Peter. “The Auteur Theory”.
http://artsites.ucsc.edu/faculty/Gustafson/FILM%20162.W10/readings/wollen.auteur.pdf

SEMESTER III

PAPER III: Choice 4

EL.535.4- Elective Course: Environment, Ecology and Literature (4 Hours /Week)

Aim

This Course aims to familiarize students with the concepts and contexts of Environmentalism, critically read Eco-literature and embrace
the ecological imperative for personal sensitivity and social change

Course Objectives

This Course wwill help students to

- Acquire knowledge regarding global environmental and ecological concerns
- Evolve a critical perspective on environmentalism and ecological conservation
- Build an awareness of the ecological issues and to develop an interest in environmental activism
- Provide an introduction to the ways in which the creative imagination has responded to Ecology
- Gain insights into the concerns of Environmentalism in India

Course Outcome

The student would have

CO 1: Comprehended the theoretical concerns in Environmental Studies
CO 2: Gained a critical perspective on environmentalism and ecological conservation
CO 3: Inspired towards making meaningful environmental interventions for social change
CO 4: Gained the skills to critically read and contextualize environmentally sensitive literature
CO 5: Evolved an understanding of the environmental concerns in India

Course Description

Module I :Theories and Contexts

Module Outcomes

The students would have
MO 1: comprehended the concepts of Environmentalism

MO 2: Familiarized themselves with different types of ecological theories

Unit 1

Natural Environment and Ecosystems- Human intervention- Anthropocene- Deforestation and Colonization- Native cultures and Peasant communities- their Ecological wisdom- Environmentalism – Green Studies - Ecocriticism and Ecopoetics, Deep Ecology, Social Ecology, Ecofeminism- Environmental activism- Climate change- Environmental Justice- Eco-tourism

Glotfelty, Cheryl. "Literary Studies in an age of Environmental Crisis". *The Ecocriticism Reader: Landmarks in Literary Ecology*. Ed. Cheryl Gotfelty and Harold Fromm. U of Georgia P. 1996. p. 20-25

Vandana Shiva. "Nature as the Feminine Principle" (from "Women in Nature", *Staying Alive*. Zed Books, 1988. P.38-42)

Wangari Maathai, Nobel Acceptance Speech, 2004
https://www.nobelprize.org/prizes/peace/2004/maathai/26050-wangari-maathai-nobel-lecture-2004/

Module II :The Environment and Literature

Module Outcomes

The students would have
MO 1: approached Eco-literature as an emerging genre in contemporary literature
MO2: evolved a critical perspective on ecologically sensitive literary texts

Ecological concerns in Literature-Nature writing- Pastoral Writing, Wilderness Writing- Ecopoetics- Place- Thinai-

Unit 2

1. Hymn to a Tree" (Trans, "Marathinu Sthuthi" Sugatha Kumari)

2. "House Warming", (a Garo song, from *Painted Words: An Anthology of Tribal Literature.* Ed. G.N.Devy, Penguin Books, 2002. P. 169)

3. John Burnside. "Penitence."
(From *Earth Songs: A Resurgence Anthology of Contemporary Eco-poetry*. Ed. Peter

Abbs.Greenbooks. 2002.)

4. Mary Oliver - "Fall"
https://www.poetryfoundation.org/poetrymagazine/browse?contentId=39077

5. "We will not leave our village" (Indian Village Song)
https://www.youtube.com/watch?v=8M5aeMpzOLU

6. The World's Most Famous Tiger, (Documentary film by Subaiah Nallamuthu, 2019.)
https://www.youtube.com/watch?v=dDkI873AHaw

Unit 3

1. Amitav Ghosh, *Gun Island*. Penguin Hamish Hamilton, 2019.

2.*The Book of the Hunter* (novel by Mahasweta Devi)

Module III: Eco-studies in India

Module Outcome
The students would have
MO 1: Understood the socio-political and historic aspects of the major environmental issues in India
MO 2: Analysed the role of tribal and peasant communities in the conservation of environment

Unit 4

Nature writing- Vedas and Classical writing- Folk and Tribal writings- Colonial interventions- Environmental degradation, deforestation and Pollution- Tribal and Peasant communities- Conservation and Biodiversity- Development- Environmental movements- Tribal revolts- Chipko-Narmada- Silent Valley- Plachimada- Enmakaje

1. Salim Ali. "Special Providence" (from *The Fall of a Sparrow*, OUP, 1985. Pp 1-11)
2. Gadgil, Madhav. "Environmentalism at the Crossroads". *Ecological Journeys: The Science andPolitics of Conservation in India*. Permanent Black. 2001. pp.121-135.

Reading List

Brara, Rita, "Ecology and Environment" 141-183. *The Oxford India Companion to Sociology and Social Anthropology.* Ed.Veena Das.Vol.1. OUP, 2003.

Buell, Lawrence. *The Future of Environmental Criticism: Environmental Crisis and Literary Imagination*. Blackwell, 2003.

Capra, Fritjof. *The Web of Life*. Flamingo, 1977.
Carson, Rachel, Silent Spring. Houghton Mifflin, 1962.

Devi, Mahasweta. *The Book of the Hunter*. Seagull Books, Trans. Mandira and Sagaree Sengupta. Seagull Books, 2002
Devy, Ganesh N. Ed. *Painted Words: An Anthology of Tribal Literature.* Penguin Books, 2002.

Gadgil, Madhav. "Environmentalism at the Crossroads". *Ecological Journeys: The Science andPolitics of Conservation in India*. Permanent Black. 2001. pp.121-135.

Gadgil, Madhav, and Ramachandra Guha. *This Fissured Land: An Ecological History of India.* OUP, 1992.
Ghosh, Amitav. *The Great Derangement: Climate Change and the Unthinkable*. The University of Chicago Press, 2017.

Glotfelty, Cheryll, et, al, ed. *The Bioregional Imagination: Literature, Ecology and Place*. U of Georgia P. 2012.

Glotfelty, Cheryl and Harold Fromm Ed. *The Ecocriticism Reader: Landmarks in Literary Ecology*. Ed. U of Georgia P. 1996.

Higginbotham, Adam. *Midnight in Chernobyl: the Untold Story of the World's Greatest Nuclear Disaster*. Simon & Schuster Paperbacks, 2020.

Kelkar, Govind, Dev Nathan, and Pierre Walter. Ed. *Gender Relations in Forest Societies in Asia: Patriarchy at Odds.* Sage Publications, 2003.

Lapierre, Dominique, et al. *Five Past Midnight in Bhopal*. Grand Central Publishing, 2009.

Māṅṅāṭ Ambikāsutan, and J. Devika. *Swarga: a Posthuman Tale*. Juggernaut, 2017.

Mahapatra, Sitakant. *Unending Rhythms: Oral Poetry of the Indian Tribes*. Inter India Publications, 1992.

Merchant, Carolyn. Ed. *Key Concepts in Critical Theory: Ecology*. Rawat Publications, 1996.
"mangal-kavya." *Encyclopedia Britannica Online.* 21 May 2008. <http://www.britannica.com/eb/article-9050512>.
<http: // www.deep-ecology.net/writing/broke/10.htm/21 15 March 1999.

Nayar, P.K. *Ecoprecarity: Vulnerable Lives in Literature and Culture* (1st ed.). Routledge. https://doi.org/10.4324/9780429294815

Our Bit of Truth: An Anthology of Canadian Native Literature. Ed. Agnes Grant. Pemmican. 1990.

Pathak, Shekhar. *The Chipko Movement: A People's History*. Permanent Black. 2020.
Roy, Arundhati. *The End of Imagination*. Haymarket Books. 2016
Sainath, P. - Articles
https://m.thewire.in/byline/p-sainath

Shiva, Vandana. *Staying Alive*: *Women, Ecology* and *Survival* in *India*. Zed. 1988.
Shiva, Vandana. Ed. *Minding Our Lives: Women from the South and North Reconnect Ecology and Health*. Kali for Women, 1993.

Sinha, Indra,. *Animal's People*. New York, NY: Simon and Schuster,2007.

Westling, Louise, ed. *The Cambridge Companion to Literature and the Environment*. CambridgeUP, 2014.

Thunberg, Greta. Speech at U.N. Climate Action Summit, 2019
https://www.npr.org/2019/09/23/763452863/transcript-greta-thunbergs-speech-at-the-u-n-climate-action-summit

Vidhyarthi, L.P. and B.K.Rai. *The Tribal Culture of India*. Concept Publishing Company, 1976.

SEMESTER III

PAPER III: Choice 5

EL.535.5- Elective Course: Travel Writing [4 hours/week]

Aim

This Course aims to acquire familiarity with samples of travel writing from across the world

Objectives

The objectives of this paper are to help:

- understand that travel writing has a chequered history of evolution
- analyse travel texts through critical reading
- acquire familiarity with samples of travel writing from across the world
- place Indian travel writing in a global context
- examine the blend of fact and fiction in travel narratives

Course Outcomes

At the end of this course student will be able to:

CO 1: display an awareness of the evolution of travel writing, its distinctive features, and to distinguish between its various forms

CO 2: identify the cross-links between travel writing and other genres such as memoirs, history, ethnography, anthropology and so on

CO 3: develop a conscious understanding of the various nuances of the author's subjectivity and perceptions that colour the narrative on place

CO 4: undertake a critical reading of travel texts to unearth probable subtexts

CO 5: display an awareness regarding the many cultural connotations and prejudices that are embedded in many travel narratives

Course Description

Module I – Departures

Module Outcomes

The students would have

MO 1: Understood the elements of travel writing as a genre

MO 2: Learned about major travel writers of the world

MO 3: Learned about diferent kinds of travel

Unit 1

Tools: maps and atlas: Mappa Mundi – Mercator's Projection – world atlas; **Guides**: Karl Baedeker – Lonely Planet – Google maps – travelogues, travel stories, travel guides -GPS

Evolution: Ptolemy's *Geographia* – Pausanias' *Description of Greece* – Marco Polo – Ibn Batuta – Fa Hien – Huan Sang – Ki no Teriyaki – Su Shi – Gerald of Wales – Petrarch's *Ascent of Mount Ventoux* - Elizabethan voyages of discovery and English explorers – Richard Hakluyt – Purchas' *Pilgrimage* – Captain James Cook -- Charles Darwin– Colonial travelers: David Livingston – Richard Burton – Pandita Ramabai – Frances Parker Bowles – Thoma Paremmakkal – S. K. Pottekkatt – contemporary travelers: Jan Morris – Bill Bryson – Michael Palin

Types of Travels: explorations – colonialism – the grand tour -- pilgrimages – adventures-piracy – war and immigration – exile – tourism

Required Reading

Thompson, Carl. "Introduction, Chapters 1, 2 & 3". *Travel Writing*. London: Routledge, 2011.

Hulme, Peter and Tim Youngs, eds. "Introduction." *Cambridge Companion to Travel Writing. Cambridge:* Cambridge U.P., 2002.

Module II - The World and Beyond

Module Outcomes

The students would have

MO 1: Understood the idea of multiple purposes in journeys

MO 2: Appreciate the idea of travel as a means of self realization

MO 3: Critically read the texts prescribed

Unit 2

Multiple purposes in journeys - a plethora of experiences beyond simple sight-seeing - record of personal realization and transformations - attempts to know new people and places - the prejudices of the author - Travel as a means of self-realisation - Road Movies.

Required Reading

Che Guevera : *The Motor Cycle Diaries*

Cheryl Strayed : *Wild*

Pico Iyer : *Falling off the Map*

Robert Pirsig : *Zen and the Art of Motorcycle Maintenance*

Required Reading

Iyer, Pico. : "Why we Travel." *Salon.com*. 18 March 2000.

Module III – Home and Away

Module Outcomes

The students would have

MO 1: Appreciated the idea of travel narratives as instruments in defining or branding national cultures

MO 2: Appreciate postcolonial travel narratives from India

Unit 3

Travel narratives - instrumental in defining or branding national cultures - the Briton's view of India as heavily colonial and condescending - branded the nation as "the land of snake charmers and sanyasis" - postcolonial travel narratives from India - complete make-over of the nation's profile - unique cultural variety and richness - attempts to redefine itself as one of the emerging economies - Indians abroad - attempts to narrate places without colonial burden.

Critical Reading

Mary Baine Campbell. "Travel Writing and its Theory" . Cambridge University Press, 2002.

Unit 4

Required Reading

Pankaj Mishra : *Butter Chicken in Ludhiana: Travels in Small Town India*

William Dalrymple's : *City of Djinns*

Samanth Subramanian : *Following Fish*

Reading List

Peter Hulme and Tim Youngs, eds. "Travel Writing and its Theory." *Cambridge Companion to Travel Writing.* Cambridge U.P., 2002.

Hulme, Peter and Tim Youngs, eds. *Cambridge Companion to Travel Writing.*Cambridge U.P., 2002.

Miller, Sam. *A Strange Kind of Paradise: India through Foreign Eyes*. London: Vintage Books, 2014.

Thompson, Carl. *Travel Writing*. London: Routledge, 2011.

SEMESTER III

PAPER III: Choice 6

EL535.6 - Elective Course: Content Writing [4 hours/week]

Aim

This course aims to initiate students into web content writing, and to enhance the employability of students by training them to write for specific purposes and in multiple formats.

Course Objectives

- To introduce the interdisciplinary field of web content writing.
- To provide an overview of content marketing.
- To inculcate the skill of writing persuasive content.
- To familiarize students with the formats, features and ethics of web content writing.
- To train students in writing content for different digital platforms.

Course Outcomes

By the end of the course, students will:

CO 1: Be familiar with the peculiarities of web content and its role in digital marketing.

CO 2: Display awareness regarding the basics strategies of digital marketing.

CO 3: Be familiar with digital platforms and the formats of online publication.

CO 4: Optimize their writing skills for multiple digital media platforms as per the required style and specifications.

CO 5: Be aware of the ethical and legal concerns in digital content creation.

Course Outline

Module I – Content Writing – An Introduction

Module Outcomes: By the end of this module, students:

MO 1: Are familiar with different types of content.

MO 2: Demonstrate knowledge of digital marketing strategies.

MO 3: Identify marketing niches and create user personas.

Unit 1

Content – Definition - Types of content – Technical and Marketing content, Content for Educational Purposes - Role of a content writer - Marketing niches and writing content for niches – Knowing the user - Creating User Personas

Digital Marketing - Inbound and Outbound marketing – Role of Content in Digital Marketing - Digital Marketing Strategies – SEO, Pay Per Click Marketing – Content Marketing through Blogs and Articles – Email Marketing – Social Media Marketing - Difference between B2B and B2C marketing - Winning leads and Converting - The Content Marketing Funnel – Discovery, Consideration and Purchase Stages – Content Types corresponding to the 3 Stages

Module II – Digital Platforms and Content Types

Module Outcomes: By the end of this module, students:

MO 1: Are familiar with the platforms and formats of content publication.

MO 2: Have basic knowledge of the technology used for content creation.

MO 3: Know the unique features of web content and incorporate them in their writing.

MO 4: Are aware of the ethical principles behind web content writing.

Unit 2

Digital platforms for Content publication – Websites - E-Commerce Websites, Blogs, Vlogs, Social Media (Facebook, Twitter, LinkedIn, Instagram) – Educational Sites, E-Learning Platforms – MOOCs - Features of different platforms - Structure of a Website - Homepage, Help Pages and FAQs, Landing Pages, Copyright Statement, Terms of Use

Formats of Digital Content – (Basic Information) - Podcasts, Videos, Images, Textual Content and Infographics

Unit 3

Use of software for Content Creation - (Basic Information) – Office Suites like MS Office - Authoring and Publishing Software - Adobe Robohelp, MadCap Flare, Frame Maker - Image and Design Editing Software - Adobe Photoshop

Common Features of Digital Media Content – Interactivity, Use of Hyperlinks, User friendliness, Multimedia, Social Reach and Search Friendliness

Ethical and Legal Concerns in Content Writing – Respecting Privacy – Maintaining Transparency - Plagiarism – Copyright - Copyleft Content and Creative Commons

Module III – Writing Process, Practice

Module Outcomes: By the end of this module, students:

MO 1: Display in-depth knowledge of the steps involved in content writing.

MO 2: Follow a systematic procedure for creating content.

MO 3: Are familiar with style specifications and apply them in the writing process.

MO 4: Gain sufficient practice in writing different types of content.

Unit 4

Writing Process – Researching the Topic, Creating Outline, Writing the First Draft, Reviewing, Editing and Proofreading - Style sheets – Examples - Microsoft Style Sheet, Yahoo Style Sheet, In-house style sheets – Use of punctuation, bullets and numbering etc.

Writing Attractive Headlines - Inverted Pyramid Style - Maintaining Unity and Coherence - Using short, scannable sentences - Conversational and Semiformal Style - Addressing the Reader (You – approach) - Avoiding jargon - Including Keywords, Using informal expressions, Popularity of American diction, Using tables, graphs and illustrations

Writing Practice - Captions - Promotional product description - Social Media posts, LinkedIn Profiles – E Mailers – Business Proposals

Website and blog articles - (Types) – How-to Guides, Listicles, Pillar Content (10x content), Reviews, Comparative Studies, Case Studies, Checklists and Cheat Sheets, News and Events

Educational Content - Scholarly Articles, Podcast Scripts, Exercise Sheets, Quizzes

Core Reference

Mill, David and David Chaffey. *Content is King: Writing and Editing Online.* Routledge, 2012.

Mizrahi, Janet. *Web Content: A Writer's Guide.* Business Expert Press, 2013.

Additional Reference

Felder, Lynda. *Writing for the Web: Creating Compelling Web Content Using Words, Pictures and Sound*. New Riders, 2012.

Handley, Ann and C.C. Chapman. *Content Rules*. Wiley, 2011.

Redish, Janice. *Letting Go of the Words: Writing Web Content that Works*. Elsevier, 2007.

Robinson, Joseph. *Content Writing Step-by-Step: Learn How to Write Content that Converts and Become a Successful Entertainer of Online Audiences.* Amazon Digital Services, 2020

https://blog.hubspot.com/marketing/what-is-digital-marketing

https://www.webfx.com/internet-marketing/actionable-digital-marketing-strategies.html

https://backlinko.com/hub/content/what-is-content-marketing

https://www.lucidchart.com/blog/content-marketing-funnel

https://backlinko.com/hub/content/writing

https://backlinko.com/hub/content/production

https://backlinko.com/templates/marketing/email

https://www.zoho.com/academy/tag/social-media

https://www.zoho.com/academy/roadmap

https://www.zoho.com/academy/e-commerce/writing-best-ecommerce-copy/writing-killer-product-descriptions.html

https://coccoer.pressbooks.com/chapter/ethics-in-technical-writing/

https://enveritasgroup.com/campfire/ethical-issues-in-content-and-social-media-marketing/

SEMESTER IV

PAPER XVII – EL.544 - Choice: 1

EL.544.1 - Elective Course: Translation Studies [4 Hours/week]

Aim

This Course aims to familiarize students with the theory and praxis of translation

Course Objectives

The objectives of this paper are to:

- provide the students a systematic understanding of the process of translation; and, of different translation types
- familiarize the students with the histories of translation in the East and the West
- provide the students a critical understanding of the concerns, concepts and issues in translation theory
- help the students evaluate translations
- enable the students to develop practical translation skills

Course Outcomes

At the end of the course, the students will be able to:

CO 1: demonstrate an understanding of the nature of translation studies as an independent academic discipline

CO 2: reflect critically on the process of translation, and on various translation types

CO 3: demonstrate a systematic and critical understanding of the concerns, concepts and issues in translation theory, both modern and traditional

CO 4: make critical judgments on the quality of translation

CO 5: apply translation techniques and strategies from theoretical essays, and analyses of existing translations

Module I – History of Translation

The students would have

MO 1: learned the history of translation in India

MO 2: learned the historyof translation in the west

Unit 1

History of translation in India: Translations from Sanskrit – translations in regional languages – translations from and through English translations during the colonial period - History of translation in the West: Translations from the classical languages of Latin and Greek – the Bible translation

Required Reading

Debendra K Dash & Dipti R Pattanaik. "Translation and Social Praxis in Ancient and Medieval India." Translation – *Reflections, Refractions, Transformations*. Ed. Paul St-Pierre and Prafulla C. Kar. Philadelphia: Benjamins Translation Library, 2007. 153-73.

Andre Lefevere. "Translation: Its Genealogy in the West." *Translation, History and Culture.* Ed. Susan Bassnett and Andre Lefevere. London: Pinter, 1990. 14 - 28.

Module II – Translation: Theoretical Issues

The students would have

MO1: understood translation theories

MO2: understood the Indian perspectives in this area

Unit 2

Translatability – Problems of Translation - translation theories – Translation as creative writing--Translation as Nation building- Limits of Translation- Indian perspectives - translation theories

Required Reading

Das, Bijay Kumar. *A Handbook of Translation Studies.* New Delhi: Atlantic Publishers, 2011.

G. N. Devy. "Translation Theory: An Indian Perspective". *In Another Tongue: Essays on Indian English Literature.* Ed. G. N. Devy. Chennai: Macmillan, 1995. 162- 7.

Simon, Sherry. "Enter the Translatress & Aphra Behn: The Translatress in Her Person Speaks." *Gender in Translation: Cultural Identity and The Politics of Transmission*. Ed. Sherry Simon. London; New York: Routledge, 1996. 43-55.

Module III – Translation Types and Process of translation

The students would have

MO 1: learned about the different types of translation

MO 2: learned the practice of translation

Unit 3: Types of translation

Types of Translation - Retellings – adaptations - translation in the 21st century– feminist translation

Required Reading

Sen, Nabaneeta Dev. "When Women Retell The Ramayana", *Manushi*, Vol. 108, September-October 1998. 18-27. (Available online at <http://www.manushi.in/>)

Thapar, Romila. "Adaptations: Another Popular Tradition and its Role in Another Court." *Sakuntala: Texts, Readings, Histories.* Ed. Romila Thapar. New Delhi: Kali for Women, 1999. 189-196.

Kapoor, Kapil. "Philosophy of Translation: Subordination or Subordinating : Translating Technical Texts from Sanskrit - Now and Then." *Translation and Multilingualism: Post-colonial Contexts*. Ed. Shantha Ramakrishna. New Delhi: Pencraft International, 1997. 146- 166.

Unit 4: Processes of Translation

Practice of translation – Role of the translator - strategies and techniques - translation of poetry – translating prose – translation of drama (can be given as assignments)

Required Reading

Paniker, Ayyappa K. "On Translating T.S.Eliot's Poetry into Malayalam." *International Journal of Translation,* Vol. 3, Nos 1 & 2, Jan-Dec 1991. 73-81.

Suhrud, Tridip. "Reading Gandhi in Two Tongues." *Reading Gandhi in Two Tongues and Other Essays*. Ed. Tridip Suhrud. Shimla: Indian Institute of Advanced Study, 2012. 1-19.

Reading List

Bassnett, Susan. Translation Studies. 4th edn. London: Routledge, 2014. Print. New Accents Series.

Bassnett, Susan. *Translation*. London: Routledge, 2014. Print. New Critical Idiom Series.

Boratti, Vijayakumar M. "Rethinking Orientalism: Administrators, Missionaries and the Lingayaths." *Translation in Asia: Theories, Practices, Histories.* Ed. Ronith Ricci and Jan Van Der Putten. Manchester: St. Jerome Publishing, 2011. 88-103.

Das, Sunil. "Drama in Translation: Dramatic Collage." *Making of Indian Literature: A Consolidated Report of Workshops on Literary Translation*, 1986-1988. Ed. K. AyyappaPaniker. New Delhi: Sahitya Akademi, 1991. 229-233.

Dryden, John. "On Translation." *Theories of Translation: An Anthology of Essays from Dryden to Derrida*. Ed. Rainer Schulte and John Biguenet. Chicago: University of Chicago Press, 1992. 17-31.

Grossman, Edith. "Translating Poetry." *Why Translation Matters.* Ed. Edith Grossman. New Haven: Yale UP, 2010. 89-120.

Nair, Sreedevi K. “One Story, Many Texts: Conceptualising Seed Text in Epics Retold.” *Reflections and Variations on The Mahabharata*. Ed. T.R.S. Sharma. New Delhi: Sahitya Akademi. 2009. 301-315.

Pound, Ezra. "Guido’s Relations." *Theories of Translation: An Anthology of Essays from Dryden to Derrida*. Ed. Rainer Schulte and John Biguenet. Chicago: University of Chicago Press, 1992. 83-92.

Reynolds, Mathew. *Translation: A Very Short Introduction*. London: OUP, 2016. Print. Very Short Introduction Series.

Trivedi, Harish. "Translating Culture vs. Cultural Translation." *Translation – Reflections, Refractions, Transformations.* Ed. Paul St-Pierre and Prafulla C. Kar. Philadelphia: Benjamins Translation Library, 2007. 251 – 260.

VPC, Ubaid. "Translating the Quran : An Analysis of Discourse on Hijab in Selected English Translations." *Translation Today* , Vol. 9, No.1, 2015. 157-177.

SEMESTER IV

PAPER XVII: Choice 2

EL.544.2 - Elective Course: Regional Literatures in English Translation [4 hours/week]

Aim

This Course aims at introducing students to the variety of regional writings in India, so that they gain a consciousness of the great linguistic and literary diversity of India

Course Objectives:

The objectives of this paper are to:

- introduce the students to the consciousness of the great linguistic and literary diversity of India
- enable the students to cultivate a political sensitivity not to dismiss these with pejorative labels such as “minor,” or “primitive”
- give students a historical awareness of regional literary movements

Course Outcomes:

At the end of this course, students will be able to:

CO 1: demonstrate knowledge of at least a few languages and literatures with a smaller number of native speakers and readers

CO 2: demonstrate basic knowledge about the 8th schedule of the Indian Constitution

CO 3: show an understanding of the major landmarks and trends in at least a few of India’s major literatures from the 19th century to the present day

CO 4: analyse critically some of the thematic concerns running through most of the above literatures such as the critical exploration of the idea of nationalism, protest against inequities based on caste, creed, gender and social status, concern for the environment and reworking/ retelling of long established myths and dominant narratives.

Course Description

Module I: Socio-political and Literary Background & Prose

Module Outcomes

The students would have

MO 1: Understood the major language families in India,

MO 2: Become aware of the oral traditionsof India

MO 3: Understand the different thematic trends in pre and post independence literature

Unit 1

Major language families in India, their history in brief and their important members – Indo-European – Dravidian – Tibeto-Burman - Khmer-Nancowry – an idea of the oral traditions – myths – fables – ballads - epics – religious myths and legends – bhakti and Sufi devotional traditions – post independence concerns – emergence of marginalized voices – revolutionary voices – ancient Indian poetry, prose – medieval Indian poetry, prose– pre- Independence poetry, – post-independence poetry, prose– thematic trends in poetry, prose and drama.

Prose

Natarajan , Nalini. : "Introduction: Regional Literature of India: Paradigms and Contexts." *Handbook of Twentieth Century Literature of India*. Ed. Nalini Natarajan. London: Greenwood, 1996.pp. 1 - 20.

A. K. Ramanujan : "Introduction" to *Folktales from India*

Module II :Poetry

Module Outcomes

The students would have

MO 1: Learned to appreciate poetry in diferent languages of India

MO 2: Learned the importance of translations

Unit 2

Amrita Pritam : "Street Dog" (Punjabi)

Thanjam Ibopishak Singh: "I Want to be Killed by an Indian Bullet" (Manipuri,

Trans.Robin Ngangom)

Devara Dasimayya : "Suppose You Cut a Tall Bamboo" (Kannada, Trans. A. K. Ramanujan)

Gulam Mohammed Sheikh : "Jaisalmer 1" (Gujarati, Trans. Saleem Peeradina)

Navakanta Barua : "Measurements" (Assamese, Trans. D. N. Bezbaruah)

Akkitham : "The Berry in the Hand" (Malayalam, Trans. Ayyappa Panikker)

Module III: Fiction and Drama

Module Outcomes

The students would have

MO 1: Learned to appreciate drama and fiction in diferent languages of India

MO 2: Learned the importance of translations

Unit 3

Rabindranath Tagore : *The Home and the World* (Bengali novel)

Bama : *Sangati*

Vijay Dan Detha : " The Compromise" (Rajasthani short story,Trans, Shyam Mathur)

Premendra Mitra : "The Fugitives" (Bengali short story,Trans. Tutun Mukherjee

Unit 4

Chandrasekhar Kamber : *Jokumaraswamy* (Kannada, trans. Rajeev Taranath)

Dharamvir Bharati : *Andhayug* (Hindi, Trans. Alok Bhalla)

Reading List

Chaudhari, Amit, ed. *The Picador Book of Modern Indian Literature*. Picador, 2001: i-xxxiv.

Dan Detha, Vijay and Shyam Mathur. "The Fugitives," *Indian Literature,* vol.43, no.2(190), Mar-Apr 1999,pp.113-17.

George, K. M., ed. *Comparative Indian Literatures*. 2 vols. Kerala Sahitya Akademi, 1984.

Gokak, V. K., ed. *Literatures in Modern Indian Languages*. Publications Division, 1957.

---. *Masterpieces of Indian Literature*. 3 vols. National Book Trust, 1997.

Indian Literature. Kendra Sahitya Akademi (relevant issues).

Mitra, Premendra. *Mindscapes*. Trans. Tutun Mukherjee. Sahitya Akademi, 2000.

Ramakrishnan, E. V., et al., eds. *Interdisciplinary Alter-Native in Comparative Literature*. Sage, 2013.

Venuti, Lawrence, ed. *The Translation Studies Reader.* Routledge, 2004.

Vinodini, M. M. "The Parable of the Lost Daughter" Trans. Uma Bhrugubanda. *The Exercise of Freedom*. Ed. K Satyanarayana and Susie Tharu. Navayana, 2013.

SEMESTER IV

PAPER XVII: Choice 3

EL.544.3 – Elective Course: Media Studies [4 hours/week]

Aim

This Course aims to introduce the students to the world of mass media and the different fields of journalism.

Course Objectives:

The objectives of this paper are to:

- Introduce the students to the world of mass media and the different fields of journalism.
- Develop in students an understanding of the mass communication process
- Help students develop life skills which enable them to analyze various forms of modern communication
- Develop a critical understanding of media in society.

Course Outcomes

At the end of the course, students will be able to:

CO 1: Demonstrate their understanding of basic components of the world of journalism and mass media

CO 2: Demonstrating their skills at reporting and editing in print and electronic media

CO 3: Do a critical appraisal of the role of media in society

Course Description

Module 1: Understanding Media

Module Outcomes

To enable students to

MO 1: understand the forms and methods of communication

MO 2: - gain awareness of the scope and limitations of print and broadcast media

Unit 1

Role of media- Media Time Line- Media and Mass Media- What is Mass Communication?- Elements in the process of communication- Forms and methods of communication- effective communication- Types of Mass Media- scope and limitations of print and broadcast media-online media and their potentials

Functions of communication- Surveillance function , Correlation function, Entertainment function, Cultural transmission

Module 2: Convergent Media

Module Outcomes

This module will enable the student to

MO 1: understand the idea of Convergence

MO 2: learn about writing for different media platforms

MO 3: learn about the structure and content of news stories

Unit 2

Idea of Convergence- History and evolution- Definition and concepts of traditional media and New Media- Writing for different media platforms-importance of Metadata- Search Engine Optimization – Google trends

Creation and maintenance of own blog/website- content creation and management of text, video and audio- Basics of integrating audio, photographs, graphics and video to enhance news/article- issues of credibility, privacy and security- Ethical concerns

Unit 3

What is news? - news values- the basics of reporting- making news- Analyzing news- news gathering techniques-types of news- Role of press in social and political movements- Freedom of press-structure and content of news stories- interactivity and participation of audience- News sources and credibility measures.

Alternatives to Mainstream Journalism- Vlogging, Blogging, social media- Facebook, Instagram,Twitter

Module 3: New Media

Module Outcomes

This module will enable the students to

MO 1: learn about New Media, Development and Society

MO 2: familiarize themselves with the internet as Mass Medium

Unit 4

Journalism as new media-Open source Journalism-Participatory Journalism-its potentials and limitations- Social networking sites

Media and civil society- media and violence- visual culture and media- Fine Arts- Photography- Film- television

Challenges and opportunities as Journalist-need for multi- skilled journalists-working with emerging and future technologies- artificial intelligence in Journalism

Reading List

Baskette, Floyd K., et al. *Art of Editing*. 5th edn. McMillan. 1992.

Fiske, John. *Introduction to Mass Communication Studies*.Routledge,1996.

Kumar, Keval J. *Mass Communication in India*. Jaico Publishers, 2010.

McLuhan, Marshall. *Understanding Media: The Extensions of Man*. Sphere Books, 1973.

Orlik, Peter B. *The Electronic Media*. Allyn and Bacon, 1995.

Ray, Tapas. *Online Journalism: A Basic Text*. Cambridge UP, 2006.

Saxena, Sunil. *Headline Writing*. Sage, 2006.

Vivian, John. *The Media of Mass Communication*. PHI Learning, 2013.

Ward, Mike. *Journalism Online*. Focal, 2002.

SEMESTER IV

PAPER XVII: Choice 4

EL.544.4 – Elective Course: Dalit Writing [4 hours/week]

Aim

To read, understand and reflect on the literature of the Dalits in India.

Course Objectives :

The objectives of this paper are to:

- centre Dalit literature as a significant locus of imaginative and polemical writing
- provide curricular recognition to the experience, art and knowledge of a marginalized community
- expose students to the Dalit renewal of the discussion on democracy, humanism and literature.
- familiarize them with the building up of a counter-canon in the Indian literary context.

Course Outcome

At the end of the course, students will be able to:

CO 1: come into contact with key modern Dalit writers and thinkers and their varied concepts

CO 2: enhance their understanding of the issues at stake in the contemporary Dalit movement

CO 3: evolve an in-depth grasp of the field at the levels of experience as well as concept

CO 4: extend their awareness of the social and aesthetic questions being raised in the writing.

Course Description

Module I – Key Concepts

Module Outcomes

Students will be able to

MO 1: Understand the socio-political background of Dalits in India

MO 2: know about the Dalit leaders and movements in India and Kerala

MO 3: know about the contemporary Dalit movements and issues

Unit **1**

Definitions of Dalit – varna and caste hierarchy – opposition to Brahminical hegemony and ideology – bhakti movement – B. R. Ambedkar's contributions to Dalit movement – Early leaders of Dalit movements – Dalit Panther movement – Adi Dharm movement – Dalit Buddhist movement – role of Brahmo Samaj and Arya Samaj – Dalit movement in Kerala and contributions of Sri Ayyankali – language of the Dalit – Dalit women writers – contemporary Dalit movements and issues

Recommended Reading

Limbale, Sharankumar. "Towards a Dalit Aesthetics." *Towards an Aesthetic of Dalit Literature: History, Controversies and Considerations.* Trans. Alok Mukherjee. New Delhi: Orient Longman, 2004. 103-21.

Satyanarayana K., and Susie Tharu. Introduction. *From Those Stubs, Steel Nibs are Sprouting: New Dalit Writing from South India: Dossier II: Kannada and Telugu.* Ed. K. Satyanarayana and Susie Tharu. Noida: Harper Collins, 2013.

Module II – Poetry & Drama

Module Outcomes

Students will be able to

MO 1: Acquaint with the Dalit poets in India

MO 2: Understand how Dalit poetry acts as a mode of Resistance

MO 3: Know about how the Dalit poets express their experience through poetry

Unit 2

Poetry

Satish Chandar : "Panchama Vedam"

S. Joseph : "Fish Monger"

M. R. Renukumar : "The Poison Fruit"

Prathiba Jeyachandran : "Dream Teller"

N. K. Hanumanthiah : "Untouchable, Yes I am!"

Namdeo Dhasal : "Cruelty"

Meena Kandasamy : "Mulligatawny Dreams"

Chandramohan S : "Killing the Shambuka"

Drama

A. Santhakumar : "Dream Hunt"

K. Gunashekaran : "Touch"

Module III – Prose, Novel/Stories & Autobiography

Module Outcomes

Students will be able to

MO 1: Understand the writings of Dalit writers through prose, novel/stories and autobiographies

MO 2: get an awareness about the aesthetic questions that are raised in their writings

MO 3: know about the real life experiences of Dalits in India

Unit 3

B. R. Ambedkar : "Annihilation of Caste"

Gopal Guru : "Dalit Women Talk Differently"

T. M. Yesudasan : "Towards a Prologue to Dalit Studies"

Unit 4

P. Sivakami : *The Grip of Change*

Paul Chirakkarode : "Nostalgia"

Gogu Syamala : "Raw Wound"

Bandhumadhav : "Poisoned Bread"

Balbir Madhopuri : "Changiya Rukh"

Om Prakash Valmiki : *Joothan*

Reading List

Ambedkar, B. R. "Annihilation of Caste". *The Essential Writings of B. R. Ambedkar.* Ed. Valerian Rodrigues. New Delhi: Oxford UP, 2002. 263-305.

Appachan, Poikayil. "Song." M. Dasan, et al., eds. *The Oxford India Anthology of Malayalam Dalit Literature*. New Delhi: Oxford UP, 2012. 5-6.

Ayyappan, C. "Madness." Trans. Abhirami Sriram. *The Oxford India Anthology of Malayalam Dalit Literature*. Ed. M. Dasan, et al. New Delhi: Oxford UP, 2012.

Bandhumadhav. "Poisoned Bread." *Poisoned Bread: Translations from Modern Marathi Dalit Literature*. Ed. Arjun Dangle. Hyderabad: Orient BlackSwan, 2009.

Basu, Tapan et al., eds. *Listen to the Flames: Texts and Readings from the Margins.* New Delhi: Oxford UP, 2016.

Chandramohan S. "Killing the Shambuka"
https://roundtableindia.co.in/index.php?option=com_content&view=article&id=9488:reading-chandramohan-sathyanathan-s-poetry&catid=129:events-and-activism&Itemid=195

Chirakkarode, Paul. "Nostalgia." *Counter Cultural Discourse and Dalit Literature in India*. Ed. M. Dasan and Rajesh Karankal. New Delhi: ABD Publishers, 2014.

D'souza, Eunice de, ed. *Both Sides of the Sky*: *Post-Independence English Poetry*. New

Delhi: National Book Trust, 2008.
Dangle, Arjun, ed. *Poisoned Bread: Translations from Modern Marathi Dalit Literature*. Hyderabad: Orient BlackSwan, 2009.
Dasan, M. and Rajesh Karankal, eds. *Counter Cultural Discourse and Dalit Literature in India*. New Delhi: ABD Publishers, 2014.
Dhasal, Namdeo. "Cruelty." *A Current of Blood*. Trans. Dilip Chitre. New Delhi: Navayana, 2011.

Gunashekaran, K. "Touch." *The Oxford Anthology of Tamil Dalit Writing.* Ed. Ravikumar and Azhagarasan. Oxford UP, 2012. 163-68.
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Valmiki, Om Prakash. *Joothan.*Trans. Arun Prabha Mukherjee. Berkeley: Columbia UP, 2003.

SEMESTER IV

PAPER XVII: Choice 5

EL.544.5 : Elective Course : Theorizing Sexualities [4 hours/ week]

Aim

The aim of this paper is to give students an awareness of biological, social and grammatical gender as being three different categories

Course Objectives

The objectives of this paper are to:

- demonstrate an awareness of biological, social and grammatical gender as being three different categories
- give a basic awareness of struggles and attainments of people with alternative sexualities in civil rights in various parts of the world
- help the students view with scepticism the simplistic conflation of biological sex with socially and culturally conditioned gender

Course Outcomes

At the end of this course the students will be able to:

CO 1: appreciate, if not accept the viewing of gender as a continuum

CO 2: display an awareness of different sexualities such as lesbian, gay and bisexual rather than seeing heterosexuality as the only ‘natural’ or ‘decent’ lifestyle option

CO 3: critically analyse different gender self-identification preferences such as transgender and inter-genders rather than seeing the polar genders male and female as the only ‘natural’ ones

CO 4: show sensitivity to the legal and social persecution faced by persons belonging to the LGBTI or simply, Queer, community in societies across the world and view their rights as human rights

CO 5: exercise an enhanced openness and honesty when encountering/ generating discourse on matters of sexuality and gender roles

Course Description

Module I – Introducing Sexuality

Module Outcomes

To enable students to

MO 1: Understand the norms of heterosexuality in religious texts and traditions

MO 2: Learn about sexological types and psychological drives

Unit 1

The norm of heterosexuality in religious texts and traditions – the Bible, Qur'an and Manusmriti – hypermasculine models in classical mythology – Sanskrit, Greek and Roman – the coexistence of characters, models and narratives that can be said to constitute counterpoints to the dominant mythical norm – the androgyny in Christ - the Sufi tradition of viewing God as the lover and the believer as the beloved - the Shiva-Mohini and Ayyappa myths in Hinduism - the tales of Shikhandin and Rishyasringa in the Mahabharata – the colonial encounter and the masculinisation of religion in India

Sexological types: Sexual Classifications, sexual development, sexual orientation, gender identity, sexual relationships, sexual activities, paraphilias, atypical sexual interests

Psychoanalytic drives: Freud and Lacan.

Required Reading:

Bristow, Joseph. *Sexuality: The New Critical Idiom Series*. London: Routledge, 1997. Introduction , Chapters 1 & 2)

De Beauvoir, Simone. “Part II, Chapter 4, ‘The Lesbian’”. *The Second Sex*. Paris: Knopf Doubleday, 2012.

Butler, Judith. “Preface” *Bodies That Matter: On the Discursive Limits of “Sex”*. London: Routledge, 1993.

Jagose, Annamarie. “Chapter 2: Theorising Same-Sex Desire”. *Queer Theory: An Introduction*. New York: Newyork Univ Press. 1996

Module II – Poetry and Prose

Module Outcomes

To enable students to

MO 1: Appreciate the poems and songs from world literatures

Unit 2

The song of songs – the Sufi and Bhakti traditions –the concept of Radha Bhaav

Required Reading

Shakespeare : Sonnet 73

Emily Dickinson : “Her Breast is Fit for Pearls”

Adrienne Rich : “Diving into the Wreck”

Walt Whitman : “The Wound Dresser”

Unit 3

Prose

Manoj Nair : “Rite of Passage”

Chimamanda N. Adichie: “On Monday of Last Week”

Mukul Kesavan : “Nowhere to Call Home”

Shyam Selvadurai : *Cinnamon Gardens* (novel)

Ismat Chugtai : "The Quilt" (Urdu short story)

Module III – Drama and Films

Module Outcomes

To enable students to

MO 1: Appreciate the dramas and films from world literatures

Unit 4

Required Reading

Drama

Edward Albee : *The Zoo Story*

Films

Moses Tulasi : Walking the Walk (English –Telugu –Urdu documentary film)

Reading List

Nair, Manoj. "Rite of Passage". *Yaraana: Gay Writing from India*. Ed. Hoshang Merchant. New Delhi: Penguin, 1999. 171-179.

Aligarh. Dir. Hansal Mehta. Script. Apurva Asrani. Perf. Manoj Bajpayee and Rajkummar Rao. 2016. DVD

De Lauretis, Teresa. *Technologies of Gender: Essays on Theory, Film and Fiction*. Indiana UP, 1987. .

Dollimore, Jonathan. *Sexual Dissidence: Augustine to Wilde, Freud to Foucault*. Clarendon, 1991.

Foucault, Michel. *A History of Sexuality* (3 Vols). Tr. Robert Hurley. New York: Vintage, 1978.

Bandit Queen. Dir. Shekhar Kapoor. Perf. Seema Biswas, Nirmal Pandey, Rakesh Vivek. 1994. DVD

Fire. Dir. Deepa Mehta. Perf. Shabana Azmi, Nandita Das, Karishma Jhalani. 1996. DVD. Rao, Raj R. and Dibyajyoti Sarma. *Whistling in the Dark: Twenty-One Queer Interviews*.

Sage, 2009.

Revathy, A. *The Truth About Me: A Hijra Life Story*. Penguin, 2013.

Sedgwick, Eve Kosofsky. *Between Men: English Literature and Male Homosocial Desire*.

New York: Columbia UP, 1985.

Vanita, Ruth and Saleem Kidwai, eds. *Same-Sex Love in India: A Literary History*. Penguin, 2000.

SEMESTER IV

PAPER XVII: Choice 6

EL.544.6 - Elective Course: Introduction to Comics Studies [4 Hours /Week]

Aim

To introduce students to the field of comics studies and enable them to develop a critical approach towards comics and graphic novels.

Course Objectives

- To introduce the key terms and concepts in comics studies
- To familiarise students with the social and cultural history of comics
- To discuss the recent trends in the field of comics and graphic novels
- To introduce canonical texts, major authors and critics in the field
- To enhance students' close-reading skills and develop their critical reading strategies

Course Outcomes

CO 1: At the end of the course the students will:

CO 2: Understand the theoretical and historical foundations of the field of comics studies

CO 3: Critically read and appreciate comics and graphic narratives, deploying multiple close-reading strategies

CO 4: Demonstrate a critical awareness of the recent trends in the field of comics studies

CO 5: Engage with canonical texts critically and examine the central formal and thematic elements of such narratives

CO 6: Probe into the formal affordances of comics which makes it a unique verbal-visual medium

Course Description

Module I : Definitions, Key terms & concepts

Module Outcomes:

By the end of the module, students

MO 1: Have a clear understanding of the definitions and basic elements of comics

MO 2: Are aware of the methods and techniques in reading and creating comics

Unit 1

Definition of comics – Comics and Graphic Novels – Affordances and components of comics [panels-gutter-grid-tier-frame-hyperframe-balloons-caption-lettering-emanata-motion lines-splash page-spread page]–Word and Image interactions - Rhetorical devices and techniques–Role of reader and reader positions

Required Reading:

McCloud, Scott. "Chapter 1: Introduction", "Chapter 2: The Vocabulary of Comics". *Understanding Comics: The Invisible Art*. New York: Harper, 1994.

McCloud, Scott. "Chapter 1: Writing with Pictures". *Making Comics*. New York: Harper, 2006.

Module II History of Comics

Module Outcomes:

By the end of the module, students

MO 1. Demonstrate an in-depth knowledge of the history of the development of comics as a medium
MO 2. Get familiarised with the recent trends in the field of comics and graphic novels

Unit 2

Social and Cultural history of comics - the Rise of Comics Strips - Superhero Narratives - Marvel and Detective Comics– Post Comic Code Authority – Underground Comics – Rise of autobiographical comics- international comics – manga and other related forms - deconstruction of superhero narratives – the Indian comics industry – Amar Chitra Katha Recent trends – movie adaptations of comics – webcomics

Required Reading:

Chute, Hilary and Marianne Dekoven. “Comic Books and Graphic Novels”. *The Cambridge Companion to Popular Fiction*. Edited by David Glover and Scott McCracken. (pp 175-195)

Stoll, Jeremy. "Comics in India." *The Routledge Companion to Comics*. Routledge, 2016. 104-113.

Module III Reading Comics

Module Outcomes:

By the end of the module, students

MO 1. Are familiarised with some of the canonical texts in the field of comics
MO 2. Learn how to close-read comics texts by paying close attention to its verbal-visual codes and affordances
MO 3. Become aware of the variations in graphic storytelling across different socio-cultural settings
MO 4. See how comics can be used to introduce themes of sexuality and minority discourses

Unit 3

Art Spiegelman: *Maus I: A Survivor’s Tale*

Marjane Satrapi: *Persepolis: The Story of a Childhood, New York: Pantheon, 2004*

Amruta Patil: *Kari*

Srividya Natarajan, Durgabai Vyam, Subhash Vyam. *Bhimayana: Incidents in the Life of Bhimrao Ramji Ambedkar*. Navayana 2011.

Unit 4

B R Bhagwat. *Mahabharata: The Great Epic of India*. Amar Chitra Katha Vol 582.

Alan Moore: *Batman: The Killing Joke* (New York: DC, 2008, 64 pp.)

Takeshi Obata and Tsugumi Ohba: *Death Note, Volume One.*

Alice Osman. *Heartstopper*. (Chapter 1, Chapter 2). Webtoons. 2018. https://www.webtoons.com/en/challenge/heartstopper/list?title_no=329660

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Carrier, David. The Aesthetics of Comics. USA: The Pennsylvania State University Press, 2000.Print.

Chute, Hillary. “Comics as Literature? Reading Graphic Narrative.” PMLA, vol. 123, no. 2, Modern Language Association, 2008, pp. 452–65, http://www.jstor.org/stable/25501865

Danziger-Russell, Jacqueline. Girls and Their Comics: Finding a Female Voice in Comic Book Narrative. UK: Scarecrow Press Inc., 2013. Print.

Duncan, Randy, and Mathew J. Smith and Paul Levitz. *The Power of Comics: History, Form and Culture*. London: Bloomsbury. 2015.

El, Refaie E. *Autobiographical Comics: Life Writing in Pictures*. Jackson: University Press of Mississippi, 2012.

Fawaz, Ramzi, Shelley Streeby and Deborah Whaley. *Keywords for Comics Studies*. New York: New York UP. 2021.

Groensteen, Thierry. *The System of Comics*. Jackson: University Press of Mississippi, 2007.

Heer, Jeet; Worcester, Kent, eds. Arguing Comics: Literary Masters on a Popular Medium. USA: U of Mississippi P, 2004. Print.

McCloud, Scott. *Understanding Comics: The Invisible Art*. New York: Harper Perennial, 1994.

McLain, Karline. India’s Immortal Comic Books: Gods; Kings, and Other Heroes. Bloomington: Indiana University Press, 2009. Print.

Petersen, Robert S. Comics, Manga, and Graphic Novels: A History of Graphic Narratives. USA: Greenwood Publishing Group, 2011. Print.

Pritchett, Francis W. “The World of Amar Chitra Katha.” Media and the Transformation of Religion in South Asia. Ed. Lawrence A. Babb, Susan S. Wadley. University of Pennsylvania Press.1995. 76-106. Google Books Search. Web. 15 Sept 2014.

Robbins, Trina; Catherine Yronwode. Women and the Comics. Eclipse Books, 1985. Print.

Saraceni, Mario. *The Language of Comics*. London: Routledge, 2003.

Serchay, David S. “Justice League of America.” Comics through Time: A History of Icons, Idols, and Ideas. Ed. M. Keith Booker. USA: ABC-CLIO, 2014.658-660. Print.

UNIVERSITY OF KERALA

COURSE STRUCTURE AND SYLLABUS

FOR

FIRST DEGREE PROGRAMME

IN

MICROBIOLOGY

UNDER

CHOICE BASED CREDIT- SEMESTER SYSTEM

(w.e.f. 2022 Admission)

THE PROGRAMME

The programme is named as Bachelor of Science (B. Sc.) in Microbiology

ELIGIBILITY FOR ADMISSION

A pass in 10+2 (Higher Secondary/ISC/CBSE) Exam with Biology as one of the papers will beeligible.

OBJECTIVES OF THE PROGRAMME

- To impart knowledge of science is the basic objective of education.
- To develop scientific attitude is the major objective to make the students open minded, critical & curious.
- To develop skill in practical work, experiments and laboratory materials and equipments along with the collection and interpretation of scientific data to contribute thescience.
- To understand scientific terms, concepts, facts, phenomenon and their relationships.
- To make the students aware of natural resources and environment.
- To provide practical experience to the students as a part of the course to develop scientific ability to work in the field of research and other fields of their own interest andto make them fit for society.
- The students are expected to acquire knowledge of microbiology and related subjects soas to understand natural phenomenon, manipulation of nature and environment in the benefit of human beings.

- To develop ability for the application of the acquired knowledge to improve agriculture and other related fields to make the country self-reliant and sufficient.

- To create the interest of the society in the subject and scientific hobbies, exhibitions and other similar activities.

- To enrich the students with the latest developments in the field of Information Technology, Biotechnology, Bioinformatics and other related fields of research and development
- To create enthusiasm to understand more about the beautiful planet Earth and to give awareness to the public the need to protect the planet from all kinds of exploitation

- To keep the scientific temper which the student acquired from school level and to develop a research culture.

Table 1. General Structure of the First-Degree Programme in Microbiology

Sem No	Course Code	Course Title	Instructional Hours/week		Credits	Uty Exam Duration	Evaluation		Total Credits
			L	P			Internal	Uty Exam	
I	EN 1111	English Language I	5	-	4	3			
	….1111	Additional Language I	4	-	3	3			
	EN1121	Foundation Course I	4	-	2	3			
	MB1141	Core Course I	2	2	3	3	20%	80 %	16
	CH1131	Complementary Course I*	2	2	2	3			
	BT 1131	Complementary Course II**	2	2	2	3			
II	EN 1211	English Language II	5	-	4	3			
	EN1212	English Language III	4	-	3	3			
	1211	Additional Language II	4	-	3	3			
	MB 1221	Core Course II	2	2	3	3	20%	80 %	17
	CH 1231	Complementary Course III	2	2	2	3			
	BT 1231	Complementary Course IV	2	2	2	3			
III	EN 1311	English Language IV	5	-	4	3			
	1311	Additional Language III	5	-	4	3			
	MB 1341	Core Course III	3	2	3	3	20%	80 %	17
	CH1331	Complementary Course V	3	2	3	3			
	BT 1331	Complementary Course VI	3	2	3	3			
IV	EN1411	English Language V	5	-	4	3			
	1411	Additional Language IV	5	-	4	3			
	MB1441	Core Course IV	3	2	3	3			
	CH1431	Complementary Course VII	3	2	3	3			
	BT1431	Complementary Course VIII (CH/BT)	3	2	3	3	20%	80 %	25
	CH1432	Complementary Course IX (Practical)	-	(8)*	4	3			
	BT1432	Complementary Course X. (Chemistry/Biotechnology Practical)	-	(8)*	4	3			
V	MB1541	Core Course V	4	3	4	3			
	MB1542	Core Course VI	4	2	3	3			
	MB1543	Core Course VII	5	2	4	3			
	MB1544	Core (Practical- 1) VIII	-	(5)*	3	3			
	MB1545	Core (Practical- 2) IX	-	(5)*	4	3	20%	80 %	20
		Open Course I	3	-	2	3			
	MB1551.1	Mushroom Culture							
	MB1551.2	Microbial Waste Management							
	MB1551.3	**Biofertilizer Technology**							
		Project	-	2	-				
VI	MB1641	Core Course X	4	3	4	3			
	MB1642	Core Course XI	4	2	4	3			
	MB1643	Core Course XII	4	2	4	3			
	MB1644	Core (Practical 3) XIII	-	(5)*	3	3			
	MB1645	Core (Practical 4) XIIII	-	(4)*	4	3	20%	80 %	**25**
	MB1661	Elective Course	3	-	2	3			
	MB1646	Project	-	3	4	3			
									120

Table 2. Semester I

Course Code	Course Title	Instructional hours/week		Credits	Univ. Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ Exam	
EN 1111	English Language I	5		4	3 Hrs	20%	80%	16
….1111	Additional Language I (Hindi/Malayalam)	4		3				
EN1121	Foundation Course I	4		2				
MB 1141	Core Course I Methodology and Perspectives of Science.	2	2	3				
CH 1131	Complementary Course I (Chemistry- I)	2	2	2				
BT 1131	Complementary Course II (Biotechnology I)	2	2	2				

Table 3. Semester II

Course Code	Course Title	Instructional hours/week		Credits	Univ Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ Exam	
EN 1211	English Language II	5		4	3 Hrs	20%	80%	17
EN1212	English Language III	4		3				
1211	Additional Language II (Hindi/Malayalam)	4		3				
MB 1221	Core Course II Fundamentals of Microbiology	2	2	3				
CH 1231	Compl. Course III (Chemistry -II)	2	2	2				
BT 1231	Complementary Course IV (Biotechnology II)	2	2	2				

Table 4. Semester III

Course Code	Course Title	Instructional hours/week		Credits	Univ. Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ. Exam	
EN 1311	English Language IV	5		4	3 Hrs	20%	80%	17
1311	Additional Language III (Hindi/Malayalam)	5		4				
MB 1341	Core Course III Microbial Diversity	3	2	3				
CH 1331	Complementary Course V (Chemistry -III)	3	2	3				
BT 1331	Complementary Course VI (Biotechnology III)	3	2	3				

Table 5. Semester IV

Course Code	Course Title	Instructional hours/week		Credits	Univ. Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ. Exam	
EN 1411	English Language V	5		4	3 Hrs	20%	80%	25
1411	Additional Language IV (Hindi/Malayalam)	5		4				
MB 1441	Core Course IV Immunology	3	2	3				
CH 1431	Complementary Course VII (Chemistry -IV)	3	2	3				
BT 1431	Complementary Course VIII (Biotechnology IV)	3	2	3				
CH 1432	Complementary Course IX (Chemistry Practical)		(8) *	4				
BT 1432	Complementary Course X Practical (Biotechnology)		(8) *	4				

Table 6. Semester V

Course Code	Course Title	Instructional hours/week		Credits	Univ. Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ. Exam	
MB 1541	Core Course V Microbial Physiology and Genetics	4	3	4	3 Hrs	20%	80%	20
MB 1542	Core Course VI Medical microbiology	4	2	3				
MB 1543	Core Course VII Environmental Microbiology	5	2	4				
MB 1544	Core Course VIII Practical(Microbial Physiology and Genetics & Environmental Microbiology)		(5) *	3				
MB 1545	Core Course IX Practical (Medical Microbiology)		(5) *	4				
MB 1551.1	Open Course – I Mushroom Culture	3		2				
MB 1551.2	Microbial Waste Management							
MB 1551.3	Bio-fertilizer Technology							
	Project		2					

Table 7. Semester VI

Course Code	Course Title	Instructional hours/week	Credits	Univ. Exam Duration	Evaluation		Total Credits
		L P			Internal	Univ. Exam	
MB 1641	Core Course X Industrial Microbiology	4 3	4	3 Hrs	20%	80%	25
MB 1642	Core Course XI Food & Dairy Microbiology	4 2	4				
MB 1643	Core Course XII Bioinformatics and bioststistics	4 2	4				
MB 1644	Core Course XIII Practical (Industrial Microbiology & Food & Dairy Microbiology)	(5)*	3				
MB 1645	Core Course XIII Practical (Bioinformatics & Biostatistics)	(4)*	4				
MB 1661.1	Elective Course Agricultural Microbiology	3	2				
MB 1646	Project	3	4				

L = Lecture P = Practical

Table 8. Distribution of Contact Hours and Credits (Core, Foundation & Open courses, Project /Dissertation)

Course Code	Course Title	Semester I			Semester II			Semester III			Semester IV			Semester V			Semester VI			Total	
		Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours	Credits
		T	P	C	T	P	C	T	P	C	T	P	C	T	P	C	T	P	C		
MB1141	Methodology & Perspectives of Science	2		3																4	3
MB1221	Fundamentals of Microbiology				2		3													4	3
MB1341	Microbial Diversity							3		3										5	3
MB1441	Immunology										3									3	3
MB1442	Practical (MB1141, MB1221, MB1341 & MB1441)		2			2			2			2	4							5	4
MB1541	Microbial Physiology and Genetics													4		4				4	4
MB1542	Medical Microbiology													4		3				4	3
MB1543	Environmental Microbiology													5		3				5	4
MB1544	Practical II (MB1541, MB 1542 &MB1543)														5	4				5	4
MB1551.1 MB1551.2 MB1551.3	Mushroom Culture Microbial Waste Management Biofertilizer Technology													3		2				3	2
MB1641	Industrial Microbiology																4		4	4	4
MB1642	Food & Dairy Microbiology																4		4	4	4
MB1643	Bioinformatics & Biostatistics																4		4	4	4
MB1644	Practical III (MB 1641 & MB 1642)																	5	4	5	4
MB1645	Practical IV (MB 1643)																	4	3	4	3
MB1661	Agricultural Microbiology																3		2	3	2
MB1646	Project, Tour Diary, Viva Voce														2				3	5	4

Duration of Examination (Theory & Practical): 3 Hours

Continuous Evaluation (CE): 25%; End Semester Evaluation (ESE): 75%

Total Weightage for Each Course (Theory & Practical): 30

Total credits for the entire programme: 120

Table 9. Scheme of Evaluation of Foundation Course II, Core Courses, Open Courses & Project

Semester	Course Code	Course Title	Weightage		Duration of Univ. Exam
			CE	ESE	
I	MB 1141	Methodology and Perspectives of Science	4	30	3 Hours
II	MB 1221	Fundamentals of Microbiology	4	30	3 Hours
III	MB 1341	Microbial Diversity	4	30	3 Hours
IV	MB 1441	Immunology	4	30	3 Hours
V	MB 1541	Microbial Physiology and Genetics	4	30	3 Hours
	MB 1542	Medical Microbiology	4	30	3 Hours
	MB 1543	Environmental Microbiology	4	30	3 Hours
	MB 1544	Microbial Physiology and Genetics & Environmental Microbiology (Practical)	4	30	3 Hours
	MB 1545	Medical Microbiology (Practical)	4	30	3 Hours
	MB 1551.1 MB 1551.2 MB 1551.3	Mushroom Culture Microbial Waste Management Bio-fertilizer Technology	4	30	3 Hours
VI	MB 1641	Industrial Microbiology	4	30	3 Hours
	MB 1642	Food & Dairy Microbiology	4	30	3 Hours
	MB 1643	Bioinformatics & Biostatistics	4	30	3 Hours
	MB 1644	Industrial Microbiology & Food & Dairy Microbiology (Practical)	4	30	3 Hours
	MB 1645	Bioinformatics & Biostatistics (Practical)	4	30	3 Hours
	MB 1661.1	Agricultural Microbiology	4	30	3 Hours
	MB 1646	Project, Tour Diary Viva Voce		20	3 Hours

CE= Continuous Evaluation ESE= End Semester Evaluatio

PATTERN OF THEORY QUESTION PAPER

Salient features:

- Question paper is set up based on grading system/marks
- The duration of exam for each course is fixed to 3 hours
- The question paper consists of five sections A, B, C & D Section A consists of 16 questions and a bunch of 4 questions carries 1 weightage
- Section B contains 12 very short answer questions of which the candidate can choose 8 and carries 1 weightage each
- Section C has 8 short answer type questions of which the candidate has to answer 5 with a weightage of 1 each
- The last section D consists of 3 questions and the candidate gets the freedom to answer 2 questions with a weightage of 4 each
- Total weightage is 30/paper

EVALUATION AND GRADING

The Evaluation of each course shall consist of two parts 1) Continuous Evaluation (CE) 2) End Semester Evaluation (ESE). The CE and ESE ratio shall be 1:4 for both courses with or without practical. There shall be a maximum of 80 marks for ESE and maximum of 20 marks for CE. For all courses (Theory and Practical), Grades are given on a 7-point scale based on the total percentage of mark (CE+ESE) as given below:

Criteria for Grading

Percentage of marks	CCPA	Letter Grade
90 and above	9 and above	A+ Outstanding
80 to < 90	8 to<9	A Excellent
70 to <80	7to<8	B Very Good
60 to < 70	6to<7	C Good
50 to < 60	5to<6	D Satisfactory
40 to < 50	4to<5	E Adequate
Below 40	<4	F Failure

Theory

Component	Weightage
Attendance	1
Assignment/ Seminar	1
Test paper	2
Total	**4**

Practical

Component	Weightage
Attendance	1
Viva-voce	1
Test	2
Total	**4**

End Semester Assessment (ESA)

Details of Papers	Duration of Exam	Weightage		
Theory & Practical		External	Internal	Total
Microbiology (Core) Courses	3 Hours	30	4	34
Complementary Courses	3 Hours	30	4	34
Open Courses	3 Hours	30	4	34

Consolidation of Grades for CE for Theory course:

Component	Weightage (W)	Grade awarded	Grade points (G)	Weighted Grade points(W×G)
Attendance	**1**	**B**	**3**	**3**
Assignment/Seminar	**1**	**C**	**2**	**2**
Test paper	**2**	**A**	**4**	**8**
Total	**4**			**13**
CE Grade	Total weighted grade points/Total weights=13/4=3.25=**Grade B**			

• With regard to the **attendance** (weight=1), the following grading scheme shall be followed:
Below 75% -**E**; 75-79%- **D**; 80-89% - **C**; 90-94%- **B**; 95-100%- **A**.
• For **assignment/ Seminar** (weight -1), the teacher shall define the quality in terms of **structure, content, presentation** and **punctuality** in submission.
• **Test papers** (weight=2) shall be graded by the same procedure adopted for theory exam evaluation

The students are required to write a minimum of 2 class tests in every semester for each course. Grades for the test component in CE shall be awarded on the basis of calculating average of the grades secured for the two class tests. Each student shall be required to do one assignment or one seminar for each Course. Valued assignments shall be returned to the students. The seminars shall be organized by the teacher/teachers in charge of CE and the same shall be assessed by a group of teachers including the teacher/teachers in charge of that Course.

CONSOLIDATION OF THE GRADE OF A COURSE
The grade of a course is consolidated by combining the ESE and CE grades taking care of their weights

Exam awarded	**Weight points(G)**	**Grade Points (W x G)**	**Grade**	**Weighted grade**
ESE	3	2.47	C	7.41
CE	1	3.20	B	3.20
Total	4			10.61
Grade of Course	Total weighted grade points/Total weights=10.61/4=2.65=Grade B			

END SEMESTER ASSESSMENT (ESA)
The University shall conduct the external examinations for all semesters. There will not be any supplementary exams. The practical examinations for **Core courses** shall be conducted at the end of 4^{th}, 5^{th} and 6^{th} semesters and **Complementary** courses at the end of 4^{th} semester according to the common calendar and questions set up by the University. The Board of Examiners constituted by the University will have the right to make necessary changes in the pattern of practical examination as and when needed.

ELIGIBILITY TO APPEAR FOR PRACTICAL EXAMINATION
Submission of the following
• Certified and *bona fide* practical record
• Certified field work
• Certified tour report

• Project report/Dissertation (certified and *bona fide*)

PROJECT

Project work/Dissertation is compulsory. It can be carried out either individually or by a group not exceeding 15 students. The topics shall either be allotted by the supervising teacher or be selected by the student in consultation with the supervising teacher. The project report/dissertation duly attested by the Supervising teacher and Certified by the Head of the Department, has to be submitted on the day of examination of **Practical - II (Core)**. The project shall be evaluated by an external examiner. The project report/ Dissertation (not less than 40 pages) shall be prepared as per the format given below.

1. Title page /Front page (Certified by the **HOD**)
2. Declaration by the candidate
3. Certificate attested by the Supervising teacher
4. Acknowledgement, if any
5. Table of contents
6. Abbreviation, if any
7. Abstract/ Summary
8. Introduction & Review of Literature (10pages)
9. Material and Methods
10. Results and Discussion (Not less than 10 pages)
11. Conclusion
12. References

Tables, Graphs, Photographs etc. can be used to present the data. Topics selected once should not be repeated.

STUDY TOUR

- Visit to a Microbiology Laboratory/Distillery /Biofertilizer unit etc. within or outside Kerala with a minimum duration of 3 days is compulsory
- A brief report of the trip has to be submitted, along with appropriate photographs

CORE COURSES

Semester	Course Code	Title of the Course	Contact hrs./week L	P	Credits
I &II	MB1141	Methodology and Perspectives of Science	3	1	3
III	MB1341	Fundamentals of Microbiology	3	2	3
IV	MB1441	Microbial Genetics & Immunology	3	2	3
V	MB1541	Instrumentation in Microbiology	4	3	4
	MB1542	Environmental Microbiology	4	2	3
	MB1543	Medical Microbiology & Molecular Biology	5	2	3
	MB1544	Practical I (MB1141, MB1341 & MB1441	-	(5)	4
	MB1545	Practical II (MB1541 & MB1542)	-	(5)	4
VI	MB1641	Industrial Microbiology	4	3	4
	MB1642	Bioinformatics & Biostatistics	4	2	4
	MB1643	Food & Dairy Microbiology	4	2	4
	MB1644	Practical III (MB1543 & MB1641	-	(5)	4
	MB1645	Practical IV (MB1642 &MB1643)	-	(4)	3

FOUNDATION COURSE II - (VOCATIONAL)
COURSE TITLE: METHODOLOGY AND PERSPECTIVES OF SCIENCES

CREDITS-3 **Total lecture hours- 36 hours (2hours/week)**

PRE- REQUISITE:

Basic knowledge of principles in science gained during H. Sc.

COURSE OBJECTIVES:

The major objective of this paper is to develop clear understanding of the methodology and perspectives of science in general so as to enable the students to systematically pursue their particular discipline in science in relation to the other disciplines that come under the rubric of sciences.

COURSE OUTCOMES:

1. To identify what is science, cite the basis of scientific laws, recognize and discuss the different applications of science in human activity.
2. To explain the theories and laws in science and describe the importance of hypothesis, models, simulations and virtual testing.
3. To restate in own words about types of experiments and summarize how to plan an experiment-design, observations, documentation and interpretation.
4. To apply statistical testing to accept or reject a hypothesis and analyze scientific correlation, pattern and trends from the data.
5. To illustrate and distinguish the different modes of data presentation and apply varied statistical tools.

   To discuss and practice the principles of ethics in science.

MODULE-I
Science and Science Studies **8hrs**

Types of knowledge: practical, theoretical and scientific knowledge. Information: What is science; what is not science; laws of science; basis of scientific laws and factual truths. Science as a human activity; scientific temper and empiricism, vocabulary of science, science disciplines. Revolution in Science and Technology

MODULE-II
Methods and Tools of Science **8hrs**

Hypotheses; theories and laws in science; Observations, evidences and proofs; Posing a question; formulation of hypothesis; Hypothetico-deductive model; inductive model. Significance of verification (proving)corroboration and falsification(disproving), auxiliary hypothesis; adhoc hypothesis**.** Revision of scientific theories and laws. Importance of models, simulations and virtual testing.

MODULE-III
Experimentation in Science **8hrs**

Design of an experiment: experimentation; observation; data collection; interpretation and deduction. Necessity of units and dimensions: repeatability and replication. Documentation of experiments; record keeping, connection between measurements and underlying theory. Types of Experiments-Experiments to test a hypothesis-to measure a variable or to gather data by preliminary and explorative experiments. Planning of experiments-Design-selection of controls-observational requirements-instrumental requirements.

MODULE-IV
Data handling and Ethics in Science **12hrs**

Documentation of experiments: Nature and types of data-typical examples; Data acquisition; treatment of data; data interpretation. Significance of statistical tools in data interpretation; errors and inaccuracies. Data presentation: graphs, tables, histograms and pie diagrams. Statistical testing of hypothesis, null hypothesis, Significance test. Statistics based acceptance or rejection of a hypothesis; Deduction of scientific correlation; patters and trends. Ethics in Science: Scientific information; depositories of scientific information, primary secondary and digital sources; sharing of knowledge; transparency and honesty; danger of pre conceived ideas.

SEMESTER I
COURSE CODE: MB1141
VOCATIONALCOURSE VII- PRACTICAL-P4
COURSE TITLE: METHODOLOGY AND PERSPECTIVES OF SCIENCE

CREDITS-3 **Total practical hours- 36hrs (2hrs/week)**

PRE- REQUISITE:
Basic knowledge of principles in science gained during H. Sc.

COURSE OBJECTIVES:

The course imparts knowledge to students on various statistical methods used for data analysis. The course also familiarizes the student with different instruments used in biology.

COURSE OUTCOMES:
1. To apply primary statistical methods to data and analyze the results generated.
2. To compile and present some of the great inventions in biology.
3. To represent a statistical data as graphs, diagrams or pie chart.

Practical 36hrs
1. Work out problems on frequency distribution, measures of central tendencies, measures of dispersion.
2. Prepare charts on great biological inventions
3. Familiarizing with different biological instruments.
4. Collection of data, sampling designs and tabulation using biological materials.
5. Graphical representation using statistical data

REFERENCES

1. Gieryn T.F. (1999) *Cultural Boundaries of Science* Univer. Chicago Press.
2. Jeffrey A. Lee (2010) The Scientific Endevor. Pearson Delhi
3. Collins H and T Punch (1993). *The Golem. What everyone should know about science*. Cambridge Univ. Press
4. Hewitt, Paul G, Suzanne Lyons, John A, Suchocki and Jennifer Yeh (2007)
5. *Conceptual Integrated Science*, Addison-Wesley
6. Newton RG: *The truth of science*, 2nd edition
7. Bass, Joel E *et al* (2009) Methods for teaching Science as Inquiry, Allyn &Bacon.

SEMESTER II
COURSE CODE: MB1221
FOUNDATION COURSE II - (VOCATIONAL)
COURSE TITLE: FUNDAMENTALS OF MICROBIOLOGY

CREDITS-3 **Total lecture hours- 36 hours (2 hours/week)**

PRE– REQUISITE:

Basic knowledge on biology gained during H. Sc.

COURSE OBJECTIVES:

To become familiar with the foundation concepts of history of Microbiology and to understand the structure and functions of a typical prokaryotic cell. To gain the knowledge of microscopy, staining concepts, culture methods and culture media. To understand and implement sterilization techniques and safety measures.

COURSE OUTCOMES:

1. To recall the history of microbiology and cite the contributions of various scientists.
2. To describe and illustrate the general structural characteristics of microorganisms.
3. To explain and apply the principles of various microscopic, staining and disinfecting techniques.
4. To describe and use the basic techniques of microbiology.

MODULEI **6 hrs.**

Definition and scope of microbiology. History of Microbiology: Spontaneous generation theory, Contributions of Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Joseph Lister, Alexander Fleming and John Tyndall. Difference between prokaryotic and eukaryotic microorganisms.

MODULEII **10hrs**

Morphology and fine structure of bacteria-size, shape and arrangements. Structure and arrangement of flagella, pili, capsule, cell wall and its composition. Cytoplasmic membrane, protoplasts, spheroplasts, intracellular membrane systems, cytoplasm, vacuoles, nuclear material, bacterial spores, cell inclusions.

MODULE-III **8hrs**

Principles and applications of microscopy. Simple, compound, bright field, dark field, phase contrast, fluorescent and electron microscopy. Principles of staining: Stains –Acidic, basic and neutral stains. Staining techniques-Simple staining, differential staining (Gram staining and acid-fast staining), and structural staining (spore, flagella, capsule and granule).

MODULE-IV **6hrs**

Sterilization and Disinfection: Principles and methods of physical (moist heat, dry heat, filtration, pasteurization, tyndallization, radiations) and chemical (alcohols, aldehydes, phenols, halogens and hypochlorites) sterilization.

MODULE-V **6hrs**

Culture media and methods-Solid, Liquid, semisolid, semisynthetic and synthetic media. Selective media, Differential media, Enriched media, Enrichment media, Indicator media, Transport media and Anaerobic media. Cultivation of bacteria: Aerobic &Anaerobic culture methods.

SEMESTER II
COURSE CODE:1221
VOCATIONALCOURSE VII- PRACTICAL-P4
COURSE TITLE: FUNDAMENTALS OF MICROBIOLOGY

CREDITS-3 **Total practical hours- 36 hrs. (2hrs/week)**

PRE- REQUISITE:
Basic knowledge of microorganisms gained during the first semester of this programme.

COURSE OBJECTIVES:
This course develops the concepts of various techniques and instruments used in the Microbiology laboratory with respect to isolation, handling and culture techniques in Microbiology.

COURSE OUTCOMES:

1. To review and practice the general rules and precautions to be followed in a microbiology laboratory.
2. To describe and apply the various techniques in cleaning and sterilization of glassware in a microbiology laboratory.
3. To explain the working principle and operate various instruments used in a microbiology laboratory.
4. To distinguish different types of microbial culture media.
5. To prepare different types of culture media used in microbiology.
6. To use the standard techniques employed for isolation of microorganisms.
7. Develop a skill for the isolation of pure cultures.
8. To discuss and summarize the colony morphology of microorganisms.

PRACTICAL

1. General rules in Microbiology laboratory
2. Cleaning and sterilization of glass wares
3. Instrumentation and working principle of
   I. Microscopy
   II. Incubator
   III. Hot air oven

IV. Autoclave
V. Laminar Air Flow Bench

4. Preparation of media
I. Solid media
II. Liquid media
III. Semisolid media

5. Isolation methods.
I. Serial dilution
II. Pour plate
III. Spread plate
IV. Streak plate
V. Lawn culture
VI. Stab culture

REFERENCES

1. Lim, D.1998.*Microbiology*. 2nd Edition; McGraw-Hill Publication.
2. Madigan, M.T. and Martinko, J.M.2006. *Brock's Biology of Microorganisms*. 11thEdition. Pearson Education Inc.
3. Pelczar, M. J. Jr., Chan, E. C. S. and Krieg, N. R. 1993. *Microbiology*, 5th Edition, Tata Mac Graw Hill Press.
4. Prescott, L.M Harley, J.P. and Klein, D.A.2005. *Microbiology*. 9th Edition. Mac Graw Hill Companies Inc.
5. Alcamo Fundamentals of Microbiology, 5thEdition.
6. Gerald J. Tortora, Berdell R. Funke, Christine L. Case, Microbiology–An Introduction, Pearson Publication
7. Salle A.J. 1971. *Fundamental Principles of Bacteriology*. 7th Edition. Tata Mac Graw Hill Publishing Co.
8. Black, J. G. 2013. *Microbiology: Principles and Explorations*. 6th Edition, John Wiley and Sons, Inc.
9. Aneja, K. R. 2003. *Experiments in Microbiology, Plant Pathology and Biotechnology*. 4thEdition. New Age International (P) Limited, New Delhi.
10. Dubey R.C and Maheswari, D.K. 2002.*PracticalMicrobiology*.2nd Edition, S. Chand & Co. New Delhi.
11. Kannan, N. 2002. *Laboratory manual in general Microbiology*. 2nd Edition, Panima Publishing Co., New Delhi

SEMESTER III
COURSE CODE: MB1341
FOUNDATION COURSE II - (VOCATIONAL)
COURSE TITLE: MICROBIAL DIVERSITY

CREDITS-3 **Total lecture hours- 54 hours (3hours/week)**

PRE- REQUISITE:

Basic knowledge of microorganisms gained during the second semester of this programme.

COURSE OBJECTIVES:

The major objective of this paper is to develop a clear understanding of the taxonomical classification of microorganisms and gain knowledge on the distinguishing morphological features of bacteria, actinomycetes, viruses, fungi and algae.

COURSE OUTCOMES:

1. To recall the principles of classification and review the taxonomical classification of microorganisms.
2. To distinguish between the different classes of microorganisms and their general characteristics.
3. To compare and distinguish the morphological features of different microorganisms.

MODULE-I **10hrs**

Principles of classification. Principles of bacterial taxonomy. Whittaker' Five Kingdom classification. Classification and characterization of bacteria according to Bergey's Manual of Systematic Bacteriology. Classification based on molecular techniques-G+C % and RNA, DNA hybridization. Classification of bacteria based on morphological and biochemical characteristics.

MODULE-II **12hrs**

Archaea bacteria and extremophiles. General properties and cultural characteristics of Mycoplasma, Rickettsia, Spirochetes, Treponema and Leptospira. General characteristics and classification of Actinomycetes.

MODULE-III **12hrs**

Morphology and fine structure of virus, size, shape capsid and capsomeres. Virions, Viroid's and Prions. Capsid symmetry - helical, icosahedral and complex, Structure of TMV. Viral multiplication-lytic and lysogenic cycle.

MODULE-IV **12hrs**

Morphological features, classification and economic importance of Fungi. Characteristics of Zygomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes. Distinguishing characteristics of *Rhizopus* sp., *Mucor* sp., *Aspergillus* sp., *Penicillium* sp. and *Fusarium* sp. Yeasts – a brief account on *Candida* sp and *Saccharomyces* sp.

MODULE-V **8hrs**

Morphological features, classification and economic importance of Algae. Ultra-structure of cyanobacterial cell.

SEMESTER III
COURSE CODE: MB1341
VOCATIONALCOURSE VII- PRACTICAL-P4
COURSE TITLE: MICROBIAL DIVERSITY

CREDITS-3 **Total practical hours- 36hrs (2hrs/week)**

PRE- REQUISITE:
Basic knowledge of microorganisms gained during the second semester of this programme.

COURSE OBJECTIVES:
This course develops the concepts of various staining techniques for the basic identification of unknown bacteria and fungi.

and instruments used in the Microbiology laboratory with respect to isolation, handling and culture techniques in Microbiology.

COURSE OUTCOMES:

1. To practice simple and differential staining techniques for the identification unknown bacteria.
2. To practice fungal identification based on lactophenol cotton blue staining method.
3. To study motility of bacteria.
4. To practice anaerobic cultivation of microorganisms.

PRACTICAL

1. Bacterial Staining Methods
   a. Simple Staining
   b. Gram's staining
   c. Spore staining
   d. Negative staining
   e. Capsule staining

2. Fungal staining-Lactophenol cotton blue mounting

3. Examination of microbes in living condition
   a. Wet mount
   b. Hanging drop method

4. Cultivation of anaerobic bacteria

REFERENCES

1. Tortora, G. J., Funke, B. R. and Case, C. L. 2012. ***Microbiology: An Introduction*****.** 11th Edition. Pearson Education Pvt. Ltd. Singapore.
2. Black, J.G. 2005. ***Microbiology, Principles and exploration.*** 6th Edition. John Wiley & Sons
3. ***Principles of Bacteriology, Virology and Immunology***. 8th Edition. Edward Arnold, London
4. Pelczar, M. J. Jr., Chan, E. C. S., Krieg, N. R. 1986. ***Microbiology*****.** McGraw Hill Book Company**,** London.
5. Prescott, L. M., Harley, J. P. and Klein, D. A. 2005. ***Microbiology***. 9th Edition. Mac Graw Hill Companies Inc.
6. Aneja, K.R .2003. ***Experiments in Microbiology, Plant Pathology and Biotechnology*****.** 4th Edition. New Age International (P) Limited, New Delhi.
7. Dubey, R. C. and Maheswari, D. K. 2002. ***Practical Microbiology***. 2nd Edition, S. Chand & Co., New Delhi.
8. Kannan, N. 2002. ***Laboratory manual in General Microbiology***. 2nd Edition, Panima Publishing Co., New Delhi.

SEMESTER IV
COURSE CODE: MB 1441
COURSE TITLE: Immunology

CREDITS-4Total lecture hours- 54 hours (3 hours/week)

PRE- REQUISITE:
Basic knowledge of immunology studied during HSc and first, second year of this programme.

COURSE OBJECTIVES:
To understand the various components of the host immune system, their structure and organization, and functions to serve as the defense system of the body. To understand the operational mechanisms which underlie the host defense system, allergy and organ transplantation.

COURSE OUTCOMES:
After the completion of this course, the student will be able to:

1. Understand various immune mechanisms.
2. Describe various immune cells and organs involved in immunity.
3. Understand different immunological techniques for the serological diagnosis of infectious diseases.
4. Understand the basis of allergy reactions, auto immune mechanisms, transplantation and preparation of various vaccines.

MODULEI **8 hrs.**

History and scope of immunology; Infection and immunity. Types of immunity-innate immunity, adaptive immunity, Active and Passive immunity, Mechanisms of innate immunity.

MODULEII **10 hrs.**

Antigens and Types of Antigens, Epitopes, Haptens, Antigenicity, Immunogenicity, Factors influencing antigenicity. Basic structure of immunoglobulin. Immunoglobulin classes and functions.

MODULEIII **8 hrs.**

Antigen-antibody reactions, Precipitation reactions, Agglutination reactions, Complement fixation test, ELISA, Western Blotting, Immunofluorescence.

MODULEIV **14 hrs.**

Primary and secondary lymphoid organs. Cells of the immune system. MHC, HLA Complement system and its biological importance, Humoral immune response, primary and secondary responses, Cell Mediated Immunity, Cytokines -Interferon, Interleukins and TNFs. Monoclonal antibodies– production and applications.

MODULE V **14 hrs.**

Immuno-hematology, Immunology of blood transfusion, Erythroblastosis fetalis. Immunodeficiency disease – AIDS. Hypersensitivity reactions and types, Anaphylaxis and atopy, immune complex disease, Arthus reaction, Serum sickness and delayed type of hypersensitivity. Autoimmune diseases. Immunology of transplantation- graft rejection. Vaccines – types, toxoids and adjuvants.

SEMESTER IV
COURSE CODE: MB1441
COURSE – PRACTICAL-P4
COURSE TITLE: Immunology

PRE- REQUISITE: **Total practical hours- 36 hrs. (2hrs/week)**

Basic knowledge of Immunology studied during the first &second year of this programme.

COURSE OBJECTIVES:
To understand blood grouping, Rh factor and diagnostic tests used in clinical microbiology lab.

COURSE OUTCOME:
1. To summarize the standard laboratory procedures in immunology.
2. To understand how to handle blood and infectious samples
3. To identify and differentiate blood groups and Rh factor.
4. To describe and use different diagnostic tests

Practical

1. Determination of ABO blood groups and Rh factor
2. ELISA-Demonstration
3. WIDAL Test
4. VDRL test

Reference

1. Tortora, G. J., Funke, B. R. and Case, C. L. 2012. *Microbiology: An Introduction*. 11th Edition. Pearson education Pvt. Ltd. Singapore.
2. Black, J.G. 2005. *Microbiology, Principles and exploration*. 6th Edition. John Wiley & Sons
3. *Principles of Bacteriology, Virology and Immunology*. 8th Edition. Edward Arnold, London
4. Pelczar, M. J. Jr., Chan, E. C. S., Krieg, N. R. 1986. *Microbiology*. McGraw Hill Book Company**,** London.
5. Prescott, L. M., Harley, J. P. and Klein, D. A. 2005. *Microbiology*. 9th Edition. Mac Graw Hill Companies Inc.
6. Aneja, K.R. 2003. *Experiments in Microbiology, Plant Pathology and Biotechnology* .4th Edition. New Age International (P) Limited, New Delhi.
   Dubey, R. C. and Maheswari, D. K. 2002. *Practical Microbiology*. 2nd Edition, S. Chand & Co., New Delhi.
7. Kannan, N. 2002. *Laboratory manual in general microbiology*. 2nd Edition, Panima Publishing Co., New Delhi.

SEMESTER V
COURSE CODE: MB 1541
COURSE TITLE: MICROBIAL PHYSIOLOGY AND GENETICS

CREDITS-3Total lecture hours- 72hrs (4hrs/week)

PRE- REQUISITE:
Basic knowledge of microorganisms during the first year of this programme.

COURSE OBJECTIVES:
To gain knowledge in nutritional requirements of bacteria and different methods for the isolation of microorganisms from various samples. In addition, become familiar with the microbial metabolism and concepts of microbial genetics and to understand the importance of recombination in bacteria along with their resistance to antibiotics.

COURSE OUTCOMES:

After the completion of this course, the student will be able:

1. To understand the nutritional diversity among microorganisms and use of different inorganic sources for energy production.
2. To understand how carbohydrates are metabolized in the microbial cells and the diverse metabolic pathways leading to energy production.
3. To illustrate different methods of bacterial recombination.
4. To understand different plasmids in bacteria.
5. To discuss regulation of gene expression in bacteria.
6. To correlate and predict the different types of mutations and molecular mechanism involved.
7. To describe various mechanisms and significance of drug resistance in bacteria.

MODULE I **12 hrs.**

Microbial Nutrition-Nutritional requirements-C, N, P, S, and minerals, Nutritional classification of bacteria. Uptake of nutrients - passive diffusion, facilitated diffusion, Active transport, Group translocation.

MODULEII **12 hrs.**

Physiology of microbial growth and nutrition. Growth Curve and generation time. Batch, continuous and synchronous cultures, Diauxic growth. Influence of environmental factors on microbial growth. Enumeration methods of bacteria-SPC, Direct microscopic count, turbido metric

estimation.

MODULEIII **16 hrs.**

Microbial Metabolism- Glycolysis, Krebs's cycle, Pentose Phosphate Pathway, gluconeogenesis, ED pathway. Electron transport Chain, oxidative Phosphorylation and Substrate level phosphorylation, Fermentation-Alcoholic fermentation, Homo and hetro-lactic acid fermentation, Propionic acid fermentation and mixed acid fermentations.

MODULEIV **16 hrs.**

Bacterial Genetics- Plasmids- brief account on pBR 322, pUC 8. Phage vectors- M13, lamda and cosmid. Bacterial recombination- transformation, transduction, conjugation (Fertility factors, F+ and F- cells, Fpili, high frequency recombination). Regulation of gene expression in prokaryotes -Operon concept: Lac operon and Trp operon.

MODULEV **16 hrs.**

Mutations: Chemical and physical mutagens. Types and Molecular mechanism–Point mutations-transition and transversion. Chromosomal mutations. Forward and reverse mutation. Biological significance of mutations-silent mutation, missense mutation and nonsense mutations. Ames test. Mechanism of drug resistance in bacteria.

SEMESTER V
COURSE CODE: MB1541
VOCATIONALCOURSE VII- PRACTICAL-P5
COURSE TITLE: MICROBIAL PHYSIOLOGY AND GENETICS

CREDITS-3 **Total practical hours - 126 hrs. (7 hrs./week)**

PRE- REQUISITE:
Basic knowledge of microorganisms gained during the third semester of this programme.

COURSE OBJECTIVES:
To gain knowledge and skill in different factors that affects the growth of microorganisms and to understand basic biochemical and growth characteristics of bacteria.

COURSE OUTCOMES:
After the completion of this course, the student will be able to:

1. To explain the nutritional diversity among microorganisms for the selective isolation of microorganisms.
2. To discuss the effect of environmental factors on the growth rate of bacteria.
3. To describe the different biochemical tests for the identification of unknown bacteria.
4. To describe fermentation of carbohydrates.

PRACTICAL

1. Effect of pH on the growth of bacteria on solid media
2. Effect of salts on the growth of microorganisms.
3. Effect of temperature on growth of microorganisms.
4. **Biochemical tests:**
   a. IMViC Test
   b. Triple sugar iron agar test
   c. Urease test
   d. Catalase test
   e. Amylase production test
   f. Oxidase test
   g. H_2S production
5. Sugar fermentation tests
6. Determination of growth curve of bacteria

REFERENCES

1. Tortora, G. J., Funke, B. R. and Case, C. L. 2012. *Microbiology: An Introduction*. 11thEdition.Pearson education Pvt. Ltd. Singapore.
2. Black, J.G. 2005. *Microbiology, Principles and exploration*. 6th Edition. John Wiley & Sons
3. *Principles of Bacteriology, Virology and Immunology*. 8th Edition. Edward Arnold, London
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5. Prescott, L. M., Harley, J. P. and Klein, D. A. 2005. *Microbiology*. 9th Edition. Mac Graw Hill Companies Inc.
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7. Dubey, R. C. and Maheswari, D. K. 2002. *Practical Microbiology*. 2nd Edition, S. Chand &Co., New Delhi.
8. Kannan, N. 2002. *Laboratory manual in general microbiology*. 2nd Edition, Panima Publishing Co., New Delhi.

SEMESTER V
COURSE CODE: MB 1542
COURSE TITLE: MEDICAL MICROBIOLOGY

CREDITS-4 Total lecture hours- 72hrs (4hrs/week)

PRE- REQUISITE:
Knowledge of microorganisms during the first & second year of this programme.

COURSE OBJECTIVES:
To learn the basic concepts of medical microbiology and microbial pathogenesis: study of microbes, antimicrobial agents, epidemiology, and virulence factors associated with the pathogenic microorganisms.

COURSE OUTCOMES:
On the successful completion of the course, student will be able to:

1. Understand the details of major human infections caused by pathogenic bacteria, virus, fungi and protozoa.
2. Define epidemiological aspects of microbial diseases.
3. Discuss about important prophylactic measures of microbial diseases.
4. Realize applications of antibiotic sensitivity tests.
5. Understand laboratory diagnostics for the identification of infectious agents.
6. Review antimicrobial agents

MODULEI **8 hrs.**

General properties of medically important bacteria. Recommendation for collection, transport of specimens, isolation of bacteria from clinical specimens. Antibiotic sensitivity tests-Disc diffusion, Well diffusion and Tube dilution testing procedures and their quality control.

MODULEII **18 hrs.**

Systematic study of *Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Neisseria meningitidis, Cornybacterium diphtheriae, Mycobacterium tuberculosis, Vibrio cholerae., Pseudomonas aeruginosa. Enterobacteriaceae-Escherichia coli, Salmonella typhi, Salmonella paratyphi, Shigella dysenteriae, Proteus sp., Klebsiella pneumoniae.*

MODULEIII **16 hrs**

Structure and clinical importance of Pox, Adeno, Herpes, Reo, Rota, hepatitis, Rabies, HIV, influenza and polio virus. An overview of emerging viral diseases- Dengue, Ebola, SARS, Nipah,

H1N1 and chikungunya. Cultivation of Viruses. Antiviral agents -Vaccines and interferons.

MODULEIV **15 hrs.**

Fungal diseases-isolation of fungi from clinical specimens. Dermatophytes and agents of superficial mycoses. Opportunistic mycoses- Candidiasis, Aspergillosis. Systemic mycoses-Coccidioidomycosis, Blastomycosis. Subcutaneous mycoses-Sporotrichosis, Mycetoma. Mycotoxins. Antifungal agents.

MODULEV **15hrs**

Introduction to medical Parasitology–Protozoa–*Entamoeba histolytica*, Plasmodium, Leishmania, Trypanosoma, Giardia, Trichomonas. Platyhelminthes – Taenia – Fasciola – Schistosoma. Nemathelminthes –Ascaris–Ankylostoma, Wuchereria. Laboratory techniques in parasitology.

SEMESTER V
COURSE CODE: MB1542
COURSE – PRACTICAL –P5
COURSE TITLE: MEDICAL MICROBIOLOGY

PRE- REQUISITE: **Total practical hours - 126 hrs. (7 hrs./week)**

Basic knowledge of microorganisms studied during the first &second year of this programme.

COURSE OBJECTIVES:

To evaluate methods used to identify common infectious agents in the clinical microbiology lab. To assess treatment strategies including the appropriate use of antimicrobial agents and common mechanisms of antimicrobial action and resistance and to perform various serological and immunological diagnostic tests.

COURSE OUTCOME:

1. To learn standard laboratory procedures in clinical microbiology.
2. To understand how to handle and identify medically important bacteria.
3. To perform antimicrobial sensitivity tests.
4. To gain knowledge on various staining and identification techniques of different bacteria

PRACTICAL

1. General requirements of collection, transport and handling of clinical Specimens.
2. Study of the morphology, staining characters, cultural characters and identification of *Staphylococcus aureus,* E.coli, *Klebsiella sp., Proteus sp.* and *Pseudomonas sp.*
3. Isolation and identification of bacterial pathogens from clinical specimens and their biochemical reactions.
4. Culture methods for isolation and identification of fungi.
5. Antimicrobial Sensitivity testing by disc-diffusion method.

Reference

1. Tortora, G. J., Funke, B. R. and Case, C. L. 2012. *Microbiology: An Introduction*. 11thEdition.Pearson education Pvt. Ltd. Singapore.
2. Black, J.G. 2005. *Microbiology, Principles and exploration*. 6th Edition. John Wiley & Sons
3. *Principles of Bacteriology, Virology and Immunology*. 8th Edition. Edward Arnold,

London

4. Pelczar, M. J. Jr., Chan, E. C. S., Krieg, N. R. 1986. *Microbiology*. McGraw Hill Book Company**,** London.
5. Prescott, L. M., Harley, J. P. and Klein, D. A. 2005. *Microbiology*. 9th Edition. Mac Graw Hill Companies Inc.
6. Aneja, K.R.2003. *Experiments in Microbiology, Plant Pathology and Biotechnology*.4thEdition. New Age International (P) Limited, New Delhi.
   Dubey, R. C. and Maheswari, D. K. 2002. *Practical Microbiology*. 2nd Edition, S. Chand &Co., New Delhi.
7. Kannan, N. 2002. *Laboratory manual in general microbiology*. 2nd Edition, Panima Publishing Co., New Delhi.

SEMESTER V
COURSE CODE: MB1543
VOCATIONALCOURSE–V
COURSE TITLE: ENVIRONMENTAL MICROBIOLOGY

CREDITS - 4 **Total lecture hours- 72hrs (4hrs/week)**

PRE- REQUISITE:
Basic knowledge of microorganisms during the first year of this programme.

COURSE OBJECTIVES:

To impart knowledge about the structure, composition and functioning of microbial communities of diverse environment and to become familiar with basics of water-borne and air-borne diseases, and also to understand the role of microbial population in waste management, mineral recovery, bioremediation, and management of various types of xenobiotics and environmental impact of genetically modified organisms.

COURSE OUTCOME:
On the successful completion of the course, student will be able to:

1. Describe the role of microorganisms as components of ecosystem.
2. Explain the principles of microbial interactions and its importance with suitable examples.
3. Review the major microorganisms present in air and aquatic environments, distinguish air-borne and water-borne diseases and discuss various methods to check air and water quality
4. Compare the various methods of treatment of solid and liquid wastes.
5. Describe the role of microorganisms in biodegradation & bioremediation.
6. Discuss environmental and ethical aspects of genetically modified organisms.

MODULE I **12 hrs.**

Organization of the biosphere and components of ecosystem. Natural habitats of microorganisms. Microorganisms as components of ecosystem as producers and decomposers. Food chains, food webs and trophic structures.

MODULE II **14 hrs.**

Microbes in air: Number and kinds of microorganisms in air, droplet and drop let nuclei. Distribution and sources of airborne organisms; Assessment of air quality, Air-borne diseases and Air sanitation.

MODULE III **15 hrs.**

Microbes in aquatic environments: Microbiology of water, Water-borne diseases. Water quality criteria-Indicator organisms, Bacteriological examination of drinking water-membrane filtration, MPN, Total plate count–pour plate and spread plate methods. Sewage microorganisms, BOD and COD. Purification and disinfection of water.

MODULEIV **16 hrs.**

Environmental application: Waste –types; Treatment of solid wastes –composting, Vermiform composting, silage, Pyrolysis and scarification; Treatment of liquid wastes: Sewage (wastewater) treatment: primary treatment, secondary treatment (Oxidation Pond Trickling Filter, the activated sludge, Anaerobic digesters), Tertiary treatment.

MODULE V **15 hrs.**

Role of microbes in biodegradation, bioremediation of dyes, oil, pesticides and petroleum pollutants. Biodegradation of xenobiotic compounds; lignin, cellulose and plastics. Role of microbes in bioleaching, biomining. Biogas. Genetically Modified Organisms released and its environmental impact assessment and ethical issues.

SEMESTER V
COURSE CODE: MB1543
VOCATIONALCOURSE VII- PRACTICAL-P5
COURSE TITLE: ENVIRONMENTAL MICROBIOLOGY

CREDITS – 3 **Total practical hours - 126 hrs. (7 hrs./week)**

PRE- REQUISITE:
Basic knowledge of microorganisms during the first year of this programme

COURSE OBJECTIVES:

To provide knowledge on water quality analysis, isolation and enumeration of microorganisms from water and air samples.

COURSE OUTCOMES:

After the completion of this course, the student will be able to:

1. Demonstrate, apply the various techniques used for assessing water and air quality as well as analyze and interpret the findings
2. Use the taught techniques to isolate and enumerate microorganisms from various environmental samples.
3. Describe Indian Standard Institute specification for drinking water

PRACTICAL

1. Standard plate count technique for the isolation and enumeration of microorganisms in water.
2. Water quality analysis by MPN method.
3. Bacterial examination of water using membrane filters.
4. Isolation and identification of *E. coli* from water samples.
5. Estimation of BOD of water.
6. Estimation of COD of water.
7. Indian standard Institute specification for drinking water.
8. Quantificationofmicroorganismsinairbysettleplateandairsamplermethods.

Reference

1. Tortora, G. J., Funke, B. R. and Case, C. L. 2012. *Microbiology: An Introduction*.11th Edition. Pearson education Pvt. Ltd. Singapore.
2. Black, J.G. 2005. *Microbiology*, *Principles and exploration*. 6th Edition. John Wiley& Sons *Principles of Bacteriology*, *Virology and Immunology*. 8th Edition. Edward Arnold, London
3. Pelczar, M. J. Jr., Chan, E.C.S., Krieg, N.R. 1986. *Microbiology*. Mc Graw Hill Book Company**,** London.
4. Prescott, L.M., Harley, J. P and Klein, D.A. 2005. *Microbiology*. 9th Edition. Mac Graw Hill Companies Inc.
5. Aneja, K. R. 2003. *Experiments in Microbiology, Plant Pathology and Biotechnology*. 4th Edition. New Age International(P) Limited, New Delhi.
6. Dubey, R. C. and Maheswari, D. K. 2002. *Practical Microbiology*. 2nd Edition, S. Chand &Co., New Delhi.
7. Kannan, N. 2002. *Laboratory manual in general microbiology*. 2nd Edition, Panima Publishing Co., New Delhi

SEMESTER VI
COURSE CODE: MB1641
VOCATIONAL COURSE –IX
COURSE TITLE: INDUSTRIAL MICROBIOLOGY

CREDITS - 4 **Total lecture hours- 72hrs (4hrs/week)**

PRE- REQUISITE:
Basic knowledge of microorganisms and laboratory techniques studied during the first & second year of this programme.

COURSE OBJECTIVES:

To make the students knowledgeable on screening, strain improvement and preservation of industrially important microbes, industrial production of various microbial products by fermentative process, downstream processing of the products and to understand various techniques and types of fermenters used in fermentation industries.

COURSE OUTCOME:

After the completion of this course, the student will be able to:

1. Review the various stages of and techniques used in fermentation industries.
2. Discuss and compare the different types of fermentative processes, fermenters, and downstream processing techniques used in industry.
3. Asses and apply isolation, screening, and preservation techniques of microbes.
4. Summarize and give examples of fermentative production of organic acids, amino acids, enzymes and antibiotics.

MODULE I **12 hrs.**

History and scope of industrial microbiology. Screening of industrially important microorganisms- Primary and Secondary Screening. Strain Improvement–Mutation, Recombination and protoplast Fusion.

MODULE II **18 hrs.**

Types of fermentation process- Surface, submerged and solid state. Basic Design &

instrumentation of Fermenter. Types of fermenters- Batch Fermenter, Continuous Stirred Tank Fermenter, Fluidized Bed Fermenter, Solid State Fermenter, Air Lift Fermenter, Tubular Fermenter. Development of inoculum for industrial fermentation. Fermentation media – carbon source, nitrogenous materials and antifoams. Industrial sterilization-batch and continuous sterilization.

MODULE III **10 hrs.**

Preservation of microbes - serial subculture, preservation by overlying culture with mineral oil, lyophilization, storage of microbes at a very low temperature or in liquid nitrogen. Methods for preservation of fungi.

MODULE IV **12 hrs.**

Downstream Processing, Intracellular and extracellular product recovery. Physical and chemical methods. Cell disruption methods, solvent extraction, and purification. Product recovery. Computer control of fermentation process.

MODULE V

20hrs

Fermentative Production of organic acids: acetic acid, citric acid, lactic acid. Production of amino acid: lysine and glutamic acid, production of enzymes: proteases and amylases. Production of antibiotics: Penicillin, Streptomycin, Production of vitamins -Vitamin B_{12} & Riboflavin.

SEMESTER VI
COURSE CODE: MB1641
VOCATIONAL COURSE –IX- PRACTICAL-P6
COURSE TITLE: INDUSTRIAL MICROBIOLOGY

CREDITS - 4 **Total practical hours - 126 hrs. (7 hrs./week)**

PRE- REQUISITE:
Basic knowledge of microorganisms and laboratory techniques studied during the first & second year of this programme.

COURSE OBJECTIVES:

To make the students knowledgeable on production of various industrial products and to understand various techniques used in fermentation industries such as screening, isolation, enumeration, immobilization and preservation of industrially important microorganisms.

COURSE OUTCOME:

After the completion of this course, the student will be able to:

1. Describe the methodology to isolate and identify microbial antibiotics from environmental samples.
2. Discuss to isolate and enumerate microorganisms from food samples.
3. Illustrate wine production from grapes.
4. Describe the immobilization and preservation techniques of microbes.

PRACTICAL

1. Crowded plate technique for screening microbial antibiotics.
2. Enumeration and isolation of Lactobacillus from curd.
3. Enumeration and isolation of Bacteria and mold from fermented foods.
5. Wine Production from grapes.
6. Immobilization of yeast cells by sodium alginate method.
7. Preservation techniques:
   a. Serial subculturing
   b. Overlaying with mineral oil

c. Lyophilization

d. Liquid nitrogen storage.

e. Methods for the storage of Fungi

Reference

1. Tortora, G. J., Funke, B. R. and Case, C. L. 2012. *Microbiology: An Introduction*. 11thEdition.Pearson education Pvt. Ltd. Singapore.
2. Black, J.G.2005. *Microbiology, Principles and exploration*. 6th Edition. John Wiley & Sons
3. *Principles of Bacteriology, Virology and Immunology*. 8th Edition. Edward Arnold, London
4. Pelczar, M. J. Jr., Chan, E. C. S., Krieg, N. R. 1986. *Microbiology*. McGraw Hill Book Company**,** London.
5. Prescott, L. M., Harley, J. P. and Klein, D. A. 2005. *Microbiology*. 9th Edition. Mac Graw Hill Companies Inc.
6. Aneja, K.R.2003. *Experiments in Microbiology, Plant Pathology and Biotechnology*. 4th Edition. New Age International (P) Limited, New Delhi.
   Dubey, R. C. and Maheswari, D. K. 2002. *Practical Microbiology*. 2nd Edition, S. Chand & Co., New Delhi.
7. Kannan, N. 2002. *Laboratory manual in general microbiology*. 2nd Edition, Panima Publishing Co., New Delhi.

SEMESTER VI
COURSE CODE: MB1642
FOUNDATION COURSE II - (VOCATIONAL)
COURSE TITLE: FOOD AND DAIRY MICROBIOLOGY

CREDITS-4 **Total lecture hours- 72 hours (4hours/week)**

PRE- REQUISITE:
Basic knowledge of microorganisms gained during the first year of this programme.

COURSE OBJECTIVES:

The course will enable students to understand the importance of microorganisms in food and allied industries. The course will teach the role of microbes in food spoilage, contamination and various food borne diseases. The course will also provide an insight into the principles of food preservation and methods for microbial examination of food.

COURSE OUTCOMES:

1. To describe the various factors affecting microbial growth and categorize the different groups of microorganisms associated with food.
2. To explain the different sources of contamination and summarize the general principles underlying spoilage of food.
3. To describe different methods for the preservation of food.
4. To understand basics of dairy microbiology microbial spoilage of milk, milk borne diseases and preservation methods.
5. To describe the beneficial role of microbes in fermented foods and fermented dairy products and other indigenous fermented foods.
6. To paraphrase on food poisoning and food borne diseases.
7. To discuss the basis of food safety regulations and HACCP.

MODULEI **12 hrs.**

Food as a substrate for microorganisms. Factors affecting microbial growth in food – hydrogen ion concentration (pH), water activity, oxidation reduction potential, nutrient content, inhibitory substance. Microorganisms important in food microbiology – Important groups of bacteria, molds and yeast associated with different foods.

MODULE II **12 hrs.**

General principles underlying spoilage of food - Causes of spoilage, classification of food by ease of spoilage. Contamination and spoilage of vegetables and fruits, meat and meat products, sea foods and canned foods.

MODULE III **18 hrs.**

Principles of food preservation, Asepsis, removal of microorganism, maintenance of anaerobic conditions, preservation by the use of high temperature, low temperature, drying, food additives and irradiation.

MODULEIV **16 hrs.**

Dairy microbiology - Sources of microorganisms in milk. - Contamination and spoilage of milk and milk products. Milk borne diseases. Bacteriological examination of milk. Preservation of milk – Pasteurization (different methods and advantages), sterilization (Ultra high temperature processed milk) dehydration. Fermented dairy products and other fermented food.

MODULEV **14 hrs.**

Food borne Diseases- Food born infections and intoxication - Bacterial – *Staphylococcus aureus, Clostridium botulinum, Salmonella typhi, Clostridium perfringens, Vibrio parahaemolyticus, Vibrio cholera, E. coli, Shigella sp., Bacillus cereus, Listeria monocytogenes,* and *Yersinia enterocolitica*. Nonbacterial – Mycotoxins, Viruses- Hepatitis, Poliomyelitis, viral gastroenteritis. Food borne parasites. Food sanitation- good manufacturing practices, Hazard Analysis Critical Control Points (HACCP).

SEMESTER VI
COURSE CODE: MB1642-P09
VOCATIONALCOURSE VII- PRACTICAL-P6
COURSE TITLE: FOOD AND DAIRY MICROBIOLOGY

CREDITS-3 **Total practical hours - 126 hrs. (7 hrs./week)**

PRE- REQUISITE:
Basic knowledge of microorganisms gained during the first and second year of this programme

COURSE OBJECTIVES:

The course imparts knowledge to students on various methods of microbial analysis of food mainly with respect to quality testing and detection of bacteria in milk.

COURSE OUTCOMES:
1. To examine the role of microorganisms in in spoilage of different varieties of food.
2. To apply different techniques for the detection of bacteria in milk.
3. To apply different techniques for quality testing of milk and analyze the results obtained.
4. To demonstrate the methods employed for mushroom cultivation.

PRACTICAL

1. Isolation and Enumeration of bacteria from spoiled food–a) Curd b) fruits and vegetables c) meat d) fish.
2. Detection of number of bacteria in milk by standard plant count.
3. Determination of quality of milk sample by methylene blue reduction test.
4. Detection of number of bacteria in milk by breed count.
5. Quality testing of milk by resazurin test.
6. Determination of phosphatase activity of milk.
7. Mushroom cultivation

Reference

1. Lim, D. 1998. *Microbiology*.2nd Edition; McGraw-Hill Publication.
2. Madigan, M.T. and Martinko, J. M. 2006. *Brock's Biology of Microorganisms*. 11thEdition. Pearson Education Inc.
3. Pelczar, M. J. Jr., Chan, E. C. S. and Krieg, N. R. 1993. *Microbiology*, 5th Edition, Tata

Mac Graw Hill Press.

4. Prescott, L.M., Harley, J.P. and Klein, D.A. 2005. *Microbiology*. 9thEdition. Mac Graw Hill Companies Inc.

5. Alcamo Fundamentals of Microbiology,5thEdition,

6.Gerald J. Tortora, Berdell. R. Funke, Christine L. case, Microbiology–An Introduction. Pearson Publication

6. Salle, A.J. 1971. *Fundamental Principles of Bacteriology*. 7th Edition. Tata Mac Graw Hill Publishing Co.

7. Black, J. G. 2013. *Microbiology: Principles and Explorations*. 6th Edition, John Wiley and Sons, Inc.

8. Aneja, K. R. 2003. *Experiments in Microbiology, Plant Pathology and Biotechnology*. 4thEdition.New Age International (P) Limited, New Delhi.

9. Dubey, R.C. and Maheswari, D.K.2002.*PracticalMicrobiology*.2nd Edition, S. Chand & Co., New Delhi.

10. Kannan, N. 2002. *Laboratory manual in general microbiology*. 2nd Edition, Panima Publishing Co., New Delhi.

SEMESTER VI
COURSE CODE: MB 1643
COURSE TITLE: BIOINFORMATICS & BIOSTATISTICS

CREDITS-4 Total lecture hours- 72hrs (4hrs/week)

PRE- REQUISITE:

Knowledge of biological data bases during the first & second year of this programme.

COURSE OBJECTIVES:

To learn the basic concepts of bioinformatics and biological databases. To distinguish molecular modeling, sequence analysis and alignment. To gain knowledge in statistical tools in data interpretation, significance test and sampling methods.

COURSE OUTCOMES:

1. Adapt the basic concepts of biological databases.
2. Integrate comparative genomics with pharmacogenomics.
3. Justify molecular phylogeny and phylogeny trees.
4. Construct graphs, tables, histograms and pi diagrams for data interpretation.
5. Compile data generated from sampling methods and evaluate tests of significance based on T and Chi square test.

MODULE I **15hrs**

Bioinformatics**:** Introduction: Definition, Origin of concept of Bioinformatics; Brief history, Importance of bioinformatics; Web lab and Wet lab. Biological databases: Brief account on Model/organism databases, Biodiversity data bases and Biomolecular Databases-Nucleic acid databases Eg: EMBL, Gen Bank - Protein sequence databases. Eg: PIR, SWISS PROT.

MODULE II **12 hrs.**

Protein structure databank- PDB -Molecular visualization- use of Rasmol- Molecular modeling (Brief account only). Molecular docking and computer aided drug design (Brief account only)**.** Basics of Genomics and Proteomics, Comparative genomics and Pharmacogenomics.

MODULE III **15 hrs.**

Sequence analysis and alignment (brief account only). Pair wise sequence alignment. Multiple

sequence alignment: Molecular Phylogeny and Phylogenetic trees. Advantages of Molecular phylogeny and phylogenetic analysis. Bioinformation Tools: BLAST, CLUSTAL X.

MODULE IV **12 hrs.**

Documentation of experiments. Nature and types of data. Significance of statistical tools in data interpretation: graphs, tables, histograms and pi diagrams. Statistical testing of hypothesis, null hypothesis. Significance test -Statistics based acceptance or rejection of a hypothesis.

MODULE V **18 hrs.**

Nature and scope of statistical methods and their limitation. Measure of average and dispersion mean, medium, mode. Sampling methods-simple random, stratified, systematic and cluster sampling procedures. Sampling distribution, Probability, Tests of significance based on T, Chi-square and f test.

SEMESTER VI
COURSE CODE: MB 1643
COURSE – PRACTICAL –P6
COURSE TITLE: BIOINFORMATICS & BIOSTATISTICS

PRE- REQUISITE: **Total practical hours - 108 hrs. (6 hrs./week)**

Knowledge of computer and software applications during the first & second year of this programme.

COURSE OBJECTIVES:

To learn how to download nucleotide and protein sequence files from databases and its visualization. To compare different sequence analysis and nucleic acid database. To compose mean, median. mode and compare different tests of significance,

COURSE OUTCOMES:

1. Compare nucleotide and protein sequence files from database.
2. Distinguish between different sequence analysis platforms and nucleic acid databases.
3. Create graphical representation from data generated from different sampling methods.
4. To compose mean. Median, mode and compare significance using different tests of significance.

PRACTICAL

1. Downloading Nucleotide and Protein sequence files from databases
2. Downloading structure files and visualizing using Rasmol
3. Sequence Analysis using BLAST, CLUSTAL Omega
4. Nucleic acid data bases Eg: EMBL, GenBank
5. Collection of data, sampling designs, tabulation and graphic representation using biological materials.
6. To find mean, mode and median using biological materials.
7. Tests of significance ‘t’ test, ‘chi’ square, standard error and standard deviation to be practically done through SPSS [statistical Package for Social Sciences] programme.

Reference

1. Lim, D.1998.*Microbiology*. 2nd Edition; Mc Graw-Hill Publication.
2. Madigan, M.T. and Martinko, J.M. 2006. *Brock’s Biology of Microorganisms*. 11thEdition.

Pearson Education Inc.

3. Pelczar, M. J. Jr., Chan, E. C. S. and Krieg, N. R. 1993. *Microbiology*, 5th Edition, Tata Mac Graw Hill Press.
4. Prescott, L.M, Harley, J.P. and Klein, D.A. 2005. *Microbiology*. 9thEdition. Mac Graw Hill Companies Inc.
5. Alcamo Fundamentals of Microbiology, 5thEdition,
6. Gerald J. Tortora, Berdell. R. Funke, Christine L. Case, Microbiology–An Introduction. Pearson
7. Publication
8. Salle, A.J. 1971. *Fundamental Principles of Bacteriology*. 7th Edition. Tata Mac Graw Hill Publishing Co.
9. Black, J. G. 2013. *Microbiology: Principles and Explorations*. 6th Edition, John Wiley and Sons, Inc.
10. Aneja, K. R. 2003. *Experiments in Microbiology, Plant Pathology and Biotechnology*. 4th Edition. New Age International (P) Limited, New Delhi.
11. Dubey, R.C and Maheswari, D.K. 2002.*PracticalMicrobiology*.2nd Edition, S. Chand &
12. Co., New Delhi.
13. Kannan, N. 2002. *Laboratory manual in general microbiology*. 2nd Edition, Panima Publishing Co., New Delhi

OPEN COURSE –I(a)

MUSHROOM CULTURE

Course Code : MB1551.1
Number of credits:2
Number of contact hours: Lecture: 54 hrs.

MODULEI **9 hrs.**

Introduction: history & scope of edible mushroom cultivation. Types of edible mushroom available in India: *Calacybe indica, Volvariella Volvacea, Pleurotus sp. and Agaricus bisporus.*

MODULEII **10 hrs.**

Pure culture technique: preparation of media & sterilization – Preparation of test tube slants to store mother culture – culturing of *Pleurotus* mycelium on petri plates – Preparation of mother spawn in saline bottle and polypropylene bags and their multiplication.

MODULEIII **15 hrs.**

Cultivation Technology: Infra structure, Substrates (locally available) polythene bag, vessels, Inoculation hood – inoculation loop – low-cost stove – sieves – Culture rack mushroom unit (Thatched house) – Mushroom bed preparation – Paddy straw, sugarcane trash, maize straw, banana leaves.

MODULEIV **10 hrs.**

Storage and nutrition: short term storage – Long term storage (scanning, Pickles, papads, drying, storage in salt solutions) – Nutrition: Proteins, amino acids, mineral elements. Nutrition: Carbohydrates – Crude fiber content, vitamins.

MODULEV **10 hrs.**

Economics of mushroom cultivation (fixed assets, recurring expenditure, labor, economics of cultivation throughout the year and seasonal growing formulation of project report for getting finance from funding agencies). Precautions in mushroom cultivation (precaution to be taken while selecting the area, spawn preparation, spawn run, during cropping harvesting etc.). Mushroom recipes.

Field study: Visit to a mushroom cultivating laboratory

REFERENCES

1. Marimuthu et al., (1991) Oyster Mushrooms, Dept. of Plant pathology, TNAU, Coimbatore.
2. Nita Bahl (1988) Hand book of Mushrooms, II edition, Vol. I &II.
3. Paul Stamets, J.S. and Chilton, J.S. (2004). Mushroom Cultivator: A Practical guide to growing mushrooms at home, Agarikon Press.
4. Shu-Ting Chang, Philip G. Miles, Chang, S.T. (2004). Mushrooms: Cultivation, nutritional value, medicinal effect and environmental impact, 2nd ed, CRC press.
5. Swaminathan M. (1990) Food and Nutrition. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
6. Tewari and Pankaj Kapoor S.C. (1988) Mushroom cultivation, Mittal Publications, Delhi.

OPEN COURSE-I (b)
MICROBIAL WASTE MANAGEMENT

Course Code : MB1551.1

Number of credits:2

Number of contact hours: Lecture: 54 hrs.

MODULE I **20 hrs.**

General concept of sanitation and disinfection. Sanitation of industrial and food processing units Air sanitation, Safe location of animal houses, hospitals, industrial fermentation units etc. based on air sanitation. Air borne diseases and preventive measures.

MODULE II **20 hrs.**

Microbiology of municipal sewage and sewage treatment BOD and COD Concept. Treatment of Industrial effluent- Waste water treatment-Mechanical and biological. Aerobic and anaerobic treatments. Domestic septic tank. Treatment of municipal water supplies water borne diseases

MODULE III **14 hrs.**

Solid waste disposal-sanitary landfills, composting, vermicompost. Disposal of animal and agricultural waste. Methanogenesis and biogas production

REFERENCES

1. Dirk, J. Elasas, V., Trevors, J.T., Wellington, E.M.H. (1997). Modern Soil Microbiology, Marcel Dekker INC, New York, Hong Kong.
2. Ec Eldowney S, Hardman D.J., Waite D.J., Waite S. (1993). Pollution: Ecology and Biotreatment – Longman Scientific Technical.
3. Grant W.D. and Long, P.L. (1981). Environmental Microbiology. Blackie Glasgow and London.
4. Mitchel, R. (1992). Environmental Microbiology. Wiley – John Wiley and Sons. Inc. Publications, New York.
5. Clescri, L.S., Greenberg, A.E. and Eaton, A.D. (1998). Standard Methods for Examination of Water and Waste

OPEN COURSE-I (c)
BIOFERTILIZER TECHNOLOGY

Course Code : MB1551.3
Number of credits:2
Number of contact hours: Lecture: 54 hrs.

MODULE–I **15 hrs.**

General account of the microbes used as biofertilizers for crop plants and their advantages. Symbiotic N2 fixer: *Rhizobium* - Isolation, characterization, identification, Classification, inoculum production and field application. *Frankia* - Isolation, characterization – actinorhizal nodules – non-leguminous crop symbiosis.

MODULE–II **8 hrs.**

Non – Symbiotic N2 fixers – *Azospirillum* – Free living - *Azotobacter* – free isolation, characterization, mass inoculum production and field application.

MODULE–III **8 hrs.**

Symbiotic N2 fixers – Cyanobacteria, Azolla – Isolation, characterization, mass multiplication – Role in rice cultivation – Crop response – field application - immobilization.

MODULE–IV **8 hrs.**

Phosphate solubilizers – Phosphate solubilizing microbes – Isolation, characterization, mass inoculum production, field application – Phosphate solubilization mechanism.

MODULE–V **15 hrs.**

Mycorrhizal bioinoculants – classification – importance of mycorrhizal association Ectomycorrhiza – Endomycorrhiza – Ectendomycorrhiza — Isolation of VA mycorrhiza – Quantification and assessment of VAM in roots – Mass inoculum production of VAM – field applications of Ectomycorrhiza and VAM.

Field study: Visit to a biofertilizer production unit

REFERENCES

1. Kannaiyan, S. (2003). Biotechnology of Biofertilizers, CHIPS, Texas.
2. Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.
3. Reddy, S.M. et. al. (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.
4. Subba Rao N.S (1995) Soil microorganisms and plant growth Oxford and IBH publishing co. Pvt. Ltd. New Delhi.
5. Subba Rao N.S. (1988) Biofertilizers in Agriculture and forestry Oxford and IBH Publishing

OPEN COURSE-II (a)

COURSE CODE: MB1661
COURSE TITLE: AGRICULTURAL MICROBIOLOGY

CREDITS-2 **Total lecture hours- 54 hours (3hours/week)**

PRE- REQUISITE:

Basic knowledge of microorganisms gained during the first year of this programme.

COURSE OBJECTIVES:

The major objective of this paper is to impart knowledge about the basics of soil microorganisms their interactions and gain insight on biogeochemical cycles. The course will also give an understanding of the use of microbial populations in agriculture, and in the generation of value-added products mainly as bio-pesticides and bio-fertilizers.

COURSE OUTCOME:

1. To paraphrase on the microbiology of the soil and explain microbial interactions.
2. To describe the interaction of soil microbes with plants and categorize the different microbial diseases of plants.
3. To discuss the role of microbes as biopesticides and examine their role in integrated pest management.
4. To describe the role of microbes as biofertilizers and review their application in agriculture.
5. To understand plant disease mechanism and how to control plant diseases and also to get awareness on the impact of chemical fertilizers.

MODULEI **10 hrs.**

Microbiology of soil- microbial flora, factor affecting flora, biogeochemical cycles- nitrogen, carbon, sulfur, phosphorus and its importance. Soil microorganisms and microbial interactions - mutualism, synergism(protocooperation), commensalisms. Amensalism, competition, parasitism, predation, neutralism.

MODULE II **10 hrs.**

Interaction of microbes with plants-Microbes with plant roots-Rhizosphere concept, mycorrhizae, ecto, endo, VAM, actinomycorrhiza, rhizoplane, phylloplane and phyllo sphere concept.

MODULE III **14hrs**

Biofertilizers: Biological nitrogen fixation- Biochemistry and physiology of nitrogen fixation, *nif* genes. PGPR – General account of the microbes used as biofertilizers for crop plants and their advantages: Isolation, characterization, identification, Classification, inoculum production and field application of *Rhizobium Azospirillum*, *Azotobacter*, *Azolla* and *Phosphate solubilizing bacteria.*

MODULE IV **10hrs**

Microbial diseases of plants- Bacterial diseases**:** Bacterial leaf blight of rice, Citrus canker Fungal diseases: Downy mildew of grapes, and Tikka disease of groundnut. Mycoplasmal diseases- Sandal spike, Grassy shoot disease of sugarcane Actinomycetes Diseases-Potato scab disease. Viral Disease – TMV, Bunchy top disease of banana

MODULEV **10 hrs.**

Bio Pesticides: bacterial, viral and fungal pesticides. Biological control of plant diseases. Integrated pest management.

Reference

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2. Madigan, M.T. and Martinko, J.M.2006. *Brock's Biology of Microorganisms*. 11thEdition. Pearson Education Inc.
3. Pelczar, M. J. Jr., Chan, E. C. S. and Krieg, N. R. 1993. *Microbiology*, 5th Edition, Tata Mac Graw Hill Press.
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5. Alcamo Fundamentalsofmicrobiology,5th Edition.
6. Gerald J. Tortora, Berdell. R. Funke, Christine L. Case, Microbiology–An Introduction. Pearson Publication
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8. Black, J. G. 2013. *Microbiology: Principles and Explorations*. 6th Edition, John Wiley and Sons, Inc.

9. Aneja, K. R. 2003. *Experiments in Microbiology, Plant Pathology and Biotechnology*. 4thEdition.New Age International (P) Limited, New Delhi.

10. Dubey, R.C. and Maheswari, D.K.2002.*PracticalMicrobiology*.2nd Edition, S. Chand & Co., New Delhi.

11. Kannan, N. 2002. *Laboratory manual in general microbiology*. 2nd Edition, Panima Publishing Co., New Delhi.

OPEN COURSE-II (b)

BIOSAFETY IN MICROBIOLOGY

Course Code : MB1661 Number of credits:2
Number of contact hours: Lecture: 54 hrs.

MODULEI **12 hrs.**

Concept of biosafety: Historical background, principles of biosafety, introduction to biological safety cabinets, selection, installation and use of biological safety cabinets, primary containment for biohazards, biosafety levels, biocontainment, biosafety levels of specific microorganisms, recommended biosafety levels for infectious agents and infected animals.

MODULE II **12 hrs.**

Biosafety guidelines - Government of India, definition of Genetically Modified Organisms (GMOs) and Living Modified Organisms (LMOs), Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture, Environmental release of GMOs.

MODULE III **10 hrs.**

Risk Analysis, Risk Assessment, Risk management and communication. Overview of national regulations and relevant international agreements including Cartagena Protocol.

MODULE IV **10 hrs.**

Plant biosafety, risk assessment, laboratory standard operating procedures, safety of laboratory personnel, environmental safety, regulated biosafety and biosecurity. Biosafety regulations and assessment of biotechnology products, drugs/vaccines and GMOs.

MODULE V **10 hrs.**

Biosafety protocols, biological weapons, biosecurity, components of biosecurity program and bioethical issues. Occupational health and immunoprophylaxis, decontamination and disinfection, transportation of infectious substances and, agriculture pathogen biosafety.

REFERENCES

1. Social issues in Science and Technology: An Encyclopedia, David E. Newton (ABC- CLIO, Santa Barbara),1999.
2. Methods for Teaching Science as Inquiry, Bass, Joel, E and et. al., Allyn & Bacon, 2009 The truth of science, Newton R.G.,
3. Biotechnology: Issues, Ethics and Regulations, Tina M. Prow, Communications Specialist, Office of Agricultural Communications and Education.
4. Fleming, D. O. and D. L. Hunt (eds.). 2006. Biological Safety: Principles and Practices, 4th ed. ASM Press, Washington, D.C.\ Tina M. Prow,
5. Centers for Disease Control and Prevention and National Institutes of Health (CDC/NIH). 2007. Biosafety in Microbiological and Biomedical Laboratories, 5th ed.

UNIVERSITY OF KERALA

COURSE STRUCTURE AND SYLLABUS

FOR

FIRST DEGREE PROGRAMME

IN

MICROBIOLOGY

UNDER

CHOICE BASED CREDIT- SEMESTER SYSTEM

(w.e.f. 2014 admission)

THE PROGRAMME

The programme is named as Bachelor of Science (B. Sc.) in Microbiology

ELIGIBILITY FOR ADMISSION

A pass in 10+2 (Higher Secondary/ISC/CBSE) Exam with Biology as one of the papers will be eligible.

OBJECTIVES OF THE PROGRAMME

• To impart knowledge of Science is the basic objective of education.

• To develop scientific attitude is the major objective to make the students open minded, critical & curious.

• To develop skill in practical work, experiments and laboratory materials and equipments along with the collection and interpretation of scientific data to contribute the science.

• To understand scientific terms, concepts, facts, phenomenon and their relationships.

• To make the students aware of natural resources and environment.

• To provide practical experience to the students as a part of the course to develop scientific ability to work in the field of research and other fields of their own interest and to make them fit for society.

• The students are expected to acquire knowledge of microbiology and related subjects so as to understand natural phenomenon, manipulation of nature and environment in the benefit of human beings.

• To develop ability for the application of the acquired knowledge to improve agriculture and other related fields to make the country self reliant and sufficient.

• To create the interest of the society in the subject and scientific hobbies, exhibitions and other similar activities.

• To enrich the students with the latest developments in the field of Information Technology, Biotechnology, Bioinformatics and other related fields of research and development

• To create enthusiasm to understand more about the beautiful planet Earth and to give awareness to the public the need to protect the planet from all kinds of exploitation

• To keep the scientific temper which the student acquired from school level and to develop a research culture.

Table 1. General Structure of the First Degree Programme in Microbiology

Sem No	Course Code	Course Title	Instructional Hours/week		Credits	Uty Exam Duration	Evaluation		Total Credits
			L	P			Internal	Uty Exam	
I	EN 1111	English Language I	5	-	4	3			
	….1111	Additional Language I	4	-	3	3			
	EN1121	Foundation Course I	4	-	2	3			
	MB1141	Core Course I	3	1	3	3	25%	75 %	16
	CH1131	Complementary Course I*	2	2	2	3			
	BT 1131	Complementary Course II**	2	2	2	3			
II	EN 1211	English Language II	5	-	4	3			
	EN1212	English Language III	4	-	3	3			
	1211	Additional Language II	4	-	3	3			
	MB 1221	Foundation Course II	3	1	3	3	25%	75 %	17
	CH 1231	Complementary Course III	2	2	2	3			
	BT 1231	Complementary Course IV	2	2	2	3			
III	EN 1311	English Language IV	5	-	4	3			
	1311	Additional Language III	5	-	4	3			
	MB 1341	Core Course II	3	2	3	3	25%	75 %	17
	CH1331	Complementary Course V	3	2	3	3			
	BT 1331	Complementary Course VI	3	2	3	3			
IV	EN1411	English Language V	5	-	4	3			
	1411	Additional Language IV	5	-	4	3			
	MB1441	Core Course III	3	2	3	3			
	CH1431	Complementary Course VII	3	2	3	3			
	BT1431	Complementary Course VIII (CH/BT)	3	2	3	3	25%	75 %	25
	CH1432	Complementary Course IX (Practical)	-	(8)*	4	3			
	BT1432	Complementary Course X. (Chemistry/Biotechnology Practical)	-	(8)*	4	3			
V	MB1541	Core Course IV	4	3	4	3			
	MB1542	Core Course V	4	2	3	3			
	MB1543	Core Course VI	5	2	4	3			
	MB1544	Core (Practical- 1) VII	-	(5)*	3	3			
	MB1545	Core (Practical- 2) VIII	-	(5)*	4	3	25%	75 %	20
		Open Course I	3	-	2	3			
	MB1551.1	Mushroom Culture							
	MB1551.2	Microbial Waste Management							
	MB1551.3	Biofertilizer Technology							
		Project	-	2	-				
VI	MB1641	Core Course IX	4	3	4	3			
	MB1642	Core Course X	4	2	4	3			
	MB1643	Core Course XI	4	2	4	3			
	MB1644	Core (Practical 3) XII	-	(5)*	3	3			
	MB1645	Core (Practical 4) XIII	-	(4)*	4	3	25%	75 %	**75**
	MB1661	Elective Course	3	-	2	3			
	MB1646	Project	-	3	4	3			
									120

*** CH-Chemistry –Same syllabus of complementary Chemistry offered for Botany/Zoology may be followed**

**** BT-Biotechnology- New syllabus**

Table 2. Semester I

Course Code	Course Title	Instructional hours/week		Credits	Univ. Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ Exam	
EN 1111	English Language I	5		4	3 Hrs	25%	75%	16
….1111	Additional Language I (Hindi/Malayalam)	4		3				
EN1121	Foundation Course I	4		2				
MB 1141	Core Course I Methodology and Perspectives of Science.	3	1	3				
CH 1131	Complementary Course I (Chemistry- I)	2	2	2				
BT 1131	Complementary Course II (Biotechnology I)	2	2	2				

Table 3. Semester II

Course Code	Course Title	Instructional hours/week		Credits	Univ Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ Exam	
EN 1211	English Language II	5		4	3 Hrs	25%	75%	17
EN1212	English Language III	4		3				
1211	Additional Language II (Hindi/Malayalam)	4		3				
MB 1221	Foundation Course II General informatics and Bioinformatics	3	1	3				
CH 1231	Compl. Course III (Chemistry -II)	2	2	2				
BT 1231	Complementary Course IV (Biotechnology II)	2	2	2				

Table 4. Semester III

Course Code	Course Title	Instructional hours/week		Credits	Univ. Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ. Exam	
EN 1311	English Language IV	5		4	3 Hrs	25%	75%	17
1311	Additional Language III (Hindi/Malayalam)	5		4				
MB 1341	Core Course II Fundamentals of Microbiology	3	2	3				
CH 1331	Complementary Course V (Chemistry -III)	3	2	3				
BT 1331	Complementary Course VI (Biotechnology III)	3	2	3				

Table 5. Semester IV

Course Code	Course Title	Instructional hours/week		Credits	Univ. Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ. Exam	
EN 1411	English Language V	5		4	3 Hrs	25%	75%	25
1411	Additional Language IV (Hindi/Malayalam)	5		4				
MB 1441	Core Course III Microbial Genetics & Immunology	3	2	3				
CH 1431	Compl. Course V (Chemistry -IV)	3	2	3				
BT 1431	Complementary Course VII (Biotechnology IV)	3	2	3				
CH 1432	Complementary Course VIII (Chemistry Practical)		(8)*	4				
BT 1432	Complementary Course IX Practical (Biotechnology)		(8)*	4				

Table 6. Semester V

Course Code	Course Title	Instructional hours/week		Credits	Univ. Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ. Exam	
MB 1541	Core Course IV Instrumentation in Microbiology	4	3	4	3 Hrs	25%	75%	20
MB 1542	Core Course V Environmental Microbiology	4	2	3				
MB 1543	Core Course VI Medical Microbiology & Molecular Biology	5	2	4				
MB 1544	Core Course VII Practical (Instrumentation in Microbiology & Environmental Microbiology)		(5)*	3				
MB 1545	Core Course VIII Practical (Medical Microbiology & Molecular Biology)		(5)*	4				
MB 1551.1 MB 1551.2 MB 1551.3	Open Course – I Mushroom Culture Microbial Waste Management Bio-fertilizer Technology	3		2				
	Project		2					

Table 7. Semester VI

Course Code	Course Title	Instructional hours/week		Credits	Univ. Exam Duration	Evaluation		Total Credits
		L	P			Internal	Univ. Exam	
MB 1641	Core Course IX Industrial Microbiology	4	3	4	3 Hrs	25%	75%	25
MB 1642	Core Course X Bioinformatics & Biostatistics	4	2	4				
MB 1643	Core Course XI Food & Dairy Microbiology	4	2	4				
MB 1644	Core Course XII Practical (Industrial Microbiology & Food & Dairy Microbiology)		(5)*	3				
MB 1645	Core Course XIII Practical (Bioinformatics & Biostatistics)		(4)*	4				
MB 1661.1	Elective Course Biosafety in Microbiology	3		2				
MB 1646	Project		3	4				

L = Lecture P = Practical

( )*Practical hour already distributed in the semester concerned

Table 8. Distribution of Contact Hours and Credits
(Core, Foundation & Open courses, Project /Dissertation)

Course Code	Course Title	Semester I			Semester II			Semester III			Semester IV			Semester V			Semester VI			Total	
		Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours	Credits
		T	P	C	T	P	C	T	P	C	T	P	C	T	P	C	T	P	C		
MB1141	Methodology & Perspectives of Science	3		3																3	3
MB1221	General Informatics & Bioinformatics				3	1	3													4	3
MB1341	Fundamentals of Microbiology							3												3	3
MB1441	Microbial Genetics & Immunology										3									3	3
MB1442	Practical (MB1141, MB1341 & MB1441)		1						2			2	4							5	4
MB1541	Instrumentation in Microbiology													4		4				4	4
MB1542	Environmental Microbiology													4		3				4	3
MB1543	Medical Microbiology & Molecular Biology													5		3				5	4
MB1544	Practical II (MB1541 &MB1542)														5	4				5	4
MB1551.1 MB1551.2 MB1551.3	Mushroom Culture Microbial Waste Management Biofertilizer Technology													3		2				3	2
MB1641	Industrial Microbiology																4		4	4	4
MB1642	Bioinformatics & Biostatistics																4		4	4	4
MB1643	Food & Dairy Microbiology																4		4	4	4
MB1644	Practical III (MB1543 & MB 1641)																	5	4	5	4
MB1645	Practical IV (MB 1642 & MB 1643)																	4	3	4	3
MB1661	Biosafety in Microbiology																3		2	3	2
MB1646	Project, Tour Diary, Viva Voce														2				3	5	4

Duration of Examination (Theory & Practical): 3 Hours
Continuous Evaluation (CE): 25%; End Semester Evaluation (ESE): 75%
Total Weightage for Each Course (Theory & Practical): 30
Total credits for the entire programme: 120

Table 9. Scheme of Evaluation of Foundation Course II, Core Courses, Open Courses & Project

Semester	Course Code	Course Title	Weightage		Duration of Univ. Exam
			CE	ESE	
I	MB 1141	Methodology and Perspectives of Science	4	30	3 Hours
II	MB 1221	General Informatics & Bioinformatics	4	30	3 Hours
III	MB 1341	Fundamentals of Microbiology	4	30	3 Hours
IV	MB 1441	Microbial Genetics & Immunology	4	30	3 Hours
V	MB 1541	Instrumentation in Microbiology	4	30	3 Hours
	MB 1542	Environmental Microbiology	4	30	3 Hours
	MB 1543	Medical Microbiology & Molecular Biology	4	30	3 Hours
	MB 1544	Instrumentation in Microbiology & Environmental Microbiology (Practical)	4	30	3 Hours
	MB 1545	Medical Microbiology & Molecular Biology (Practical)	4	30	3 Hours
	MB 1551.1 MB 1551.2 MB 1551.3	Mushroom Culture Microbial Waste Management Bio-fertilizer Technology	4	30	3 Hours
VI	MB 1641	Industrial Microbiology	4	30	3 Hours
	MB 1642	Bioinformatics & Biostatistics	4	30	3 Hours
	MB 1643	Food & Dairy Microbiology	4	30	3 Hours
	MB 1644	Industrial Microbiology & Food & Dairy Microbiology (Practical)	4	30	3 Hours
	MB 1645	Bioinformatics & Biostatistics (Practical)	4	30	3 Hours
	MB 1661.1	Bio-safety in Microbiology	4	30	3 Hours
	MB 1646	Project, Tour Diary Viva Voce		20	3 Hours

CE= Continuous Evaluation ESE= End Semester Evaluation

PATTERN OF THEORY QUESTION PAPER

Salient features:

• Question paper is set up based on grading system/marks
• The duration of exam for each course is fixed to 3 hours
• The question paper consists of five sections A, B, C & D Section A consists of 16 questions and a bunch of 4 questions carries 1 weightage
• Section B contains 12 very short answer questions of which the candidate can choose 8 and carries 1 weightage each
• Section C has 8 short answer type questions of which the candidate has to answer 5 with a weightage of 1 each
• The last section D consists of 3 questions and the candidate gets the freedom to answer 2 questions with a weightage of 4 each
• Total weightage is 30/paper

EVALUATION AND GRADING

The Evaluation of each course shall consist of two parts 1) Continuous Evaluation (CE) 2) End Semester Evaluation (ESE). The CE and ESE ratio shall be 1:4 for both courses with or without practical. There shall be a maximum of 80 marks for ESE and maximum of 20 marks for CE. For all courses (Theory and Practical), Grades are given on a 7-point scale based on the total percentage of mark (CE+ESE) as given below:

Criteria for Grading

Percentage of marks	CCPA	Letter Grade
90 and above	9 and above	A+ Outstanding
80 to < 90	8 to<9	A Excellent
70 to <80	7to<8	B Very Good
60 to < 70	6to<7	C Good
50 to < 60	5to<6	D Satisfactory
40 to < 50	4to<5	E Adequate
Below 40	<4	F Failure

Theory

Component	Weightage
Attendance	1
Assignment/ Seminar	1
Test paper	2
Total	**4**

Practical

Component	Weightage
Attendance	1
Viva-voce	1
Test	2
Total	**4**

End Semester Assessment (ESA)

Details of Papers	Duration of Exam	Weightage		
Theory & Practicals		External	Internal	Total
Microbiology (Core) Courses	3 Hours	30	4	34
Complementary Courses	3 Hours	30	4	34
Open Courses	3 Hours	30	4	34

Consolidation of Grades for CE for Theory course
Example:

Component	Weightage (W)	Grade awarded	Grade points (G)	Weighted Grade points(W×G)
Attendance	**1**	**B**	**3**	**3**
Assignment/Seminar	**1**	**C**	**2**	**2**

Test paper	**2**	**A**	**4**	**8**
Total	**4**			**13**
CE Grade	Total weighted grade points/Total weights=13/4=3.25=**Grade B**			

• With regard to the **attendance** (weight=1), the following grading scheme shall be followed:
Below 75% -**E**; 75-79%- **D**; 80-89% - **C**; 90-94%- **B**; 95-100%- **A**.
• For **assignment/ Seminar** (weight -1), the teacher shall define the quality in terms of **structure, content, presentation** and **punctuality** in submission.
• **Test papers** (weight=2) shall be graded by the same procedure adopted for theory exam evaluation

The students are required to write a minimum of 2 class tests in every semester for each course. Grades for the test component in CE shall be awarded on the basis of calculating average of the grades secured for the two class tests. Each student shall be required to do one assignment or one seminar for each Course. Valued assignments shall be returned to the students. The seminars shall be organized by the teacher/teachers in charge of CE and the same shall be assessed by a group of teachers including the teacher/teachers in charge of that Course.

CONSOLIDATION OF THE GRADE OF A COURSE
The grade of a course is consolidated by combining the ESE and CE grades taking care of their weights
Example:

Exam awarded	**Weight points(G)**	**Grade Points (WxG)**	**Grade**	**Weighted grade**
ESE	3	2.47	C	7.41
CE	1	3.20	B	3.20
Total	4			10.61
Grade of Course	Total weighted grade points/Total weights=10.61/4=2.65=Grade B			

END SEMESTER ASSESSMENT (ESA)
The University shall conduct the external examinations for all semesters. There will not be any supplementary exams. The practical examinations for **Core courses** shall be conducted at the end of 4^{th}, 5^{th} and 6^{th} semesters and **Complementary** courses at the end of 4^{th} semester according to the common calendar and questions set up by the University. The Board of Examiners constituted by the University will have the right to make necessary changes in the pattern of practical examination as and when needed.

ELIGIBILITY TO APPEAR FOR PRACTICAL EXAMINATION
Submisiion of the following
• Certified and *bona fide* practical record
• Certified field work
• Certified tour report

• Project report/Dissertation (certified and *bona fide*)

PROJECT

Project work/Dissertation is compulsory. It can be carried out either individually or by a group not exceeding 15 students. The topics shall either be allotted by the supervising teacher or be selected by the student in consultation with the supervising teacher. The project report/dissertation duly attested by the Supervising teacher and Certified by the Head of the Department, has to be submitted on the day of examination of **Practical - II (Core)**. The project shall be evaluated by an external examiner. The project report/ Dissertation (not less than 40 pages) shall be prepared as per the format given below.

1. Title page /Front page (Certified by the **HOD**)
2. Declaration by the candidate
3. Certificate attested by the Supervising teacher
4. Acknowledgement, if any
5. Table of contents
6. Abbreviation, if any
7. Abstract/ Summary
8. Introduction & Review of Literature (10pages)
9. Material and Methods
10. Results and Discussion (Not less than 10 pages)
11. Conclusion
12. References

Tables, Graphs, Photographs etc. can be used to present the data. Topics selected once should not be repeated.

STUDY TOUR

• Visit to a Microbiology Laboratory/Distillary /Biofertilizer unit etc within or outside Kerala with a minimum duration of 3 days is compulsory

• A brief report of the trip has to be submitted, along with appropriate photographs

CORE COURSES

Semester	Course Code	Title of the Course	Cotact hrs/week L	P	Credits
I &II	MB1141	Methodology and Perspectives of Science	3	1	3
III	MB1341	Fundamentals of Microbiology	3	2	3
IV	MB1441	Microbial Genetics & Immunology	3	2	3
V	MB1541	Instrumentation in Microbiology	4	3	4
	MB1542	Environmental Microbiology	4	2	3
	MB1543	Medical Microbiology & Molecular Biology	5	2	3
	MB1544	Practical I (MB1141, MB1341 & MB1441	-	(5)	4
	MB1545	Practical II (MB1541 & MB1542)	-	(5)	4
VI	MB1641	Industrial Microbiology	4	3	4
	MB1642	Bioinformatics & Biostatistics	4	2	4
	MB1643	Food & Dairy Microbiology	4	2	4
	MB1644	Practical III (MB1543 & MB1641	-	(5)	4
	MB1645	Practical IV (MB1642 &MB1643)	-	(4)	3

METHODOLOGY AND PERSPECTIVES OF SCIENCES

Course code: MB1141
Number of credits: 3
Number of contact hours: 54 hrs (Lecture); 18hrs (Practical)
Aim of the course: To introduce the methodology and perspectives of Science in general so as to enable the students to systematically pursue his particular discipline in science in relation to other disciplines that come under the rubric of sciences.
Objectives:
- To familiarize the students with the fundamental characteristics of science as a human enterprise
- To see how science works
- To apply scientific methods independently
- To interpret scientific data using basic statistical methods

MODULE-I
Science and Science Studies **10 hrs**
1. Types of knowledge: practical, theoretical and scientific knowledge
2. Information: What is science; what is not science; laws of science; basis of scientific laws and factual truths.
3. Science as a human activity; scientific temper and empiricism, vocabulary of science, science disciplines
4. Revolution in Science and Technology

MODULE- II
Methods and Tools of Science **16 hrs**
1. Hypotheses; theories and laws in science; Observations, evidences and proofs;
2. Posing a question; formulation of hypothesis; Hypothetico-deductive model; inductive model. Significance of verification (proving) corroboration and falsification (disproving), auxiliary hypothesis; adhoc hypothesis
3. Revision of scientific theories and laws.
4. Importance of models, simulations and virtual testing

MODULE-III
Experimentation in Science **10 hrs**
1. Design of an experiment: experimentation; observation; data collection; interpretation and deduction.
2. Necessity of units and dimensions: repeatability and replication; documentation of experiments; record keeping, connection between measurements and underlying theory.
3. Types of Experiments-Experiments to test a hypothesis-to measure a variable or to gather data by preliminary and explorative experiments
16
4. Planning of experiments- Design-selection of controls-observational requirements,-

instrumental requirements.

MODULE- IV

Data handling and Ethics in Science 18 hrs

1. Documentation of experiments: Nature and types of data-typical examples; Data acquisition; treatment of data; data interpretation Significance of statistical tools in data interpretation; errors and inaccuracies.
2. Data presentation: graphs, tables, histograms and pie diagrams.
3. Statistical testing of hypothesis, null hypothesis, Significance test. Statistics based acceptance or rejection of a hypothesis; Deduction of scientific correlation; patters and trends.
4. Ethics in Science: Scientific information; depositories of scientific information, primary secondary and digital sources; sharing of knowledge; transparency and honesty; danger of pre conceived ideas.

Practical 18 hrs

1. Workout problems on frequency distribution, measures of central tendencies, measures of dispersion.
2. Prepare charts on great biological inventions
3. Familiarizing with different biological instruments.

REFERENCES

1. Gieryn T.F. (1999) *Cultural Boundaries of Science* Univer. Chicago Press.
2. Jeffrey A. Lee (2010) The Scientific Endevor. Pearson Delhi
3. Collins H.and T Punch (1993). *The Golem. What everyone should know about Science*. Cambridge Univ. Press
4. Hewitt, Paul G, Suzanne Lyons, John A, Suchocki and Jennifer Yeh (2007) *Conceptual Integrated Science*, Addison-Wesley
5. Newton RG: *The truth of Science*, 2nd edition
6. Bass, Joel, E *et al* (2009) Methods for teaching Science as Inquiry, Allyn& Bacon.

FUNDAMENTALS OF MICROBIOLOGY

Course code: MB1341
Number of credits: 3
Number of contact hours: 54 hrs (Lecture); 36hrs (Practical)

MODULE I 12 hrs

Definition, scope and history of microbiology. Difference between the prokaryotic and eukaryotic microorganisms. Classification of microorganisms – general principles and nomenclature –Whittaker's five kingdom concept. Carl Woese's three domain system of Classification-Classification and characterization of bacteria according to Bergey's Manual of Systematic Bacteriology (9th edition). Basic understanding of classification of viruses, algae, fungi and protozoa.

MODULE-II 12 hrs

Principles and applications of microscopy simple, compound, bright field, dark field, phase contrast, fluorescent and electron microbiology. Principles of staining: Nature of dyes, types of staining – simple, differential, negative and spore staining, Sterilization: Principles and methods of physical (moist heat, dry heat, filtration, pasteurization, tyndallization, radiations) and chemical (alcohols, aldehydes, phenols, halogens and hypochlorites) sterilization. Antimicrobial chemotherapy.

MODULE- III 6 hrs

Physiology of microbial growth and nutrition. Batch, continuous and synchronous cultures; Growth Curve. Nutritional requirements. Transport of nutrients by active and passive transport. Sporulation.

MODULE- IV 14 hrs

Energy production in bacteria- Energy and ATP, aerobic respiration, Glycolysis and tricarboxylic acid cycle, Electron transport and oxidative phosphorylation in Bacteria, catabolism of other carbohydrates. Anaerobic respiration- Fermentation, alcohol fermentation by yeasts and bacteria, lactic acid fermentation, Methnogenic bacteria, Acetobacter and acetic acid fermentation.

MODULE-V 10 hrs

Methods of bacterial identification- morphological, physiological, biochemical and serological properties. Culture techniques: Types of media simple, defined, enriched and transport media with specific examples for each type. Types of streaking. Maintenance and preservation of microbes.

Practical **36 hrs**

1. Study the parts and usage of a Compound Microscope
2. Study the parts and working and uses of Autoclaves, Hot air oven, Membrane Filter, Safety Cabinet, Anaerobic Jar, Centrifuge, and Incubator.

3. Preparation of culture Media and dispensing media in test tubes, bottles, petridishes.
4. Cultivation of Bacteria on nutrient Agar for obtaining isolated colonies. Study of cultural colony characters- Size, shape, colour etc.
5. Viable Count of bacteria by pour plate/ spread plate and streak plate method.
6. Examination of wet films under high power objectives.
7. Preparation and examination of Hanging drop mount for studying the motility of bacteria.
8. Preparation of slide smears for staining.
9. Staining- Principle & techniques, Simple staining, Gram Staining, Negative Staining Acid fast staining, Special Staining -endospores, volutin granules.
10. Microscopic study of Bacteria - Cocci, Bacilli
11. Preparation of Fungal media
12. Cultivation of fungi study of colony characters of yeast and mold.

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2. Heritage, J. Evans E.G.V. and Killington, R.A. (1996). Introductory Microbiology. Cambridge University Press.
3. Prescott L.M. Harley J.P. and Klein D.A. (2003). Microbiology (5th edition) McGraw Hill, New York.
4. Madigan, M.T. Martinko.J.M and Parker J Brock T.D. (1997). Biology of Microorganisms. (8th edition).Prentice Hall International Inc, London.
5. Nester, E.W., Roberts, C.V. and Nester, M.T. (1995).Microbiology, A human perspective. IWOA, U.S.A.
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8. Caldwell, D.R. (1995). Microbial Physiology and metabolism, Wm. C. Brown Publishers, U.S.A.
9. Lansing M. Prescott, John P. Harley and Donald A. Klein. (2003). Microbiology. (5th edition). McGraw - Hill company, New York.
10. Schelegel, H.G. (1993) General Microbiology, 7th Edn.Cambridge University Press, Cambridge.

MICROBIAL GENETICS & IMMUNOLOGY

Course code: MB1441
Number of credits: 3
Number of contact hours: 54 hrs (Lecture); 36hrs (Practical) Total: 90 hrs

MODULE I 15 hrs

History and scope of immunology; Infection and immunity, Innate and adaptive immunity-humoral and humoral and cell mediated immunity, Cells and organs involved in immune system clonal selection theory, Lymphocyte activation Antigens-types, properties Haptens Adjuvants, Vaccines-Types-Toxoids - antitoxins –DNA vaccines and subunit vaccines response-T-cell, B-cell. clonal selection theory. Lymphocyte activation. Clonal proliferation, Differentiation., CD markers. Complement. Antigens – properties, types. Vaccine. Immunoglobulins – types, structure and functions of different classes of IgG – theories of Antibody formation; Mechanism of immune response.

MODULE II 15 hrs

Imunoglobulins-Structure types and properties. Monoclonal antibody Complement structure properties, function of complement components and pathways, Major histocompatibility complex-HLA, H2-Antigen Antibody reaction-Precipitation reactions, agglutination reactions Immunofluorescence, ELISA, RIA

MODULE III 4 hrs

Immunohaematology, Blood groups, Blood transfusion Rb incompatibilities, Hypersensitivity reactions Type I, II, III & IV, Brief account of Transplantation immunology, Autoimunity, Tumor immunology Vaccines: Principles underlying the preparation of live and attenuated vaccines. Synthesis of peptide vaccines.

MODULE IV 10 hrs

Microbial genome-basic structure, Molecular concept of gene. Bacterial plasmids – structures & properties; Bacteriophage – Lytic & Lysogenic cycle – phage λ. Structures of bacterial Transposons – Types of bacterial transposons.

MODULE V 10 hrs

Gene transfer – transformation, Conjugation (Fertility factors, F+ and F- cells, F pili, high frequency recombination) and transduction. Operon concept: Lac operon – trp operon. Mutations: types and mechanisms – Ames test, Role of mutation in evolution. Mechanism of Antibiotic resistance.

Practical 36 hrs

1. Slide agglutination test ,Blood grouping, ASO

2. Bacterial agglutination test
3. Precipitation reaction - RPR ,VDRL, ODD, RID
4. ELISA-Demonstration
5. Titration of Antibody - Widal Test.

REFERENCES

1. Ivan M. Roit. (1994) Essential Immunology – Blackwell Scientific Publications, Oxford.
2. Tizard, R.I. (1983) Immunology: An Introduction. Saunders College Publishing, Philadelphia.
3. Kuby, J. (1994) Immunology, 2nd Edn. H.W.Freeman and Company, New York.
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5. Paul (1998). Fundamental Immunology, II Edition, Raver Press, New York.
6. Peter J. Delves, Ivan M. Roit (eds) (1998) Academic Press – Encyclopedia of Immunology – 2nd edition.
7. Ridklad, M. Aydl (1995). Immunology, II Edition, Baltimore, Hong Kong, NMS Publication.
8. Roit, J.M. Brostaff, J.J. and Male, D.K. (1996). Immunology (4th Edition) C.V. Mosby Publisher, St. Loius.
9. Roitt, I.M. (1988) Essential Immunology. Blackwell Scientific Publications, Oxford.
10. Jacqucline S, Williams and Wilkins A. (1998) Basic Immunology - Warerly Company.
11. Janeway Travers. (1997). Immuno biology - The immuno system in health and Disease. 3rd edition Current Biology Ltd., London, New York.
12. Lydyard P, Whelan A and Fanzer MW (2000) Instant notes in Immunology, Edited By Hames BD, Viva Books Private Ltd.
13. Mark Reakman Diego Vergani. Basic and clinical immunology, Longman Asia Ltd., Hong kong.
14. Richard M. Hyde. (1995). Immunology III edition. National Medical series, Williams and Wilkins, Harward Publishing Company.
15. Holt J.S, Kreig N.R, Sheath P.H.A, Williams S.T. (1994) Bergey's Manual of Determinative Bacteriology (9th ed.), Williams & Wilkins, Baltimore.

INSTRUMENTATION IN MICROBIOLOGY

Course code: MB1541
Number of credits: 4
Number of contact hours: 72 hrs (Lecture); 36hrs (Practical) Total: 108 hrs

MODULE- I
Basic laboratory Instruments **8 hrs**
Common laboratory equipment –Incubators – Biosafety Cabinent - Principle and working of pH meter, Laminar-air flow. Centrifugation: Types & principles and their applications- Lyophilizer - Flow cytometry.

MODULE- II **4 hrs**
Chromatographic techniques
Theory, principles and applications of paper, thin layer, gel filtration, ion exchange,

MODULE-III **6 hrs**
Electrophoretic techniques
Basic principles of electrophoresis, theory and application of paper and agarose electrophoresis.

MODULE-IV
Spectroscopy **8 hrs**
Spectroscopic techniques, theory and applications of UV, Visible, IR, NMR, Fluorescence, Atomic Absorption, CD, ORD, Mass, Raman Spectroscopy.

MODULE-V
Radioisotopic techniques **10 hrs**
Use of radioisotopes in life sciences, radioactive labeling, principle and application of tracer techniques, detection and measurement of radioactivity using ionization chamber, proportional chamber, Geiger- Muller and Scintillation counters, autoradiography and its applications.

Practical **36 hrs**
1. Separation of bacterial lipids/amino acids/sugars/organic acids by TLC or Paper Chromatography.
2. Separation of serum protein by horizontal submerged gel electrophoresis.
3. Study of UV absorption spectra of macromolecules (protein, nucleic acid, bacterial pigments).
4. Quantitative estimation of hydrocarbons/pesticides/organic Solvents /methane by Gas chromatography.
5. Demonstration of PCR, DNA sequencer, Fermenter, Flow cytometry

REFERENCES
1. Instrumental Methods of Chemical Analysis. 1989 by Chatwal G and Anand, S.Himalaya Publishing House, Mumbai.

2. A Biologists Guide to Principles and Techniques of Practical Biochemistry. 1975 by Williams, B.L. and Wilson, K.
3. Gel Electrophoresis of Proteins- A Practical Approach by Hanes.
4. Chromatography: Concepts and Contrasts- 1988 by James Miller. John Wiley and Sons.Inc., New York.
5. Analytical Biochemistry by Holme.
6. Introduction to High Performance Liquid Chromatography by R R. J. Hamilton and P. A. Sewell.

ENVIRONMENTAL MICROBIOLOGY

Course code: MB1542
Number of credits: 3
Number of contact hours: 72 hrs (Lecture); 54 hrs (Practical) Total: 126 hrs

MODULE I 18 hrs

Introduction: Organization of the biosphere and components of ecosystem, Natural habitats of microoganisms, Microbial communities in aquatic and terrestrial habitats, Microorganisms as components of ecosystem-as producers and decomposers.

MODULE II 14 hrs

Microbes in aquatic environments: The nature of aquatic habitats, Methods used in the study of aquatic (fresh and marine water) microbial community, Pollution of aquatic habitats, Water quality criteria, Water-borne diseases, Microbiological analysis of water purity, Indicator organisms, ground water quality and home treatment system.

MODULE III 10 hrs

Microbes in air: Composition of Air; Number and kinds of organisms in air; Distribution and sources of air borne organisms; Droplet and droplet nuclei; Assessment of air quality; Air sanitation; Air-borne diseases.

MODULE IV 15 hrs

Microbial life in extreme environments: Effect of temperature, pH, Pressure, salt and heavy metals such as As, Sb, Hg, Pb and Cd, Microbial life in conditions of high irradiation, Radiosensitivity; mechanism of damage and recovery, Growth in nutrient limited environment – mechanism of adaptations, Microbes in space.

MODULE V 15 hrs

Environmental application: Waste –types; Treatment of solid wastes –composting, Vermiform composting, silage, Pyrolysis and scarification; Treatment of liquid wastes, degradation of liquid industrial wastes; Degradation of pesticides and detergents;
Degradation of lignin; synthetic polymers; Xenobiotic compounds; Alkyl benzyl sulphonates; Petroleum and hydrocarbon degradation.

Practical 54 hrs

1. Determination of BOD and COD of wastewater. Water analysis a) MPN method b) Memberane filter method.
2. Quantification of microorganisms in air by settle plate and air sampler methods.
3. Detection of aflatoxin B1 from moldy grains using thin layer chromatography.
4. Isolation and identification of *E. coli* from water samples and its identifications.
5. Environmental distribution of microorganisms -Examination of microbial flora of the available soil and water samples

REFERENCES

1. Atlas Ronald, M., Bartha, and Richard (1987). Microbial Ecology 2nd Edition. Benjamin/Cummings Publishing Company, California.
2. Dirk, J. Elasas, V., Trevors, J.T., Wellington, E.M.H. (1997). Modern Soil Microbiology, Marcel Dekker INC, New York, Hong Kong.

3. Ec Eldowney S, Hardman D.J., Waite D.J., Waite S. (1993). Pollution: Ecology and Biotreatment – Longman Scientific Technical.
4. Grant W.D. and Long, P.L. (1981). Environmental Microbiology. Blackie Glasgow and London.
5. Mitchel, R. (1992). Environmental Microbiology. Wiley – John Wiley and Sons. Inc. Publications, New York.
6. Clescri, L.S., Greenberg, A.E. and Eaton, A.D. (1998). Standard Methods for Examination of Water and Waste

MEDICAL MICROBIOLOGY

Course code: MB1543
Number of credits: 4
Number of contact hours: 90 hrs (Lecture); 36 hrs (Practical) Total: 126 hrs

MODULE I 7 hrs

Classification and general properties of medically important bacteria. Recommendation for collection, transport of specimens, isolation of bacteria from clinical specimens. Primary media for isolation and their quality control – Antibiotic sensitivity discs, testing procedures and their quality control.

MODULE II 12 hrs

Staphylococcus, *Streptococci* and related Catalase negative Gram positive cocci; *Neisseria* and *Branhamella Corynebacterium* and related organisms. *Mycobacterium* - typical and atypical. Aerobic pathogenic actinomycetes.. *Bacillus*, *B. anthracis*, *Vibrios*, *Aeromonas*, *Helicobacter*, *Pseudomonas*, *Brucella*, *Haemophilus*, *Bordettella*. *Enterobacteriaceae*, *Salmonella*, *Shigella*, *Proteus*, *Escherichia*, *Klebsiella. Clostridia, Mycoplasma, Rickettsiae, Spirochetes, Trepenema, Leptiospira* and *Borrelia*.

MODULE III 12 hrs

Morphology, Taxonomy, Classification of fungi. Characteristics of Zygomycetes, Ascomycetes, Basidiomycetes and Duteromycetes. Dermatophytes and agents of superficial mycoses. Trichophyton, Epidermophyton and Microsporum. Opportunistic mycoses- Candidiasis, Cryptococcosis, Aspergillosis. Systemic mycoses- Histoplasmosis, Coccidioidomycosis, Blastomycosis. Subcutaneous mycoses- Sporotrichosis, Mycetoma.. Collection, transport of specimens, isolation of fungi from clinical specimens. Newer methods in diagnostic mycology. Mycotoxins, Antifungal agents, testing methods and quality.

MODULE IV 7 hrs

Introduction to medical Parasitology – Classification, Protozoa – Entameoba – Plasmodium, Leishmania – Trypanosoma –Giardia – Trichomonas – Balantidium. Platyhelminthes – Taenia – Fasciola – Paragonimus – Schistosoma. Nematihelminthes – Ascaris – Ankylostoma – Enterobius – Trichuris – Trichinella – Wuchereria – Dracanculus. Laboratory techniques in parasitology.

MODULE V 8 hrs

General Properties of viruses – Detection of viruses and antigens in clinical specimens – Serological diagnosis of virus infections. Cultivation of Viruses. Arthropod borne and rodent borne virus diseases – Picorna viruses and diseases. Hepatitis viruses: Rabies and other neuro viruses: Orthomyxo and Paramyxoviruses.

MODULE VI 8 hrs

Pox, Adeno, Herpes, Reo, Rota and HIV Viruses, Oncogenic viruses, Viral vaccines, their Preparation and their immunization schedules. Viruses of importance to bacteria – Bacteriophages – Their Structure, types – Uses in Microbiology. Applied virology – Viral diseases, epidemiology diagnosis, prevention and treatment. Vaccines and interferons – Antiviral agents.

Practical 36 hrs

1. General requirements of collections, transport of clinical Specimens – Methods of enriched, selective and enrichment culture techniques used to isolate organisms from clinical materials. Simple, differential and special staining of clinical materials viz: throat swab, pus, urine, sputum, stool etc. Enumeration of bacteria in urine, quantitative urine culture.
2. Isolation and identification of bacterial pathogens from clinical specimens their biological reactions. Antimicrobial Sensitivity testing by disc-diffusion technique and determination of MIC.
3. Identification of pathogenic viruses in Slides/ Smears / Spotters. Isolation of phage from natural sources.
4. KOH and Lactophenol preparations for skin scrapings for dermatophytes. Microscopic identification and cultural characteristics of medically important fungi and lab contaminants. Germ tube, carbohydrate assimilation and fermentation tests for yeasts.
5. Direct examination of faeces- wet mount and Lugol's iodine method demonstration of protozoan cysts and helminthes eggs. Concentration techniques of stool specimen- floatation and sedimentation methods. Examination of blood for malarial parasites, thin & thick smears preparation. Identification of pathogenic parasites in slides/ specimens as spotters.

REFERENCES

1. Alexopoulus CJ and C W. Mims. (1993).Introductory Mycology (3rd edition) WileyEastern Ltd, New Delhi.
2. Ananthanarayan, R. and Jeyaram Paniker, C.K. (1994) Text Book of Microbiology, 6th Edn. Orient Longman, Chennai.
3. Balows, A., Hauser Jr K.L., Isenberg, H.D., Shalomy, H.J. (1991). Manual of Clinical Microbiology, ASM, Washington D.C.
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16. Lorian, V. (1991) Antibiotics in laboratory medicine, 3rd edition, Williams and Wilkins, Baltimore.
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19. Purohit SS (2005). Microbiology - Fundamentals and Applications. Student Edition Publishers, Jodhpur.

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21. Schmidt, G.D. and Roberts, L.S. (1981) Foundations of Parasitology, 2nd Edn, Mosby, St. Louis.
22.Timbury, M.C. (1986) Medical Virology, 9th Edn. Churchill Livingstone, London.
23. Topley & Wilsons's. (1990) Principles of Bacteriology, Virology and Immunity, VIII edition, Vol. III Bacterial Diseases, Edward Arnold, London.

INDUSTRIAL MICROBIOLOGY

Course code: MB1641
Number of credits: 4
Number of contact hours: 72 hrs (Lecture); 54 hrs (Practical) Total: 126 hrs

MODULE-I **15 hrs**

Introduction to fermentation process. Microbial growth kinetics-batch, continuous and fed batch culture. Large scale cultivation of industrially important microbes. Fermentation media design, desired qualities of fermentation media and formulation strategies- carbon, nitrogen, vitamin, mineral sources, role of buffers, precursors, inhibitors, inducers and antifoams.

MODULE-II **15 hrs**

Types of fermentation process-(submerged and solid state) different types of fermentors, basic functions, design and components. Specifications of fomenters- sterilization of fomenters- aseptic inoculation methods. Brief idea on monitoring and control of variables such as temperature, aeration, agitation, pressure, pH, foaming.

MODULE-III **7 hrs**

Microbial products of commercial use: penicillin, xanthan gum**,** ethanol, vitamin B 12, protease, citric acid, glutamic acid and L- lysine. SCP and microbial enzymes.

MODULE-IV **15 hrs**

Scale up and down stream processing of biologicals. Separation of cells, cell disruption and recovery. Direct extraction of products and metabolites. Large scale separation techniques like chromatographic and affinity techniques, membrane filtration –ultra filtration and reverse osmosis. Spray drying, drum drying & freeze drying.

MODULE-V **20 hrs**

Ecology of microorganisms affecting pharmaceutical industries atmosphere- water- raw materials- packaging- equipment. Factors affecting microbial spoilage of pharmaceutical products - Control of contamination during manufacture- good pharmaceutical manufacturing process. Quality control of pharmaceutical products. Manufacture of sterile pharmaceutical products- injections and ophthalmic preparations.

Practical **54 hrs**

1. Enumeration and isolation of Lactobacillus from curd
2. Enumeration and isolation of Bacteria and mold from fermented foods
3. Production of Alcohol from Cashew Apple
4. Mushroom cultivation
5. Wine Production from grapes
6. Immobilization of yeast cells

REFERENCES

1. Casida, J.E. (1968) Industrial Microbiology. Wiley Eastern, New Delhi.
2. Demain, A.L. and Davies, J.E. (1999). Manual of Industrial Microbiology and Biotechnology. ASM Press.
3. Hugo WB and Russell AD. (1989) Pharmaceutical Microbiology IV edition. Blackwell Scientific Publication, Oxford.
4. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1995) Principles of Fermentation Technology, 2nd Edn. Pergamon Press, Oxford.
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BIOINFORMATICS AND BIOSTATISTICS

Course code: MB1642
Number of credits: 4
Number of contact hours: 72 hrs (Lecture); 36 hrs (Practical) Total: 108 hrs

MODULE I **8 hrs**

Overview of information Technology: Features of the modern personal Computer and peripherals, computer network and internet, introduction to mobile phone technology, purchase of technology, license, guarantee, overview of operating system and major application softwares.

MODULE II **15 hrs**

Bioinformatics**:** Introduction: Definition, Origin of concept of Bioinformatics; Brief history, Importance of bioinformatics; Web lab and Wet lab. Biological databases: Brief account on Model/organism databases, Biodiversity databases and Biomolecular databases - Nucleic acid databases Eg: EMBL, Gen Bank - Protein sequence databases. Eg: PIR, SWISS PROT. Bioinformatics in relation to Biomolecular structure • Protein structure databank- PDB - Molecular visualization- use of Rasmol- Molecular modeling (Brief account only). Molecular docking and computer aided drug design (Brief account only)

MODULE III **14 hrs**

Basics of Genomics and Proteomics, Comparative genomics and Pharmacogenomics 2. Sequence analysis and alignment (brief account only). Pair wise sequence alignment. Multiple sequence alignment: Molecular Phylogeny and Phylogenetic trees. Advantages of Molecular phylogeny and phylogenetic analysis. Bioinformation Tools: BLAST, CLUSTAL X

MODULE IV **10 hrs**

Science and Tools of Science:Types of knowledge: practical, theoretical and scientific knowledge. Basis for Scientific laws and factual truths.Revolutions in Science and Technology.Hypothesis; theories and laws in Science; observations, evidences and proofs.Significance of peer Review.

MODULE V **15 hrs**

Experimentation in Science and Data Handling.Design of an experiment; experimentation; observation; data collection; interpretation and deduction.Necessity of units and dimensions; repeatability and replication.Documentation of experiments, Record keeping.Connection between measurements and underlying theory.Documentation of experiments.Nature and types of data -typical examples; data acquisition; treatment of data; data interpretation. Significance of

statistical tools in data interpretation: graphs, tables, histograms and pi diagrams.Statistical testing of hypothesis, null hypothesis. Significance test -Statistics based acceptance or rejection of a hypothesis. Deduction of scientific correlation, patterns and trends.

MODULE VI **10 hrs**

Nature and scope of statistical methods and their limitation.compilation, classification, tabulation, and application in life science.Graphical representation, Measure of average and dispersion mean, medium, mode. Sampling methods -simple random, stratified, systematic and cluster sampling procedures. Sampling distribution, Probability, Tests of significance based on T, Chi-square and F Test Designing and methodology of experiment.

Practical **36 hrs**

1. Students are expected to work with at least any one of the scientific packages, to explore the WEB and able to find, recognize, download, install and use software in various areas useful to the research in Biology.
2. Familiarization of academic data bases INFLIBNET, NICNET, and BRNET.
3. Nucleic acid databases Eg: EMBL, Gen Bank
4. Blast Search, Protein structure databank- PDB, Molecular visualization tools- Rasmol, Molecular modeling, Molecular docking and computer aided drug design.
5. Collection of data, sampling designs, tabulation and graphic representation using biological materials.
6. To find mean, mode, meridian, coefficient of variance using biological materials.
7. Tests of significance‘t’ test, ‘chi’ square, standard error and standard deviation.
8. t TEST, chi square, statistical error, standard deviation also, to be practically done through SPSS [statistical Package for Social Sciences] programme.

REFERENCES

1. Debbie Holmes, Peter Moody, Diana Dine. Research methods for the biosciences, International student edition,Oxford University Press Inc.New York
2. S.K.Aggarwal. Foundation course in Biology, Anes Student Edition, 2nd edition
3. R.C. Sobti, V.L.Sharma. Essentials ofModern Biology, Anes Student Edition.
4. Fundamentals of Biostatistics. Bernard Rosner
5. Biostatistics for medical, nursing and pharmacy students.a.indrayan and L.Satyanarayana.
6. Statistics for Biologists. Campbell.R.C
7. Fundamentals of Biostatistics. Bernard Rosner

FOOD AND DAIRY MICROBIOLOGY

Course code: MB1643
Number of credits: 4
Number of contact hours: 72 hrs (Lecture); 36 hrs (Practical) Total: 108 hrs

MODULE I 7 hrs

Food as a substrate for microorganisms. Microorganisms important in food microbiology; Molds, yeasts and bacteria, General Characteristics.Classification and importance.

MODULE II 15 hrs

Food fermentation: wine, bread cheese, vinegar, fermented vegetables and fermented dairy products. Spoilage and defects of fermented dairy products and fermented foods.

MODULE III 10 hrs

Principles of food preservation – Asepsis – Removal of micro organisms, anerobic conditions – High temperature – Low temperature- Drying –Food additives.

MODULE IV 20 hrs

Food spoilage-Types of microorganisms in food and source of contamination. Factors influencing microbial growth in food. Contamination and spoilage of cereals, sugar products, vegetables and fruits, meat and meat products, milk and milk products, fish and sea foods, poultry and spoilage of canned foods.

MODULE V 20 hrs

Food borne infections and intoxications – bacterial, non-bacterial – Food borne disease outbreaks – Laboratory testing – preventing measures – Food sanitation – plant sanitation – Employees' heals standards – waste treatment and disposal –quality control.

Practical

1. Detection of number of Bacteria in milk by breed count. Detection of number of bacteria in milk by standard plant count.
2. Determination of quality of milk sample by methylene blue reductase test and Resorzurin method.
3. Isolation of yeast and molds from spoiled nuts, fruits, and vegetables. Bacteriological examination of specific food a) Curd b) Raw meat c) Fish d) Ice cream.

REFERENCES

1. Adams MR and Moss MO. (1995). Food Microbiology, The Royal Society of Chemistry, Cambridge.
2. Andrews AT, Varley J. (1994) Biochemistry of milk products. Royal Society of Chemistry.
3. Banwart GJ. (1989), Basic food microbiology, Chapman & Hall, New York.
4. Frazier WC and Westhoff DC. (1988) Food microbiology, TATA McGraw Hill Publishing Company Ltd. New Delhi.
5. Hobbs BC and Roberts D. (1993) Food poisoning and food hygiene, Edward Arnold (A division of Hodder and Stoughton), London.
6. Jay JM. (1987) Modern food microbiology, CBS Publishers and distributors, New Delhi.
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8. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1995) Principles of Fermentation Technology, 2nd Edn. Pergamon Press, Oxford.
9. Casida, J.E. (1968) Industrial Microbiology. Wiley Eastern, New Delhi.

FOUNDATION COURSE

FOUNDATION COURSE-II

Semester	Course Code	Title of the Course	Contact hrs/week		Credits
			L	P	
II	MB1221	General Informatics and Bioinformatics	3	1	3

MB 1221: GENERAL INFORMATICS AND BIOINFORMATICS

Course code : MB1221
Number of credits : 3
Number of contact hours : 54 hrs (Lecture); 18 hrs (Practical)

MODULE- I **6 hrs**

Overview of information Technology: Features of the modern personal Computer and peripherals, computer network and internet, introduction to mobile phone technology, purchase of technology, license, guarantee, overview of operating system and major application softwares.

MODULE- II **8 hrs**

Knowledge skill for Higher Education: Data information and knowledge, knowledge management- Internet as a knowledge repository, academic search techniques, creating your cyber presence, open access initiatives, open access publishing models, basic concepts of IPR, copy rights and patents, plagiarism, introduction to use of I T in teaching and learning, case study of educational software, Academic services-INFLIBNET, NICNET and BRNET.

MODULE- III **10 hrs**

Social Informatics: IT and Society- issues and concerns- digital divide, IT and development, new opportunities and new threats, Cyber ethics, Cyber crime, Security, privacy issues, cyber addictions, Information overload, Health issues, guidelines for proper usage of computers, internet and mobile phones. Localization issues-IT and Regional languages-IT for the disabled, the free software debate.

MODULE-IV **15 hrs**

Bioinformatics

1. Introduction: Definition, Origin of concept of Bioinformatics; Brief history, importance of bioinformatics; Web lab and Wetlab.
2. Biological databases: Brief account on Model/organism databases, Biodiversity databases and Biomolecular databases
- Nucleic acid databases Eg: EMBL, Gen Bank
- Protein sequence databases. Eg: PIR, SWISS PROT
3. Bioinformatics in relation to Biomolecular structure
• Protein structure databank- PDB
• Molecular visualization- use of Ras mol
• Molecular modeling (Brief account only)
• Molecular docking and computer aided drug design (Brief account only)

MODULE-V **15 hrs**

1. Basics of Genomics and Proteomics, Comparative genomics and Pharmacogenomics
2. Sequence analysis and alignment (brief account only)
• Pair wise sequence alignment

• Multiple sequence alignment
3. Molecular Phylogeny and Phylogenetic trees
Advantages of Molecular phylogeny and phylogenetic analysis
4. Bioinformation Tools: BLAST, CLUSTAL X

Practical **18 hrs**

1. Create, Copy and Save a document with Header, Footer, Page Number, Date and Time using Word processing
2. Insert a table in the above Document
3. Prepare the mark list of students in a class using Excel
4. Prepare five slides each using power point with different design templates
5. Students are expected to work with at least any one of the commercial / scientific packages, to explore the WEB and able to find, recognize, download, install and use software in various areas useful to the research in Biology.
6. Blast Search
7. Molecular visualization using Rasmol

REFERENCES

1. Selzer PM, Marhofer RJ, Rohwer A (2009) Applied Bioinformatics. Springer-Verlag Berlin Heidelberg, Germany
2. Ingvar Eidhammer, Inge Jonassen,William R Tailor 2009, Protein Bioinformatics, Wiley India Edition
3. Venkatarajan S Mathura and Pandjassarame Kangueane (2009) Bioinformatics- a concept based introduction. Springer-Verlag Berlin Heidelberg, Germany
46
4. Agrawal S (2009) Bioinformatics for Beginners: Introduction to Bioinformatics. Ane Books India Pvt. Ltd
5. Niel C Jones and Pavela Pevzner (2009) An introduction to Bioinformatics Algorithms. Ane Books India Pvt. Ltd
6. Selzer (2008) Applied Bioinformatics: An Introduction, Ane Books India Pvt. Ltd
7. Kolchanov (2008) Bioinformatics of Genome regulation and Structure. Ane Books India Pvt. Ltd.
8. Rubin (2007) The Avenues in Bioinformatics. Ane Books India Pvt. Ltd.
9. Joseph Seckback and Eitan Rubin (2007) Springer, Kluwer Academic publishers
10. Jin Xiong (2007) Essential Bioinformatics. Cambridge University Press India Pvt. Ltd
11. Higgs (2005), Bioinformatics and Molecular evolution. Ane Books India Pvt. Ltd
12. Ethan Cerami (2005) XML for Bioinformatics. Springer International Edition
13. Moni K and Vijayraj N (2000) Bioinformatics a practical Approach, Coimbatore
14. Mukerjee DP (2000) Fundamentals of Computer Graphics and Multimedia. Prentice Hall of India Pvt. Ltd.

WEB RESOURCES

• www.fgcu.edu/support/office2000
• www.openoffice.org *Open office official website*
• www.microsoft.com/office *MS Office website*
• www.lgta.org *Office online lessons*

• www.learntheneth.com *Web Primer*
• www.computer.org/history/timeline
• www.computerhistory.org
• http://computer.howstuffworks.com
• http://vmoc.museophile.org *Computer history*
• www.dell.com *Dell Computers*
• www.intel.com *Intel*
• www.ibm.com *IBM*
• www.keralaitmission.org *Kerala Govt. IT Dept.*
• www.technopark.org
• http://www.studentworkzone.com/question.php?ID=139
• http://www.scribd.com/doc/259538/All-about-mobile-phones

OPEN COURSES

OPEN COURSE 1

Offered to the students from other disciplines

Semester	Course Code	Title of Course	Contact hrs/week	Credits
V	MB1551.1	Mushroom Culture	3	2
	MB1551.2	Microbial Waste Management		
	MB1551.3	Biofertilizer Technology		

OPEN COURSE-II

Offered to the students of Microbiology

Semester	Course Code	Title of the Course	Contact hrs/week	Credits
VI	MB1651	Biosafety in Microbiology	3	2

OPEN COURSE –I (a)

MUSHROOM CULTURE

Course Code : MB1551.1
Number of credits: 2
Number of contact hours: Lecture: 54 hrs

MODULE I **9 hrs**

Introduction: history & scope of edible mushroom cultivation. Types of edible mushroom available in India: *Calacybe indica*, *Volvariella Volvacea, Pleurotus* sp. and Agaricus *bisporus.*

MODULE II **10 hrs**

Pure culture technique: preparation of media & sterilization – Preparation of test tube slants to store mother culture – culturing of *Pleurotus* mycelium on petri plates – Preparation of mother spawn in saline bottle and polypropylene bags and their multiplication.

MODULE III **15 hrs**

Cultivation Technology : Infra structure, Substrates (locally available) polythene bag, vessels, Inoculation hood – inoculation loop – low cost stove – sieves – Culturel rack mushroom unit (Thatched house) – Mushroom bed preparation – Paddy straw, sugarcane trash, maize straw, banana leaves.

MODULE IV **10 hrs**

Storage and nutrition: Short term storage – Long term storage (scanning, Pickles, papads, drying, storage in salt solutions) – Nutrition: Proteins, amino acids, mineral elements. Nutrition: Carbohydrates – Crude fiber content, vitamins.

MODULE V **10 hrs**

Economics of mushroom cultivation (fixed assets, recurring expenditure, labour, economics of cultivation throughout the year and seasonal growing formulation of project report for getting finance from funding agencies). Precautions in mushroom cultivation (precaution to be taken while selecting the area, spawn preparation, spawn run, during cropping harvesting etc.). Mushroom recipes.

Field study: Visit to a mushroom cultivating laboratory

REFERENCES

1. Marimuthu et al., (1991) Oyster Mushrooms, Dept. of Plant pathology, TNAU, Coimbatore.
2. Nita Bahl (1988) Hand book of Mushrooms, II edition, Vol.I & II.
3. Paul Stamets, J.S. and Chilton, J.S. (2004). Mushroom Cultivator: A practical guide to growing mushrooms at home, Agarikon Press.
4. Shu-Ting Chang, Philip G. Miles, Chang, S.T. (2004). Mushrooms: Cultivation, nutritional value, medicinal effect and environmental impact, 2nd ed, CRC press.

5. Swaminathan M. (1990) Food and Nutrition, Bappco. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
6. Tewari and Pankaj Kapoor S.C. (1988) Mushroom cultivation, Mittal Publications, Delhi.

OPEN COURSE-I (b)
MICROBIAL WASTE MANAGEMENT

Course Code : MB1551.1
Number of credits: 2
Number of contact hours: Lecture: 54 hrs

MODULE I **20 hrs**

General concept of sanitation and disinfection .Sanitation of industrial and food processing units Air sanitation, Safe location of animal houses, hospitals, industrial fermentation units etc based on air sanitation. Air borne diseases and preventive measures.

MODULE II **20 hrs**

Microbiology of municipal sewage and sewage treatment BOD and COD
Concept. Treatment of Industrial effluent- Waste water treatment-Mechanical and biological. Aerobic and anaerobic treatments.Domestic septic tank.Treatment of municipal water supplies water borne diseases

MODULE III **14 hrs**

Solid waste disposal-sanitary landfills, composting, vermincompost. Disposal of animal and agricultural waste.Methanogenesis and biogas production

OPEN COURSE-I (c)
BIOFERTILIZER TECHNOLOGY

Course Code : MB1551.3
Number of credits: 2
Number of contact hours: Lecture: 54 hrs

MODULE – I **15 hrs**

General account of the microbes used as biofertilizers for crop plants and their advantages. Symbiotic N2 fixer: *Rhizobium* - Isolation, characterization, identification, Classification, inoculum production and field application. *Frankia* - Isolation, characterization – actinorrhizal nodules – non-leguminous crop symbiosis.

MODULE – II **8 hrs**

Non – Symbiotic N2 fixers – *Azospirillum* – Free living - *Azotobacter* – free isolation, characterization, mass inoculum production and field application.

MODULE – III **8 hrs**

Symbiotic N2 fixers – Cyanobacteria, Azolla – Isolation, characterization, mass multiplication – Role in rice cultivation – Crop response – field application - immobilization.

MODULE – IV **8 hrs**

Phosphate solubilizers – Phosphate solubilizing microbes – Isolation, characterization, mass inoculum production, field application – Phosphate solubilization mechanism.

MODULE – V **15 hrs**

Mycorrhizal bioinoculants – classification – importance of mycorrhizal association
Ectomycorzhiza – Endomycorrhiza – Ectendo mycorrhiza – Taxonomy of mycorrhizae – Isolation of VA mycorrhiza – Quantification and assessment of VAM in roots – Mass inoculum production of VAM – field applications of Ectomycorrhiza and VAM.

Field study: Visit to a biofertilizer production unit

REFERENCES

1. Kannaiyan, S. (2003). Bioetchnology of Biofertilizers, CHIPS, Texas.
2. Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.
3. Reddy, S.M. et. al. (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.
4. Subba Rao N.S (1995) Soil microorganisms and plant growth Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.
5. Subba Rao N.S. (1988) Biofertilizers in Agriculture and forestry Oxford and IBH Publishing

OPEN COURSE-II

BIOSAFETY IN MICROBIOLOGY

Course Code : MB1661
Number of credits: 2
Number of contact hours: Lecture: 54 hrs

MODULE I **12 hrs**

Concept of biosafety: Historical background, principles of biosafety, introduction to biological safety cabinets, selection, installation and use of biological safety cabinets, primary containment for biohazards, biosafety levels, biocontainment, biosafety levels of specific microorganisms, recommended biosafety levels for infectious agents and infected animals.

MODULE II **12 hrs**

Biosafety guidelines - Government of India, definition of Genetically Modified Organisms (GMOs) and Living Modified Organisms (LMOs), Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture, Environmental release of GMOs.

MODULE III **10 hrs**

Risk Analysis, Risk Assessment, Risk management and communication. Overview of national regulations and relevant international agreements including Cartagena Protocol.

MODULE IV **10 hrs**

Plant biosafety, risk assessment, laboratory standard operating procedures, safety of laboratory personnel, environmental safety, regulated biosafety and biosecurity. Biosafety regulations and assessment of biotechnology products, drugs/vaccines and GMOs.

MODULE V **10 hrs**

Biosafety protocols, biological weapons, biosecurity, components of biosecurity program and bioethical issues. Occupational health and immunoprophylaxis, decontamination and disinfection, transportation of infectious substances and, agriculture pathogen biosafety.

REFERENCES

1. Social issues in Science and Technology: An Encyclopedia, David E. Newton (ABC-CLIO, Santa Barbara), 1999.
2. Methods for Teaching Science as Inquiry, Bass, Joel, E and et. al., Allyn & Bacon, 2009 The truth of science, Newton R.G.,
3. Biotechnology: Issues, Ethics and Regulations, Tina M. Prow, Communications Specialist, Office of Agricultural Communications and Education.
4. Fleming, D. O. and D. L. Hunt (eds.). 2006. Biological Safety: Principles and Practices, 4th ed. ASM Press, Washington, D.C. \
5. Centers for Disease Control and Prevention and National Institutes of Health (CDC/NIH). 2007. Biosafety in Microbiological and Biomedical Laboratories, 5th ed. L. C.

Chosewood and D. E. Wilson (ed.). U.S. Government Printing Office, Washington, D.C. Available free at http://www.cdc.gov/OD/ohs/biosfty/bmbl5/bmbl5toc.htm.
6. Biosafety and Bioethics – Joshi, R.M.: Eastern Book House.
7. Sree Krishna, V. (2007) Bioethics and Biosafety in Biotechnology, New Age International (P) Ltd., Publ., Mumbai.
8. Biosafety in Microbiological and Biomedical Laboratories (2009). 5th edition. U.S. Department of Health and Human Services, Public Health Service Centers for Disease Control and Prevention, National Institutes of Health, HHS Publication No. (CDC) 21-1112.