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The American College

Re-accredited (2nd cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4 point scale
(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Madurai – 625 002

MEETING OF THE ACADEMIC COUNCIL

Friday 31 May 2019
4:30 P.M.

Venue
PLL Seminar Hall

APPENDIX – AN
VOLUME - II

CONTENTS

VOLUME-I

Undergraduate Programmes:

VOLUME-II

Postgraduate & Research Programmes:

UGC Approved B.Voc. Programmes:

PGE / PSE 1

Postgraduate Department of English
Programme Grid
(w.e.f. June 2018 onwards)
(Outcome Based Education for PGE/PSE 18 series & 19 series onwards)

Sem	Course Code	Course Titles	Hour	Credit	Mark
I	PGE/PSE4341	ACADEMIC WRITING	5	3	60
	PGE/PSE 4343	PROSE	5	3	60
	PGE/PSE 4445	BRITISH POETRY I: CHAUCER TO HOPKINS	5	4	80
	PGE/PSE 4447	BRITISH FICTION I: VICTIORIAN TO EARLY MODERN	5	4	80
	PGE/PSE 4449	BRITISH DRAMA-I: ELIZABETHAN TO VICTORIAN	6	4	60
	PGE/PSE 4351	ENGLISH FOR CAREER	4	3	60
	Total		**30**	**21**	**420**
II	PGE/PSE 4342	STRUCTURE OF MODERN ENGLISH	5	3	60
	PGE/PSE 4444	BRITISH POETRY II: YEATS TO THE PRESENT TIMES	5	4	80
	PGE/PSE 4446	BRITISH FICTION II: LATE MODERN TO POST-MODERN	5	4	80
	PGE/PSE 4448	AMERICAN AND AFRICAN-AMERICAN LITERATURE	6	4	80
	PGE/PSE 4350	SHAKESPEARE	5	3	60
	PGE/PSE 4352	FILM STUDIES	4	3	60
	Total		**30**	**21**	**420**
III	PGE/PSE 5453	LITERARY CRITICISM & THEORY I	6	4	80
	PGE/PSE 5455	BRITISH DRAMA II: MODERN & POSTMODERN	5	4	80
	PGE/PSE 5457	INDIAN LITERATURE IN ENGLISH	5	4	80
	PGE/PSE 5459	CULTURAL STUDIES	5	4	80
	PGE/PSE 5461	TRANSLATION STUDIES	4	4	80
	PGE/PSE 5463	HISTORY OF THE ENGLISH LANGUAGE	5	4	80
	Total		**30**	**24**	**480**
IV	PGE/PSE 5454	LITERARY CRITICISM & THEORY II	6	4	80
	PGE/PSE 5456	NEW LITERATURES IN ENGLISH	5	4	80
	PGE/PSE 5458	INDIAN LITERATURE IN TRANSLATION	5	4	80
	PGE/PSE 5460	EUROPEAN LITERATURES IN TRANSLATION	5	4	80
	PGE/PSE 5462	TEACHING ENGLISH AS SECOND LANGUAGE	5	4	80
	PGE/PSE 5464	RESEARCH METHODOLOGY	4	2	80
	PGE/PSE 5466	PROJECT	**(3)**	**2**	
	Total		**30+3**	**24**	**480**
	Grand Total		**120+3**	**90**	**1800**

PGE / PSE 2

Programme Specific Outcomes (PSOs) for MA English

On completion of the programme, postgraduates will be able to

1. approach a wide range of literary texts and critical perspectives in English with an open mind; and contextually locate, critically evaluate, and creatively synthesize large amounts of ideologically conflicting information, concepts and theories;
2. negotiate the social, environmental and global implications of English studies; recognize the ethical implications of reading literary texts; and interpret literary texts within and beyond the theoretical framework offered by various literary-critical theories;
3. diligently identify and objectively assess the relative merits, values and ways of life and cross cutting issues relating to gender, environment, equality and human rights through national and regional literatures;
4. write well-organized and well-developed text-based essays in standard English with clear thesis statement at the discourse level and with the topic sentence together with supportive ideas at the paragraph level;
5. dispassionately evaluate the secondary sources and synthesize them with their original responses to literary texts; and demonstrate their capacity for critical reading of texts;
6. analyze Modern English both synchronically and diachronically; and teach and research on English as a second language;
7. participate as critical and active citizens in society and at work; and pursue career and research in English studies and allied disciplines;
8. document their reading and interpretive practices in assignments, translation works, and independent projects;
9. confidently and effectively articulate their literary and textual experiences; and
10. reorganize a professional and reflective approach to leadership, responsibility, personal integrity, empathy, care and respect for others, accountability and self-regulation.

PGE / PSE 3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGE/PSE4341	✓	✓		✓	✓	✓	✓	✓	✓	
PGE/PSE 4343	✓		✓	✓	✓	✓		✓	✓	
PGE/PSE 4445	✓	✓	✓	✓			✓	✓	✓	✓
PGE/PSE 4447	✓	✓	✓	✓	✓		✓	✓	✓	✓
PGE/PSE 4449	✓	✓	✓		✓		✓	✓	✓	✓
PGE/PSE 4351		✓		✓	✓	✓	✓	✓	✓	✓
PGE/PSE 4342		✓		✓		✓	✓	✓	✓	✓
PGE/PSE 4444	✓	✓	✓	✓	✓				✓	✓
PGE/PSE 4446	✓	✓	✓	✓	✓		✓	✓	✓	✓
PGE/PSE 4448	✓	✓	✓	✓	✓		✓		✓	✓
PGE/PSE 4350	✓	✓	✓		✓	✓		✓	✓	✓
PGE/PSE 4352	✓	✓	✓	✓	✓				✓	✓
PGE/PSE 5453	✓	✓	✓		✓		✓		✓	✓
PGE/PSE 5455	✓	✓	✓		✓		✓	✓	✓	✓
PGE/PSE 5457	✓	✓	✓	✓	✓		✓	✓	✓	✓
PGE/PSE 5459	✓	✓			✓		✓	✓	✓	✓
PGE/PSE 5461	✓	✓		✓	✓		✓	✓	✓	✓
PGE/PSE 5463		✓	✓		✓	✓	✓		✓	✓
PGE/PSE 5454	✓	✓	✓		✓				✓	✓
PGE/PSE 5456	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PGE/PSE 5458	✓	✓	✓		✓	✓		✓	✓	✓
PGE/PSE 5460	✓	✓			✓		✓	✓	✓	✓
PGE/PSE 5462	✓	✓				✓	✓		✓	✓
PGE/PSE 5464	✓	✓	✓	✓	✓			✓	✓	✓
PGE/PSE 5466	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Mapping of Programme Specific Outcomes (PSOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	✓	✓	✓	✓		✓	✓	✓	✓	✓
PSO2	✓	✓	✓	✓			✓	✓	✓	✓
PSO3		✓	✓				✓	✓	✓	✓
PSO4	✓	✓	✓		✓	✓	✓			
PSO5	✓	✓	✓	✓	✓		✓	✓	✓	✓
PSO6	✓	✓		✓	✓	✓		✓	✓	✓
PSO7		✓	✓	✓	✓		✓	✓	✓	✓
PSO8		✓	✓		✓	✓				
PSO9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PSO10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

PGE/PSE 4341 **ACADEMIC WRITING** **5 Hr./4 Cr.**

Ability to express in writing one's graph of the subject and ability to demonstrate in writing higher order thinking skills are integral components of higher education curriculum. The Course aims at helping students fine-tune their academic writing skills since academic writing helps students convey their understanding and think critically and objectively.

At the end of the course, students will be able to

a) design the process writing
b) express sentence skills
c) structure and develop paragraphs through techniques
d) compose academic essays
e) distinguish between content editing and substantive editing

Unit 1 **Writing as a Process**
Pre-writing strategies, while-writing strategies, post-writing strategies; developing writing through extended practices; developing reflective abilities & meta-awareness about writing

Unit 2 **Sentence Skills**
Sentence structure; S-V agreement; modifiers; sentence fragments; comma splice; coordination; subordination; parallelism; making complete, logical comparisons; avoiding wordy prhasing; V-T sequence;

Unit 3 **Structuring Paragraphs**
Topic sentence; supporting details; unity & coherence; Methods of development (Examples, comparison & contrast, process, definition, cause & effect, division & classification)

Unit 4 **Structuring Essays**
Introduction; development of body; conclusion; description, narration, exposition; argumentation;

Unit 5 **Content editing and substantive editing**: Proof reading, copy-editing (involves an intensive check of word choice, style & sentence structure, comprehension and terminologies) & substantive editing (to resolve content ambiguity, to eliminate language errors, to improve structure, and to enhance the overall comprehension of the paper); features of written English

References

Zemach, Dorothy E. & Rumisek, Lisa A. *Academic Writing from Paragraph to Essay.* London: Macmillan

Langan, John. 2001. *Sentence Skills with Readings.* Boston: McGrawHill.

Hartley, James. 2008. *Academic Writing and Publishing: A Practical Handbook.* London: Routledge.

Bailey, Stephen. 2003. *Academic Writing: A Practical Guide for Students.* London: RoutledgeFalmer.

Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1						6
CO2						6
CO3						6
CO4						6
C05					5	

Mean: 5.8

PGE/PSE 4343 **PROSE** **5 Hrs./3 Cr.**

The course aims at introducing students to the various aspects of prose, different style, and devices employed by prose writers. Students will be trained to appreciate and analyse the style of select pieces of non-fiction prose. Prose pieces representing the essentials of good prose writing will be used as illustrations for discussion.

At the end of the course, students will be able to

i. analyse various aspects of prose,
ii. assess diction, sentences and paragraphs and chapters,
iii. distinguish different prose styles and other devices used by the writers,
iv. develop their reading skill and inculcate the practice of reading and appreciating prose, and
v. create rhetorical ability.

Unit 1 **Aspects of Prose**

Types of prose: narrative, argumentative, expository, descriptive
Elements of prose: diction, sentence, paragraph, form and rhythm
Different devices: Objective, subjective, abstract, concrete, point of view, tone and mood, figures of speech, using text to interpret meaning
Style of prose: simplicity, ornamentation, common, individual, cheap, and civil
Service style

Unit 2 **British Prose Writers I**

Francis Bacon	Of Studies
Joseph Addison	Sunday in the Country
Oliver Goldsmith	The Man in Black
Charles Lamb	Dream Children: A Reverie

Unit 3 **British Prose Writers II**

Abraham Cowley	On Avarice
Robert Lynd	Sweets
G.K. Chesterton	Worship of the Wealthy
J.B. Priestly	On Doing Nothing

Unit 4 **Indian Prose Writers**

Jawaharlal Nehru	A Glory has Departed

Nirad C. Chaudhuri	Indian Crowd
R.K. Narayan	Advantages of Anonymity
Khushwant Singh	Communalism –An Old Problem

Unit 5 **American Prose Writers**

Martin Luther King Jr.	I have a Dream
John Updike	The Bankrupt Man
Amy Tan	Mother Tongue
Wendell Berry	In Distrust of Movements

Textbooks

Boulton, Marjorie. *The Anatomy of Prose*. Kalyani Publishers, 1996.
A Collection of Essays compiled by the Department

References

Knott, William C. *The Craft of Non-Fiction*. Reston Publishing Company, 1974.
Lewin, Gerald. *Prose Models*. Harcourt Brace Jovanovich, 1964.
Mayne, Andrew and John Shuttleworth. *Considering Prose*. Hodder & Stongton, 1988.
Minto, William. *A Manual of English Prose Literature*. Atlantic Publishers, 1995.

Mappings of the Course Outcomes (COs)

	K1	K2	K3	K4	K5	K6
CO 1				4		
CO 2					5	
CO 3					5	
CO 4						6
CO 5						6

Mean: 5.2

PGE/PSE 4445 BRITISH POETRY I: CHAUCER TO HOPKINS 5 Hrs. /4Cr.

This course aims to introduce the aspects, sub-genres and movements of British Poetry. It helps students to trace the development of British poetry chronologically from Geoffrey Chaucer to Gerard Manley Hopkins. Poems in the reading list have been selected on the basis of literary movements and trends they represent in literary history.

At the end of this course, the students will be able to

i. identify the various aspects and sub-genres of poetry,
ii. trace the evolution of various literary movements,
iii. assess British Poetry with focus on content and form,
iv. evaluate various poets as representatives of their periods, and
v. justify British Poetry as an aesthetic record of the societies concerned

Unit 1 **Aspects of Poetry**

Devices of sound: rhyme, rhythm, foot and meter; Onomatopoeia, Euphony, Alliteration, Consonance and Assonance, Anaphora, Anadiplosis, Antenaclassis, Antimetabole, Epistrophe, Parison, Epizeuxis and Stichomythia

Devices of Comparison: Simile, Metaphor, Personification, Pathetic Fallacy, Transferred Epithet, Conceit, Metonymy, Synecdoche, symbol, imagery, Oxymoron, Hyperbole
Subgenres of poetry: Epic, Ballad, Dramatic Monologue, Dramatic Narratives, Lyric, Sonnet, Ode and Elegy

Unit 2 **Middle English, Elizabethan and Metaphysical Poetry**
Chaucer Lines 1-100 from "The General Prologue" The Canterbury Tales
Spenser "Prothalamion"
Shakespeare "Shall I compare Thee to a Summer's Day?" "My Mistress Eyes are Nothing Like the Sun"
John Donne "A Valediction: Forbidding Mourning"
George Herbert "The Pulley"
Andrew Marvell "To His Coy Mistress"
Henry Vaughan "The Retreat" Richard Lovelace "To Althea from Prison"

Unit 3 **Renaissance Poetry**
John Milton Lines 192-393 from *Paradise Lost Book IX*

Unit 4 **Neoclassical & Romantic Poetry**
John Dryden "Mac Flecknoe"
Alexander Pope "Canto First" The Rape of the Lock (145Lines)
Thomas Gray "Elegy Written in a Country Churchyard"
William Blake "The Tyger"
William Wordsworth "Lines Composed a Few Miles above Tintern Abbey"
S. T. Coleridge "Kubla Khan'
P. B. Shelley "Ode to West Wind" 6
John Keats "Ode on a Grecian Urn"

Unit 5 Victorian Poetry
Alfred Tennyson "Ulysses"
Robert Browning "My Last Duchess"
Mathew Arnold "Dover Beach"
Dante Rossetti "The Blessed Damozel"
G. M. Hopkins "The Windhover"

Refernces

Bennett, Joan. *Five Metaphysical Poets*. CUP, 1964.
Behrdendt, Stephpen C. *History and Myth*. Wayne State University Press, 1990. Brewer, D.S. Chaucer. Longman, 1973.
Brooks, Cleanth and Robert Penn Warren. *Understanding Poetry*. Holt, RineHart & Winston, 1976.
Hobsboum, Philip. *Tradition and Experiment in English Poetry*. Macmillan, 1979.
Parfitt, George. *English Poetry of the Seventeenth Century*. Longman, 1985.
Perrine, Laurence. *Sound and Sense*. Harcourt Brace Jovanovich, 1976.
Richards, Bernard. *English Poetry of the Victorian Period 1830-1890*. Longman, 1988.
Waston, J.R. *English Poetry of the Romantic Period 1789-1830*. Longman,

Mapping Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1	1					
CO2		2				
CO3			3			
CO4				4		
C05						6

Mean: 3.2

PGE/PSE 4447 BRITISH FICTION: VICOTIRAN TO EARLY MODERN 5 Hr. /4 Cr.

This course aims at an in-depth understanding of the British novel from the 19th to the early 20th century. Students will learn different elements of fiction and narrative techniques that were developed during this period. This course will enable students to comprehend the reciprocal relationship between social, political, scientific developments of the period and imaginative writings. The students will also learn the influence of Marxism, Darwinism, Freudian psychoanalysis, print culture and changes in readership through the prescribed texts.

At the end of the course students shall be able to

i. distinguish various elements of Narrative fiction and its techniques,
ii. summarize aspects of Bildungsroman and realist fiction along with thematic concerns
iii. evaluate Social, domestic and gothic novels,
iv. assess philosophical and political underpinnings of Victorian morality, anti-Victorian realities and the aesthetic movement, and
v. infer themes relating to the turn of the century events through close reading of text

Unit 1 **Aspects of Fiction**

Narrative and Narratology; Story and plot, Foreshadow and flashback, surprise and suspense, point of view and focalization, character and characterisation; Mimesis/verisimilitude and Diegesis; Typology of Narrators; Diegetic levels: Autodiegetic, Extradiegetic, Homodiegetic and Heterodiegetic; frame narrative, Realism, Naturalism, imperialism, colonialism

Unit 2 **Provincial life, Religion and Gender**

Charlotte Bronte *Jane Eyre*(1847)
George Eliot *Silas Marner*(1861)

Unit 3 **Class and Industrialisation, Gothic, Science and Psychology**

Charles Dickens *Hard Times* (1854)
Bam Stoker *Dracula* (1897)

Unit 4 **Aestheticism and Anti-Victorian Realities**

Oscar Wilde *The Picture of Dorian Gray* (1890)
Thomas Hardy *Tess of d'Urbervilles* (1892)

Unit 5 **Empire, Imperialism and Early Modernism**

Joseph Conrad *Heart of Darkness* (1901)

D. H. Lawrence *The Rainbow* (1915)

References

David, Herman. *The Cambridge Companion to Narrative*. Cambridge: Cambridge University Press, 2007.

Forster, E. M. *Aspects of the Novel.* Penguin, 1974.

Hoffman, Michael and Patrick Murphy. *Essentials of the Theory of Fiction*. Duke University Press, 1988.

James, Louis. *The Victorian Novel*. Blackwell Publishing, 2006. (pdf)

Jeremy, Hawthorn(ed.). *The Nineteenth-Century British Novel*. Edward Arnold, 1986.

King, Jeannette. Tragedy *in the Victorian Novel: Theory and Practice in the novels of George Eliot, Thomas Hardy and Henry James*. Cambridge University Press, 1978.

Milligan, Ian. *The Novel in English: An Introduction*. Macmillan, 1983.

Prince, Gerald. *A Dictionary of Narratology (Revised Edition.)* University of Nebraska Press, 2003.

Tomlison, T. B. *The English Middle-Class Novel.* Macmillan, 1970.

Shilomith, Kennan Raymon. *Narrative Fiction*. Methuen, 1984.

Sutherland, John. *Victorian Fiction: Writers, Publishers, Readers*. Macmillan, 1995.

Wheeler Michael. *English Fiction of the Victorian Period 1830-1890.*Longman, 1985.

Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1					5	
CO2					5	
CO3					5	
CO4					5	
C05						6

Mean: 5.2

PGE/PSE 4449 **British Drama-I: Elizabethan to Early Modern 6 Hr./4 Cr.**

The course aims to introduce students to drama during Elizabethan, Restoration and Victorian periods. It aims to trace the origin and history of British Drama back to Classical Greek Theatre and to understand the various aspects of drama such as Plot-structure, Characterization and Dialogue as different from those of other literary genres. It will train students to view drama primarily as a product of its space and time by choosing plays from Elizabethan age -except those of Shakespeare- Restoration, Victorian, and Early Modern age.

At the end of the course, students will be able to

i. appraise various aspects of drama and theatre,
ii. identify drama and performance as a cultural process and an artistic discourse,
iii. evaluate plot structure, characterization and dialogue,

iv. interpret drama texts as aesthetic records of their times viz., Elizabethan, Restoration, Victorian and Early Modern ages,

v. examine the sequential course dealing with Modern and Postmodern British Drama

Unit 1 **Aspects of Drama**

Etymology/Etiology of the terms: Drama, Tragedy and Comedy
Aristotelian concept of Tragedy with reference to Poetics and the later Renaissance Tragedy, focusing on the five elements of tragedy, Tragic Flaw, Catharsis, Peripeteia and Anagnorisis,
Various types of Comedy such as Satyr plays, Aristophanean Comedies, Restoration Comedies and Anti-Sentimental Comedies, Plot Structure: Gustav Freytags Pyramid
Characterization: various dimensions and types of characters
Dialogue: semiotic functions and rhetorical devices of theatrical language

Unit 2 **Elizabethan Drama**

Christopher Marlowe	*Edward, the Second* (1594)
Ben Jonson	*Volpone* (1606)

Unit 3 **Jacobean Drama**

John Webster	*The Duchess of Malfi* (1612-1613)
Thomas Dekker	*The Shoemaker's Holiday* (1600)

Unit 4 **Anti-Sentimental Comedy**

Oliver Goldsmith	*She Stoops to Conquer* (1771)
R. B. Sheridan	*The Rivals* (1775)

Unit 5 **Farce / Drama of Idea**

Oscar Wilde	*The Importance of Being Earnest* (1898)
Bernard Shaw	*Arms and the Man* (1898)

References

Bentley, Eric. *What is Theatre? Incorporating the Dramatic Event*. Limelight Editions, 1968.
Brockett, Oscar. G. *The Theatre: An Introduction*. Holt, Rinehard and Winston Inc., 1964.
Esslin, Martin. *The Field of Drama*. Methuen, 1987.
Griffiths, Trevork. *Practical Theatre: How to Stage Your Own Production*. Chartwell Books, 1982.

Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1				4		
CO2		2				
CO3					5	
CO4			3			
CO5			3			

Mean: 3.4

PGE/PSE 4351 ENGLISH FOR CAREER 4 Hrs/3 Cr.

English serves as a vital and efficient tool in the development of one's career. An understanding of the nuances of English usage and practice helps in professional growth of an individual. This course focuses on equipping students with an overall development of communication skills. The course also presents students a wider range of English usage for their career. Further, it also enables students to express their opinion, participate in group discussions, conversations, and interviews.

At the end of this course students will be able to

i. identify the nuances of communication,
ii. solve Reading Passages effectively and critically,
iii. write paragraphs, essays and various types of business letters,
iv. create English for media such as news reportage, interviews, columns and features and reviews, and
v. design English for presentation, documentation, group discussion and Negotiation

Unit 1 **Speaking**
Short conversations –details, idiomatic expressions, suggestions, assumptions, predictions, implications, problems, topics - longer conversations – informal conversations, academic conversations - talks – lectures – discussions.

Unit 2 **Reading**
Identifying the main idea and supporting details of a text – scan and skim the texts to find specific information – guess unknown words in a text through the use of a contextual clues and decoding strategies – think critically in response to a text - understand a wide range of content words and idiomatic expressions in a text.

Unit 3 **Writing**
Develop and understand sentence structures and paragraphs. Understand and use the key concepts of paragraphs. Interpreting information from charts and graphs; Turning ideas into sentences / paragraphs / essays / articles.

Unit 4 **English for specific purposes**
Journalism, reporting, feature writing, technical writing

Unit 5 **English at workplace**
Presentation skills, negotiation skills, interview skills, group discussion, using the telephones.

References

Kalkar, Anjali et al. *Textbook of Business Communication*. OrientBlackswan, 2010
Thorpe, Edgar and Showick Thorpe. *Objective English*, Pearson, 2012
Sharpe, Pamela J. *Barron's TOEFL iBT 15th ed.* Galgottia, 2017
Swan, Michael. *Practical English Usage*. International Student's Edition. Oxford: OUP, 2000.

Simon, Peter. *Communication Skills: the stepladders to success with effective communication.*
Ramesh publishing House, 2013

Mapping of the Course Outcomes (COs) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1		2				
CO2			3			
CO3			3			
CO4						6
CO5						6

Mean: 4

PGE/PSE4342 STRUCTURE OF MODERN ENGLISH 5 Hrs./4Cr.

Students at the Masters level are expected to familiarize themselves with a proper synchronic perspective of the organization of Modern English in order to become better users/teachers of English as a language. The course focuses on the phonological, morphological, and syntactical aspects of Modern English, and alternative grammars like Phrase Structure Grammar, and TGG.

At the end of the course, students will be able to

i. integrate the traditional, structural and post-structural points of view of language,
ii. produce pronunciation skills,
iii. express their morphological knowledge,
iv. negotiate alternative theories of English such as IC Analysis and PS Grammar, and
v. design Transformational and Generative Grammars pedagogically

Unit 1 **Grammar and Grammars**
Why study grammar? What is grammar? Correct vs. incorrect; speech vs. writing; form vs. meaning

Unit 2 **English Phonetics and Phonology**
Organs of speech, classifications of English consonants and vowels, English phonology, IPA, phone, phoneme, and allophone, syllable and syllabification, word accent and sentence accent, rhythm and intonation, and supra-segmental features, such as assimilation, elision, and liaison

Unit 3 **English Morphology**
Types of morphemes; inflectional morphology; derivational morphology (prefixation, suffixation, conversion, compounding)

Unit 4 **English Syntax**
IC Analysis and Phrase Structure Grammar

Unit 5 **English Syntax**
Transformational and Generative Grammars

Textbooks

Lieber, Rochelle. 2009. *Introducing Morphology*. CUP.
Roach, Peter. 1997. *English Phonetics and Phonology: A self-Contained, comprehensive Pronunciation Course*. CUP.
Palmer, Frank. 1983. *Grammar*. Pelikan Books.

References

Brinton, Laurel J. 2000. *The Structure of Modern English*. John Benjamins
Chomsky, Noam. 1975. *Syntactic Structures*. Mouton.
O'Connor, J.D. 2000. *Better English Pronunciation*. CUP.
Plag, Ingo. 2002. *Word-formation in English*. CUP.
Yule, George.1996. *The Study of Language*. CUP

Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1						6
CO2						6
CO3						6
CO4						6
C05						6

Mean: 6

PGE/PSE 4444 BRITISH POETRY II: YEATS TO THE PRESENT TIMES 5 Hrs. /4Cr.

This course aims to introduce literary modernism in British poetry to the students. It will help the students analyze various influences, trends, techniques and issues in British poetry from the beginning of the twentieth century to the present.

At the end of the course students will be able to

i. identify modernist trends in British poetry,
ii. critique how poetry reflects and influences the aesthetic-political-intellectual life of the British,
iii. analyse the changing face of poetry in modern times,
iv. employ the various movements to discuss literary works, and
v. distinguish various trajectories of the poetic process.

Unit 1 **Myth and Symbolist Poetry**
Yeats: "Byzantium" &"Leda and the Swan"

Unit 2 **Cubism, Fragmentation and Mosaic Art**
T.S. Eliot: "The Waste Land"

Unit 3 **Anti-war Poetry**
Wilfred Owen: "Anthem for the Doomed Youth" & "Strange Meeting"
W.H. Auden: "Shield of Achilles" & "Lullaby"

Unit 4 **Modern Romantic Archetype, Eco poetry and Movement Poets**

Dylan Thomas: "The Green Fuse that Drives the Flower" "Do Not Go Gentle into the Night"
Ted Hughes: "Hawk Roosting" & "View of a Pig"
Seamus Heaney: "Digging" & "Bog land"
Philip Larkin: "Church Going"

Unit 5 **Ethnic British Poetry**

James Fenton: "God, a Poem" & "In Paris with You"
Paul Muldoon: "Hedgehog" & "A Mayfly"
Carol Ann Duffy: "Talent" "Valentine" & "Anne Hathaway"

References

Corcoran, Neil. *English Poetry Since 1940*. Longman, 1993.
Emig, Rainer. *Modernism in Poetry: Motivations, Structures, and Limits*. Longman, 1995.
Kermode, Frank. *Romantic Image*. Routledge, 1957.
Larrisy, Edward. *Reading Twentieth Century Poetry*. Basil Blackwell.

Mapping of the Course Outcomes (Cos) with Blooms' Taxonomy

	K1	K2	K3	K4	K5	K6
CO1		2				
CO2					5	
CO3				4		
CO4			3			
CO5					5	

Mean: 4

PGE/PSE 4446 BRITISH FICTION II: LATE MODERN TO POSTMODERN 5Hrs/ Cr.4

This course will be a survey of the British fiction that emerged in the 20th century. The aim of the course is to understand the rapid changes in social life and the significance of the literary style reflective of that change. The modern and postmodern fiction challenges conventional norms of fiction writing and pre-modern notions of authority and order. Students will learn about the major thematic concerns and literary styles of this period.

At the end of the course students shall be able to

i. distinguish the concepts modern, modernity, post-modern and postmodernity and narrative strategies used during this period,
ii. debate philosophical/ideological and aesthetics positions of modernist writing in Britain during the period of High Modernism,
iii. critique post-war/cold war scenario in Britain as reflected in the texts,
iv. infer postmodern themes and techniques, and
v. express opinions about a range of socio-political and historical possibilities.

Unit 1 **Terms and Techniques**

Stream of consciousness, Time, Modernity, Modernism, Postmodernity and Postmodernism, irony, paradox, fragmented narrative, metafiction, intertextuality, pastiche, magical realism, minimalism, maximalism, and self-reflexivity

Unit 2 **High Modernism**

James Joyce *A Portrait of the Artist as a Youngman* (1916)
Virginia Woolf *To the Lighthouse* (1927)

Unit 3 **Dystopian / Modern Gothic**

George Orwell *1984* (1949)
Iris Murdoch *An Italian Girl (1964)*

Unit 4 **History/Metafiction/Anti-war**

John Fowles *The French Lieutenant's Woman* (1969)
Pat Barker *Regeneration* (1991)

Unit 5 **Multicultural/Transcultural Fiction**

Kazuo Ishiguro *The Remains of the Day (1989)*
Zadie Smith *White Teeth*

References

Daiches, David. *The Novel and the Modern World.* The University of Chicago Press, 1960.
English, F. James (ed.). *A Concise Companion to Contemporary British Fiction.* Blackwell, 2006. Pdf.
Head, Dominic. *Modern British Fiction*, 1950-2000. Cambridge: CUP, 2002. Pdf.
Hewit, Douglas. *English Fiction of the Early Modern Period 1890-1940.* Longman Group, 1988.
Nicol, Brian. *The Cambridge Introduction to Postmodern Fiction.* CUP, 2009. Pdf.
Stevenson, Randall. *The British Novel Since the Thirties: An Introduction.* University of Georgia Press, 1986.

Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1					5	
CO2					5	
CO3					5	
CO4					5	
C05						6

Mean: 5.2

PGE 4448 AMERICAN AND AFRICAN-AMERICAN LITERATURE 6 Hrs. /4Cr.

This course will focus on the significant contribution made by American writers to Literature. The focus will be on distinct aspects of American Literature like the American Dream, the American Intellectual Independence and the Broadway theatre. In addition, the course will briefly survey African-American Literature with texts representing different literary genres.

At the end of the course, the students will be able to

i. analyze the movements and trends that shaped American and African-American literature,
ii. differentiate between American and African-American oeuvres in poetry,
iii. estimate various speeches and concepts of living which changed American history,
iv. evaluate the relation between Black Aesthetics and racism in fiction, and
v. validate representative socio-political, cultural, racial and gender perspectives in theatrical works

Unit 1 Lectures on American and African-American history and literature

Unit 2 **Poetry**

Edgar Allan Poe	"The Raven"
Walt Whitman	"When Lilacs Last in the Dooryard Bloomed"
Emily Dickinson	"A Bird Came Down the Walk"
	"I Felt a Funeral in My Brain"
e.e. Cummings	"Buffalo Bills"
Wallace Stevens	"Anecdote of the Jar"
William Carlos Williams	"Red Wheel Barrow"
Ezra Pound	"Pact", "Papyrus"
Paul Laurence Dunbar	"We Wear the Mask"
Claude Mckay	"If We Must Die"
Langston Hughes	"Dream Deferred"
Countee Cullen	"Heritage"
Gwendolyn Brooks	"We Real Cool"
Maya Angelou	"Still I Rise"
Adrienne Riche	"A Valediction Forbidding Mourning"
Rita Dove	"Heart to Heart"

Unit 3 **Prose**

Marcus Garvey	"Speech Delivered at Madison Square, March 1924"
W.E.B. Dubois	"Of the Dawn of Freedom"
Thoreau	"Where I lived and What I Lived for"
William Faulkner	"Nobel Prize Acceptance Speech"

Unit 4 **Fiction**

Ernest Hemingway	*The Old man and The Sea*
Toni Morrison	*The Beloved*
Ralph Ellison	*Invisible Man*

Unit 5 **Drama**

Eugene O'Neill *Emperor Jones*
Arthur Miller *Death of a Salesman*
Lorraine Hansberry's *Raisin in the Sun*

References

Barksdale, Richard and Keneth Kinnamon. *Black Writer of America: A Comprehensive Anthology*. New York: Macmillan, 1972.

Cohen, Hennig (ed.). *Landmarks of American Writing*. Voice of America Forum Series, 1982.

Cunliffe, Marcus. *The Literature of the United States*. Penguin, 1970.

Feidelon Jr., Charles and Paul Brodtkorb Jr. *Interpretations of American Literature*. New York: OUP, 1971.

Fender, Stephen. *American Literature in Context I to IV*. New York: Methuen & Co. 1983.

Massa, Ann and Scott Donaldson. *American Literature*. London: David and Charles, 1978.

Spiller, E. Robert. *The Cycle of American Literature*. New York: The Free Press, 1967.

Mapping of the Course Outcomes (Cos) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1				4		
CO2				4		
CO3					5	
CO4					5	
CO5						6

Mean: 4.8

PGE/PSE 4350 **SHAKESPEARE** **5 Hrs. /3 Cr.**

Reading Literature in the light of auteurist theory is as important as its generic, chronological and geographical approach. This course chooses one of the best English dramatists, Shakespeare, for study. The course will train the students in traditional approaches to Shakespearean drama as well as the re-readings of them. Further, this course will also focus on versatility and universality of Shakespearean texts by analysing the narrative and filmic adaptations of Shakespearean drama.

At the end of the course, students will be able to

i. deduce the different features of Shakespearean tragedy, comedy and history plays,
ii. connect Shakespearean theatre and Shakespearean language,
iii. critique the Elizabethan view on Cosmic Universe, Man, History, Nature and supernatural Elements through the prescribed plays,
iv. speculate how a classic work of art provides space for re-reading, and
v. modify verbal text into visual text.

Unit 1 **Shakespearean Tragedy**
Hamlet

Unit 2 **Shakespearean Comedy**
As You Like It

Unit 3 **Shakespearean History-Play Proper**
Henry V

Unit 4 **Changing Perspectives of Shakespearean Drama**
Postcolonial and Eco-feminist readings of Shakespeare
Reading List: *The Tempest, A Midsummer Night's Dream*

Unit 5 **Verbal and Visual Adaptation of Shakespeare**
"Macbeth" from *Tales from Shakespeare – Charles Lamb and Mary Lamb*
Akira kurasowa's *Throne of Blood*
Roman Polanski's *Macbeth*

References

Peck, John and Martin Coyle. *How to Study a Shakespearean Play*.2nd ed. Macmillan, 1985.
Davidson, Peter. *Text and Performance*. Hamlet. Macmillan, 1983.
Dollimore, Jonathan &Alan Sinfield (Eds.). *Political Shakespeare*: *Essays in Cultural Materialism*. Cornell University Press, 1994
Schoenbaum, Samuel. *Shakespeare, The Globe and the World*. OUP, 1979
Gurr, Andrew. *The Shakespearean Stage, 1574 – 1642*. CUP, 1970
Brown, John Russel. *Discovering Shakespeare, A New Guide to the plays*: Macmillan, 1981
Web Source:
Throne of Blood- Macmillan International Higher Education –
https://www.macmillanihe.com>resources

Mapping of the Course Outcomes (COs) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1				4		
CO2				4		
CO3					5	
CO4						6
CO5						6

Mean: 5

PGE/PSE 4352 **FILM STUDIES** **4 Hrs. /3 Cr.**

The course aims to train students to decode the visual messages imparted by movies and amplify their impacts. It also aims to train the students to read the films they watch, both as an aesthetic work and as politically motivated. The course aims at enabling the learners to use a touchstone method in evaluating contemporary Indian main stream cinema with World Cinema as well as Indian Classics.

At the end of the course students will be able to

i. discuss the aspects of Cinema,
ii. analyse the aesthetics as well as the politics in films,
iii. read and review films,
iv. develop an understanding of contemporary aesthetic trends in political, social, cultural and philosophical contexts, and
v. write film scripts and reviews.

Unit 1 Introduction
Filmic Visual: Mise-en-Scene

Unit 2 Screenwriting
One-line, plot, characterization, one-line scene order & treatment

Unit 3 Film history and film genres

Unit 4 Critical understanding of films
Auteurist, Formalist, Marxist, Feminist and Post-colonial Perspectives

Unit 5 Writing film reviews and criticisms

Recommended Viewing

Origins
One minuters
Lumiere Brothers *The Arrival of Train* and *Workers Leaving the Factory*
Twelve Minuters *The Waterer Watered*

Earliest Features: Auteurism
Porter *The Great Train Robbery*
Milieus *Voyage to the Moon*

Early Full-Length Feature Films in Silent Era
Film & Politics: Marxism
Sergei Eisenstein *The Battleship Potemkin*
Charlie Chaplin *Modern Times*

Flash back, Phenomenology & Multiple Narratives
Film & Truth: Formalism
Akira Kurosowa *Rashomon* (Japan)
Orson Wells *Citizen Kane* (English)

S. Balachandar — *Andha Naal* (Tamil)
Kamal Hasan — *Virumandi* (Tamil)

Film & Society: Neo- Realism
Vittoria De Sica — *Bicycle Thieves*

Film and Psychology: Psychoanalysis
Alfred Hitchcock — *Psycho*
Christopher Nolan — *Prestige*

Film and Gender: Feminist Approach
Rudhraiya — *Aval Apdithaan* (Tamil)
K. Balachandar — *Kalyana Agadhikal* (Tamil)
Ram — *Tharamani* (Tamil)

Film and Collective Dream: Spaghatti Western & the Cowboy Myth
Sergio Leone — *The Good, the Bad, the Ugly*
Ronald Emmerich — *Independence Day*

Film and Epic
Cecil de Mille — *The Ten Commandments*

Film and History: New Historicism
Steven Spielberg — *Saving Private Ryan*
Oliver Stone — *Born on the Fourth of July*

Film and Literature
Roman Polanski — *Oliver Twist*

Film & Justice
Sidney Lumet — *Twelve Angry Men*

Film and the Underworld
Francis Ford Coppola — *The God Father*

Film and Children
Majit Majidhi — The Colour of Paradise
The Children of Heaven
Janaki Viswanathan — Kutti (Tamil)

Film & Documentation: Non-Fictions
Flagherti — *Nanook of the North*
Micheal Moore — *Farenheit 9/11*
Barathi Krishna Kumar — *Enru Thaniyum*
B. R Amuthan — *Pee*

Indian Panorama

Sathyajit Ray	*Charulatha*
Adoor Gopalakrishnan	*Madhilukal*
Blessy	*Pranayam*
S.K Sasidharan	*Oru Thivasathande Kazhi*
K. Balachander	*Avargal*
Mahendran	*Udhiri-p-pookal*
Balu Mahendra	*Veedu*
Barathiraja	*Mudhal mariyadhai*
Bala	*Pidhamakan*
Balaji Sakthivel	*Vazhaku En 18/9*
Manikandan	*Kaakaa Muttai*
Sundar, C	*Anbe Sivam*
Bhramma	*Kutram Kadidhal*
Santhana Bharathi	*Mahanadhi*

References

Monaco, James *How to Read a Film* 5th ed. OUP, 2005
Bordwell, David and Thompson, Kristin, *Film Art: an Introduction*, 7th ed. McGraw-Hill Co., 2004.
Kawin, Bruce, *How Movies Work.* University of California Press, 1992.
Cook, David A., *A History of Narrative Film*, 4th ed. W.W. Norton, 2004.
Nelken, Jill, *Introduction to Film Studies*, 5th ed. Routledge, 2011
Feild, Syd, *Screenplay: The Foundations of Screenwriting*. RHUS, 2005.

Mapping of the Course Outcomes (COs) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1		2				
CO2				4		
CO3		2				
CO4			3			
CO5						6

Mean: 3.4

PGE/PSE5453 LITERARY CRITICISM & THEORY I 6Hrs./4Cr.

Being the first of the two sequential courses, it aims at problematizing and professionalizing Literary Studies, at enabling students to grasp the basics of philosophical and linguistic trends and 'turns' that have informed structuralist and poststructuralist thinking, and at facilitating students to use literary theories as interpreting tools.

At the end of the course, students will be able to

i. problematize literary studies
ii. reframe theories contextually
iii. evaluate the role of the reader and the text
iv. compare and contrast the basic features of structuralism and poststructuralism
v. deconstruct literary texts

Unit 1	**What is Literary Studies?**	
	Terry Eagleton	"What is Literature?" & "The Rise of English" (2003)
	Gerald Graff	"Introduction: The Humanist Myth" (1987)
	Gauri Viswanathan	"Lessons of History" (1989)
Unit 2	**What is Literary Theory?**	
	J. Hillis Miller	"The Search for Grounds in Literary Study" (1984)
	Aijaz Ahmad	"Literary Theory & 'Third World Literature': Some Contexts" (1992)
Unit 3	**Reader-Response Theory**	
	Stanley Fish	"Interpreting the Variorum" (1980)
	Wolfgang Iser	"The Role of the Reader in Fielding's *Joseph Andrews*" (1992)
Unit 4	**Structuralism**	
	Ferdinand de Saussure	"Selections from *Course in General Linguistics*" (1916)
	Roland Barthes	"What is Criticism?" (1964)
Unit 5	**Deconstruction & Poststructuralism**	
	Michel Foucault	"What is an Author?" (1969)
	Catherine Belsey	"Constructing the Subject: Deconstructing the Text" (1985)

References

Davis, Robert Con & Ronald Schleifer. Eds. *Literary Criticism: Literary and Cultural Studies*. Longman, 1988.
Eagleton, Terry. *Literary Theory: An Introduction*. Blackwell, 2003.
Newton, K.M. Ed. *Theory into Practice: A Reader in Modern Literary Criticism*. Palgrave Macmillan, 1992.
Rice, Philip & Patricia Waugh, Eds. *Modern Literary Theory*. Arnold, 2001.

Mapping of Course Objectives with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1						6
CO2					5	
CO3			3			
CO4					5	
CO5						6

Mean: 5

PGE 5455 BRITISH DRAMA II: LATE MODERN TO POSTMODERN 5 Hrs./4 Cr.

The sequential course to British Drama I covers three decades of British Drama. Furing 1950s 60s and 70s British drama engaged its audience/readers with a flurry of thearical activities with its Broadway, Off-Broadway and Off Off-Broadway dramas. The demarcation between aesthtic and political, mainstream and parallel plays started to vanish. This course as a final instalment of British drama will enable students to complete their analysis of British drama with context and contemporaneity.

After completing the course students will be able to

i. distinguish various subgenres of modern and postmodern theatres
ii. evaluate how well human predicament is dramatized in literature
iii. intervene how theatre can be taken beyond the traditional proscenium art form
iv. articulate emotions and values in public without losing human dignity
v. create a space for dialogue on various issues and a dialogic society where there is a space for the other.

Unit 1 **Social Realism**
John Osborn Look Back in Anger

Unit 2 **The Absurd**
Samuel Beckett Krapp's Last Tape

Unit 3 **Comedy of Menace**
Herald Pinter The Birthday Party

Unit 4 **Meta-theatre**
Tom Stoppard Roscencranz and Guildenstern are Dead

Unit 5 **Epic Theatre**
Edward Bond Lear

References

Bentley, Eric. *The Theory of the Modern Stage.* Penguin, 1996.
Heilpern, John. *John Osborne: A Patriot for Us.* Chatto & Windus. 2006.
Knowlson, James. *Krepp's Last Tape: The Evolution of Play.* Journal of Beckett Studies 1976.

Mapping of Course Objectives with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1				4		
CO2				4		
CO3					5	
CO4					5	
CO5						6

Mean: 4.8

PGE/PSE 5457 INDIAN LITERTURE IN ENGLISH 5Hrs/ 4 Cr

As a sequel to Regional Literatures in Translation, this course aims at studying the development of various forms of Indian Literature written in English. Students will be able to identify distinct Indian modes of Literary Expression in the language of the colonial masters. This course will also attempt to familiarize students with literary techniques and debates and reinterpret the contested sites of language, culture, nation, history memory and authenticity.

At the end of the course students will be able to

i. analyze poetic techniques and themes in Indian English poetry,
ii. distinguish techniques and themes in Indian English drama from Western models, evaluate modern prose as a representation of India's diversity,
iii. assess novel as a genre that narrates the nation with particular emphasis on postcolonial Indian experience of the nation, its history and politics, the role of memory and also estimate narrative strategies, and
iv. integrate literature and society via debating social structures of Indian society and Human Rights issues.

Unit 1 **Poetry**

A.K. Ramanujan	"A River," "Love Poem for a Wife- I"
Nissim Ezekiel	"Background Casually," "Night of the Scorpion"
Jayanta Mahapatra	"Grandfather," "The Abandoned British Cemetery at Balasore
Kama Das	"An Introduction," "The Old Playhouse"

Unit 2 **Prose**

Gurucharan Das	"Draupadi's Courage"
Shashi Tharoor	"A Myth and an Idea"
Amartya Sen	"Tagore and His India"
Romila Thapar	"Knowledge as Heritage"

Unit 3 **Drama**

Mahesh Dattani	*Dance Like a Man*
Manjula Padmanabhan	*Harvest*

Unit 4 **Novel: Politics of the Nation**

Amitav Gosh	*The Shadowlines*
Rohinton Mistry	*A Fine Balance*
Salman Rushdie	*Haroun and Sea of Stories*

Unit 5 **Novel – Writing the Margin**

Shashi Deshpande	*Binding Vine*
Arundhati Roy	*The God of Small Things*

References

Bharat, Meenakshi (ed.). *Desert in Bloom: Contemporary Indian Women's Fiction in English.* Pencraft International, 2004.

De Souza, Eunice. *Talking Poems: Conversations with Poets.* OUP, 1999.

Khair, Tabish. *Babu Fictions: Alienation in Contemporary Indian English Novels*. OUP, 2001.
King, Bruce (ed.). *Modern Indian Poetry in English*. OUP, 2001.
Needham, Anuradha Dingwany. *Using Master's Tools: Resistance and the Literature of the African and South Asian Diasporas.* St. Martin's Press, 2000.
Mehrotra, Arvind Krishna (ed.). *An Illustrated History of Indian Literature in English.* Permanent Black, 2003.
Mukherjee, Meenakshi. The Perishable Empire: Essays on Indian Writing in English. OUP, 2000.
Sanga, Jaina C. *Salman Rushdie's Postcolonial Metaphors: Migration, Translation, Hybridity, Blasphemy, and Globalization*. Greenwood Press, 2001.

Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1				4		
CO2				5		
CO3					5	
CO4					5	
C05						6

Mean: 5

PGE/PSE 5459 **CULTURAL STUDIES** **5 Hrs./4 Cr.**

Cultural Studies is a comparatively young area of research and teaching that brings in new perspectives to our notions regarding 'texts' and 'meanings' and therefore to the study of literatures, cultures and societies. This course seeks to pool together theoretical tools and critical perspectives to interrogate cultural texts of multiple kinds like, advertisements, films, television, newspaper and internet texts and so on that saturate our lives.

At the end of this course, students will be able to

i. discover the contours of Cultural Studies as a field of inquiry, situating their learning within explorations of the disciplinary and historical context of the field,
ii. discriminate the diverse and sometimes contested meanings of cultural objects and processes, establishing a basic knowledge of the theoretical paradigms of Cultural Studies,
iii. devise strategies to connect cultural knowledge to everyday life and practices, gaining a preliminary understanding of the relationship of methodology (paradigms for study) to inquiry in Cultural Studies,
iv. develop their analyses of culture through oral and written modes of communication,

with an emphasis on the skills of critical analysis and close reading, and

v. formulate a foundation for further study of Cultural Studies theory and praxis

Unit 1 **Introduction**

Williams, Raymond, (1985) "Culture" pp.87-93 in Keywords: A Vocabulary of Culture and Society. New York: Oxford University Press.

"Introduction" The Cultural Studies Reader. Simon During (ed). Routledge,1993, pg1-25.
Stuart Hall: Race, Culture and Communications: Looking backward and forward at Cultural Studies

Unit 2 **Literature and Culture**

Mathew Arnold	*Culture and Anarchy* Chap IV
F.R. Leavis	Mass Civilization and Minority Culture
Dwight Macdonald	A Theory of Mass Culture

Unit 3 **Gender. Sexuality and Culture**

Chris Weedon	The Question of Difference. In Feminism, Theory and the Politics of Difference
Rethinking Gender Stereotypes: A Queer Eye At Home. Conference paper.	
Serena Nanda	Life on the Margins: A Hijra's Story.

Unit 4 **Media and culture**

Barbara Creed, Barbara	The Castrating Mother: Psycho
Tejaswini Niranjana	Interrogating Whose Nation: Tourists and Terrorists in Roja
Chandrima Chakraborty.	Bollywood Motifs: Cricket Fiction and Fictional Cricket. Bollywood Motifs

Unit 5 **Leisure and Culture**

Allen, Matthew Harp.	Rewriting the Script for South Indian Dance
Bhaskar Mukhopadhyay	Between Elite Hysteria and Subaltern Carnivalesque: Street-Food and Globalization in Calcutta".
Amanda Weidman	Can the Subaltern Sing? Music, Language and the Politics of Voice

References

Barker, Chris. *Cultural Studies: Theory and Practice* 3rd ed. Sage,2008.
During, Simon. *The Cultural Studies Reader.* Routledge, 2007.
Storey, John. *An Introduction to Cultural Theory and Popular Culture.* Pretence Hall, 1997.

Mapping Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1		2				
CO2					5	
CO3						6
CO4						6
CO5						6

Mean: 5

PGE/PSE 5461 **TRANSLATION STUDIES** **4 Hrs./4 Cr**

The course will impart training to students in the skills of translating literary, journalistic, scientific passages, and articles of general interest. It willget students acquainted with theories of translation. Problems in translation will also be discussed to make the students understand the limitations in translating different genres. The course will enable them to become trained translators in different fields including Journalism, Tourism, Public Relations and Public Administration.

At the end of the course, students will be able to

i. identify the issues and understand the significance of translation as an art and craft,
ii. estimate theories of translation,
iii. employ different translation techniques and methods,
iv. assess the problems of translation and resolve them,
v. write like a professional translator in the fields like journalism & mass, and communication, public administration, and science & technology and thus facilitating trans-creations.

Unit 1 **Central Issues**
Language and Culture
Types of Translation
Decoding and Recoding
Problems of Equivalence
Problems in Translation

Unit 2 **Theory**
Bible Translation from Cicero to Tytler
A linguistic Theory of Translation J. C. Catford
Semantic Translation Peter Newmark

Unit 3 **Translating Literary Genres**
Structures
Poetry and Translation
Translating Prose
Translating Dramatic Texts

Unit 4 **Practice in Translation**
Translating literary, scientific, and journalistic passages from Tamil to English

Unit 5 **Practice in Translation**
Translating literary, scientific, and journalistic passages from English to Tamil

Textbook

Bassnett, Susan. *Translation Studies*. Routledge, 2002.

Reference Books

Catford, J.C. *A Linguistic Theory of Translation*. OUP, 1978.

Chelliah, S. *Translation: Theory and Practice*. Jeyalakshmi Publishers, 2018.
Gupta, R.S. *Literary Translation*. Creative Books, 1999.
Kuhiwczak, Piotr and Karin Littau(eds). *A Companion to Translation Studies*. Orient BlackSwan, 2016.
Newmark, Peter. *A Textbook of Translation*. Prentice Hall, 1988.
Savory, Theodore. *The Art of Translation*. Cape, 1957.

Mapping of the course outcomes (COs) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1		2				
CO2					5	
CO3			3			
CO4					5	
CO5						6

Mean: 4.2

PGE/PSE 5463 HISTORY OF THE ENGLISH LANGUAGE 6 Hrs/4 Cr.

The course aims to introduce students to history of the English language from the beginning to the contemporary age. This course also introduces students to the various aspects of the English language.

At the end of the course students will be able to

i. construct the history of English in terms of how it is historically developed, socially learnt, and orally transmitted,
ii. critique the influence of social happenings on English,
iii. evaluate the influence of science and colonization on the development of English as international language,
iv. appraise the various development that promoted English vocabulary and meaning, and
v. defend the changing nature of the English language.

Unit 1 **Old & Middle English**
Theories on the Origin of Language, Origin of English, Old English: Sounds, Letters, Vocabulary, Grammar, Vowel Gradation, i-mutation, & Influence of Foreign Languages, Middle English: Sounds, Words, Influence of French, Grammar

Unit 2 **Renaissance and Reformation**
Influence of the Renaissance and Reformation on English, Early Modern English, & Role of Dictionaries in English

Unit 3 **English Vs. Science & Colonization**
Influence of Science & Technology, Colonization, the World Wars on English, Branching of English into National Dialects

Unit 4 **Vocabulary & Meaning**

Growth of Vocabulary, Change of Meaning, & Etymology of Words

Unit 5 **Status of English in the 21st Century**
Contemporary English, English for Specific Purposes, English as a Global Language, English as the Language of the Virtual World

References

Baugh, Albert C. 2000. *A History of the English Language*. Routledge.
Flavell, Linda and Roger. 2000. *Dictionary of Word Origins*. Kyle Cathie.
Jesperson, Otto. 2009. *Growth and Structure of the English Language*. Cambridge Scholars Publishing.
Wood, Frederick T. 1979. *An Outline History of the English Language*. Macmillan.
Wrenn, C. C. 2001. *The English Language*. Vikas.

Mapping Course Outcomes with Bloom's Taxonomy

Bloom's Taxonomy	K1	K2	K3	K4	K5	K6
CO1						6
CO2					5	
CO3					5	
CO4					5	
CO5					5	

Mean: 5.2

PGE/PSE 5454 LITERARY CRITICISM & THEORY II 6Hrs./4Cr.

Being the second and final sequential course, it is intended to introduce students to six literary theories from Marxism to postmodernism, and to enable students to critically examine their strengths and limitations.

At the end of the course, students will be able to

i. evaluate the basics of Marxism and feminism,
ii. justify their grasp of psychoanalytic reading of literary texts,
iii. design postcolonial reading strategies to read canonical literary texts,
iv. integrate literary texts along with the non-literary, and
v. restructure a text from postmodernist point of view.

Unit 1 **Marxism & Feminism**

Raymond Williams	From Marxism and Literature (1977)
Etienne Baliber & Pierre Macherey	From Literature as an Ideological Form (1978)
Elaine Showalter	"Towards a Feminist Poetics" (1979)
Annette Kolodny	From *Dancing through the Minefield: Some Observations on the Theory, Practice and Politics*

Unit 2	**Psychoanalysis**	
	Sigmund Freud	"The Interpretation of Dreams" (1900)
	Frantz Fanon	"The Negro and Psychopathology" (1952)
Unit 3	**Postcolonialism**	
	Edward Said	From *Culture & Imperialism* (1983)
	Gayatri Chakravorty Spivak	From *The Post-Colonial Critic* (1990)
	Homi Bhabha	"Of Mimicry and Man: The Ambivalence of Colonial Discourse" (1983)
Unit 4	**New Historicism**	
	H. Aram Veeser	"The New Historicism" (1994)
	Stephen Greenblatt	"The Improvisation of Power" (1994)
	Catherine Gallagher	George Eliot and *Daniel Deronda*: The Prostitute and the Jewish Question"
Unit 5	**Postmodernism**	
	Jean-Francois Lyotard	Answering the Question: What is Postmodernism? (1986)
	Terry Eagleton	From *The Illusions of Postmodernism* (1977)

References

Rice, Philip & Patricia Waugh, eds. *Modern Literary Theory*. Arnold, 2001.
Rivikin, Julie & Michael Ryan, eds. Literary Theory: An anthology. Blackwell, 2004.
Veeser, H. Aram, ed. The New Historicism: Reader. Routledge, 1994.

Mapping of the Course Outcomes (COs) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1					5	
CO2					5	
CO3						6
CO4						6
CO5						6

Mean: 5.6

PGE/PSE 5456 NEW LITERATURES IN ENGLISH 5Hrs/ 4 Cr

This course aims at a critical engagement with the literary texts that have emerged from countries in Asia, Africa, Canada, the Caribbean Islands and the Oceanic world. These regions have their own specific experiences with and histories of European colonization. The literary responses from the former colonies are an anti-colonial and anti-essentialist discourse that interrogates the colonial constructions of the Other. Students will engage with these texts from the postcolonial perspective. This course will also help students explore the portrayal of colonial process and the strategies of anti-colonial resistance that inhere in these texts. They will also be able to analyze the relevance of Postcolonialism in the era of globalization.

At the end of the course students will be able to

i. appraise the philosophical and theoretical issues relating to colonialism, race, mimicry, Orientalism, indiegneity, de-colonisation and postcolonial condition,
ii. assess central issues and techniques in literary texts from these regions,
iii. evaluate literary texts by using key theoretical concepts in Postcolonial Studies such as cultural encounter and change, negritude and apartheid,
iv. critique concepts such as Migration, creole and hybridity, and
v. formulate paradigms of cultural formation and diversity through the notions of Diaspora, Home-in-exile, post-nation and to engage with emerging global concerns.

Unit 1 **Introduction: Definitions, Scope, Politics**

C.D. Narasimaiah	"Commonwealth or Commonwealth of Literature"
Ngũgĩ wa Thiong'o	"The Language of African Literature," *Decolonising the Mind*
Ania Loomba	"Situating colonial and Postcolonial studies," *Colonialism/Postcolonialism,* pp. 7-24

Unit 2 **South and South East Asia**

Kee Thuan Chye	*1984 Here and Now*
Shyam Selvadurai	*Funny Boy*

Unit 3 **Africa**

Wole Soyinka	*The Strong Breed*
James Coetzee	*Waiting for the Barbarians*
Chimamanda Ngoziande Adichie	*Half* A *Yellow Sun*

Unit 4 **The Caribbean**

Derek Walcott	*The Pantomime*
	"A Far Cry from Africa"
Sam Selvon	*Those who Eat the Cascadura*

Unit 5 **Australia/Canada/New Zealand**

David Malouf	*An Imaginary Life*
Michael Ondaatjee	*The English Patient*
Briar Grace-Smith	*Nga Pou Wahine*

References

Ashcroft, Bill, et al. *The Empire Writes Back: Theory and Practice in Post-Colonial Literatures*. Routledge, 2002.
Birbalsingh, Frank. *Novels and the Nation: Essays in Canadian Literature.* TSAR Publications, 1995.
King, Bruce. *The New English Literatures: Cultural Nationalism in a Changing World.* Macmillan, 1980
Loomba, Ania. *Colonialism/Postcolonialism*. Routledge, 1998.
West Indian Literature. (1973). Macmillan, 1973.
Narasimhaiah, C.D. (ed.). *Commonwealth Literature*. Oxford university Press, 1976.
---. (ed.). *Awakened Conscience: Studies in Commonwealth Literature*. Sterling, 1978.
Walsh, William (ed.). *Readings in Commonwealth Literature.* Clarendon, 1973.
---. *Commonwealth Literature.* Oxford University Press, 1973.

Mapping of the Course Outcomes (COs) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1					5	
CO2					5	
CO3					5	
CO4					5	
C05						6

Mean: 5.2

PGE/PSE5458 INDIAN LITERATURE IN TRANSLATION 5 Hr. /3 Cr.

This course offers students a chance to be aware of, and read the literature of their own country. Students are to be sensitised about the different cultures and societies that exist in our nation. This course also exposes the students to the influences such as politics, history, social customs in making up the region and the nation. The students are expected to read these creative works written by well-established regional writers who have captured the essence of India.

At the end of the course, students will be to

i. survey the existence of different cultures and sub-cultures in India,
ii. analyse the social structure that exists in each region,
iii. assess different kinds of regional writers and their writing techniques,
iv. evaluate the political, historical, religious and social narrations of the texts, and
v. express the human psyche, emotions and conflicts represented in the works.

Unit 1 **Poetry**

Natrinai	172 Playing with friends one time
Kurunthokai	40 Your mother and my mother
Bharathiyar	I dreamed a dream my friend
Chulikad	Where is John?
JyothnaKalita	Home Tr. Kallol Choudhury
Shakti Chattopadhyay	I could go, but why should I? Tr. Antara Dev Sen

	Naseem Shafaie	Deception Tr. Brij Nath Betab
	NamdeoDhasal	People Tr. DilipChitre
	Sujata Chaudhry	The Last Question Tr. Poet
	Amrita Pritam	I will meet you yet again Tr. NirupamaDutt
Unit 2	**Fiction I**	
	ThakazhiSivasankara Pillai	*Chemmeen* Tr.Anita Nair
	P. Sivakami	*TheGrip of Change*
	U.R. Ananthamurthy	*Samskara* Tr. A.K. Ramanujan
Unit 3	**Fiction II**	
	Mahasweta Devi	*Pterodactyl* Tr. Gayatri Chakravorty Spivak
	Premchand	*Godan* Tr. Jai Ratan, P.Lal
Unit 4	**Drama**	
	Vijay Tendulkar	*Silence! The Court is in Session* Tr. Priya Adarkar
	Girish Karnad	*Hayavadana* Tr. Author
Unit 5	**Prose**	
	E.V. Ramaswamy (Periyar)	Rationalism
	Raj Gauthaman	Dalit Culture Tr. M.S.S. Pandian
	A. Balakrishna Pillai	The Art of Acting Tr. Leela Muralidharan
	M. Govindan	The Psychology of Power Tr. AnithaDevasia

References

Indian Drama. Publication Division, Govt. of India, 1981.
Iyengar, Srinivasa. *Indian Writing in English*. Sterling Publishers, 1962.
Rao, P. Mallikarjuna & M. Rajeshwar (Ed.). *Indian Fiction in English*. Atlanta Publishers, 1999.
Satchidanandan, K. *Indian Poetry: Modernism and After: A Seminar*. Sahitya Akademi.
Tiwari, Shuba (Ed.). *Indian Fiction in English Translation*. Atlanta Publishers, 2005.

Mapping of the Course Outcomes (COs) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO 1				4		
CO 2				4		
CO 3					5	
CO 4					5	
CO 5						6

Mean: 4.8

PGE/PSE5460 EUROPEAN LITERATURES IN TRANSLATION 5 Hrs./4Cr.

Europe has always been the hub of political, philosophical and aesthetic activities. The intended learning outcome of this program is that students will have learned how literary texts record, respond to and influence the socio-political activities of a nation.

At the completion of this course, students will be able to

i. examine the literary texts of at least five major western literatures namely Greek, German, Italian, French and Russian that are part of the European Literary canon,
ii. evaluate by re-reading the classical concepts using the tools of Marxism, Existentialism, and the Absurd,
iii. critique civilization, human dignity, honor, patriotism and political ideologies such as socio-political myths,
iv. justify the accountability and social responsibilities of literary writers who were literary activists, and
v. validate how modern European literature brought down the barrier between work and art to evolve the concept of work of art.

Unit 1	**Poetry**	
	Homer	*The Iliad* Bk xxiv "Priam and Achilles"
	Virgil	The Aeneid_Bk I The Trojans reach Carthage
	Johann Wolfgang von Gothe	*Faust* "Prologue in Heaven"
	Dante Alighieri	*Divine Comedy*_3 Paradise Canto XXX "Dante Swathed in Light"
Unit 2	**Modern poetry**	
	Charles Baudelaire	"Her Hair"
	Gunter Grass	"Do Something"
	Yevtushenko	"Babiyar" "Lies"
Unit 3	**Classical Prose**	
	Plato	"The Apology of Socrates"
	Michel De Montaigne	"Of Cannibals"
	Jean- Jacques Rousseau	"Confessions" Part I Book I
	Fyodor Dostoevsky	"Notes from Underground"
	Albert Camus	"The Myth of Sisyphus" *The Outsider*
Unit 4	**Fiction**	
	Anton Chekov	"Vanka"
	Leo Tolstoy	*The Death of Ivan Ilyich*
	Franz Kafka	*The Metamorphosis*
Unit 5	**Drama**	
	Sophocles	*Oedipus Rex*
	Samuel Beckett	*Waiting for Godot*
	Eugene Ionesco	*Rhinoceros*

References

Bradbury, Malcolm and James Mcfarlane (eds.). *Pelican Guide to European Literature: Modernism.* Pelican, 1981.
Thorlby, Anthony (ed.). *Companion to European Literature*. Penguin Books, 1969.

Mapping of the Course Outcomes (COs) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1			3			
CO2					5	
CO3					5	
CO4					5	
CO5						6

Mean – 4.8

PGE/PSE 5462 TEACHING OF ENGLISH AS A SECOND LANGUAGE 5 Hrs/4 cr.

This course provides the theoretical input and the practice-teaching required for prospective teachers of English in the present context. It enables the students to learn theoretical concepts which serve as a back drop for teaching English, get trained in the methodology of teaching English as a second language, and in the material preparation, and also gain opportunities to teach in classroom situations in the college.

At the end of the course, students will be able to

i. appraise different teaching and learning of English,
ii. evaluate merits and limits of skill based teaching,
iii. integrate teaching with areas of applied linguistics,
iv. discuss the recent ELT theories, and
v. plan & prepare teaching in real time classroom situation

Unit 1 **Methodology**

Study the practices and procedures used in teaching and the principles and beliefs that under lie them- Methods Debate-Grammar-Translation Method-Audiolingualism- 'Designer Methods'- Communicative Language Teaching-Task Based Language Teaching and Second Language Acquisition Research

Unit 2 **Teaching of Listening, Speaking, Reading & Writing**

Listening: Top-down and bottom-up processing; different listening types; specific information and gist/global listening, inferences; examples of listening task types

Speaking: Identify the "levels" of spoken language and explain their relationships; main difference between audiolingual method and communicative language teaching; techniques for fostering speaking skill

Reading: concepts central to understanding reading; silent reading, interactive models of reading, reading fluency, extensive reading and intensive reading; practical classroom techniques for teaching reading

Writing: ways of introducing writing instruction to ESL class- Process Vs Product approach to writing; quick writing; brainstorming; word mapping; drafting and peer review- Assessment options

Unit 3 **Applied Linguistics**
Sociolinguistics, Psycholinguistics, Error Analysis, Contrastive Analysis, Lexicography.

Unit 4 **Recent ELT Theories**
Collaborative Learning, Flipped Classroom, Mobile Assisted Language Learning (MALL), Content and Language Integrated Learning (CLIL), Socio Constructivism.

Unit 5 **Practice Teaching**
Internship involves practical teaching and teaching in real time classroom situation

References

Anderson, N.J. 1999. *Exploring Second Language Reading: Issues and Strategies*. Heinle & Heinle.
Bailey, KM. and L. Savage (eds) 1994. *New Ways in Teaching Speaking*. TESOL.
Beatty, K. (2003). *Applied Linguistics in Action*: CALL. Pearson
Benson, P. 2001. *Teaching and Researching Autonomy in Language Learning*. Longman.
Campbell, C. 1998. *Teaching Second Language Writing*: Interacting with text. Heinle & Heinle
McCarthy, M.1991. *Discourse Analysis for Language Teachers*. CUP.
Mendelsohn, D. and J.Rubin (eds) 1995. *A Guide for the Teaching of Second Language Listening*. Dominie Press.
Nunan,D. 1999. *Second Language Teaching and Learning*. Heinle & Heinle
Richards J. and W. Renandaya (eds) 2002. *Methodology in Language Teaching*. CUP.

Mapping Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1					5	
CO2					5	
CO3						6
CO4				4		
CO5						6

Mean: 5.2

PGE/PSE 5464 RESEARCH METHODOLOGY 4Hrs/2Cr.

The course intends to familiarizing students with the research traditions of language and literature research according to Modern Language Association (MLA) and American Psychological Association (APA).

At the end of the course, students will be able to

i. devise research writing,
ii. formulating research papers,
iii. devise mechanics of writing,

iv. produce MLA documentation & citation traditions, and
v. produce APA documentation & citation traditions.

Unit 1 Research & Writing
Unit 2 Formatting Research Paper

Unit 3 Mechanics of Writing

Unit 4 Documentation of Works Cited & Cited in the Text (MLA)

Unit 5 Documentation of Works Cited & Cited in the Text (APA)

References

American Psychological Association. 2013. *Publication Manual of the American Psychological Association.* 6th ed.
Modern Language Association. *MLA Handbook.* 8th ed. 2016.

Mapping of the Course Outcomes (COs) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1						6
CO2						6
CO3						6
CO4						6
CO5						6

Mean: 6

PGE/PSE 5466 **PROJECT** **3Hrs./2Cr.**

The main purpose of the Master's Project Proposal is to help students organize ideas, material and objectives for their Master's Thesis, to fine tune their higher order thinking skills, and to begin development of communication skills.

At the completion of the project, students will be able to

1. formulate scientific research questions,
2. hypothesize research problems/create thesis statement,
3. solve the problem/issue with scientific approach (theory-based),
4. prepare interpretation, discussion, and communication of language issues and literary texts in written form, and
5. express experience in critical/academic writing.

Unit 1 **Rudiments**
Chose the topic in collaboration with the supervisor
Discuss the research questions, goals, approach, methodology, data needed (texts & issues) with the supervisor
Work in Progress I

Unit 2 **Review of Lit & Outline Preparation**
Define and read key literature

Construct a logical outline for the project
Work in Progress II

Unit 3 **Identifying Theories**
Literary and Language Theories
Relating it to the texts/problems chosen
Work in Progress III

Unit 4 **Primary & Secondary Reading & Chapter Division**
Critical Reading of texts
Conducting pilot study and experiments/field work
Chapterization
Work in Progress IV

Unit 5 **Thesis Writing & Defense**
Writing a full length thesis in 40 pages on 4size paper in Times New Roman Font 12 two-line spacing without justifying the pages
Submission
Defence of the thesis in an open house viva voce
Identifying Include analysis steps and expected outcomes

Mapping of the Course Outcomes (COs) with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1						6
CO2						6
CO3						6
CO4						6
CO5						6

Mean: 6

Administrative Steps to Follow
Institutional intervention is crucial in effectively guiding the students and therefore the following administrative steps can be considered:

1. Encourage students to involve themselves in both language and literature (action) research with a view to producing original knowledge.
2. Translation of critical-theoretical writings and critical study of different translations of creative writings along with the original can be encouraged
3. Students are encouraged to explore unexplored texts/writers.
4. Each student is expected to have presented at least one research paper in the chosen area for presentation at national/international conferences.
5. All the faculty members of the department are eligible to be project supervisors.
6. They can guide candidates either in language or in literature; it is better to inform the students about the area of specialization/interests of the faculty supervisors.
7. Guides will be chosen by candidates through lots after identifying their area of research—language and literature.
8. Students can seek the help from supervisors outside the regular working hours.

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9. There shall be five stages across the project period as unitized. There will be four work-in-progress sessions and they are followed by submission of thesis and viva voce before the commencement of the end-of-semester examinations.
10. CIA Weight for the Project: 20% for topic defence, 20% for work-in-progress sessions, and 60% for the final written project to be awarded by the supervisor.
11. EOS Weight for the Project: 60% for the thesis and 40% for viva voce.
12. Performance of a candidate in viva voce shall be evaluated collectively by the viva board for 100 marks.
13. The viva voce board shall consist of the PG Head & PG Coordinator of the department & the Guide.
14. Project shall have a separate course code.
15. Project carries two credits.

Program of Courses for the M.A Degree in Economics under CBCS (With effect from 2019-20)

M.A Economics program highlights practical applications of economic theory. It is organized to provide students with analytical tools by which they can use to solve many economic problems existing in the real world. The program provides students with practical econometric skills that are popularly used in both private and public sectors. Students will be able to apply critical thinking, quantitative reasoning skills, problem-solving skills and communication skills

Course Code	Course Title	Contact Hours	Credits	Max Marks
	I SEMESTER			
PEC 4431	Price Theory I	6	4	080
PEC 4433	Macro Economic Analysis I	6	4	080
PEC 4435	Public Economics	6	4	080
PEC 4337	Mathematical Methods and Applications	4	3	060
PEC 4339	Statistical Methods and Applications	4	3	060
PEC 4341 PEC 4343	Globalization and Economic Reforms Buffer course : Human Development	4	3	060
	Total	30	21	
	II SEMESTER			
PEC 4432	Price Theory II	6	4	080
PEC 4434	Macro Economic Analysis II	6	4	080
PEC 4436	Econometric Theory and Applications	6	4	080
PEC 4338	Research Methodology	4	3	060
PEC 4340	Agriculture and Rural Development	4	3	060
PEC 4342 PEC 4344	China and Global Economy Buffer course : Small Business Management	4	3	060
	Total	30	21	
	III SEMESTER			
PEC 5431	Environmental Economics	6	4	080
PEC 5433	Financial Markets and Services	6	4	080
PEC 5435	Advanced Econometrics	4	4	080
PEC 5437	Actuarial Economics	4	4	080
PEC 5439	Computer Applications in Economics (Lab)	4	4	080
PEC 5400	Special Area Study	6	4	--
	Total	30	24	
	IV SEMESTER			
PEC 5632	International Economics	7	6	120
PEC 5634	Indian Economy	7	6	120
PEC5436	Development Economics	6	4	080
PEC 5438	Gender Economics	4	4	080

PEC5400	Project	6	4	160
	Total	30	24	
	Grand Total	120	90	

Special Area Study and Project are sequential courses

Programme Specific Outcomes (PSOs) for MA Economics

On completion of the programme, postgraduates will be able to

1. Gain an understanding of core economic principles and how they apply to a wide range of real-world issues.
2. Study the various terms, concepts principles and theories in Economics.
3. Learn how to articulate pragmatic, principles-based policies to enhance economic well-being and promote social justice.
4. Understand research methodology in Economics to undertake research.
5. Apply the quantitative techniques and its applications in Economics.
6. Explore topics relevant to academic, Industry and policy-making fields.
7. Analyze macroeconomic policies including fiscal and monetary policies of India
8. Determine economic variables which will help to make decisions regarding entrepreneurship, market and Industry
9. Identify the theoretical and applied tools necessary to critique and create economic research.
10. Comprehend the global economic understanding like Globalization, Privatization and Liberalization.

Mapping of Courses with Programme Specific Outcomes (PSOs)

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PEC 4431		X	X		X	X		X	X	X
PEC 4433	X	X	X		X	X	X	X	X	X
PEC 4435	X	X	X		X	X		X	X	X
PEC 4337	X	X	X		X	X		X	X	X
PEC 4339	X	X	X		X	X		X	X	X
PEC 4341	X	X	X			X	X	X	X	X
PEC 4343	X	X	X			X	X	X	X	X
PEC 4432		X	X		X	X		X	X	X

PEC 4434	X	X	X		X	X		X	X	X
PEC 4436	X	X	X		X	X		X	X	X
PEC 4338	X	X	X	X	X	X	X	X	X	X
PEC 4340	X	X	X			X	X		X	X
PEC 4342	X	X	X		X	X			X	X
PEC 4344	X	X	X		X	X			X	X
PEC 5431	X	X	X	X	X	X	X		X	X
PEC 5433	X	X	X		X	X	X		X	
PEC 5435	X	X	X	X	X	X			X	X
PEC 5437	X	X	X	X	X	X			X	X
PEC 5439	X	X	X	X	X	X			X	X
PEC 5400	X		X	X	X	X	X	X	X	X
PEC 5632	X	X	X	X		X	X		X	X
PEC 5634	X	X	X			X	X	X	X	X
PEC5436	X	X	X	X		X	X		X	X
PEC 5438	X	X	X	X		X	X		X	X
PEC5400	X		X	X	X	X	X	X	X	X

Mapping of PSOs with POs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
PSO 1	X	X		X		X	X	X	X	X
PSO 2	X	X	X	X			X	X	X	X
PSO 3	X	X	X	X	X	X	X			X
PSO 4	X	X	X	X	X	X	X		X	
PSO 5	X	X	X	X	X	X	X		X	

PSO 6	X	X		X		X	X	X	X	X
PSO 7	X	X	X	X		X	X	X	X	
PSO 8	X	X	X	X		X	X	X	X	
PSO 9	X	X	X	X	X	X	X			X
PSO 10	X	X	X	X		X	X	X		X

PEC 4431 PRICE THEORY - I 6 Hrs/4 Cr

The student's get trained with the knowledge to handle tools of price theory in Economic Analysis

At the end of the course, students will be able to

i. Recognize the relevance of economic models in price theory.
ii. Apply theoretical constructs of consumer behavior in decision making
iii. Identify the choice of production technology and scalability in resource use efficiency
iv. Acquire the skill of differentiating firm's behavior under market structure
v. Appraise decision making and profit seeking strategies under oligopolistic models

Unit- I: Models and Demand Analysis

Models: Relevance of Economic Models – Types – Markets: Classification – Criteria - Consumer Behaviour: Cardinal Utility Theory – Indifference Curve Theory – Revealed Preference Hypothesis – Determinants and Exception to Law of demand – Elasticity of demand

Unit -II: Cost and Production Theories

Cost – Types – Traditional vs. Modern Theories – Scale Economies - Production Function – Technical Progress and Production Function – Equilibrium of the Firm – Laws of Production: Law of Variable Proportion – Returns to Scale

Unit -III: Firms and Market Structure

Perfect Competition: Short and Long Run Equilibrium - Monopoly: Short and Long Run Equilibrium – Comparison with Pure Monopoly – Bi-lateral Monopoly – Price Discrimination – Effects of Discrimination – Monopoly power - Monopolistic Competition: Product Differentiation - Equilibrium of the Firm

Unit -IV: Oligopolistic Models

Non-Collusive Oligopoly: Curonot's Duopoly Model – Bertran's Duopoly – Chamberlin's Oligopoly – Kinked Demand Curve Model – Stackelberg's Duopoly Model - Collusive Oligopoly: Cartels – Joint Profit Maximisation – Market Sharing Cartels – Price Leadership – Low Cost Firm Leader – Dominant Firm Price Leader – Barometric Price Leadership

Unit -V: Critique on Marginalism

Assumptions of Neo Classical Theory – Hall and Hitch Report and the Full-Cost Pricing Principle – Gordon's Attack on Marginalism – In Defense of Marginalism

Text Books

1. Ahuja, H.L. (2012), Advanced Economic Theory, Chand and Company Limited, New Delhi.
2. Koustoyiannis. A, (2013), Modern Micro Economics, Mac Millan Press Limited, London.

References

1. Joshi, J.M. and Joshi, R. (1994), Micro Economic Theory: Analytical Approach, Vishwa Prakashan, New Delhi.
2. Watson, D.S., and Getz, M. (1996), Price Theory and its Uses, AITBS Publishers and Distributors, New Delhi.
3. Peter Pashigian, B. (1999), Price Theory and Applications, Irwin Mc Graw Hill, Boston, USA.
4. Gould, J.P. and C.E. Ferguson, (2003), Micro Economic Theory, AITBS, New Delhi
5. Robert S. Pindyck and Daniel L. Rubengeld, (2006), Micro Economics, Prentice Hall of India Limited, New Delhi.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying		3			
K4: Analyzing				4	
K5: Evaluating	5		5		
K6: Creating					6

Mean: 4.6

PEC 4433 MACRO ECONOMIC ANALYSIS – I 6 Hrs/4 Cr

Theoretically and empirically, Macro Economic behavior in its facts the behavior of aggregative variables related to macro policy. National income accounting as the basis for aggregative supply and aggregative demand, consumption function, multiplier, supply and demand for money

At the end of the course, students will be able to

i. Apply methods of accounting national income vis-à-vis competing accounting systems
ii. Appraise Keynesian approach to income, output and employment
iii. Identify nature and types of investment in view of super multiplier
iv. Find out ways and means of regulating economic behavior of money supply
v. Examine motives behind demand for money in view of liquidity preference

Unit -I: National Income and Accounting

Income and related concepts - Circular Flow of Income in two - three - and four - sector economy; different forms of national income accounting — social accounting, input-output accounting, flow of funds accounting and balance of payments accounting

Unit -II: Consumption Function

Consumption – classical Vs modern - Keynes' psychological law of consumption — implications and Empirical evidence on - Determination of Income, Output, and Employment - Aggregate demand function and Aggregate supply function - Income-consumption relationship — absolute income, relative income, life cycle and permanent income hypotheses

Unit -III: Investment Function

Investment – types - Marginal efficiency of investment - Marginal efficiency of capital - Investment behavior – accelerator, multiplier and super multiplier - effect of policy measures on investment

Unit -IV: Supply of Money

Money – types – money as financial intermediation — a mechanistic model of bank deposit determination - A behavioral model of money supply determination, a demand determined money supply process, RBI approach to money supply, High powered money and money multiplier - budget deficits and money supply - money supply and open economy - control of money supply

Unit -V: Demand for Money

Classical approach to demand for money — Quantity theory approach, Fisher's equation, Cambridge quantity theory, Keynes's liquidity preference and demand for money — aggregate demand for money; Derivation of LM curve

Text Books

1. Edward Shapiro, (2013), Keynes and Post – Keynesian Economics, Kalyani Publishers, New Delhi
2. Rana and Verma, (2015), Macro Economic Analysis, Vishal Publication, Jalandhar.

References

1. Danlio, EA. (1974), Macro Economic Theory, Prentice Hall of India, New Delhi
2. Brooman, F.S., (1976), Macro Economics, Blackie and Son Limited, London.
3. Campbell R Mconnel and Harish C Gupta, (1987), Introduction to Macro Economics, Tata Graw Hill Publishing Company Limited, New Delhi.
4. Gupta, R D and A.S. Rana, (1997), Keynes and Post-Keynesian Economics, Kalyani Publishers, New Delhi.
5. Branson, (2003), Macro economic theory and policy, AIMBS, New Delhi..
6. .Richard T. Froyen, (2003) Macro Economics – Theories and Policies, Pearson Education, New Delhi
7. Rana and Verma, (2007), Macro Economic Analysis, Vishal Publication, Jalandhar

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying	**3**				
K4: Analyzing			**4**		
K5: Evaluating		**5**		**5**	
K6: Creating					6

Mean: 4.6

PEC 4435 PUBLIC ECONOMICS 6 Hrs/4 Cr

Students can acquaint and understand with the changing role and functions of government in economic transition. Students will learn the knowledge of relative roles of government and the market in matters related to public goods, finance, enterprise and social welfare

At the end of the course, students will be able to

i. Apply value judgments in comprehending public goods and their inbuilt social welfare
ii. Evaluate nature and mode of state intervention in economic governance
iii. Assess role of state as a means of market failure
iv. Apprise public spending as state intervention in economic activities in view of public sector dominance
v. Review analytically the rationale of public policy with regard to social justice and economic stabilization

Unit- I: Public Goods and Welfare

The Value Judgments, Inter-Personal relationship and Social Welfare –Spillover Benefit and Cost-Efficient Provision of Public Goods and Private Goods – Principle of Exclusion and Consumption, Classification of Goods: Private, Toll, Collective and common pool Goods – Merit Goods, Demerit Goods -Economic and Social Goods – Mixed Goods

Unit- II: Economic Governance

Demand for and Supply of Government Services – Role of Government in a Mixed Economy onto market economy - Corporate Governance and Forms of Economic Governance – E-Governance – Privatization- PPP Model – Laffer Curve analysis

Unit -III: Public Activities

Engle's Law – Application of Wagner's Law of Increasing State Activities – Peacock–Wiseman Hypothesis – Lindhal, Samuelson Views on Benefit Principle – Evaluation and Project Expenditure Evaluation

Unit- IV: Public Policy

Rationale of Public Policies - Poverty Alleviation and User Price - Provision of Infrastructure, Correcting Regional Imbalance – Balanced Budget Multiplier – Automatic and Discretionary Stabilizers – Built-in-Flexibility – Functional Finance – Fiscal Policy for Economic Development

Unit- V: Government Finance

Concept of Tax Incidence – Fiscal Incidence - Public Debt Redemption – Theories of Budgets – Performance Budgeting – Programme Budget – Zero Base Budgeting – Budget as the means of operationalising the Planning Process – Fiscal Federalism and Cooperative Federalism- GST - Local Finance .

Text Books

1. Tyagi, B. P. (2011), Public Finance, Jai Prakahnath Meerut.
2. Maria John Kennedy (2012), Public Finance, PHI Learning Private Limited, New Delhi.
3. Musgrave, R. A. and Peggy B. Musgrave, (2013), Public Finance in Theory and Practice, Mc Graw Hills, New York.

References

1. Chelliah, R. (1971), Fiscal Policy in Underdeveloped Countries, George Allen and Unwin, Bombay.
2. Dates, W. E. (1972), Fiscal Federalism, Harcourt Brace and Jovanowich, New York.
3. Peacock, A. and G. K. Shaw (1976), The Economic Theory of Fiscal Policy, George Allen and Unwin, London.
4. Musgrave, R. A., (1977), Essays in Fiscal Federalism, Greenwood Press, Westport.
5. Muller, D. C., (1979), Public Choice, Cambridge University Press, Cambridge.
6. Buchanan, J. M., (1980), Fiscal Theory and Political Economy, Selected Essays, University of North Carolina Press, Chapel Hill.
7. Mishra, D. K., (1985), Public Debt and Economic Development of India, Prince House, Lucknow.
8. Atkinson, A. B. and J. Estiglitz, (1989), Lecturers on Public Economics, McGraw Hill, New York.

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying	**3**				
K4: Analyzing			**4**		
K5: Evaluating		**5**			
K6: Creating				**6**	6

Mean: 4.8

PEC 4337 MATHEMATICAL METHODS AND APPLICATIONS 4 Hrs/3Cr

Students can benefit to use the techniques of mathematical methods which are commonly applied to understand and analyze economic problems

At the end of the course, students will be able to

i. Apply maximization/minimization principles in economic analysis
ii. Determine price, output and profit under different market conditions
iii. Estimate the extent of surplus realized in taking appropriate economic decisions with the help of application of integration
iv. Make use of difference equation in inventory management and investment decision making
v. Solve complex economic decisions of conflicting nature with help of linear programming and input - output model

Unit – I: Differential Calculus

Concept and Rules of Differentiation – Derivatives of Higher Order – Maximum and Minimum Values of a Function – Partial Derivatives – Applications – Utility, Production and Cost Functions with and without Constrained Optimization and Determination of Output and Profit Under Different Market Structures

Unit – II: Integral Calculus

Concept of Integration – Basic Rules and Methods of Integration – Applications in Economics – Consumer Surplus and Producer Surplus

Unit – III: Difference Equation

First Order Difference Equation and Applications – Cobweb Model – Market Model with Inventory – Multiplier and Accelerator Model

Unit – IV: Matrices and Linear Programming

Matrices – Types – Application of Matrices to the Solution of Linear Equations – Input-Output Analysis – Formulation of LP Problem – Concept of Duality – Graphical Solutions – Simplex Method

Unit – V: Game Theory

Concept of Game – Two-Person Zero-Sum Game - Pay-Off Matrix - Pure and Mixed Strategies, Maximum and Minimax Solutions – Graphical method -Saddle Point Solution – Non-Constant Sum Game – Prisoner's Dilemma

Text Books:

1. Henderson, J.M and R.E Quandt (2000). Micro Economic Theory: A Mathematical Approach, McGraw Hill, New Delhi.
2. Chiang, A.C. (2011), Fundamental Methods of Mathematical Economics, McGraw Hill, New York.

References:

1. Allen, R.G.D.(1976), Mathematical Economics, Macmillan, London.
2. Kothari, C.R (1982) , An Introduction to Operations Research, Vikas Publishing House, New Delhi.
3. Carl P Simson and Lawrence Blume, (2006), Mathematics for Economists, Viva Books (P) Ltd., New Delhi.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO3**	**CO4**	**CO5**	**CO6**
K1: Remembering					
K2: Understanding					
K3: Applying		3			
K4: Analyzing		4	4		
K5: Evaluating				5	
K6: Creating					6

Mean: 4.4

PEC4339 STATISTICAL METHODS AND APPLICATIONS 4 Hrs/3 Cr

Learners will get training in the application of statistical methods to enrich the understanding of economics and instill the scientific rigor in economic thinking and they can equip in use of the statistical tools to understand the economic theory better.

At the end of the course, students will be able to

i. Understand the significance of statistical applications in economic analysis
ii. Apply the methods of sampling to draw sample from population
iii. Examine distributional characteristics (level, spread and shape) of sample distribution

iv. Explore causal relationships among economic variables
v. Analyze inter-temporal changes in economic behavior over time and space

Unit-I: Introduction to Statistics

Meaning of Statistics - Characteristics – Functions – Importance – Limitations – Methods of Sampling – Sources of Data – Methods of Collecting data

Unit – II: Distributional Characteristics

Central Tendencies – Mean, Median, Mode – Measures of Dispersion – Range, Mean Deviation, Standard Deviation, Co-efficient of Variation, Quartile Deviation, Skewness and Kurtosis

Unit –III: "Bi-variate Analysis"

Correlation – Types – Karl Pearson Coefficient – Spearman Rank Correlation - Regression – Regression Co-efficient – Correlation Vs Regression-Attributes – Difference between Correlation and Attributes – Methods of Studying Association-Non-Parametric methods – Chi-square Test – Sign Test

Unit-IV: Time Series and Index Numbers

Time series analysis and its Components –-Index Numbers – Importance and Classification of Index numbers – Price, Quantity, Value: Laspeyer's, Paasche's and Fisher, Family Budget Method – Problems and Limitations of Index Number

Unit- V: Probability and Hypothesis testing

Probability and its related Concepts – Theorems of Probability – Addition and Multiplication-Theoretical Distribution – Binomial, Poisson and Normal: their Properties and Uses- Hypothesis testing – type I and II errors Z-test, t-test, F-test and ANOVA

Text Books

1. Gupta S P (2008), Statistical Methods, Sultan Chand & Sons, New Delhi.
2. Pillai R S N and Bagavathi , Statistics: Theory and Practice,(2009), S.Chand & Company Pvt.Ltd. New Delhi.

References

1. Elhance, D.N and Aggarwal, B.M (2006), Fundamentals of Statistics, Kitab Mahal, Allahabad.
2. Gupta, S.C and Kapoor, V.K (2007), Fundamentals of Applied Statistics, Sultan Chand and Sons, New Delhi.
3. Arora.P.N, Sumeet Arora and S.Arora (2007), Comprehensive Statistical Methods, Sultan Chand and Sons, New Delhi.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	**2**				
K3: Applying		**3**			
K4: Analyzing			**4**	**4**	
K5: Evaluating					
K6: Creating					**6**

Mean: 3.8

PEC 4341 GLOBALISATION AND ECONOMIC REFORMS 4 Hrs/3 Cr

The course enables students to acquaint with contemporary global economic affairs concerning economic, political and cultural dimensions of globalization, country experiences and economic reforms in India

At the end of the course, students will be able to

i. Understand social, economic, political, cultural and philosophy of globalization
ii. Analyze the role of international organizations in globalization
iii. Address issues and challenges in globalization
iv. Examine critically emergence of neo-liberalism in light of globalization
v. Assess Indian experience of economic reforms and globalization

Unit I: Introduction to Globalization

Meaning and Definition- Origin- Related Concepts- Profile of the World- Economic System- Features of Globalization – Process- Causes- Stages – Major Players-Ideology of Globalization: Economics, Political and Religious Dimensions – Globalization at the Firm and Corporate Level – Cross Border Mergers and Acquisitions – Advantages and Disadvantages – Essential Conditions for Globalization

Unit -II: International Organization and Globalization

IBRD, IMF, WTO – Origin, Objectives, Functions – WTO Agreements- Basic Principles – Main Elements- Agreements on Agriculture – Industry – Trade – Services – Property Rights – Rules of Origin

Unit- III: Globalization Issues and Challenges

State Vs Market – Deregulation and Decontrol – Investment: MNC's FDI and Capital Flows – Global Financial Crisis – Technology Transfer – Privatization – Factor Mobility - Alternatives to Globalization - Challenges

Unit- IV: Experiences of Countries on Globalization

Benefits of Globalization across Countries - Developed Vs. Developing, Small Vs. Large - Rich Vs. Poor - Experiences Asian Tigers

Unit -V: Globalization and Economics Reforms in India.

Economic Reforms – Origin – Features – Strategies (LPG) – Process - Agricultural and Industrial Sector Reforms - External Sector Reforms - Financial Sector Reforms – Fiscal and Banking Sector Reforms – Labour Reforms- Health and Education Sector Reforms

Text Books:

1. Martin Hhor (2001), Rethinking Globalization: Critical Issues and Policy Choices, Zed Books, London.
2. Jagdish Gandhi, P. (2003), Globalised Indian Economy: Contemporary Issues and Perspectives, Deep and Deep Publications Private Limited, New Delhi..
3. Datt, Ruddar (2015), Indian Economy, S. Chand and Company, New Delhi.
4. Radhakrishna, R (2008), India Development report, Oxford University press, NewDelhi.

References

1. Marjan and H W Singer (1996), The World Economy: Challenges of Globalization and Regionalization, Macmillan Press Ltd., London.
2. Sumi Krishna (2004), Globalization and people's development choices-Hivos-Netherlands.
3. Greg Buckman (2004), Globalization: Tame It or Scrap It? University Press, Dhaka
4. Stefano Pelle (2007), Understanding Emerging Markets, Response Book, New Delhi.
5. Thomas Sebastian (2007), Globalization and uneven Development, Rawat Publications, New Delhi.
6. Pranab Kanti Baxe (2008), Globalization An Anti-Text- A local view, Aakar Books – New Delhi.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying	3				
K4: Analyzing		4			4
K5: Evaluating				5	
K6: Creating			6		

Mean: 4.4

PEC4343 **HUMAN DEVELOPMENT** **4 Hrs/3 Cr**

The course enables students to acquaint Human Growth and Development is planned to acquaint you with developmental concepts in psychology and to give you an understanding of the basic dynamics, which underlie human behavior at various stages in the lifespan. Investigating these processes in relation to biological, psychological, socioeconomic and cultural factors

At the end of the course, students will be able to

i. Comprehend different dimensions of human development
ii. Analyze notion of human development within the framework of human capabilities and entitlement
iii. Appraise role of gender and its partnership in development
iv. Enable to perceive wholesome human development with inclusiveness of psychological and disabilities dimensions
v. Evaluate human development efforts, policies and strategies

Unit -I: Introduction to Human Development

Concept of Human Development - Defining Human Development - Measuring Human Development- HDI - Human Poverty Index - Gender Development Index (GDI) Gender Empowerment Measure (GEM) - Changes in and Implications of HDI and GDI Across the

Unit -III: Macroeconomics in an Open Economy

Mundell - Fleming model — Asset markets, expectations and Exchange Rates; Monetary approach to balance of payments

Unit -IV: Theory of Inflation

Classical, Keynesian and Monetarist approaches to inflation; Structuralist theory of inflation; Philips curve analysis — Short run and long run Philips curve; Samuelson and Solow — the natural rate of unemployment hypothesis; Tobin's modified Philips curve; Adaptive expectations and rational expectations; Policies to control inflation

Unit -V: Business Cycles

Theories of Schumpeter, Kaldor, Samuelson and Hicks, Goodwin's model; Control of business cycles — Relative efficacy of monetary and fiscal policies

Text Books

1. Rana and Verma, (2007), Macro Economic Analysis, Vishal Publication, Jalandhar.
2. Edward Shapiro, (2011), Keynes and Post – Keynesian Economics, Kalyani Publishers, New Delhi.

References

1. Danlio, EA. (1974), Macro Economic Theory, Prentice Hall of India, New Delhi
2. Brooman, F.S. (1976), Macro Economics, Blackie and Son Limited, London.
3. Campbell R Mconnel and Harish C Gupta, (1987), Introduction to Macro Economics, Tata Graw Hill Publishing Company Limited, New Delhi.
4. Gupta, R D and A.S. Rana, (1997), Keynes and Post-Keynesian Economics, Kalyani Publishers, New Delhi.
5. Branson, (2003), Macro economic theory and policy, AIMBS, New Delhi..
6. Richard T. Froyen, (2003), Macro Economics – Theories and Policies, Pearson Education, New Delhi

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying				**3**	
K4: Analyzing			**4**		
K5: Evaluating	**5**	**5**			
K6: Creating					6

Mean: 4.6

PEC 4436 ECONOMETRIC THEORY AND APPLICATIONS 6 Hrs/4Cr

This course aims at imparting analytical skill essential to validate economic phenomenon. It includes linear, multiple linear regression models, ANOVA, and violation of OLS assumptions.

At the end of the course, students will be able to

i. Comprehend the relevance of econometrics and econometric methodology
ii. Test bi-variate causal relationship between economic variables
iii. Explore multivariate causal relationships among economic variables
iv. Deduct and correcting violation of OLS assumptions in econometric models
v. Examine relationship between analysis of variance and regression

Unit -I: Introduction

Definition – Scope – Goals and Division of Econometrics – Methodology of Economic Research

Unit -II: Simple Linear Regression Model

Simple Linear Regression Model – Assumption of the Linear Regression Model – Properties of OLS estimators – Sampling Distribution of OLS estimators – Statistical tests of Significance of the Estimates Confidence Intervals and Hypothesis Testing – Goodness of Fit with R^2 – Applications.

Unit -III: Multiple Linear Regression Model

Multiple Linear Regression Model – Assumptions of the Multiple Linear Regression Model – Properties of OLS estimators – Generalization to More Than Two Variables – Both Normal and Matrix Approach – Application.

Unit -IV: Violation of OLS Assumptions

Tests of the Assumptions of the Linear Regression Model- – Normality – Autocorrelation – Meaning , Consequences, Detections and Methods of Removal- Hetrocdeasticity – Multi collinearity – Meaning – Consequences – Detections and methods of removal

Unit -V: Analysis of Variance and Regression Model

Analysis of Variance – Difference between Regression and Analysis of Variance – Sampling Distribution of OLS Estimators – Statistical Tests of Significance of the Estimates – Confidence Intervals and Hypothesis Testing – Goodness of Fit with R – Applications.

Text Books

1. Gujarati,D. (2009) , Basic Econometrics, Tata McGraw-Hill
2. G M K Madnani (2010), Introduction to Econometrics, Oxford & IBH Publishing Co Pvt. Ltd, New Delhi, India.

References

1. Johnston (1985), Econometrics, McGraw Hill, New York.
2. Koutsoyiannis, A. (2003), Theory of Econometrics, Harper and Row Publishers, Inc.,
3. Kements (2003), Elements of Econometrics, Harper and Row Publishers, New York.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	**2**				
K3: Applying					
K4: Analyzing		**4**			**4**
K5: Evaluating			**5**		
K6: Creating				**6**	

Mean: 4.2

PEC 4338 RESEARCH METHODOLOGY 4 Hrs/3Cr

Students can get training in scientific thinking and helps to develop socially concerned and competent researchers, administrators and activists. Students also acquaints with the identification of researchable problem, hypothesis formulation, research methods and techniques and ultimately the method of report writing

At the end of the course, students will be able to

i. Understand the basic skill of social science research and its relevance in addressing socio economic issues
ii. Identify researchable issues and developing a suitable research methodology
iii. Corroborate and formulating testable hypotheses
iv. Validate sources of data in relation to workable hypotheses

v. Apply qualitative and quantitative techniques to test hypotheses and arrive at statistical inferences for the chosen research

Unit- I: Introduction

Meaning – criteria for good research – assumptions, objectives and difficulties of social research – qualities of a good research

Unit- II: Dimensions of Research

Classification of research - fundamental – applied – descriptive – historical –exploratory-experimental - case study – characteristics of case study- sources -utility and limitations of case study method - survey research - evaluation – comparative method –precautions used in comparative method and inter disciplinary research

Unit- III: Hypothesis and Research problem

Selection of the research problem - types of research problem – sources-criteria of good research problem – justification of the problem evaluating the problem. Definition of hypothesis – types - functions, sources of hypothesis - criteria of usable hypothesis-utility - difficulties in formulation of hypothesis

Unit -IV: Sources of Data and Research Design

Meaning of research design - concepts relating to research design - major steps in preparing a research design - factors affecting research design - evaluation and advantages of research design-Sources of data – primary and secondary data - census and sampling method – essentials of a good sample - methods of sampling – observation - types of observation – merits and limitations

Unit -V: Scaling Techniques and Report Writting

Statistical applications in research-scaling techniques - criteria of validity of a scale - difficulties in scaling - kinds of scales - point scales - Bogardus scale - intensity scale, ranking scale - Scale and Likert scale - Processing, analysis and interpretation of data meaning of research report -purpose and structure of research report

Text Books

1. Thanulingam, N., (2012), Research Methodology, Himalaya Publishing House, Mumbai.
2. Kothari, C.R, (2013), Research Methodology: Methods and Techniques, Wiley Eastern Limited, New Delhi.

References

1. Kurein, C.T., (1973), A Guide to Research in Economics, Sangam Books, Madras.
2. Wilkinson and Pandarkar, (1984), Methodology and Techniques of Social Research, Himalaya Publishing House, Bombay.
3. Goode, William J. and Hatt, Paul K (1987), Methods in Social Research, Mc Graw Hill, London.

4. Sonachalam, K.S., (1988), Research Methodology of Social Sciences, Emerald Publication, Madras.
5. Diwivedi, R.S., (1997), Research Methods in Behavioral Sciences, Macmillan, New Delhi.
6. Sarvanavel, P., (1999), Research Methodology, Kitab Mahal, Allahabad.
7. Loraine Blaxter, Christina Hughes and Malcom Tight, (1999), How to Research, Viva Books Private Limited, New Delhi.
8. Martyn Denseombe, (1999), The Good Research Guide for Small-Scale Social Research Projects, Viva Books Private Limited, New Delhi.
9. Uma Sekaaran, (2006), Research Methods for Business- A skill building Approach, Wiley India (P) ltd, New Delhi.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	**2**				
K3: Applying			**3**		
K4: Analyzing					**4**
K5: Evaluating				**5**	
K6: Creating		6			

Mean: 4.0

PEC 4340 AGRICULTURE AND RURAL DEVELOPMENT 4 Hrs/3Cr

This course enables the students to obtain a detailed treatment of issues in agricultural economics and to get familiarized with policy issues that are relevant to Indian agricultural economics.

At the end of the course, students will be able to

i. Experience agriculture as a mainstay for development
ii. Enrich modernization, mechanization and labour absorption in agriculture
iii. Engage in development of integrated farming systems to enhance sustainable farm income
iv. Understand the relevance of building up rural infrastructure as a pre-requisite for viable agriculture

v. Assess the access and utilization of agricultural credit

Unit -I: Agriculture and Economic Development: Nature and Scope of Agricultural and Rural Economics - Traditional Agriculture and Its Modernization - Role of Agriculture in Economic Development - Interdependence between Agriculture and Industry - Models of Interaction between Agriculture and the Economy

Unit -II: Agricultural Production and Productivity: Agricultural Production - Agriculture Growth Debate - Farm Size and Laws of Returns – Size-Productivity Debate - Farm Budgeting - Resource Use Efficiency in Agriculture – Impact of Modernization and Mechanization on Agriculture - Reforms and Revolutions - Labour Absorption - Gender Issues in Agriculture

Unit- III: Diversification of Rural Economic Activities: Rural Livelihood System - Nature and Types of Rural Economic Activities - Livestock and Animal Husbandry Activities - Livestock Resources and Their Productivity -White Revolution - Fishery and Poultry Development - Blue Revolution- Forestry - Horticulture and Floriculture - Issues and Problems in Rural Industrialization - Development of Agro-based Industries - Problems of Agricultural Marketing

Unit-IV: Agriculture and Rural Infrastructure: Importance of Economic and Social Infrastructures - Land Resources, Water Resources - Energy Resources - Rural Transport - Communication - Banking - Extension Services - Rural Electrification - Rural Social Infrastructure: Education - Health - Information Dissemination

Unit -V: Rural Finance: Rural Indebtedness: Status, Causes and Remedies - Role of Capital and Rural Credit - Organized and Unorganized Capital Market - Rural Savings and Capital Formation - Characteristics and Sources of Rural Credit — Institutional and Non-Institutional - Reorganization of Rural Credit — Cooperatives, Commercial Banks, Regional Rural Banks- Role of NABARD - Self-Help Groups (SHGs) - Micro Units Development and Refinance Agency Bank (MUDRA Bank)

Text Books:

1. Subba Reddy S, P.Raghu Ram, T.V.Neelakanta Sastry abd I. Bhavani Devi (2010), Agricultural Economics, Oxford & IBH Publishing Co Pvr. Ltd, New Delhi.
2. Tyagi B.P. (2015), Agricultural Economics and Rural Development, Jai Prakash Nath & Co, Meerut

References:

1. Chaudhary, P. (1972), Readings in Indian Agricultural Development, George Allen & Unwin, London.
2. Bhaduri, A. (1984), The Economic Structure of Backward Agriculture, Macmillan, Delhi.
3. Uppal, J.S. (Ed.) (1987), India's Economic Problems — An Analytical Approach, Tata McGraw Hill, New Delhi.

4. Brahmananda, P.R. and V.R. Panchumukhi (Eds.) (1987), The Development Process of the Indian Economy, Himalaya Publishing House, Bombay.
5. Raj, K.N. et.al. (1988), Essays in the Commercialisation of Indian Agriculture, Oxford University Press, New Delhi.
6. Rao, C.H. Hanumantha (1994), Agricultural Growth, Rural Poverty and Environmental Degradation in India, Oxford University Press, New Delhi.
7. Vaidyananthan, A. (1995), The Indian Economy : Crisis, Response and Prospects, Orient Longmans, New Delhi.
8. Soni, R.N. (1995), Leading Issues in Agricultural Economics, Arihant Press, Jalandhar.
9. Bilgrami, S.A.R. (1996), Agricultural Economics, Himalaya Publishing House, Delhi.
10. Basanta K Pradhan, M.R.Saluja, P K Roy and S'L.Shetty (2003), Household Savings and Investment Behaviour in India, EPW Research Foundation, Mumbai

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	**2**				
K3: Applying			**3**	**3**	
K4: Analyzing					
K5: Evaluating					**5**
K6: Creating		**6**			

Mean: 3.8

PEC 4342 CHINA AND GLOBAL ECONOMY 4 Hrs/3Cr

The students get familiarized with the basic characteristics of Chinese Economy, its development process and its challenges and prospects. It helps to understand how each country is peculiar and enable them to learn from other economies.

At the end of the course, students will be able to

i. Familiarize the history, profile and features of Chinese economy
ii. Understand the ideology, political system and governance in China
iii. Analyze growth performance of China
iv. Examine China's approach to foreign relations and diplomacy
v. Trace the emerging market and the rise of China as a global power

Unit -I: Introduction to Chinese Economy

Profile of China – History – Culture – Resources – Infrastructure – Special Features of Chinese Economy – Relevance of Chinese Studies

Unit- II: China's Political System

Political Ideology - Party State - Structure and levels of Governance - Central and Local Relations

Unit -III: Economic Growth and Development of China

Dimensions of Growth and Development of China – Composition and Trends in National Income - Growth Models and New Economic Strategy - Achievements of China –Challenges and Prospects

Unit- IV: China's Foreign Relations and Policy

Priorities of Chinese Diplomacy – Relations with Nations of Groups (developed, developing and neighboring countries) - Dimensions of International Relations – China's Relations with India – China and International Organizations.

Unit- V: Emerging Market and China

Emerging Market- China's Contribution to World Economy - China and Globalization - Rise of China as a Global Power – World's View of China - Learning from China's Development Experience

Text Books:

1. Robert L. Worden, Andrea Matles Savada, and Ronald E. Dolan (1987): China, A Country Study. Area Handbook Series, Federal Research Division, Library of Congress Washington, D.C.
2. Shuxun Chen and Charles Wolf, Jr (2001): China, the United States and the Global Economy, RAND, Santa Monica, CA.

References:

1. Jan Joost Teunissen (2003) China's Role in Asia and the World Economy: Fostering Stability and Growth, FONDAD, The Hague.
2. Edward Friedman and Bruce Gilley (2005): Asia's Giants: Comparing China and India, Palgrave Macmillan Ltd, New York.
3. Dwight H. Perkins (2006): The Challenges of China's Growth, AEI Press, Washington, D.C.
4. Shaun Breslin (2007): China and the Global Political Economy, International Political Economy Series, Palgrave Macmillan Ltd, New York.

5. Martin Jacques (2009) When China Rules the World, Allen Lane, Penguin Books Ltd, London. England.
6. Vittorio Valli, Donatella Saccone (2009) Structural Change and Economic Development in China and India, Working paper No. 7/2009, University of Torino, Italy.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding		**2**			
K3: Applying					**3**
K4: Analyzing			**4**		
K5: Evaluating				**5**	
K6: Creating	**6**				

Mean: 4.0

PEC 4344 **SMALL BUSINESS MANAGEMNET** **4Hrs/3Cr**

Students will get better understanding of small business entrepreneurship that includes the concept of Enterprise; Project planning, financial and marketing feasibility and they will also learn the challenges of small business such as Innovation, and Crisis Management and inculcates in students the spirit of enterprise.

At the end of the course, students will be able to

i. Understand the types, role and environment of small business
ii. Identify business ideas and preparation of a project report
iii. Analyze marketing aspects of small business enterprises
iv. Examine the problems of small business and preparing SWOT analysis
v. Develop managerial skills in managing growth and transition of small enterprises

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Unit -I: Small Enterprise – An Introduction

Definition – Classification – Environment of Small Business – Role – Risk and Survival Strategy – Entrepreneurship and Small Enterprises – Nurturing Entrepreneurship

Unit- II: Project Planning

Search for a business idea – Environment scanning – concepts of Projects and classification – Project Identification – Formulation – Design and Network Analysis – Project Report – Project Appraisal: Factory Design and Layout – Shop Floor Environment – Forms of Organization – Incentives and Subsides – Finance and Consultancy supports

Unit- III: Marketing Assessment

Definition and Functions of Marketing – Marketing Mix – Marketing Channels – Packaging, Branding , Buying Motive – Marketing Institutions and Assistance – Marketing Research and Marketing Information System – Pricing – Market Segmentation and Marketing Strategies – Export Potential

Unit- IV: Challenges of Small Business

Problems of Small Business – Sickness – Reasons and Remedies – Creativity and Innovation – Opportunities – SWOT analysis – Product and Process Protection – Measures

Unit -V: Branding and Crisis Management

Patents – Trade Marks – Copy Rights – Managing Growth and Transition - Crisis Management – Time Management and Quality Management

Text Books

1. Suri, K.B. (2006) Small-Scale Enterprises in Industrial Development: The Indian Experience, SAGE publications, New Delhi.
2. Vasanth Desai (2010) Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, New Delhi

References

1. Paul, (2006), 'Business Environment', Tata McGraw-Hill, New Delhi
2. David, Holt (2008), Entrepreneurship, New Venture Creation, Prentice Hall, New Delhi.
3. David Campbell and Tom Craig, (2011), Organizations and the Business Environment
4. Peter J. Buckley, Peter Ender wick, Adam R. Cross, (2018), International Business, Prentice Hall, New Delhi

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	**2**				
K3: Applying				**3**	
K4: Analyzing					
K5: Evaluating		**5**	**5**		
K6: Creating					**6**

Mean: 4.2

PEC 5431 **ENVIRONMENTAL ECONOMICS** **6 Hrs 4Cr**

(Equivalence to the Course Code: PEC 5502)

The course deals with the integration of ecology and economics, impact, analysis, environment planning and environmental strategies with the view to creating awareness and also the ability to analyze environmental issues.

At the end of the course, students will be able to

i. Model environment as public good
ii. Analyze and triangulating population– development-environment
iii. Undertake environmental impact analysis on development
iv. Address environmental issues in a sustainable development framework
v. Evaluate environmental policies, programmes and strategies towards Green development

Unit-I: Basic Concepts

Environment as Public Goods, as Exhaustible and Renewable Resources – Environmental Quality and Quality of Life – Resource Depletion and Pollution – Externalities and Market Failure – Coase Theorem – Cake Eating Model – Conservation Model – Limits to Growth – Tragedy of Commons.

Unit- II: Environmental Issues

Population- Poverty- Environment Triangle – Urbanization and Toxicity – Socio – Cultural Factors leading to Environmental Problems.

Unit -III: Environmental Impact Analysis

Social Cost-Benefit Analysis – Risk Benefit Analysis – Decision Analysis – EIA Methodologies – Contingent Valuation Method

Unit- IV: Environmental Planning

Sustainable Development as a basis for Rural and Urban Environmental Planning – Participative Rural Appraisal – Waste Disposal Strategies– Slum Clearance versus Slum Renewal

Unit- V: Environmental Policy and Strategies

Role of Government – Fiscal and Legal Measure: Tax versus Subsidy – International Policy on Environment.-Role of Voluntary Agencies – Environmental Movements - Voluntary Agencies versus "service learning" - People Participation – Environmental Education as Participatory Experience – Eco-Tourism – Appropriate Governance provided by Government.

Text Books

1. N.Rajalakshmi and Dhulasi Birundha (1994), Environomics, Economic analysis of Enviroment, Allied publishers, Ahmedabad.
2. M. Karpagam (2010), Environmental Economics, Sterling Publishers, New Delhi
3. S. Sankaran(2011) Environmental Economics, Margham , Madras

References:

1. Madhu Raj (2001), Environmental Economics, Ivy Publishing House, New Delhi.
2. Prakash Gole (2001), Nature Conservation and Sustainable Development in India, Rawat Publication, Jaipur.
3. Sudhir Dawra (2001), Environmental Economics, Mohit Publication, New Delhi.
4. Sankar, U. (2002), Environmental Economics, Oxford University Press, New Delhi.
5. Benimadhab Chatterjee (2003), Environmental laws, Deep and Deep Publication Private Limited, New Delhi.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding			2		
K3: Applying				3	
K4: Analyzing		4			
K5: Evaluating					5
K6: Creating	6				

Mean: 4.0

PEC 5433 FINANCIAL MARKETS AND SERVICES IN INDIA 6 Hrs/4 Cr

The objective of the course is to familiarize students with innovations in financial services. It covers financial system and institutions with focus on stock training. New instruments and services such as ventures capital, factoring, forfeiting are also included

At the end of the course, students will be able to

i. Understand the functioning of financial system in relation to primary and secondary cash/equity market
ii. Expose stock market and mutual funds and participating in imaginary stock market trading
iii. Apprise the role and functions of depositing system and regulating body
iv. Identify innovations in financial services
v. Design the role of securitization of debt and credit rating.

Unit -1: Financial system and Capital Market

Financial Markets: Role and functions of financial markets – Classification of Financial Markets - Instruments of Financial Markets – Weakness of Indian financial system. Primary Market (New Issue Market): Methods of Flotation - Secondary Market: Services of Stock Exchanges – Listing of Securities – Listing procedure – Criteria – Stock Brokers: Code of Conduct – Genuine Trading vs. Speculative Trading – Kinds of Brokers and Speculators

Unit II: Understanding equity markets and mutual funds

Stock market: online trading – trading mechanism in stock markets – clearing and settlement of equities – Pitfalls of investing: insider trading – price rigging – business cycle – Government policy.. Mutual funds: meaning – importance – operation of the fund – advantages of mutual funds – types of mutual funds – Equity linked Saving Schemes - Exchange Traded Funds (ETF)

Unit III: Investing in Equity markets

Fundamental Analysis: - Economic Analysis – Industry Analysis – Economic Activity and Security markets. Company Analysis: Financial Statement – Profit and Loss Account – Ratio analysis – Shareholding Pattern – Quality of management. Technical analysis: Charts – Types of Charts – Chart patterns – Volume and its importance – Moving Averages – Us

Unit -IV: SEBI and Depository System

Securities and Exchange Board of India (SEBI): Objectives, Functions, Powers - Investors Protection from unfair trade practices- Depository System in India: Objectives – Meaning and Objectives – Depository Process – NSDL – CDSL - Depository participants

Unit - V: Financial Services in India

Financial Services: Fund and Non-fund Based Activities – Financial Innovation – New Financial Products and Services - Challenges Facing the Financial Sector. Merchant Banking- Venture Capital - Hire-Purchase and Leasing: Features – Hire-purchase and Credit Sale, Installment Sale and Leasing - Types of Leasing. Discounting, Factoring and Forfeiting: Meaning – Modus Operandi – Types – Discounting vs Factoring vs Forfeiting - Edifactoring – Advantages and Disadvantages

Text books

1. Gordon, E and Natarajan, K., (1999), Financial Markets and Services, Himalaya Publishing House, New Delhi.
2. Vinod Kumar and Raj Sethi Nangia, (2017), Ane Books Private Limited, New Delhi.

References:

1. L.M.Bhole, (2009), Financial Institutions and Markets, Tata Mc Graw Hill, New Delhi.
2. V.A.Avadhani, (2011), Indian Capital Market, Himalaya Publishing House, Bombay.
3. M.Y. Khan, (2015), Indian Financial System, Tata Mc Graw Hill, New Delhi.
4. Vasant Desai, (2017), Indian Financial System, Himalaya Publications, Bombay.

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	**2**	**2**			
K3: Applying				**3**	
K4: Analyzing					
K5: Evaluating			**5**		
K6: Creating					**6**

Mean: 3.6

PEC 5435 **ADVANCED ECONOMETRICS** **4Hrs. / 4Cr.**

(Equivalence to the Course Code: PEC 5506)

The objective is to comprehend the factual data and obtain conceptualizing ability. Time series analysis, co-integration, distributed lag models, identification and estimation of simultaneous equation models are covered.

At the end of the course, students will be able to

i. Apply lagged distribution models in exploring economic relations
ii. Enable to use dummy as binary variable in assessing policy shocks
iii. Estimate the ILS, 2SLS and Equivalence between ILS and 2 SLS
iv. Acquire the skill of exploring data generating process
v. Explore possible long-term equilibrium relationships between economic variable if any

Unit – I Distributed Lag Models

Koyck and Almon lag structure – distributed lag models – method of estimating lagged models – nature of dummy variables – use of dummy variables –ANOVA Models - linear probability model – logit and probit models – applications.

Unit – II Simultaneous Equation Model: Identification

Simultaneous equation system – structural, reduced and recursive models – problem of identification – implications of the identification state of a model – FORMAL rules for identification – identification and choice of econometric method. Problems – Indirect Least Squares (ILS) – Two Stage Least Squares (2SLS) – Equivalence between ILS and 2 SLS.

Unit – III Time Series Analysis

ARIMA representation – random walk model – white process – data generating process – stationary versus non-stationary – unit root testing – drifting and stochastic trend – Dickey-Fuller(DF) test – Engle-Granger's augmented DF test – applications

Unit– IV Co-integration Model

Co-integration – distribution co-integration from integration – co-integration frame work – co-integration test – stochastic trend – relevance of co-integration tests in equilibrium analysis – Angel arranger co integration Test -Johensent Co-integration Test.

Unit – V Causality and Error Correction

Granger representation theorem – error-correction model – ECM approach to granger causality – multiple rank F test – criteria for model selection –Theil's residual variance criterian, Akaiki's information criterion, Amemiya's prediction criterion, schwarz's Bayesian information criterian, Hannan's criterion – applications

Text Books

1. Enders, W. (2013) Applied Econometric Time Series, John Wiley & Sons Inc.,
2. Gujarati, D.(2014), Basic Econometrics, McGraw Hill Book company, New Delhi.
3. Patterson, (2016), An Introduction to Applied Econometrics: A Time Series Approach, Palgrave, NewDelhi.

References:

1. Davidson, J. (2000) Econometric Theory, Blackwell, USA
2. Goldberger, A.S. (2000) Introductory Econometrics, Harvard University Press, Cambridge.
3. Hayashi, F (2000), Econometrics, Princeton University Press, Princeton.
4. Pattreson, Kerry (2000) An Introduction to Applied Econometric: Time Series Approach, Palgrave Macmillan, New York
5. Ramanathan Ramu (2002), Introductory Econometrics with applications, Thomson South Western, Singapore
6. Greene, W. (2004) Econometric Analysis, Prentice Hall, New York.
7. Cameroon Samuel (2005), Econometrics, McGraw Hill, New York.
8. Asteriou Dimitrious,(2006), Applied Econometrics, Palgrave Macmillan, New York
9. Wooldridge (2006), Introductory Econometrics, Thomson-South Western, Singapore

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying	**3**	**3**			
K4: Analyzing			**4**		**4**
K5: Evaluating				**5**	
K6: Creating					

Mean: 3.8

PEC 5437 ACTUARIAL ECONOMICS 4 Hrs 4 Cr

The course imparts actuarial techniques that are used for insurance purposes. It covers the techniques drawn from statistics, financial mathematics along with the insights of economic theory to equip the learners with the insurance processes.

At the end of the course, students will be able to

i. Enable to differentiate benefits of annuity contracts
ii. Develop marketable premiums and appropriate annuities
iii. Predict possible survival chances of human life in chaotic world
iv. Build up rational expectation models for all contract types
v. Factor heterogeneity in life insurance contracts for risk management

Unit I: Life Assurance and Annuity Contracts

Pricing of life insurance contracts, equations of value, allowance for investment income, present value random variable, expected present value, variance of the present value random variable for life assurance contracts; life assurance benefits payable immediately on death; claim acceleration approximation; life annuity contracts: immediate annuity; annuity-due; temporary annuity; temporary annuity-due; deferred annuities; deferred annuities-due; and continuous annuities

Unit II: Quantity Theory of Life Contingencies

Advance Problems in mathematical theory of life contingencies; force of mortality; laws of mortality; premiums and reserves for insurance and annuities based on a single life- sums and integrals for mean and variance of present value of benefit payments; annuities payable in advance and in arrears; temporary and deferred and whole lifetime annuities; net premiums and reserves-prospective and retrospective reserves; Gross and net premium reserves; profit contracts

Unit III: Joint Life Probabilities

Joint life probabilities, annuities and insurances; cash flow dependent upon death or survival of either or both of two lives; competing risks; transition intensities for given dependent probability

Unit IV: Multiple-Decrement Theory and Pension fund Mathematics

Multiple decrement theory; pension fund mathematics-techniques of discounting emerging cost, for use in pricing, reserving and assessing profitability for all contract types and for

pensions; expected cash flow dependent upon more than one decrement; expected cash flow contingent upon risks other than human risks

Unit V. Principal Forms of Heterogeneity within a Population

Variations in mortality and morbidity; main forms of selection-temporary initial selection, time and class selections, spurious and adverse selection, different mortality tables for different lives; risk classification of life insurance, genetic information of risk classification in life insurance, directly and indirectly standardized mortality rates

Text books:

1. Bowes, N.L., Gerber, H.U., Hickman, J.C, Jones, D.A., and nesbitt, C., J. (1986). Actuarial Mathematics, Society of Actuaries, Lthaca, lllins, U.S.A
2. Mc Cutchheon, J.J. and Scott, W.F., (1997), An introduction to Mathematics of finance.

References:

1. Spurgeoin,E.T .(1972). Life Contingencies. Cambridge University Press.
2. Nall, A (1977), Life Contingencies. Heinemann.
3. Bhole, L.M. (1990), The Indian Financial System, Tata McGraw Hill, New Delhi.
4. Bickelhaupt, D.L. (1992), General Insurance, Irwin Inc., Burr Ridge, Ill.
5. Graves, E.E. and L. Hayes (Eds.) (1994), McGill's Life Insurance, The American College, BlynMawr, Pa.
6. Bailey, R. (Ed.) (1999), Underwriting in Life and Insurance, LOMA, Atlanta

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying	**3**				**3**
K4: Analyzing			**4**	**4**	
K5: Evaluating					
K6: Creating		6			

Mean: 4.0

PEC 5439 - COMPUTER APPLICATIONS IN SOCIAL SCIENCES - 4 Hrs. / 4Cr

(Equivalence to the Course Code: PEC 5508)

The course provides hands on training to enable students to develop computer-aided application skills in Social Science research. It covers Windows, SPSS, Spreadsheet analysis and Word Processing.

At the end of the course, students will be able to

i. Understand the working of windows
ii. Acquire skill of applying in economic analysis
iii. Prepare analytical reports using Ms-word
iv. Use SPSS package in economic research
v. Make use of internet as an knowledge powerhouse for social engineering

Unit- I: Introduction to Windows

IT and Computer Applications – Introduction to Windows – Features - Components – Customizing Windows – Accessories – Control Panel – Windows Explorer

Unit -II: Spreadsheet Analysis

Introduction to Spread Sheet – Basic Skills for working with a spread sheet – Shortcut Menus – Entering, Editing and Protecting Worksheet – Moving , Copying and Deleting cells and Ranges – Creating and Working with formula and Statistical Tools – Data Base in Excel – Graphics and Charts.

Unit- III : Word Processing and Presentations

Introduction to Word Processing – Starting MS Word – Formatting Text and Documents - Customizing the Work Place – Types of Views and Types of Style – File Management Tools – Columns, Tables and Graphs – Mail Merge – MS Power Basis, Creating, Presentation with Graphs and Multimedia – Interacting with Spreadsheet/Database Application – Desktop Printing and its Application.

Unit- IV: Application of SPSS

Introduction to SPSS (Statistical Package for Social Sciences) Packages – Cross Sectional and Time-Series Analysis – Application in Social Science Research Work

Unit- V: Introduction to R Package

Introductory Statistics with R – Cross Sectional and Time-Series Analysis – Application in Social Science Research Work

Text Books

1. Marija.J.Norusis (2007) SPSS for windows Base System Users Guide Release 6.0 SPSS Inc., Chicago, Illinois.
2. Vikas Gupta (2008) , Comdex Computer Course, Kit Dream Tec. New Delhi
3. ABC of MS-Office 2008 professional, Hart, BPB Publications.

References:

1. Foster,J.J.(2001), Data Analyzing using SPSS For Windows 8.0 – 10.0, A Beginner's Guide
2. Peter Dalgaard (2008): Introductory Statistics with R, 2nd Edition, Springer, New York. (Chapters 1, 2, 3,4,5,6 and 7)
3. Peter Norton's Introduction to computers, Tata McGraw Hill Publishing Co., New York.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	**2**				
K3: Applying			**3**		
K4: Analyzing				**4**	
K5: Evaluating					**5**
K6: Creating		**6**			

Mean: 4.0

PEC 5400 SPECIAL AREA STUDY 6 Hrs. / 4 Cr

(Equivalence to the Course Code: PEC 5609)

The objective is to develop the skill of narrowing down to a specific researchable problem from the branch of Economics

At the end of the course, students will be able to

i. Develop the skill of identifying issues of social relevance and national importance
ii. Review critically the existing body of knowledge to identify the issues requiring to be probing
iii. Acquire the skill of identifying research gap to formulate workable hypothesis
iv. Formulate appropriate research design suited for the problem under study
v. Prepare a term paper to be used as a ready reckoner

Self-Study: In the pursuit of excellence, the memory power testing has to be downgraded and independent self-study needs to be insisted.

Library Resources: In this course, the learner is expected first to get a synoptic view of economics and in course of time to focus attention on aspects of the topic that are of special interest to him or her. The learner is to make the maximum use of "library resource" in the department. The use of Internet, visit to research institutes and universities are also encouraged.

Empirical Study: The student is guided to narrow down or to adopt a filtering process from general topic to specific topic and then towards a researchable problem. During this semester, the student is expected to acquire the skills of identifying the research gap formulating the workable hypothesis and learning the art of questionnaire and schedule preparation. The student is required to formulate a hypothesis, frame objectives and collect the relevant data and information either through questionnaire/ schedule or from secondary sources.

Presentation: By way of "presentation" of a topic to the audience, the leaner acquires the skill of blending two or more pieces of economic concepts. Eventually the learner will prepare a "term paper". In the mean time, the publication of article by the learner is also advised. Thus, the student lays the foundation for his project work to be pursued in the fourth semester.

References:

1. The Social Science Encyclopedia (1985), Routledge the Kegan.
2. The New Palgrave Dictionary of Economics (1987), Macmillan, 4 volumes.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying			**3**		
K4: Analyzing				**4**	
K5: Evaluating	**5**				**5**
K6: Creating		6			

Mean: 4.6

PEC 5632 **INTERNATIONAL ECONOMICS** **7 H/5cr**

(Equivalence to the Course Code: PEC 5501)

The course provides a deep understanding about the broad principles and theories which tend to govern the free flow of trade in goods, services and capital –both short term and long term –at the global level. Besides preparing the students about the relevance and limitations of these principles, the contents of the paper spread over different modules lay stress on the theory and nature of the subject which, in turn, will greatly help them to examine the impact of trade policies followed both at national and international level

At the end of the course, students will be able to

i. Internalize theoretical considerations in international trade
ii. Enable to bring forth challenges of internationalization of goods and services trading
iii. Assess the role of international organizations in evolving direction and volumes of trade
iv. Acquire the skills of documenting trade related instruments as well as resolving international trade disputes
v. Develop a feasible export –import projects for financial support

Unit- I: Rationale for International Trade

Relevance and bases of International Trade – Classical, Neo Classical and Modern Theories

Unit -II: Trade and Development

Gains from trade - gains from specialization – Foreign exchange – exchange rate – BOP theories – transfer of technology – terms of trade – Singer –Perbish theories – trade as engine of growth and exploitation – Jagdish Bhavati's Immiserising Growth – Rybczynsky theorem – factor mobility – out sourcing of commodities and services.

Unit- III: World Trading System and Institutions

World Trade – bilateral and multilateral trading systems – NIEO – Regional economics groupings – international commodity agreements – multilateral financial institutions: IMF-WORLD BANK- WTO

Unit -IV: Forms of International Trade Contracts and Documentations

Trading methods – international commercial terms – letter of credit – types of L/C – operation of a L/C – documents used in international trade – transport documents – international trade disputes – FERA – FEMA.

Unit- V: International Trade Finance

Financing exports – post shipment finance – project exports – EXIM bank – export credit insurance – export promotion measures: EPZ, EOU, and SEZ – financing imports.

Text Books

1. Francis Chernulium (2007), "International Economics", Tata McGraw Hill Publishing Company Ltd., New Delhi
2. Rana, K.C and Verma, K.N (2007), "International Economics", Vishal Publishing Co, Jalandhar
3. Jeevanandam, C (2008), "Foreign Exchange Practice-Concepts and Control", Sultan Chand and Sons, New Delhi
4. Jhingan M.L. (2015), "International Economics", Virendra publication Pvt. Ltd., New Delhi

References

1. Caves, R. and Jones, R. World trade and payments (chapters 4, 6, and 7). Boston: Little, Brown and Company, 1977.
2. Dixit, A. and Norman, V. The theory of international trade. Cambridge University Press, 1980.
3. Sodersten, B. and Reed, G. International Economics (chapters 1-11, 13-16, 19, 20, 22-24, 26 & 27). Macmillan Company, 1994.
4. Grossman, G. M. and Rogoff, K., eds. Handbook of international economics. Vol III. Elsevier, 1995.
5. Bhagwati, J, Arvind Panagariya, & T.N. Srinivasan: Lectures on International Trade, 2nd ed. MIT Press 2001.
6. Paul Krugman & Maurice Obstfeld (6th ed.) International Economics, (Chapters 2-11) Addison Wesley, 2003

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	**2**				
K3: Applying				**3**	
K4: Analyzing			**4**		
K5: Evaluating					**5**
K6: Creating		**6**			

Mean: 4.0

PEC 5634 **INDIAN ECONOMY** **7 Hrs /5cr**

The Purpose of this course on Indian Economy is to enable the students to have an understanding of the various issues of the Indian Economy with a policy perspective. The focus of the syllabus is on the development perspectives of Indian Economy during the post Liberalization period since 1991.

At the end of the course, students will be able to

i. Explore resource use, demographic dividend, infra development and growth trends
ii. Understand impact of technological changes in agriculture on doubling farmers income and access to institutional support
iii. Examine growth performance of industrial sector in view of industrial policies and programmes
iv. Analyze service led growth, trade performance and balance of payments
v. Evaluate economic reforms in relation to planning strategies

Unit- I Structure of Indian Economy

Natural Resources – Land, Forest, Water,-Demographic dividend: Characteristics of population-Infrastructure: - Transport – Power –Communication-Energy. National Income: Trend and sectoral contribution

Unit -II .Agricultural Sector

Role of Agriculture – low Agricultural productivity- land reforms— Green Revolution and New Agricultural Strategy - Agricultural Marketing and warehousing-Agricultural Credit

Unit- III Industrial Scenario

Role of Industrialization – PSU-Rationale and problems, Disinvestment of PSU: Industrial Policy Resolution 1948, 1956 and recent Industrial policies-EPZ-SEZ-MSME-Make in India.

Unit- IV Tertiary Sector and External Sector

Role of Banking, Insurance and Information Technology: Direction and trends in foreign trade, trade policy, Balance of Payments in India-Disequilibrium and corrective measures, MNCs, FEMA and FERA.

Unit -V: Planning and Economic Reforms

Planning in India-Objectives of Five Year Plans, Achievements and failure-New Economic Reforms-Contemporary planning –NITI Aayog-LPG, India and WTO

Text Books

1. Sankaran(2015) –Indian Economy- Markham publications-Chennai-

2. S.K.Misra and V.K. Puri(2016), Indian Economy, Himalaya Publishing House, New Delhi,
3. Dutt and Sundharam (2018), Indian Economy, Sultan Chand Co, New Delhi.

References:

1. Ghosh. Alak(1989), Indian Economy – Its Nature and Problems, The World Press Private Limited, Calcutta,
2. Sen R.K and B.Chatterjee(2001), Indian Economy-Agenda for 21st Century, Deep and Deep Publications, New Delhi,
3. . Jalan.B(2006), The Indian Economy Problems and Prospects, Viking Publications, New Delhi,.
4. Dhingra (2008), The Indian Economy: Environment and policy, Sultan Chand, New Delhi.
5. Agrawal (2008), Indian Economy, Wiley Eastern, New Delhi.
6. Ray, S,K (2008), Indian Economy, Prentice Hall, New Delhi.
7. Ruddar Datt and Sundaram (2008), K.P.M, S.Chand and Company, New Delhi.

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying	**3**				
K4: Analyzing		**4**		**4**	
K5: Evaluating					**5**
K6: Creating			**6**		

Mean: 4.4

PEC 5436 DEVELOPMENT ECONOMICS 6 Hrs 4Cr

Development Economics represents an engaging branch of Economics. A course on the Economics of Growth and Development connects students of Economics to academic concerns, policies and practical solutions relevant for progression of all economies. The objective of this paper is to familiarizing students with the conceptual routes, theoretical dynamics and practical strategies of growth and development. It is expected that this course would orient them towards major themes of development, lead them towards more methodical probes and equip them with adequate analytical knowledge.

At the end of the course, students will be able to

i. Comprehend conceptual and measurement issues in growth vis-à-vis development
ii. Understand salient features of developing economies and obstacles to development
iii. Acquire the skill of assessing the development process in light of competing theories
iv. Examine pace and pattern of growth performance in view of growth models
v. Analyze mobilization of resources, choice of techniques and appropriate investment criterion

Unit -I: An Overview of Economic Growth and Development

Conceptualization of Economic Growth Vs. Economic Development - Measures of Growth - GNP and Per-Capita Income, Measures of development - HDI,PQLI, GDI and GNHI - Development issues - Characteristics of Developing Economics – Obstacles of Economic Development

Unit-II: Theories of Development

Adam Smith's Development Model - Malthusian Theory - Marxian Theory- Schumpeterian Theory - Rostow's Stages of Economic Growth - Lewis Theory - Big Push Theory - Balanced Growth - Unbalanced Growth

Unit-III: Growth Models

Harrod-Domar Model Dynamic Theory – Kaldor-Pasinetti Model - Solow Model - Joan Robinson Model - Mahalanobis Model - Chakravarthy Model- Vakil and Brahmanandha Model

Unit -IV: Resource Development and Investment Criteria

Capital Formation - Human Capital and Manpower Planning- Migration - Choice of Techniques - Investment Criterion- Project Evaluation

Unit- V: State and Economic Development

Role of State and Sectoral Dimensions - Agriculture, Industrialization and Services in Economic Development - Role of External Sector – Foreign Capital - Foreign Direct Investment - Technology Transfer – Foreign Aid – New International Economic Order

Text books

1. Meier, G.M. (2000), Leading Issues in Economic Development, Oxford University Press, New York.
2. Michael P. Todaro and Stephen C.Smith, (2004), Economics Development, Pearson Education, New Delhi.
3. Misra and Puri, (2012), Economics of Development and Planning, Himalaya Publications, Mumbai.
4. Jhingan, M.L, (2014), The Economics of Development and Planning, Vrinda Publications Limited.

References

1. Sen, A.K. (1971), Growth Economics, Penguin Books, Harmondsworth, London.
2. Jones H.G. (1976), An Introduction to Modern Theories of Economic Growth, McGraw Hill, Kogakusha, Tokyo.
3. Thirwali, A.P. (1978), Growth and Development, Macmillan, London.
4. Little, I.M.D. (1982), Economic Development Theory, Policy and International Relations, Basic Books, New York.
5. Chakravarthy, S. (1982), Alternative Approaches to Theory of Economic Growth, Oxford University Press, Delhi.
6. Chatek, S. (1986), An Introduction to Development Economics, Allen & Unwin, London.
7. Meier, G.M. and D. Seers, (1987), Pioneers in Development, Oxford University Press New York
8. Jagdish Bhagwati, (2004), Economics of Under Developed Countries, AITBS, New Delhi.
9. Taneja Sharma, (2006), Economics of Development and Planning, Vishal Publishers, Allahabad.
10. Agarwal and Kundan lal, (2007), Economics of Development and Planning, Publications, Ludhiana.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying	**3**	**3**			
K4: Analyzing				**4**	
K5: Evaluating					**5**
K6: Creating			**6**		

Mean: 4.2

PEC 5438 GENDER ECONOMICS 4hrs/4 c

This course makes available a critical overview of economic theories, methods and economic policy-debates from a gender perspective. The course is intended to cover major debates in gender economics relevant to developed and developing countries. The course will propose students the chance to explore alternative gender economic theory and apply these different theoretical understandings to concrete examples in the real world.

At the end of the course, students will be able to

i. Motivate to familiarize students with the key theoretical concepts,
ii. Impart knowledge on theoretical approaches and views related to the role of women in the achievement of development.
iii. Familiarize contribution in gender in development
iv. Analyze the role of gender in social sector
v. Enrich the knowledge on f Feminization of poverty

Unit-I: Introduction to Gender Studies

Basic Concepts - Difference between Gender and Sex - Patriarchy - Feminism - Schools of Feminism - Gender Division of Work - Invisibility of Women's Work - Gender Mainstreaming - Concept of Gender Economics - Gender Concerns in Economic Theory - Sen's Contribution.

Unit -II: Subject and Methods of Gender Economics

The Subject of Gender Economics - Institutionalization of Gender Economics - Methods of Gender Economics - Inter-Disciplinary Approach in Gender Studies - Gender Inequality Factors: Development Factor - Discrimination and Behavioral Factors - Gender Gap in access to Resources and Control over Economic Resources.

Unit- III: Gender and Economic Growth

Globalization of the World Economy and Gender Status - Impact of Economic Growth on Gender Equality - Gender Equality and Economic Growth and Socio-Economic Development- Impact of Globalization on Gender Status - Feminization of Poverty - Gender Differences in Incomes - Women's Contribution to GDP - Estimation of Women's Unpaid Work.

Unit- IV: Gender Factor in Household Economics

Distribution of Resources and Decision-Making Mechanisms within the Household - Household Time Budgets: Structure, and Problem of Measurement - Work in the Labour Market - Inter-Generational and Gender Aspect - Model of Investment in Human Capital - Marital and Age-Dependent Models of Female and Male Employment

Unit -V: Measuring Gender Equity

Meaning of Gender Equity and Equality - Gender Equity Index - Gender Inequality Index of UNDP - Gender Status Index - Gender in Human Development - Gender Development Index - Gender Empowerment Measure - Gender in Social Development Indicators - Social Institutions and Gender Index (SIGI)

Text Books

1. Seth, M. (2000), Women and Development: The Indian Experience, Sage Publications, New Delhi.
2. Beneria, L. (2003), Gender, Development and Globalisation. Economics As If All People Mattered. New York: Routledge
3. Jacobsen, J. (2007), The Economics of Gender. Cambridge: Wiley Blackwell.
4. Eswaran, M. (2014), Why Gender Matters in Economics, Princeton University Press.

References

1. Boserup E. (1970), Women's Role in Economic Development, George Allen and Unwin, London.
2. Desai, N. and M.K. Raj (Eds.) (1979), Women and Society in India, Research Center for Women Studies, SNDT University, Bombay
3. Devasia Leelamma (1994) Empowering Women for Sustainable Development, Ashish Publishing House, New Delhi
4. Sen, A. and J. Drèze (1995), India: Economic Development and Social Opportunity, Oxford University Press
5. Venkateswaran S. (1995), Environment, Development and the Gender Gap, Sage Publications, New Delhi.
6. Nelson, J. 1995, Feminism, Objectivity and Economics. London: Routledge.
7. Jackson, C. and R. Pearson (eds) 1998. Feminist Visions of Development: Gender Analysis and Policy, London and New York: Routledge
8. Krishnaraj, M., R.M. Sudarshan and A. Shariff (1999), Gender, Population and Development, Oxford University Press, New Delhi.
9. UNDP, (2006), Human Development Report, Fighting Climate Change: Human Solidarity in A Divided World. Palgrave, New York.
10. Rai, S. and G. Waylen (eds). 2014. New Frontiers in Feminist Political Economy, London, Routledge.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	**2**	**2**			
K3: Applying					
K4: Analyzing			**4**		
K5: Evaluating				**5**	
K6: Creating					6

Mean: 3.8

PEC 5400 **PROJECT** **6Hrs. / 4Cr**

(Equivalence to the Course Code: PEC 5610)

This is sequential course to Special Area Study, enables students to carry out a project on a researchable topic identified in the Special Area Study. It is a mandatory and independent research work to be carried out by a student under the guidance and supervision of a faculty member. It is in partial fulfillment of the requirements of the M.A. degree programme.

In the light of experience gained during the third semester under Special Area Study, the data collected is processed and tabulated; facts are scientifically analysed with the help of various mathematical, statistical and econometric tools to test and validate the hypothesis. Results in tabular form and illustrations are discussed in the light of the relevant theoretical frame work. The outcome of the project work is to be submitted in the form of a research report of dissemination of knowledge.

At the end of the course, students will be able to

i. Carry out independently research project on a topic identified in the special area study
ii. Design theoretical frame work for the research project
iii. Validate data sources to arrive at data reliable for study
iv. Apply relevant statistical tools in testing hypothesis
v. Interpret the empirical results of the study in light of theoretical consideration

Evaluation Pattern

The guide and P.G.H.O.D will be the internal and external examiners respectively to evaluate the project work for awarding credits. They will value the project report separately on 50:50 basis.

1. Literature review and researchable topic : 30 Marks
2. Field work, collection of data and analysis : 50 Marks
3. Defending the report
   - i) Oral Presentation : 10 Marks
   - ii) Viva-Voce : 10 Marks

Total **: 100 Marks**

PEC 50

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying	**2**				
K4: Analyzing			**4**		**4**
K5: Evaluating				**5**	
K6: Creating		**6**			

Mean: 4.2

THE AMERICAN COLLEGE
POST GRADUATE DEPARTMENT OF PHYSICS
Programme for M. Sc. PHYSICS (w. e. f. 2018-19 onwards)

Semester	Course No.	Course Title	Hours/Wk	Credits	Marks
I	PGP / PSP 4431	Classical & Non Linear Dynamics	5	4	80
	PGP / PSP 4433	Mathematical Physics – I	4	4	80
	PGP / PSP 4435	Condensed Matter Physics – I	4	4	80
	PGP / PSP 4337	Astrophysics	4	3	60
	PGP / PSP 4339 PGP / PSP 4341	Observational Astronomy Physics of Home Appliances*	4	3	60
	PGP / PSP4343	Physics Lab – I	9	3	60
			30	**21**	**420**
II	PGP / PSP 4434	Instrumentation & Microcontrollers	5	4	80
	PGP / PSP 4436	Mathematical Physics – II	4	4	80
	PGP / PSP 4438	Quantum Mechanics – I	4	4	80
	PGP / PSP 4340	Nanophysics	4	3	60
	PGP / PSP 4342 PGP / PSP 4344	Physics in Human Physiology Sustainable Energy Resources*	4	3	60
	PGP / PSP 4346	Physics Lab – II	9	3	60
			30	**21**	**420**
III	PGP / PSP 5431	Nuclear & Particle Physics	5	4	80
	PGP / PSP 5433	Electrodynamics & Plasma Physics	4	4	80
	PGP / PSP 5435	Physical Electronics	4	4	80
	PGP / PSP 5437	Laser & Spectroscopy	4	4	80
	PGP / PSP 5439	Quantum Mechanics – II	4	4	80
	PGP / PSP 5441	Project – I	9	4	80
			30	**24**	**480**
IV	PGP / PSP 5432	Thin Films &Vacuum Technology	5	4	80
	PGP / PSP 5434	Condensed Matter Physics – II	4	4	80
	PGP / PSP 5436	Analog Electronics	4	4	80
	PGP / PSP 5438	Thermodynamics & Statistical Physics	4	4	80
	PGP / PSP 5440	Matrix, Fourier & Non Linear Optics	4	4	80
	PGP / PSP 5442	Project – II	9	4	80
			30	**24**	**480**

Programme Specific Outcome

On completion of the programme, postgraduates will be able to

PSO1 : Interpret fundamental interactions at quantum to astronomical scales;

PSO2 : Demonstrate a coherent understanding of the academic field of Physics, and its linkage with related disciplinary subjects;

PSO3 : Develop experimental and data analysis skills through a wide range of advanced level physics experiments;

PSO4 : Demonstrate the ability to use Physics skills such as formulating, identifying, and applying appropriate methodologies to solve and interpret a wide range of problems associated with Physics;

PSO5 : Design and execute mini projects to experience the aspects of research and to provide lucid summation of the scientific literature on a chosen topic;

PSO6 : Analyse and interpret data collected using appropriate methods, including the use of suitable software and customized worksheets, and relating the conclusions to relevant theories of Physics;

PSO7 :Demonstrate professional behaviour such as (i) being objective, unbiased and truthful in all aspects of work; and (ii) appreciation of intellectual property, environmental and sustainability issues;

PSO8 : Develop communication skills, both written and oral, for specialized and non-specialized audience;

PSO9 : Acquire subject knowledge and skills of the calibre sought by industry, professional career and public service, as well as providing academic teachers and researchers of the future;

PSO10: Demonstrate relevant generic skills and global competencies such as (i) skills of independent investigation of physics-related issues and problems; (ii)ability to construct logical arguments using correct technical language related to physics.

PSO to PO Mapping for PG Physics

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	X	X		X		X	X		X	
PSO2	X	X		X		X	X		X	
PSO3	X	X		X	X	X	X		X	
PSO4	X	X	X	X	X			X		
PSO5	X	X	X		X	X			X	
PSO6	X	X	X	X	X			X		
PSO7	X		X		X	X	X	X		
PSO8	X		X	X		X	X		X	
PSO9	X	X		X		X		X	X	
PSO10	X		X		X	X			X	X

Mapping of Courses with Programme Specific Outcomes (PSOs)

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGP/PSP 4431	X	X		X			X		X	X
PGP/PSP 4433	X	X		X			X		X	X
PGP/PSP 4435	X	X		X			X		X	X
PGP/PSP 4337	X	X		X			X		X	X
PGP/PSP 4339	X	X					X		X	X
PGP/PSP 4341	X	X					X		X	X
PGP/PSP 4343	X	X	X	X		X	X		X	
PGP/PSP 4434	X	X		X			X		X	X
PGP/PSP 4436	X	X		X			X		X	
PGP/PSP 4438	X	X		X			X		X	X
PGP/PSP 4340	X	X		X			X		X	
PGP/PSP 4342	X	X					X		X	X
PGP/PSP 4344	X	X				X	X		X	
PGP/PSP 4346	X	X	X	X			X		X	
PGP/PSP 5431	X	X		X			X		X	X
PGP/PSP 5433	X	X		X			X		X	X
PGP/PSP 5435	X	X		X			X		X	X
PGP/PSP 5437	X	X		X			X		X	X
PGP/PSP 5439	X	X		X			X		X	X
PGP/PSP 5441	X	X		X	X	X	X	X	X	
PGP/PSP 5432	X	X		X			X		X	X
PGP/PSP 5434	X	X		X			X		X	X
PGP/PSP 5436	X	X		X			X		X	X
PGP/PSP 5438	X	X		X			X		X	X
PGP/PSP 5440	X	X		X			X		X	X
PGP/PSP 5442	X	X		X	X	X	X	X	X	

PGP/PSP 4431 **CLASSICAL AND NON-LINEAR DYNAMICS** **5 hrs / 4Cr**

This course is designed to introduce to the students, the basic concepts and application of Lagrangian dynamics, Hamiltonian dynamics, small oscillations, rigid body systems and nonlinear dynamics

At the end of thecourse, students will be able to

i. construct Lagrangian for holonomic systems and analyze its behaviour using Lagrangian dynamics
ii. analyze central force problems and find the normal modes of vibration of oscillating bodies
iii. form inertia matrix and solve rigid body problems using Euler's equation of motion
iv. analyze the system using Hamiltonian dynamics and Poisson brackets
v. find the equilibrium points and classify the non-linear systems in to major bifurcations

Unit I: Lagrangian Dynamics

Constraints - D' Alembert's Principle and Lagrange's Equations - Velocity-Dependent Potentials and the Dissipation Function - Hamilton's Principle - Some Techniques of the Calculus of Variations - Derivation of Lagrange's Equations from Hamilton's Principle - Conservation Theorems and Symmetry Properties - Energy Function and the Conservation of Energy.

Unit II: Central Force Problem and Small Oscillations

Reduction to the Equivalent One-Body Problem - The Equations of Motion and First Integrals - Scattering in a Central Force Field - Transformation of the Scattering Problem to Laboratory Coordinates-Small Oscillations- The Eigenvalue Equation and the Principal Axis Transformation- Frequencies of Free Vibration, and Normal Coordinates, Linear Tri atomic Molecule.

Unit III: Rigid body Dynamics

The Independent coordinates of a Rigid Body - Orthogonal Transformations - The Euler Angles - Angular Momentum and Kinetic Energy of Motion about a Point – Tensors - the Inertia Tensor and the Moment ofInertia - The Eigenvalues of the Inertia Tensor and the Principal Axis Transformation - Solving Rigid Body Problems and the Euler Equations of Motion.

Unit IV: Hamiltonian dynamics and Canonical Transformations

Legendre Transformations and the Hamilton Equations of Motion - Cyclic Coordinates and Conservation Theorems - Equations of Canonical Transformation - Examples of Canonical Transformations - The Harmonic Oscillator - The Symplectic Approach to Canonical Transformations - Poisson Brackets and Other Canonical Invariants - The Angular Momentum Poisson Bracket Relations.

Unit V: Nonlinear dynamics

Autonomous and non - autonomous systems – Differential equation: equilibrium points- Phase space and Phase trajectories - Stability, Attractors and Repellers - General criteria forstability– Classification of Equilibrium Points - Periodic Attractor - Some simple bifurcations - Saddle-Node, Pitchfork, Transcritical and Hopf.

Text Books:

1. Goldstein, Poole and Safko, *Classical Mechanics*, 3 edition, Pearson Publication (2001)

2. M. Lakshmanan and S. Rajasekar, *Nonlinear Dynamics*, Springer (India) Pvt. Ltd. (2003)

References:

1. John R. Taylor, *Classical Mechanics*, University Science Books, (2004)
2. Louis N. Hand and Janet D. Finch, *Analytical mechanics*, Cambridge University Press, (1998)
3. J.C. Upadyaya, *Classical Mechanics*, Himalayan Publishing House, New Delhi (2009)

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2		2	2	
K3: Applying	3		3		
K4: Analyzing				4	4
K5: Evaluating		5			5
K6: Creating					
Mean					3.10

PGP/PSP 4433 **MATHEMATICAL PHYSICS - I** **4 hrs / 4 Cr**

This course helps to understand the complex variables and acquire knowledge about special functions and series solutions of differential equations in physics. Students get basic concept about Fourier series and integral transforms also familiarizing withnumerical methods and to impart mathematical knowledge for the description of physics phenomena

At the end of the course, students will be able to

i. explain the characteristics of complex functions, evaluate residues and definite integrals.

ii. describe the properties and usage of special functions in physics

iii. elucidate the characteristics of orthogonal polynomials

iv. expand the periodic functions using Fourier series and apply integral transforms

v. solve polynomials, integral and differential equations using numerical methods.

Unit I: Complex Variable

Functions of a complex variable – analytic function – Cauchy-Riemann conditions - Cauchy's integral theorem and integral formula - Taylor's and Laurent's expansions - Cauchy residue theorem – Evaluation of residues - Evaluation of definite integrals

Unit II: Special Functions in Physics

Gamma functions – Beta functions – Dirac-Delta functions – Green's functions- One dimension – Two and three dimension - Applications of Green's functions.

Unit III: Series Solutions of Differential Equations in Physics

Differential equations, Generating function, Rodrigues' formula Recurrence relations and Orthogonality of Bessel, Legendre, Hermite and Laguerre polynomials

Unit IV: Fourier series and Integral Transforms

Fourier series - Application of Fourier series - Fourier Integral theorem - Fourier Transform – Convolution theorem – Parseval's relation – Transforms of derivatives - Application of Fourier transform - Laplace transform - Application of Laplace transform.

Unit V: Numerical Methods

Roots of polynomial and transcendental equations - Newton-Raphson method - Lagrange's interpolation - Numerical integration - Trapezoidal, Simpson's method - Euler's method, Runge-Kutta method

Text Books:

1. Charlie Harper, *Introduction to Mathematical Physics*, Prentice-Hall, Inc, (2008)
2. George B. Arfken and Hans J. Weber, *Mathematical Methods for Physicists*, Elsevier Academic Press Seventh Edition, (2012)
3. M.K. Venkataraman, *Numerical Methods in Science and Engineering*, National Publishing Co, Fifth Edition, (1999)

References:

1. Eugene Butkov, *Mathematical Physics*, Addison Wesley Publishing Company (1995).
2. Louis A. Pipes and Lawrence R. Harvill,*Applied Mathematics for Engineers and Physicists*, McGraw-Hill, International Third Edition (1970).
3. Sadri Hassani, *Mathematical Physics. A Modern Introduction to its Foundations*, Springer Second Edition (2002).
4. Mary L Boas, *Mathematical Methods in the Physical Sciences*, John Wiley & Sons Third Edition (2005).
5. P.K.Chattopadhyay, *Mathematical Physics*, New Age International Publishers (2013).

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering		1			
K2: Understanding	2				
K3: Applying		3			3
K4: Analyzing	4		4	4	
K5: Evaluating				5	5
K6: Creating					
Mean					3.44

PGP/PSP 4435 **CONDENSED MATTER PHYSICS – I** **4 hrs / 4 Cr**

This course exposes students to have a detailed discussion on different crystal structures, various diffraction techniques and different imperfection in crystals; it also deals with the different bonding natures in crystals. It also attempts to have a systematic approach to problem solving in crystal vibrations.

At the end of the course, students will be able to

i. determine the structure factors and atomic scattering factor of crystal lattices.
ii. describe the X-ray diffraction and anomalous dispersion to predict the crystal structure and temperature effects
iii. classify and differentiate the defects in crystals.
iv. explain and relate different crystal binding forces.
v. describe and examine the effect of lattice vibrations.

Unit I: Crystallography

Basic concepts of crystallography-Index system for crystal planes –Simple crystal structure – Reciprocal lattice vectors – Fourier analysis of the basis: Structure factor for SC, BCC, FCC structures – Atomic scattering factor- Quasi crystals.

Unit II: Crystal diffraction

Braggs law – different scattering methods-derivation of scattered wave amplitude -anomalous dispersion of scattering by crystals- Theory of X-ray diffraction-temperature effect- crystal structure determination

Unit III: Crystal imperfections

Imperfections in crystals –Point defects: Lattice vacancies- Diffusion- Colorcenters- Surface and interface physics: Concentration of Frenkel and Schottky defects – Line imperfections – Screw imperfection – Burger vector – Surface imperfections – volume defects-Dislocations.

Unit IV: Crystal binding

Crystals of inert gas – van der Walls interactions – Repulsive interaction – Equilibrium lattice constants – Cohesive energy – Ionic crystals – Madelung energy – Evaluation of Madelung constant – Covalent, Metallic and Hydrogen bonding – elastic strain components

Unit V: Crystal vibrations

Vibrations of crystal with monoatomic basis – group velocity – Two atoms per basis – Quantization of elastic waves – Phonon momentum – Phonon heat capacity – Debye theory of specific heat – Debye T^3 law – Anharmonic crystal interactions

Text Book:

1. Charles Kittel, *Introduction to Solid State Physics*, 5th edition, (1993).

References:

1. S.O. Pillai, *Solid State physics*, New age international (P) limited (1997).
2. Ali Omar, *Elementary Solid State Physics*, Pearson Education India, (2000).
3. H.V Keer, *Principles of Solid State*, Wiley Eastern Lmt. (1994)
4. M.A.Wahab, *Solid State Physics*, Narosa Publishing house, Delhi, (1999)

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding			2	2	2
K3: Applying			3		
K4: Analyzing		4			
K5: Evaluating	5			5	
K6: Creating					
Mean					3.0

PGP / PSP 4337 **ASTROPHYSICS** **4hrs/3Cr**

This course offers a comprehensive introduction to astronomy and astrophysics. The students are exposed to evolution of stars and mysterious objects. The models of universe and theories of cosmology are also intended.

At the end of the course, students will be able to

i. explainthe role of Copernicus, Kepler and Newton in the development of modern astronomy and specify the classification of stars and compute the magnitudes of stars.
ii. describe the working of various types of telescopes and outline the spectral analysis
iii. predict the structure of the sun, its layers and compile types of galaxies and various mysterious objects
iv. analyse the birth and death of stars using H-R diagram and quote the fate of the star using Chandrasekhar's mass limit.
v. ascertain the evolution of universe using different models

Unit I: Positional Astronomy

Development of Astronomy and Birth of Modern Astronomy – Physics of Kepler and Newton – Seasons – Time and Precession – Constellation and nomenclature of stars – Stellar distance – Stellar magnitude – Spectral Classification – Colour index – Aberration and Parallax.

Unit II: Astronomical Observations

Optical telescopes – Types of telescopes – Reflector and refractor type - Recording devices – Photography , Photomultipliers and CCDs. Radio telescope – Interferometers, T, Y and Cross interferometers. Techniques of observation in IR, UV, X – Ray and Gamma ray regions.

Unit III: Sun and Stellar Bodies

Sun as a star – layers of Sun – Photosphere – Chromosphere – Corona – phenomenon of Sun – sun spots – Prominences – solar flares – eclipses – Galaxy – Types of Galaxies – Milky way galaxy – Comets- Asteroids and meteoroids.

Unit IV: Stellar Structure and Evolution:

Basics equations of stellar structure – Nuclear energy sources – Jean's criterion - Star formation – H-R diagram – Main sequence stars – end state of stars – Chandrasekhar mass limit – white dwarfs – Novae and Super novae – Neutron star – Black hole – Binaries and Variable stars.

Unit V: Cosmology

Hubble's law – Models of Universe – The Big-Bang – Steady State theory – consequences of general theory of relativity – Bending of light – Background radiation – Future of the Universe.

Text Books:

1. George O. Abell, *Exploration of the Universe*, Saunders College Publishing, (1986)
2. K.D.Abhyankar, *Astrophysics – Stars and Galaxies*, Tata McGraw Hill Publications, (1989).
3. William Kaufmann, *Astronomy: The Structure of the Universe*, McMillan Publishing Co.inc, New York.(1999).

References:

1. R.Alder, M.Bazrin and M.Schiffer, *Introduction to General theory of Relativity*, McGraw Hill Publications, (1975)
2. Frank H. Shu, *The Physical Universe, An introduction to Astronomy*, University Science Books, Mill Valley, California, (1982)

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding		2			
K3: Applying			3		
K4: Analyzing				4	
K5: Evaluating		5			5
K6: Creating					3.33

PGP/PSP 4339 **OBSERVATIONAL ASTRONOMY** **4 hrs / 3 Cr**

This course intends to provide the knowledge on the birth of modern astronomy and views from astronomers. It provides an understanding about the evolution of stars. It also deals with the classification of galaxies.It enables the student to compare and to learn the working principle of different types of telescopes. In addition the course deals with the different theories of universe.

At the end of the course, students will be able to

i. summarise the birth of modern astronomy from ancient times
ii. describe the theory of birth and evolution of stars.
iii. categorize galaxies based on Hubble classification and distinguish various mysterious objects
iv. compare the different types of telescopes
v. explain different models of origin of universe

Unit I: Birth of Modern Astronomy

Birth of modern astronomy- –Compare and contrast the views of reality held by Plato and Aristotle– universe in the seventeenth century – Kepler's Laws – Newtonian gravitation – seasons – Eclipse – Solar, lunar - solar family.

Unit II: Stellar Evolution

Formation of a star from a cloud of interstellar matter- Birth of low mass stars like our sun, - main-sequence star to a dead star- white dwarf - neutron star - Inventory of the Solar System

Unit III Galactic astronomy:

Milky Way - Hubble classification of galaxies-Spiral galaxies, Elliptical galaxies,Irregular galaxies, Dwarf galaxies – Mysterious objects – Pulsar, Quasar, comets, asteroids - meteors and meteoroids.

Unit IV: Telescopes

Astronomical observations – optical telescopes – Reflecting – refracting – telescope mount – – Radio telescope — UV-IR-X-ray telescopes.

Unit V: Origin of Universe

The Big bang - Formation of Elements, Discovery of the Galaxies, Expansion of the Universe – Hubble's law – steady state – pulsating theory

Text books:

1. Nigel Marshall, *GCSE Astronomy*, IV Edition , Mickledore Publishing, (2010)
2. William J. Kaufmann, *Astronomy: The Structure of the Universe*, Macmillan Publishers Co.,Inc. New York, (1999)

References:

1. Shu F, *The physical universe*, University of California, (1982).

2. George O.Abell, *Exploration of the Universe*, Saunders college publishing, (1986)
3. K.D.Abhayanker, *Astrophysics Stars and Galaxies*, Tata McGraw – Hill publishing, New Delhi (1992)

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2	2			2
K3: Applying			3		
K4: Analyzing				4	
K5: Evaluating		5		5	
K6: Creating					
Mean					3.0

PGP/PSP 4341 **PHYSICS OF HOME APPLIANCES** **4hrs / 3 Cr**

This course intends to provide an understanding on the basics of electricity and electronics. It enables the student to have a hands-on experience on the usage of multimeter and for soldering the basic components. It also deals with the working principle of different domestic appliances and provides knowledge for maintaining them.

At the end of the course, students will be able to

i. explain the fundamentals of electricity and electronic components.
ii. implement the skills of testing and servicing the basic equipment of the home appliances.
iii. classify different domestic appliances and explain the physics of appliances
iv. ascertain the maintenance of domestic appliances
v. explain the energy consumption of home appliances

Unit I: Introduction to Electricity and Electronics

Basic Electricity: Voltage, Current, Resistance, Impedance & Power factor -Transformers - Step-up & Step-down - Single phase & Three phase circuits – Fuse, Concept of Earthing

Electronics: Familiarization of electronic components - Capacitor, Choke coil, Diode, Transistor, Thyristor

Basic Equipments for testing and servicing: Multimeter - Measurement of current, voltage and resistance - Checking transistors and diodes in circuit measurements - Soldering Iron - Flux - Lead

Unit II: Heating Appliances

Electric stove - Electric Rice cooker - Toaster - Kettle - Coffee maker -Iron box -Immersion heater - Geyser - Hair drier- Microwave oven

Unit III: Motorised Appliances

Electric fans - Mixer - Grinder/Blenders –Washingmachine - Vacuum cleaner - Domestic water pump - Dish washer

Unit IV: Refrigeration Appliances

Refrigerator: Compressor - coolants - Automatic defrost circuits - Air coolers - Air conditioners

Unit V: Other Appliances

Lights: Incandescent Bulbs, Tubelight, CFL bulb – LED- Voltagestabilizer - Inverters – UPS

Text books:

1. B.L. Theraja& A.K. Theraja, *A Text Book of Electrical Technology*, S. Chand & Company Ltd., New Delhi, India, (2005)

References

1. Eric Kleinert, *Troubleshooting and Repairing major appliances*, McGraw Hill Professional, 3rd edition, (2012)
2. ShashiBhushanSinha, *Handbook of Repair and Maintenance Of Domestic Electronics Appliances*, BPB Publications, India, (2016)

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2		2	2	2
K3: Applying			3		
K4: Analyzing				4	
K5: Evaluating		5			
K6: Creating		6			6
Mean					3.33

PGP/PSP 4343 **PHYSICS LAB - I** **9 hrs / 3 Cr**

The laboratory sessions are designed toinculcate good laboratory practice and work habits. This is also a place to reinforce the concepts and techniques presented in the lectures. This course also teaches the students to get acquainted with data and error analysis and offers hands-on experience with moderninstrumentation and soft skills.

At the end of the course, students will be able to

i. practice systematic laboratory work habits;
ii. design experiments and verify theoretical concepts;
iii. perform Data and error analysis;
iv. handle advanced equipment in the lab;
v. troubleshoot physics experiments.

Total of 16 Experiments:
Compulsory experiments:

1. Fabrication of a dual power supply –regulation study
2. Familiarization of CRO, signal generators
3. Work shop practice – Use of tools and machines.

Any 7 from the following:

4. Familiarization - excel – calculations and graph and PCB software
5. CDS calibration – Na Lamp – Hg spectrum –FabryPerot etalon.
6. Michelson interferometer – Wavelength –Na, Hg & laser.
7. Reflection grating – finding groove spacing- CD, DVD and grating.
8. Calibration techniques - Thermister - Thermocouple
9. linear polarizer & Quarter wave plate - circular and elliptical polarization
10. Eddy current – Electromagnet & mapping the magnetic field.
11. Refractive index of glass, and liquids, sugar content– laser pointer.
12. Fourier series - analyzing periodic function - experiment
13. Balmer series - hydrogen spectrum – Rydberg constant
14. Hartman interpolation formulae – CDS
15. Age of universe - using spectrum and galaxy diagram
16. Channelled spectrum – to determine the thickness of mica sheet

Any 6 from the following:

17. Characteristics of a solar cell- fill factor.
18. Band Energy gap using diode and LED
19. Study of ac circuits – RC, RL, and LCR – using CRO.
20. Use of Digital and Analog Simulation software for solving circuits.
21. Lab View – Data logging
22. Study of charging and discharging of a capacitor.
23. OP-AMP - wave form generator- sine-square-triangle-ramp
24. second order active filter - OP-AMP
25. Timer 555 – a stable, mono stable, bi stable, VCO and Schmidt trigger.
26. Multiplexing and demultiplexing - 4- bit

Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering	1				
K2: Understanding		2			
K3: Applying			3	3	
K4: Analyzing			4		
K5: Evaluating					
K6: Creating					6
Mean					3.17

PGP / PSP 4434 **INSTRUMENTATION & MICROCONTROLLERS** **5 hrs/4Cr**

This course enables the students to learn the fundamentals of system design and instrumentation and to study its characteristicsand applications. This course gives the fundamental knowledge of signal processing. This course also introduces the students to know the basics of microcontroller and to write simple programs.

At the end of the course, students will be able to

i. analyze the fundamentals of system design and instrumentation.
ii. elucidate the characteristics and applications of transducers
iii. explain the fundamentals of signal processing
iv. describe the architecture and the instruction sets of microcontroller
v. explain the different interfaces related to microcontroller

Unit I: Generalized Characteristics of Instruments & Error

Static characteristics: Accuracy – precision-repeatability – resolution – sensitivity – linear and non linear systems – drift – span – range - noise and filtering - loading effect- Dynamics characteristics: Transfer function – response of first and second order instruments to standard inputs - dead – time elements. Measurement- need for measuring errors in physics - types, measurement and propagation of errors- linear and non -linear curve fitting– least square fitting – Goodness of fit – chi squares fitting

Unit II:Transducers

Introduction – Classification of transducer – Potentiometer - linear measurement – strain gauge – thermistor – thermocouples –capacitive transducers – thermoelectric transducers – Piezo electric transducers - characteristics and applications.

Unit III: General measurements and signal processing

Pressure / vacuum transducers - Measurement of time and energy –Signal conditioning and recovery, impedance matching, amplification (Op-amp based, instrumentation amp, feedback), filtering and noise reduction, shielding and grounding; Fourier transforms; lock-in detector, box-car integrator.

Unit IV: Microcontroller:

PIC18FXX2 Microcontroller Introduction- Architecture- memory organization-registers-addressing modes-data transfer and control instructions-basic arithmetic instructions-logic instructions-assembly language programs-embedded C programs

Unit V: Operations and Applications

PIC18FXX2 Microcontroller I/o Operations and Applications - Interrupts- Timers- PWM – UART - I2C bus - SPI interface – USB - A/D Conversion - D/A Conversion - frequency measurement - temperature measurement - Stepper motor control.

Text Books:

1. A.K.Sawney, *Electrical and electronic measurements and instrumentation*, Dhanpat Roy and co, (2005)
2. Robert B. Reese, *Microprocessors from assembly language to C using PIC18FXX2*, Shroff publishers and distributors, (2005)

References:

1. Alan.S.Morris,*Principles of Measurement and Instrumentation*, Prentice Hall of India, New Delhi,(1999)
2. D.V.S.Murthy,*Transducers and Instruments* , Prentice Hall of India, New Delhi, (1995)
3. W.D.Cooper and A.D.Helfrick, *Electronic Instrumentation and Measurement Techniques,* Dorling Kindersly Pvt. Ltd. India (2009)
4. John B Peatman, *Embedded design with the PIC18F452 microcontroller*, Pearson Education Inc., (2003).
5. Smith D. *W, PIC n practice.A project based approach*, Elsevier, (2008).

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2		2		
K3: Applying		3			3
K4: Analyzing		4	4	4	
K5: Evaluating				5	
K6: Creating					
Mean					**3.11**

PGP / PSP 4436 **MATHEMATICAL PHYSICS - II** **4 hrs / 4 Cr**

This Course introduce linear vector, matrices, Tensors, probability and group theory by exploring mathematical behaviour in physics. Students familiarize themselves with the importance and uniqueness of mathematical tools to analyse physics phenomenon.

At the end of the course, students will be able to

i. explain the properties of linear vector space and matrices and apply them to analyze a broad range of physical models
ii. apply the concepts of Tensor analysis and Tensor calculus to formulate physical laws and simplify them using coordinate transformations
iii. apply probability and statistical laws to physical problems
iv. explain basic concepts in group theory and its importance in physics
v. usecharacter table and group symmetry to form irreducible representations

Unit I: Linear Vector Space and Matrix Analysis

Definition of a linear vector space – Linear independence, basis – Scalar product – Orthonormal basis – Gram-Schmidt orthogonalization process – Linear operators. Special matrices – Eigen values and Eigen vectors – Cayley Hamilton theorem – Coordinate transformations.

Unit II: Tensors Analysis

Introduction – Transformation of Coordinates – Contravariant and Covariant tensors - Algebra of tensors – Quotient law – The line element – Fundamental metric tensor – Associate tensors.

Unit III: Tensors Calculus and Probability

Christoffel symbols – Covariant differentiation of tensors – Equation of the Geodesic line – Riemann-Christoffel tensors. Elementary probability theorem – random variables – Binomial, Poisson and Normal distributions

Unit IV: Abstract Group Theory

Definition and nomenclature – multiplication table – Rearrangement theorem – Cycle groups – Sub-groups – Cosets, class – Normal divisors and factor groups – Class multiplication - Continuous groups – SU(2) and SU(3) – Orthogonal.

Unit V: Theory of Group Representation

Reducible and irreducible representation – Great orthogononality theorem (no proof) – Character representation – Character table decomposition of reducible representation – Regular representation – Application of representation theory

Text Books:

1. P.K.Chattopadhyay, *Mathematical Physics*, New Age International Publishers (2013).
2. Charlie Harper, *Introduction to Mathematical Physics*, Prentice-Hall, Inc (1976),
3. Louis A. Pipes and Lawrence R. Harvill,*Applied Mathematics for Engineers and Physicists*, McGraw-Hill, International Third Edition (1970)
4. A.W.Joshi, *Elements of group theory for physicists*, New Age International Publishers (1997),

References:

1. Eugene Butkov, *Mathematical Physics*, Addison Wesley Publishing Company (1995).
2. A.W.Joshi, *Matrices and Tensors in Physics*. New Age International Publishers (2017).
3. George B. Arfken, Hans J. Weber and Frank E. Harris, *Mathematical Methods for Physicists*, Elsevier Academic Press Seventh Edition (2012).
4. Sadri Hassani, *Mathematical Physics. A Modern Introduction to its Foundations*, Springer Second Edition (2002).
5. Mary L Boas, *Mathematical Methods in the Physical Sciences*, John Wiley & Sons Third Edition (2005).
6. SathyaPrakash, *Mathematical Physics*, Sultan Chand and Sons (2014).

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2	2			
K3: Applying			3		3
K4: Analyzing			4	4	
K5: Evaluating		5			
K6: Creating					
Mean					3.0

PGP / PSP 4438 **QUANTUM MECHANICS - I** **4 hrs / 4 Cr**

This course deals with the basics of quantum mechanics, exactly solvable eigenvalue problems, theory of angular momentum, and scattering theory.

At the end of the course, students will be able to

i. describe and apply the concepts of quantum mechanics to exactly solvable systems
ii. explain the general formalism of wave mechanics.
iii. find the energy eigen functions and eigen values of bound state systems
iv. describe the theory of general angular momentum and its applications
v. elucidate the quantum theory of scattering in low energy and high energy approximations.

Unit I: The Schrodinger Equation and Stationary States

A Free particle in One Dimension – Generalization to Three Dimensions – The Operator Correspondence and the Schrodinger Equation for a Particle Subject to Forces – Normalization and Probability Interpretation – Non- normalizable Wave Functions and Box Normalization – Conservation of Probability – Expectation Values : Ehrenfest's Theorem – Admissibility Conditions on the Wave Function – A Particle in a Square Well Potential – Square Potential Barrier – Delta-Function Well

Unit II: General Formalism of Wave Mechanics

The Fundamental Postulates of Wave Mechanics – The Eigenvalue Problem: Degeneracy – Observables: Completeness and Normalization of Eigenfunctions – Closure – Physical Interpretation of Eigenvalues, Eigenfunctions and Expansion Coefficients – The Uncertainty Principle – States with Minimum Value for Uncertainty Product – Commuting Observables: Removable Degeneracy.

Unit III: Exactly Solvable Eigenvalue Problems

The Simple Harmonic Oscillator – Analytical Method – The Abstract Operator Method – Angular Momentum and Parity – Eigenvalue Equation for L^2: Eigenvalues and Eigenfunctions – Spherical Harmonics – The Hydrogen Atom – Solutions of the Radial

Equation: Energy levels – Stationary State Wave functions - Charged particle in a uniform magnetic field – Integer Quantum Hall Effect.

Unit IV: Angular Momentum

The Hilbert Space of State Vectors: Dirac notation – Representation of Dynamical Operators – Unitary Transformation - The Eigenvalue Spectrum – Matrix representation – Spin Angular Momentum – A Charged particle in a uniform magnetic field - Non-relativistic Hamiltonian with Spin : Diamagnetism – Addition of Angular momenta – Evaluation of C. G. Coefficients - Spin Wave functions for a system of two spin-1/2 particles - Identical Particles with Spin.

Unit V: Scattering Theory

Kinematics of the Scattering Process – Wave Mechanical Picture of Scattering – Green's functions: Formal Expression for Scattering Amplitude – The Born Approximation; Partial Wave Analysis – Phase Shifts – The Scattering Amplitude in terms of Phase shifts – The Differential and Total Cross-Section: Optical Theorem – Phase shifts: Relation to Potentials – – Scattering by a Square Well, Hard Sphere;

Text Book:

1. P. M. Mathews & K. Venkatesan, *A Text Book of Quantum Mechanics*, 2nd Ed., Tata McGraw Hill, New Delhi (2013)

References:

1. L. I. Schiff, *Quantum Mechanics*, 3rd Ed., McGraw Hill New York (1968).
2. G. Aruldhas, *Quantum Mechanics*, 2nd Ed., PHI Learning Private limited, New Delhi (2013).
3. J. J. Sakurai, *Modern Quantum Mechanics*, Addition-Wisley (1999).
4. S. R. Shankar, *Principles of Quantum Mechanics*, 2nd Ed., Springer (2007).

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2	2	2		
K3: Applying				3	3
K4: Analyzing	4		4	4	4
K5: Evaluating		5			
K6: Creating					**3.09**

PGP / PSP 4340 **NANO PHYSICS** **4 hrs/3 Cr**

This course is designed to introduce the students to Basic concepts of crystal growth and its application, Characterization adopted in industries and scientific laboratories, Basic concepts of the nano particle. It also deals with Nano structure and its applications, Biological importance of nano materials

At the end of the course, students will be able to

i. explain the various techniques of crystal growth
ii. discuss the basics of Nanophysics and Methods of synthesis
iii. analyze quantum nanostructure and discuss its applications
iv. describe biological nanostructures, MEMS AND NEMS
v. compute nano particle size and structure using various instruments

UNIT I

Nucleation – Concept of nucleus formation – Shapes of nucleus – Phase diagrams and phase rules – Methods of melt growth – Vapour growth – Slow cooling – Gel growth – Etching techniques.

UNIT II

Introduction to Physics of the Solid State – Structure - Energy Bands - Localized Particles – Metal Nanoclusters- Magic Numbers - Theoretical Modelling of Nanoparticles - Magnetic Clusters – Semiconducting Nanoparticles – Optical Properties - Rare Gas and Molecular Clusters – Carbon Nanotubes – Methods of Synthesis - RF Plasma - Chemical Methods - Pulsed Laser Methods

UNIT III

Preparation of quantum Nanostructure – Size and dimensionality effects – Conduction Electrons and Dimensionality - Properties Dependent on Density of States - Excitons – Single-Electron Tunnelling – Applications – Superconductivity – Self-Assembly – Semiconductor Islands- Monolayers- Process of self-assembly- Catalysis- Porous Materials

UNIT IV

Biological Building Blocks – Nucleic Acids – Biological Nanostructures – Microelectromechanical Systems (MEMSs) – Nanoelectromechanical Systems (NEMSs) – Molecular and Supramolecular Switches

UNIT V

Atomic Structures – Crystallography – Particle Size Determination – Surface Structure – Transmission Electron Microscopy – Field Ion Microscopy – Scanning Microscopy – Spectroscopy of Semiconductors; Excitons – Infrared and Raman Spectroscopy – Brillouin Spectroscopy – Photoemission and X - Ray Spectroscopy – Magnetic Resonance – Luminescence

Text book:

1. P.S. Raghavan and P. Ramasamy, *Crystal Growth Process and Methods*, KRU publications (2000)

2. C.P. Poole Jr, F.J. Owens, *Introduction to Nanotechnology*, Wiley Students Edition (2007)

References:

1. Richard Booker & Earl Baysen, *Nano Technology*, Wiley (2005)
2. HuozhongGao, *Nano structures &Nanomaterials*, Imperial College press (2004)

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding		2		2	
K3: Applying					
K4: Analyzing	4		4		
K5: Evaluating			5		5
K6: Creating					
Mean					3.28

PGP / PSP 4342 **PHYSICS IN HUMAN PHYSIOLOGY** **4 hrs / 3 Cr**

This course enables learners to understand themusculoskeletal system, circulatory system, nervous system, auditory system andmetabolic processes of human body

At the end of the course, students will be able to

i. describe the behavior of human body under various forces
ii. explain the human functions under gravitational force
iii. identify the physics behind the blood flow in the human body
iv. relate the biological phenomenon to the physics of sound and heat
v. explain the physics of vision

Unit I: Forces and human body

Equilibrium and Stability - Equilibrium Considerations for the Human Body - Stability of the Human Body under the Action of an External Force - Skeletal Muscles - Levers - The Elbow - The Hip - The Back - Standing Tip-Toe on One Foot - Dynamic Aspects of Posture. Standing at an Incline - Friction at the Hip Joint - Spine Fin of a Catfish

Unit II: Motions and human body

Vertical Jump - Effect of Gravity on the Vertical Jump- Running High Jump - Range of a Projectile - Standing Broad Jump - Long Jump- Motion through Air - Energy Consumed in Physical Activity. Forces on a Curved Path - A Runner on a Curved Track - Pendulum - Walking - Physical Pendulum - Speed of Walking and Running - Energy Expended in Running - Alternate Perspectives on Walking and Running - Carrying Loads.

Unit III: Motion of Fluids and human body

Force and Pressure in a Fluid - Pascal's Principle - Hydrostatic Skeleton - Archimedes' Principle - Power Required to Remain Afloat - Buoyancy of Fish - Surface Tension - Soil - Insect Locomotion on Water - Contraction of Muscles – Surfactants.

Viscosity and Poiseuille's Law - Turbulent Flow - Circulation of the Blood - Blood Pressure - Control of Blood Flow - Energetics of Blood Flow - Turbulence in the Blood - Arteriosclerosis and Blood Flow - Power Produced by the Heart - Measurement of Blood Pressure.

Unit IV: Sound / Heat and human body

Energy Requirements of People - Energy from Food - Regulation of Body Temperature - Control of Skin Temperature - Convection - Radiation - Radiative Heating by the Sun - Evaporation - Resistance to Cold - Heat and Soil.

Properties of Sound - Hearing and the Ear - Bats and Echoes - Sounds Produced by Animals - Acoustic Traps - Clinical Uses of Sound - Ultrasonic Waves

Unit V: Optics/Electricity and human body

Vision - Nature of Light - Structure of the Eye - Accommodation - Eye and the Camera - Lens System of the Eye - Reduced Eye - Retina - Resolving Power of the Eye - Threshold of Vision - Vision and the Nervous System - Defects in Vision - Lens for Myopia - Lens for Presbyopia and Hyperopia - Extension of Vision.

The Nervous System- Electricity in the Bone- Electric Fish

Text book:

1. Paul Davidovits, *Physics in Biology and Medicine*, 3rd Edition, Academic press (2008).

Reference books:

1. VasanthaPattabhi and N. Gautham, *Biophysics*, Kluwer academic publishers, (2002).

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding		2			2
K3: Applying			3		
K4: Analyzing				4	
K5: Evaluating		5		5	
K6: Creating					
Mean					3.0

PGP / PSP 4344 **SUSTAINABLE ENERGY RESOURCES** **4 hrs / 3 Cr**

This course deals with the principles of renewable energy, energy conversion systems, thermal energy systems and energy storage systems.

At the end of the course, students will be able to

i. distinguish the characteristics of renewable energy.
ii. explain the significance of solar radiation and their applications
iii. explain the energy extraction from wind, tides and organic substances.
iv. describethe thermal energy conversions in ocean and earth's core.
v. interpret different forms of energy storage and their transmission.

Unit I: Principles of Renewable Energy

Fundamentals - Scientific principles of renewable energy - Technical implications - Social implications - Heat transfer - Heat circuit analysis and terminology - Conduction - Convection - Radiative heat transfer - Properties of transparent materials - Heat transfer by mass transport.

Unit II: Solar Energy Systems

Solar radiation - Measurements of solar radiation- Solar water heating - Evacuated collectors - Solar ponds - Solar concentrators - Solar thermal electric power systems –Photo-voltaic generation - Solar radiation absorption - Types of photo-voltaicsystemsand their Applications

Unit III: Energy Conversion Systems

Power from the wind - Turbine types and terms - Characteristics of the wind - Power extraction by a turbine - Electricity generation - Mechanical power - Biomass and biofuels - Biofuel classification - Biomass production for energy farming - Direct combustion for heat - Pyrolysis (destructive distillation) - Anaerobic digestion for biogas - Vegetable oils and biodiesel - Tidal power - The cause of tides - Tidal current/stream power - Tidal range power.

Unit IV: Thermal Energy Systems

Ocean thermal energy conversion (OTEC) - Principles - Heat exchangers - Pumping requirements - Environmental impact - Geothermal energy - Geophysics - Dry rock and hot aquifer analysis - Harnessing Geothermal Resources.

Unit V: Energy Storage Systems

Energy systems, storage and transmission - The importance of energy storage and distribution - Biological storage - Chemical storage - Heat storage - Electrical storage: batteries and accumulators - Fuel cells - Mechanical storage.

Text Book:

1. John Twidell and Tony Weir, *Renewable Energy Resources*, 2nd edition, London, Taylor & Francis Group, (2006).

References:

1. D. Y. Goswami, F. Kreith and J. F. Kreider, *Principles of Solar Engineering*, Philadelphia, Taylor and Francis, (2000).
2. L.L. Freris, *Wind Energy Conversion Systems*, Prentice Hall, (1990).
3. C. S. Solanki, *Solar Photovoltaics: Fundamental Applications and Technologies*, Prentice Hall of India, (2009)
4. S.P. Sukhatme, *Solar Energy: principles of Thermal Collection and Storage*, Tata McGraw-Hill (1984).
5. E H Thorndike, *Energy & Environment: A Primer for Scientists and Engineers*, Addison-Wesley Publishing Company, (1976)
6. R Wilson & W J Jones, *Energy, Ecology and the Environment*, Academic Press Inc. (1975)

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2	2			2
K3: Applying				3	
K4: Analyzing			4		
K5: Evaluating		5		5	
K6: Creating					
Mean					

PGP / PSP 4346 **PHYSICS LAB - II** **9 hrs / 3 Cr**

The laboratory sessions are designed to inculcate good laboratory practice and work habits. This is also a place to reinforce the concepts and techniques presented in the lectures. This course also teaches the students to get acquainted with data and error analysis and offers hands-on experience with modern instrumentation and soft skills.

At the end of the course, students will be able to

i. practice systematic laboratory work habits.
ii. design experiments and verify theoretical concepts
iii. perform Data and error analysis
iv. handle advanced equipment in the lab
v. troubleshoot physics experiments

Total of 16 Experiments: **Any 8 from the following:**

1. Hall Effect - Hall coefficient, Hall voltage, carrier density and mobility.
2. GM counter - counter plateau and resolving time

3. CDS - arc spectrum
4. Michelson interferometer - optical bread board - refractive index of gas
5. Ultrasonic interferometer - Physical parameters of pure and binary liquids - dielectric constant, verification of iterative equations
6. XRD – Determination of structural parameters
7. Determination of Hysteresis loss – tracing B-H loop on the CRO
8. Free fall – displacement-time graph, g calculation using charging and discharging
9. Four probe - Measurement of sheet resistance, resistivity, Energy gap -thin films, silicon & aluminum foil.
10. Susceptibility - electro magnet - Quinke's method – liquid
11. Microwave - Characteristics, dielectric constant in liquid and solids
12. Thick lens systems – nodal points – optical bench
13. Charge of the electron - using spectrometer.
14. MATH-CAD – Graphics and Mathematical analysis

Any 8 from the following:

15. Pulse Width Modulation - Study & DC motor control.
16. Op-Amp - logarithmic and Anti logarithmic amplifier, current to voltage converters and voltage to current converters
17. FM Modulation and demodulation.
18. Experiments in physics with expEYE-17.
19. Lab view –multiplexer and demultiplexer
20. Stepper motor control - using micro controller.
21. Design of counters – using flip flops, MOD counters using 7490.
22. FET – characteristics – Vp, I_{DSS}, gm, rd.
23. Analog computation using - OP-AMP.
24. D/A conversion - (R-2R and weight network).
25. Instrumentation amplifier.
26. Study of RAM – using ICs.

Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering	1				
K2: Understanding	2		2		
K3: Applying		3			3
K4: Analyzing		4	4	4	
K5: Evaluating				5	
K6: Creating					
Mean					

PGP / PSP 5431 **NUCLEAR & PARTICLE PHYSICS** **5 hrs / 4 Cr**

This course enables students to acquire knowledge of basic properties of nucleus and the nature of nuclear forces. It introduces the concepts of radioactivity and students get an insight into nuclear reactions. Also it helps students to gain the knowledge on elementary particles.

At the end of the course, students will be able to

i. explain the structure of nucleus, its stability and various nuclear models
ii. categorize various nuclear decay process and the associated selection rules
iii. discuss the nature of nuclear forces
iv. elucidate key features of nuclear fission reactors and fusion reactions
v. classify elementary particles and quark states using group theory

Unit I: Nuclear Structure and Models

Nuclear size –theories of nuclear composition-binding energy- semi empirical mass formula of Weizsacker - nuclear stability – Fermi gas model – liquid drop model – shell model - magic numbers - extreme single particle model- predictions of shell model- Unified model.

Unit II: Radioactivity

Geiger Nuttal law- fine structure of alpha spectra- Gamow's theory of alpha decay- beta decay- Neutrino hypothesis- Fermi's theory of beta decay- Kurie plots- Fermi and G.T.Selection rules- Non- conservation of parity in beta decay- Gamma emission- internal conversion- nuclear isomerism.

Unit III: Nuclear Scattering and Reactions

Nuclear forces-deuteron-low energy n–p scattering- phase shift, scattering length- p-p scattering at low energies- n-n scattering- types of nuclear reactions-Conservation laws- Q-equation- endoergic and exoergic reactions- nuclear cross section-Breit- Wigner one level formula- Direct reactions

Unit IV: Nuclear Fission and Fusion

Nuclear fission: types of fission-fission cross section- fission isomer-deformation of liquid drop-Bohr and Wheelers theory of nuclear fission-parity violation in fission- nuclear fusion and thermonuclear reactions- controlled thermonuclear reactions-nuclear fission reactor: nuclear chain reaction-four factor formula-critical size of a reactor.

Unit V: Elementary Particles

Introduction- classification of elementary particles- fundamental interactions- conservation laws- conservation of isospin- strangeness- hypercharge-Gell-Mann Nishijima relation-charge conjugation- parity- Combined Inversion- time reversal- combined inversion of CPT-

neutrino and antineutrino-graviton, photon and gluon-elementary particle symmetry- SU(2) group- SU(3) group- quarks model.

Text Books:

1. D.C.Tayal, *Nuclear Physics*, Himalaya Publishing house, New Delhi (2013)

References:

1. H.A. Enge, *Nuclear Physics*, Addison Wesley Pub. Co, London(1969)
2. R.C. Sharma, *Nuclear Physics*, Wily Eastern Ltd, New Delhi.(1980)
3. V.Devanathan, *Nuclear Physics*, Narosha Publishing House, New Delhi (2006).

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2		2	2	
K3: Applying	3	3			3
K4: Analyzing		4	4		4
K5: Evaluating				5	
K6: Creating					
Mean					

PGP/PSP5433ELECTRODYNAMICS AND PLASMA PHYSICS 4 hrs/4 Cr

To apprise the students regarding the concepts of electrodynamics and Maxwell equations and use them various situations. Also the course introduces the students to elementary phenomena and concepts in plasma physics.

At the end of the course, students will be able to

i. describe electrostatic phenomenon using method of images and boundary value approach
ii. explain magneto-statics phenomenon and construct Maxwell's equations
iii. describe propagation of electromagnetic waves in different media using Maxwell's equations
iv. elucidate the production of electromagnetic waves and derive the relativistic electro dynamic field equations
v. explain elementary phenomena and concepts in plasma physics.

UNIT I: Electrostatics

The Electric field – Differential form of Gauss Law – Applications of Gauss Law – Poisson's Equation and Laplace's Equation- The Method of Images - Boundary Value Problems – Multipole Expansion - Electric fields in Matter – Polarization – Bound Charges – Electric Susceptibility - Boundary value problems with linear dielectrics

UNIT II Magneto statics& Maxwell's Equations

The Biot-Savart Law – The Divergence and Curl of Magnetic field – Ampere's Law – Magnetic Vector Potential – Magnetic Fields in Matter – Magnetization - Bound Currents – Magnetic Susceptibility – Maxwell's Equations: Electrodynamics Before Maxwell - Magnetic Charge - Maxwell's Equations in Matter - Boundary Conditions-Electromagnetic waves in Vacuum - The Wave Equation for E and B - Monochromatic Plane Waves - Energy and Momentum in Electromagnetic Waves -

UNIT III Propagation of EM Waves

Electromagnetic Waves in Matter – Propagation in Linear Media - Reflection and Transmission at Normal Incidence and Oblique Incidence – Fresnel's equation - Electromagnetic Waves in Conductors - Reflection at a Conducting Surface - Wave Guides - TE Waves in a Rectangular Wave Guide - The Coaxial Transmission Line

UNIT IV Radiation of EM Waves & Relativistic Electrodynamics

Dipole Radiation: Electric Dipole Radiation - Magnetic Dipole Radiation – Radiation from an Arbitrary Source - Electric and Magnetic fields and Total Radiated Power - Point Charges - Power Radiated by a Point Charge; **Relativistic Electrodynamics** - The Field Tensor – Electrodynamics in Tensor Notation - Relativistic Potentials – Maxwell's equations.

UNIT V: Introduction to Plasma Physics

General Properties of Plasma – Debye Shielding – The Occurrence of Plasma in Nature - Applications of Plasma Physics: Controlled Thermonuclear Fusion – The Magneto-hydrodynamic Generator – Plasma Propulsion – Plasma Devices – Theoretical Description of Plasma Phenomena; Charged Particle Motion in Non-uniform magneto-static fields: Gradient Drift – Magnetic Mirror Effect.

Text Books:

1. J. H. Griffiths, 3rd ed., *Introduction to Electrodynamics*, Prentice-Hall of India Pvt Ltd, New Delhi (2013).
2. J. A. Bittencourt, *Fundamentals of PLASMA PHYSICS*, 3rd Ed., Springer-Verlag, NewYork (2004)

References:

1. Dale Corson& Paul Lorrain, 2ndedn, *Electromagnetic fields and waves*, CBS Publishers, New Delhi(1988)
2. J.D.Jackson ,*Classical electrodynamics*, John Wiley, New York(1978).
3. Francis F. Chen, 2ndedn, *Introduction to Plasma Physics and controlled Fusion* (Vol. I), Plenum Press, New York

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2	2			2
K3: Applying		3	3		
K4: Analyzing				4	
K5: Evaluating			5	5	
K6: Creating					
Mean					

PGP/PSP5435 **PHYSICAL ELECTRONICS** **4 hrs / 4 Cr**

This course aims to provide students with knowledge of conduction in electronic devices, the theory behind conduction mechanism, Field effect transistors, microwave devices and photonic devices.

At the end of the course, students will be able to

i. explain the phenomena of conduction in metals
ii. describe electrical conduction in semiconductors
iii. account for charge transport across semiconductor junctions
iv. describe the operations of FET and microwave devices
v. elucidate the physics of photonic devices

UNIT-1 Conduction in metals

Electron volt - unit of energy - current density - motion in a magnetic field - Nature of the atom - energy band theory of crystals - insulators - semiconductors - conductors- Conduction in metals - potential energy field in a metal - bound and free electrons - energy density - Fermi level -density of states - work function .

UNIT-2 Theory of semiconductors

Conduction in semiconductors - electrons and holes - conductivity - carrier concentration in conduction and valence band - intrinsic concentration- effective mass - fermi level in an intrinsic and extrinsic semiconductor - donor acceptor impurity - charge density in a semiconductor - Diffusion - carrier life time - The continuity equation- Hall effect.

UNIT-3 Semiconductor Diode

Semiconductor diode characteristics - qualitative theory - P-N junction as a diode - Metal-semiconductor junctions, Schottky diode- ohmic contacts - open circuited p-n junction. Theory of p-n diode forward and reverse currents - the volt-ampere characteristics - diode resistance - transition and diffusion capacitance

UNIT-4 FET and microwave Devices

JFET- construction - characteristics - small signal model - FET as voltage and current regulator - homo and hetero junction devices - the MOSFET transistor, CMOS technology, the UJT - frequency dependence and applications. Tunnel - Gunn diode - IMPATT diode - Klystron - travelling Magnetron and back ward oscillators - working, characteristics and applications.

UNIT-5 Physics of Photonic Devices

Basic monolithic circuits - monolithic diode - integrated resistor - integrated capacitors and inductors - Radiative and non-radiative transitions - optical absorption- photo emissivity - photo tubes - photo multiplier tubes - photo conductivity - photo diode - laser diode - photo voltaic effect - solar cell - photo detectors - LED- OLED.

Text Books:

1. Christos C. Halkias, SatyabrataJit, Jacob Millman, (2015) *Electronic devices and circuits*, 4e ,Mcgraw hill publishing company.

References:

1. Samuel Y. Leo, Microwave Devices and Circuits. Third Edition. Prentice hall, Englewood Cliffs, New Jersey.
2. Bill Wilson, Introduction to Physical Electronics (2010) Connexions publications

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2		2		
K3: Applying		3			3
K4: Analyzing			4	4	
K5: Evaluating		5		5	
K6: Creating					
Mean					

PGP/PSP 5437 **LASER & SPECTROSCOPY** **4 hrs/ 4 Cr**

This Course deals with the basic physics behind laser operation, the different laser systems and their applications like interaction with matter and information processing. Physical and Chemical processes in molecular systems are also analyzed through various spectroscopic methods in different regions of electromagnetic spectrum.

At the end of the course, students will be able to

i. explain the theory of lasers and its line broadening mechanism.
ii. describe the design characteristics of optical cavities for laser systems.
iii. elucidate rotational and vibrational spectroscopy
iv. discuss Raman and electronic spectroscopy
v. describe the theory ofresonance spectroscopy

UNIT I: LASER - I

Einstein Coefficients – Light amplification – Threshold condition – Laser rate equations – Three level system – Four level system – Variation of laser power around threshold – Optimum output coupling – Line broadening mechanisms.

UNIT II: LASER - II

Modes of a rectangular cavity and the open planar resonator – Quality factor – Ultimate line width of a laser – Mode selection – Q - Switching – Mode locking in lasers – Modes of a confocal resonator system

UNIT III Rotational and Vibrational Spectroscopy

Types of molecules – Rotational spectra of rigid and non-rigid rotators – Intensity of rotational lines– Effect of isotopic substitution –Stark modulated microwave spectrometer – Vibrational spectra of simple harmonic oscillator – Anharmonic oscillator – vibrating rotator – IR Spectrometer.

UNIT IV: Raman and Electronic Spectroscopy

Classical and quantum theory of Raman effect – Pure rotational Raman Spectra – Vibration Raman spectra – Raman activity of vibrations – Raman spectrometer – Vibrational coarse structure – Frank Condon principle – Rotational fine structure – Dissociation and pre dissociation – Deslander's table – Fortrat parabola – Photo-electron spectroscopy.

UNIT V: Resonance Spectroscopy

Interaction of spin and applied magnetic field – Relaxation processes – Chemical shift – Coupling constant – NMR spectrometer – Principles of electron spin resonance – Multiplet structure – ESR spectrometer - Mössbauer effect – Recoilless emission of gamma rays.

Text Books:

1. A.K. Ghatak& K. Thyagarajan, *Optical Electronics*, Cambridge University Press, Cambridge, (1989).

2. G.N. Banwell& E.M. Mccash, *Fundamentals of Molecular Spectroscopy*, 4th Ed. Tata McGraw Hill Publishing, (2000).

References:

1. P.W. Milonni,& J.H. Ederly, *Lasers*, John Wiley & Sons, (1988).
2. G. Aruldhas, *Molecular structure and spectroscopy*, Prentice Hall, India, (1997).

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2	2			
K3: Applying				4	
K4: Analyzing		4	4		4
K5: Evaluating				5	
K6: Creating					
Mean					

PGP/PSP 5439 **QUANTUM MECHANICS -II** **4 hrs/4 Cr**

This course gives an insight of applying different approximation methods for stationary states and deals with alternative pictures of time evolution and relativistic quantum mechanics. It also helps the students to acquire basic knowledge of quantum field theory.

At the end of the course, students will be able to

i. apply different approximation methods for stationary states.
ii. describe the time evolution of quantum systems and discuss matter radiation interaction
iii. differentiate Schrodinger, Heisenberg and Dirac pictures and quantum theory of photon interaction
iv. describe the relativistic quantum phenomena and account for electron spin and electron magnetic moment.
v. AnalyzeFermi and Bose systems using quantum field theory

Unit I: Approximation methods for stationary states

Perturbation theory for discrete levels: Non-Degenerate and Degenerate case - Stark Effect - Two electron Atoms; The variational method: Upper bound on ground state energy - Application to excited states – The Hydrogen Molecule; The WKB Approximation: The Bohr-Sommerfeld quantum condition

Unit II: Evolution with Time

Exact Formal Solutions: Propagators – Relation of Retarded propagator to the Green's function; Perturbation Theory for time evolution problems: Perturbative solution for transition amplitude–Selection Rule - First order transitions – Fermi's Golden rule – Harmonic perturbations – Interaction of an Atom with EM Radiation – The Dipole Approximation – The Einstein's coefficients.

Unit III:Alternative Pictures of Time Evolution

The Schrodinger Picture – The Heisenberg Picture – Matrix Mechanics - The Simple Harmonic Oscillator - Electromagnetic wave as Harmonic Oscillator: Photons – Atom Interacting with Quantized Radiation: Spontaneous Emission – The Interaction Picture – Time Evolution of Ensembles: Density Matrix.

Unit IV: Relativistic Wave Equations

The Klein-Gordon Equation – Plane wave solutions - Interaction with Electromagnetic Fields: Hydrogen-like Atom; The Dirac Equation: Dirac's Relativistic Hamiltonian – Dirac Matrices – Plane wave solutions and Energy Spectrum - The Spin of the Dirac Particle –Spin Magnetic Moment – The Spin orbit Energy.

Unit V: Introduction to Quantum Field Theory

Lagrange's Classical Field Equation – Quantization of the field: Schrodinger Field– Commutation Algebra for Bosons & Fermions-Relativistic fields: Klein-Gordon field- Dirac field - Quantization of EM field.

Text Books:

1. P. M. Mathews & K. Venkatesan, *A Text Book of Quantum Mechanics*, 2nd Ed., Tata McGraw Hill, New Delhi (2013)
2. G. Aruldhas, *Quantum Mechanics*, 2nd Ed., PHI Learning Private limited, New Delhi (2018)

References:

1. Schiff L.I. *Quantum Mechanics*, 3rd Ed., McGraw Hill New York (1968).
2. G. Aruldhas, *Quantum Mechanics*, 2nd Ed., PHI Learning Private limited, New Delhi (2013).
3. Thankappan V. K. *Quantum Mechanics*, 2nd Ed., New Age International (P) Ltd, New Delhi (1993).
4. Ajay &Ghatak, *Quantum mechanics Theory and applications*, Mac Millan, (2003).
5. MezbacherE "*Quantum Mechanics*" 2nd Ed, John Wiley & Sons Inc, (1970).

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1	1			
K2: Understanding				2	
K3: Applying	3				
K4: Analyzing		4			4
K5: Evaluating			5	5	
K6: Creating					

PGP/PSP 5441 **PROJECT – I** **9 hrs/4 cr**

This course enables the Students to have hands-on experience in the design experiments / methodologies and record the process of measurements. He will also learn to correlate with the respective theoretical concepts and draw non-trivial conclusions of the significance of the observations.

At the end of the course, students will be able to

i. define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data;
ii. identify relevant assumptions or implications; formulate coherent arguments;
iii. act together as a group or a team in the interests of a common cause and work efficiently as a member of a team;
iv. use ICT and demonstrate ability to access, evaluate, and use a variety of relevant information sources;
v. communicate with others using appropriate media; confidently share one's views and express herself/himself.

Students are given the freedom of choosing the topic of the project and approved by the staff supervisor/ guide. It may be theoretical or experimental. After getting approval of the proposed project work within 5 sessions, students are supposed to carry out these projects in the department laboratory. Students shall maintain daily records and present at least two oral progress reports while doing the project. They shall submit the dissertation at the end of the semester. Students are encouraged to have hands-on experience in designing, fabricating, and analyzing the observations using fundamental concepts studied in the course of study.

Evaluation Method For Project:

1. Project Proposal (Oral and written) 20%
2. Oral progress reports 20%
3. Continuous assessment 35%
4. Final Report 25%

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2				
K3: Applying	3		3	3	
K4: Analyzing	4	4		4	
K5: Evaluating	5				5
K6: Creating					
Mean					

PGP/PSP 5432 **THIN FILMS & VACUUM TECHNOLOGY** **4 hrs/4 Cr**

This course introduces students to the theory and practice of high vacuum systems as well as thin film deposition. Students will have hands on experience of system operation, thin filmcoating and design. This course also introduces the students to various characterization techniques adopted in industries and scientific laboratories.

At the end of the course, students will be able to

i. identify and explain different high vacuum system and its components
ii. distinguish between different types of coating procedures
iii. explain the physics of thin film growth
iv. analyze and interpretthe characteristics of thin film
v. describe the properties and applications of thin films

UNIT I: Production of High Vacuum

Production and maintenance of high and ultrahigh vacuum systems - Kinetics of vacuum - Low and high vacuum – high vacuum materials - Gas transport - conductance - pumping - Vacuum pumps - vacuum gauges -types of valves and flanges - Types of vacuum systems and their components - types of leakages. system switching ON and OFF procedure.

Lab: Pump down characteristics, flow rate determination, McLeod's gauge,Identifyingtypes of valves and flanges.

UNIT II: Physical evaporation Process

Physical vapour deposition - evaporation rate - Evaporation of alloys- Film thickness uniformity and purity- Thermal evaporation - source heaters - substrate materials and cleaning - Glow discharge - plasma species - Sputtering systems, its types - sputter yield - alloy sputtering - RF sputtering - PLD process and coating - Evaporation Vs Sputtering.

Lab: Demonstration of thermal and sputtering coating- Hard coatings

Unit III: Growth and Chemical Coating Process

Film formation and structure: growth process- basic models - kinetic models of nucleation - theory of homogeneous and heterogeneous nucleation - nucleation rate - sticking coefficient -

compar. **Chemical vapour deposition** - Reaction types - CVD process and systems - Low and high temperature systems - LPCVD, PECVD, LECVD, MOCVD - safety.

Unit IV: Surface and thickness of thin films

Film thickness - micro balance - quartz crystal monitor - Profilometer (stylus) - ellipsometry - photometric method- spectro photometric method - FIZEAU and FECO methods - structural analysis, LEED, HEED, SEM, TEM, AES, EDAX and XPS (Description only).
Lab:–Thickness measurement usingmicrobalance, quartz crystal, profile meterandFizeau method.

Unit V: Properties and application of thin films
Hardness and corrosion of thin films - adhesion test -hard and protective coatings.Electricalproperties - General definitions - film resistivity - four probe, Conduction and TCR of continuous and discontinuous thin films. Optical properties - General definitions - non absorbing films - one and two interfaces - Absorbing films. Thin film resistors–antireflection coatings – Transparent conducting coatings.
Lab: study of reflection, transmission curves of UV-visible spectrophotometer & determination of n and k values – Optical E_g determination - E_g of thin films four probe method.

Text Books:

1. Milton Ohring, 2006, *The material science of thin films*, 2ed , Academic press limited.

2. K. L Chopra 1969, *Thin film phenomena,* McGraw hill book company.
Chapter II, III, IV, V VI, XI relevant topics.

References:

1. Andrew Guthrie, 1963 "*Vacuum technology*" John Wiley& sons, Inc.
2. T. J. Coutts 1974 "*Electrical conduction in thin metal films*" Elsevier scientific publishing company.
3. L.I.Maissel and R.Glang 1970. "*Handbook of Thin Film Technology*" McGraw Hill Book Company, New York.

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2		2		
K3: Applying		3			3
K4: Analyzing		4	4	4	
K5: Evaluating				5	
K6: Creating					
Mean					

PGP/PSP 5434 **CONDENSED MATTER PHYSICS – II** **4 hrs/4 Cr**

This course enables learners to acquire knowledge of energy bands in crystals, understand the different classification of materials, translate the learned information to a variety of quasi particles, present reasoned explanation for various superconducting effects and apply the systematic approach to problem solving in dielectrics and Ferro electrics

At the end of the course, students will be able to

i. derive and explain the electrical properties of crystals
ii. explain the theory of quasi particles and their characteristics
iii. classify the types of superconductors and explain its properties
iv. explain the origin of dielectric and Ferro-electric phenomena
v. describe quantum theory of magnetism and classify magnetic materials

Unit I:Fermi Gas and Energy Bands:

Free electron theory in 1D and in 3D – Fermi-Dirac distribution – Density of states – Heat capacity of the electron gas – Electrical conductivity and Ohm's law – Motion of electrons in magnetic field – Hall Effect – Nearly free electron model – Bloch functions – Kronig-Penney model.

Unit II:Plasmons, Polaritons, Polarons and Excitons

Dielectric function of the electron gas – Plasma Optics – Transverse and Longitudinal modes of Plasma – Plasmons – Polaritons – LST equation – Polarons, Optical Reflectance-Kramer-Kronig relation –Excitons- Frenkel and Mott-Wannierexcitons

Unit III:Superconductivity:

Experimental survey – Destruction of superconductivity by magnetic field – Meissner effect – Isotopic effect – Type I and Type II superconductors – London equation – Coherence length – BCS theory of superconductivity – Flux quantization – Vortex state – DC and Ac Josephson effect – High temperature superconductors – Fullerenes

Unit IV:Dielectric and Ferro electrics

Macroscopic electric field – Local electric field at an atom – dielectric constant and Polarizability – Classius-Mossati equation – electronic polarizability and its frequency dependence – Structural phase transitions – Ferro electric crystals – Displacive transition – Landau theory of phase transition – antiferroelectric materials –Piezoelectricity-Ferroelasticity

Unit V:Magnetism

Quantum theory of dia and para magnetism- Rare earth ions- Hund's rule- Orbital quenching- Paramagnetic susceptibility of conduction electrons- Ferromagnetic order- antiferromagnetic order- Magnons, thermal excitons of magnons , spin waves

Text Book:

1. Charles Kittel, *Introduction to Solid State Physics*, 5th edition.

References:

1. S.O Pillai(1997), *Solid State Physics*, Wiley Eastern Lmt.
2. S.V Subramanian, E.S Rajagopal(1989), *High Temperature Super conductivity*, Wiley Eastern Lmt
3. H.V Keer(1994), *Principles of Solid State,* Wiley Eastern Lmt.
4. M.A.Wahab(1999), *Solid State Physics*, Narosa Publishing house, Delhi

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
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K3: Applying					3
K4: Analyzing		4		4	
K5: Evaluating			5		
K6: Creating					
Mean					

PGP/PSP 5436 **ANALOG ELECTRONICS** **4 hrs/4 Cr**

This course enables the students to understand mainly the operational amplifier in detail and to analyse the different modes of operation.
At the end of the course, students will be able to

i. interpret the theory behind the modes of operation
ii. analyse theoretically, the different types of filters and their characteristics
iii. describe the non-linear models of operational amplifiers
iv. design and explain oscillator circuits
v. explain the limitations in the use of operational amplifier and apply it for constructing amplifiers and oscillators.

Unit I: OP-AMP Introduction

Amplifier fundamentals - Ideal OP-AMP model-frequency response OP-AMP testing circuit - impact of virtual ground - difference amplifier - negative feed -back-real inverting OP-AMP - real non-inverting OP-AMP

Unit II: Active Filters

Transfer function - Bode plot-first order low pass filter - first order high pass filter-first order band pass filter –band reject filter- second order responses - Salen-key second order low pass filter - KRC second order low pass filter - Salen-key second order high pass filter - KRC second order high pass filter - second order band pass filter.

Unit III: Non linear circuits

Positive feed - back - voltage comparator - threshold detector - level detector -window detector - pulse width modulation - Schmitt trigger - inverting Schmitt trigger - non-inverting Schmitt trigger - Analog switches - peak detector - sample and hold circuits.

Unit IV: Signal Generators

Practical Wien's bridge oscillator - multi-vibrators - CMOS Gate multi-vibrator -CMOS crystal oscillator - voltage controlled oscillator - Triangle to sine wave converter.

Unit V: Limitations and Applications

Input bias-offset current-low input bias-input offset voltage-low input offset voltage OP-AMPs-slew rate limiting-current to voltage converter-photo detector amplifier-charge amplifier-Instrumentation amplifier-transducer bridge amplifier-log amplifier-anti log amplifier

Text Book:

1. Sergio Franco, *Design with Operational Amplifiers and Analog Integrated Circuits*, McGraw - Hill Book Company, 4th Edition (2014).

References:

1. G.J Deboo and C.N.Burrous, *Integrated circuits and semiconductor devices*, McGraw Hill,Kogakusha Ltd. (1977).

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2		2		
K3: Applying		3		3	3
K4: Analyzing				4	
K5: Evaluating		5			5
K6: Creating					
Mean					

PGP/PSP 5438 **THERMODYNAMICS & STATISTICAL PHYSICS** **4hrs/ 4 Cr**

This course helps students to understand the laws involving statistical techniques & its application to physics. Various quantum statistical models are proposed & their appropriate involvement in understanding physical behavior of system of particles is discussed.

At the end of the course, students will be able to

i. solve problems related to heat and thermodynamics using the laws of thermodynamics and thermodynamic potentials
ii. define statistical ensembles and use partition function to derive the thermodynamic properties of two level system and ideal gas model
iii. explain the thermodynamic properties of Black body radiation, degenerate Fermi gas and Bose gases using quantum statistics
iv. identify the order of phase transitions, explain its properties using Clayperon latent heat equation and Landau theory and calculate the energy transfer involved in phase transitions
v. appreciate the role of non-equilibrium statistics in nature and explain its origin using physical laws

Unit I: Thermodynamics

Introduction- Review of Thermodynamic laws- Carnot Engines- Entropy- Approach to Equilibrium and Thermodynamic Potentials- Enthalpy, Helmholtz free energy and Gibb's free energy- Useful Mathematical Results: Extensivity, Maxwell's Relations- Gibb's Phase Rule- Stability Conditions- Consequences of the Third Law

Unit II: Classical Statistical Mechanics

The Microcanonical Ensemble- Two-Level Systems- Ideal Gas- Mixing Entropy And The Gibbs Paradox- Canonical Ensemble- Partition Function- Canonical Examples(Two-Level Systems and Ideal Gas)- Gibbs Canonical Ensemble- Grand Canonical Ensemble

Unit III: Quantum Statistical Mechanics

Black-Body Radiation- Quantum Microstates- Quantum Macrostates-Hilbert Space of Identical Particles- Canonical Formulation- Grand Canonical Formulation- Non-Relativistic Gas- Degenerate Fermi Gas- Degenerate Bose Gas – Bose Einstein Condensation- Superfluid He^4

Unit IV: Phase Transitions

First Order Phase Transition- Condition For Phase Co-Existence- Clayperon Equation-Van Der Waal's Equation of State- Virial Expansion- Critical Point- Maxwell's Construction- Order Parameter- Landau Theory- Relation To Microscopic Theory- Functional Integration And Differentiation- Second Order Phase Transition- Mean Field Theory- Critical Exponents- Correlation length.

Unit V: Elements of Non-Equilibrium Statistical Mechanics

Thermal Fluctuations- Nyquist Noise- Brownian Motion- Einstein Theory- Diffusion- Einstein's Relation- Ensemble of Paths- Ensemble Average- Power Spectrum And Correlation Function- Signal And Noise- Transition Probabilities- Markov Process- Fokker Planck Equation- Langevin Equation.

Text Books:

1. MehranKardar, *Statistical Physics Of Particles*, Cambridge University Press, 3 Edition (2010)
2. Kerson Huang, *Introduction To Statistical Physics*, Chapman and Hall/CRC,2 Edition, (2009)

References:

1. R. K. Pathria and Paul D. Beale, *Statistical Mechanics*, 3rd ed. Academic Press (2011)
2. Walter Greinear, Ludwig Neise and Stocker, *Thermodynamics and Statistical Mechanics*, Springer, (1997)
3. V. Balakrishnan, *Elements Of Non equilibrium Statistical Mechanics*, Ane Books Pvt. Ltd. (1997)
4. Kerson Huang, *Statistical Mechanics*, 2nd ed., Publisher: John Wiley (2008)

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding			2		2
K3: Applying	3	3	3		
K4: Analyzing				4	
K5: Evaluating		5		5	
K6: Creating					
Mean					

PGP/PSP 5440 **MATRIX, FOURIER AND NON LINEAR OPTICS** **4hrs/ 4 Cr**

This course enables the students to the use of matrix methods and Fourier and Non-linear techniques in optics. Effectively, this is an applied mathematics course, taught with a systems flavor, for students interested in optics.

At the end of the course, students will be able to

i. apply matrix methods in optics.
ii. describe the characteristics of two dimensional Fourier transform and explain the analysis of linear optical systems.
iii. explain the theory of construction and reproduction of holograms and its applications
iv. elucidate the propagation of light in anisotropic media and electro-optic effect
v. discuss acousto-optic effect and non-linear phenomena in crystals

Unit I: Matrix Methods in Optics

Paraxial Optics: Ray transfer matrices – Translation and refraction matrix – Derivation of properties of a system from its matrix – Experimental determination of the matrix elements of an optical system. Polarization Optics: Jones Matrices – Experimental determination of the elements of a Jones matrix or a Maxwell Column.

Unit II: Fourier Optics

Fourier analysis in two dimensions – Scalar diffraction theory – Integral theorem of Helmholtz and Kirchhoff – Kirchhoff formulation of diffraction by a planar screen – Rayleigh-Sommerfeld formulation of diffraction – Comparison of Kirchoff and Rayleigh-Sommerfeld theories – A thin lens as a phase transformation - Fourier Transforming properties of lenses.

Unit III: Holography

Wavefront Reconstruction – Gabor Hologram – Leith-Upatnieks hologram – Fourier - Transmission and reflection holograms – Recording Materials – Applications: Microscopy, Interferometry, Vibration Analysis, Holographic data storage.

Unit IV: Crystal Optics & Electro Optic Effect

Plane waves in anisotropic media – wave refractive index – ray refractive index – index ellipsoid – index ellipsoid in the presence of external electric field – Electro optic effect: Electro optic effect in KDP.

Unit V: Acousto and Non Linear Optic Effect

Raman – Nath diffraction – Theory of Raman – Nath diffraction – Bragg diffraction – Raman Nathacousto optic modulator – Bragg modulator – Self focusing phenomenon – second harmonic generation

Text Books:

1. Gerard A & Burch J.M, *Introduction to Matrix Methods in Optics*, John Wiley, (1975).
2. Goodman J. W, *Introduction to Fourier Optics*, McGraw Hill, New York, (1996).
3. Ghatak. A. K &Thyagarajan. K, *Optical Electronics*, Cambridge University Press, Cambridge, (1989).

References:

1. Gaskill J.D, Linear Systems, *Fourier Transforms and Optics*, John Wiley, (1975).
2. Pedrotti F. L and Pedrotti L.S, *Introduction to Optics*, Pretice Hall Inc, (1987).
3. Grant R. Fowles, *Introduction to Modern Optics*, Holt, Rinehart & Winston Inc, (1975).
4. Born M and Wolf E, *Principles of Optics*, Pregamon Press, Oxford, (1975).

5. Nussbaum A and Philips R. A, *Contemporary Optics for Scientists and engineers*, Prentice Hall, New Delhi, (1976).
6. Laud B. B, *Lasers and Non Linear Optics*, Wiley Eastern Limited, New Delhi,(1985).

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1	1			
K2: Understanding		2			
K3: Applying	3		3		3
K4: Analyzing				4	
K5: Evaluating			5	5	
K6: Creating					
Mean					

PGP/PSP 5442 **PROJECT – II** **9 hrs/4 cr**

This course enables the Students to have hands-on experience in the design experiments / methodologies and record the process of measurements. He will also learn to correlate with the respective theoretical concepts and draw non-trivial conclusions of the significance of the observations.

At the end of the course, students will be able to

i. define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data;
ii. identify relevant assumptions or implications; formulate coherent arguments;
iii. act together as a group or a team in the interests of a common cause and work efficiently as a member of a team;
iv. use ICT and demonstrate ability to access, evaluate, and use a variety of relevant information sources;
v. communicate with others using appropriate media; confidently share one's views and express herself/himself.

Students are given the freedom of choosing the topic of the project and approved by the staff supervisor/ guide. It may be theoretical or experimental. After getting approval of the proposed project work within 5 sessions, students are supposed to carry out these projects in the department laboratory. Students shall maintain daily records and present at least two oral progress reports while doing the project. They shall submit the dissertation at the end of the semester. Students are encouraged to have hands-on experience in designing, fabricating, and analyzing the observations using fundamental concepts studied in the course of study.

Evaluation Method for Project:

1. Project Proposal (Oral and written) 20%
2. Oral progress reports 20%

3. Continuous assessment 35%
4. Final Report 25%

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding	2				
K3: Applying	3		3	3	
K4: Analyzing	4	4		4	
K5: Evaluating	5				5
K6: Creating	6				
Mean					

THE AMERICAN COLLEGE, MADURAI

PROGRAM / COURSE FRAME ,P.G. DEPARTMENT OF CHEMISTRY (AIDED)

Program for Choice Based Credit System - 2018 – 2019 onwards

S.N.	Sem	Course Code	Course Title	Hours	Credits	Marks
1	1	PGC 4431	Organic Chemistry – I	6	4	80
2	1	PGC 4433	Inorganic Chemistry – I	5	4	80
3	1	PGC 4435	Physical Chemistry – I	5	4	80
4	1	PGC 4301	Chemistry and Health	4	3	60
5	1	PGC 4303	Organic Qualitative Lab	5	3	60
6	1	PGC 4305	Physical Chemistry Lab – I	5	3	60
			Total	**30**	**21**	**420**
7	2	PGC 4432	Organic Chemistry – II	6	4	80
8	2	PGC 4434	Inorganic Chemistry – II	5	4	80
9	2	PGC 4436	Physical Chemistry – II	5	4	80
10	2	PGC 4302	Chemistry in Beauty and Health	4	3	60
11	2	PGC 4304	Organic Quantitative Lab	5	3	60
12	2	PGC 4306	Physical Chemistry Lab – II	5	3	60
			Total	**30**	**21**	**420**
13	3	PGC 5531	Organic Chemistry – III	5	5	100
14	3	PGC 5533	Inorganic Chemistry – III	5	5	100
15	3	PGC 5535	Physical Chemistry – III	5	5	100
16	3	PGC 5301	Inorganic Qualitative Lab	5	3	60
17	3	PGC 5601	Research Methodology Lab	10	6	120
			Total	**30**	**24**	**480**
18	4	PGC 5532	Organic Chemistry – IV	5	5	100
19	4	PGC 5534	Inorganic Chemistry – IV	5	5	100
20	4	PGC 5536	Physical Chemistry – IV	5	5	100
21	4	PGC 5302	Inorganic Quantitative Lab	5	3	60
22	4	PGC 5602	Project	10	6	120
			Total	**30**	**24**	**480**
			Grand Total	**120**	**90**	**1800**

PGC 2

SEMESTER –III

PGC 5531 **ORGANIC CHEMISTRY – III** **5hrs/ 5 Cr**

Course Objectives:

This is the third of the four semester sequential course in organic chemistry. This course deals with oxidation and reduction reactions, photochemical and pericyclic reactions in addition to organometallic reagents.

Course Outcome:

At the end of the course, students will be able to:

1. Analyze the various oxidizing reagents to effect organic transformations.
2. Use the various reducing reagents and synthesize organic compounds.
3. Predict the product along with stereochemical nature of the reactions under photochemical conditions.
4. Compare various rules in pericyclic reactions to predict product and their stereochemistry.
5. Identify the potential use of various organometallic reagents and apply them to synthesize compounds

UNIT-I : Oxidation Reactions

DMSO -Swern oxidation, HIO_4, $Pb(OAC)_4$, $Hg(OAC)_2$, I_2 / AgOAc (dry and wet)- Woodward and Prevost, Peroxides- Sharpless asymmetric epoxidation and dihydroxlation, Peroxyacids, PCC (Corey's reagent), PDC, Etards reagent, Jones reagent, MnO_2, OsO_4, DDQ, SeO_2, N_2O_4 and Wacker reagent ($PdCl_2$), Oxidation with Ruthenium tetraoxide, Iodobenzene diacetate , Thallium (III) nitrate.

UNIT-II : Reduction Reactions

Complex metal hydrides such as $LiAlH_4$, $NaBH_4$, $Na(CN)BH_3$, $Zn(BH_4)_2$ and trialkyl tin hydrides-Dissolving metals such as alkali metals, tin and zinc-H_2/various metal catalysts (hydrogenation)-$SnCl_2$, Lawessonn reagent – $TiCl_4$ / Zn-Cu (Mac Murrays reagent) – $TiCl_4$ / Mg-Hg-Wilkinson's catalyst, Lindlar catalyst-BH_3/THF, 9-BBN, optically active boranes-Baker's yeast

UNIT-III : Photochemistry

Introduction - Jablonski diagram - geometry of excited states - quenching - sensitisation - quantum efficiency - introduction to photo chemical reaction - photo sensitized reaction - reactivity of electronically excited ketones - Norrish-I and Norrish-II reactions - photo reductions - Paterno Buchi reaction – Barton's reaction – photo addition – photo oxidations (di-pi methane or Zimmerman rearrangement) - photo Fries rearrangement - photo chemistry of α , β unsaturated compounds – photo chemistry of arenes – photo chemistry of vision.

UNIT-IV : Pericyclic reactions

Atomic and molecular orbitals - Electro cyclic reaction - concepts of con and dis rotation - stereo chemical course of electro cyclic reaction in terms of conservation of orbital symmetry - cyclization of butadienes and 1,3,5- hexatriene - Frontier-Molecular orbital approach - orbital correlation diagram - state correlation diagram - theory of cyclo additions [4+2] and [2+2] additions - suprafacial and antrafacial additions - Diels alder reactions - endoselectivity regioselectivity - catalysis of Lewis acid theory of sigma tropic reactions - sigma tropic migrations of hydrogens and carbons - Claisen, Cope and Aza–Cope rearrangements - Fluxional tautomerism.

UNIT-V : Organometallic reagents

Organometallic reagents- principle, preparation, properties and applications of the following in organic synthesis with mechanistic details Cu, Li (Shapiro reaction), Mg, Pd, B, Rh, Si, Ti, Hg, Cd, Zn, P, Cr.

References:

1. S.M. Mukergi, Pericyclic reactions, Mac millan, India.
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20. A.J. Pearson, Metallo organic chemistry, Wiley India Ltd.
21. Clayden, Greeves, Warren and Wothers, Organic Chemistry, OXFORD University Press, 2007.

Mapping of Bloom's Taxonomy with Course Outcome					
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X		X	
K5: Evaluating		X		X	
K6: Creating		X			

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Course	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGC 5531	✓			✓		✓	✓		✓	

Semester-III
PGC 5533 **INORGANIC CHEMISTRY-III** **Core Theory 5 hrs/ 5 cr**

Course Objective:

This course exposes students to a detailed discussion on organometallics, some aspects of bioinorganic and f-block elements.

Course Outcome:

After completion of the course the students will be able to:

1. Describe the bonding and deduce the structure & stability of sigma and pi complexes
2. Illustrate the catalytic property of organo-metallic compound
3. Explain and highlight the properties of f-block elements
4. Discuss the structure and functions of metalloenzymes
5. Reason the role of metals in redox proteins, diagnosis and medicine

UNIT – I: ORGANOMETALLIC CHEMISTRY - I

Stability of organometallic compounds – effective atomic number rule – theoretical basis – metal carbonyls – preparation, properties and structures – carbonylate anions – carbonyl hydrides – synthetic utility – metal nitrosyls - preparation-bonding - stereochemical control of valence – dihydrogen complexes – carbocyclic systems – benzene, cp, cht, cot, cyclobutadiene – synthesis of ferrocene – reactions – MO diagram – alkene, alkyne, carbene and carbyne metal complexes – synthesis, structure and bonding – fluxional behavior

UNIT – II: ORGANOMETALLIC CHEMISTRY- II

Coordinative unsaturation – oxidative addition – reductive elimination – agostic interaction – activation of small molecules – insertion and elimination – nucleophilic attack on coordinated ligands – catalysis by organometallic compounds – hydrogenation cycle – hydroformylation – Monsanto acetic acid process – Wacker process – isomerisation reaction – WGS reaction - synthesis of gasoline – Fischer Tropsch process – Mobil process – olefin metathesis- Zeigler – Natta catalysis.

UNIT – III: THE f-BLOCK ELEMENTS

General features – occurrence –variable valencies - lanthanide and actinide contraction – separation of lanthanides – absorption spectra of Ln – magnetic properties– coordination chemistry – applications - shift reagents – transactinide elements – chemistry of uranium –uranyl complexes – extraction cycles of U and Np.

UNIT – IV: BIOINORGANIC CHEMISTRY- I

Essential and trace elements in biological systems – biological significance of metals – alkali & alkaline earth metals – Na/K pump – transition metal storage and transport of Fe, Cu, Zn – biological oxygen transport systems - structure and function of heme and non- heme proteins (Mb, Hb, Hc, Hr) – non-redox metalloenzymes - carboxy peptidase - carbonic anhydrase.

UNIT –V: BIOINORGANIC CHEMISTRY- II

Metalloproteins in electron transport processes – Functions of Fe, Cu proteins- cytochrome C – cytochrome P-450 – iron - sulphur proteins – blue copper proteins- superoxide dismutase – nitrogen fixation – coenzyme B_{12}- metal-nucleic acid interactions- fundamental reactions of metals with nucleic acids – metals in diagnosis and medicine –chelate therapy.

References:

1. Huheey J.E., Inorganic Chemistry IV Edn. Principles of Structure and Reactivity, Collins College Publishers, New York (1993).
2. Cotton, F.A. and Wilkinson, G.I., Advanced Inorganic Chemistry VI Edn. John Wiley and Sons, New York, (2004).
3. Purcell, K.F. and Kotz, J.C., Inorganic Chemistry, Saunders, Philadelphia, (1977).
4. Powell, P., Principles of Organometallic Chemistry II Edn. Chapman and Hall, New York, (1988).
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12. Joseph.J. Katz, Glenn. T. Seaborg, The Chemistry of the Actinide elements, Methurn& Co, Ltd, London (1957).

Mapping of Bloom's Taxonomy with Course Outcome					
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X		X		X
K5: Evaluating	X				
K6: Creating					

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Course	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGC 5533	✓			✓	✓	✓			✓	✓

PGC 6

SEMESTER –III *CORE/ THEORY*

PGC 5535 **PHYSICAL CHEMISTRY – III** **5 hrs/ 5cr**

Course objectives: The learners should be able to apply chemical thermodynamic concepts in understanding the physical behaviour of solution mixtures, utilize elementary laws of chemical kinetics in chemical reactions, acquire analytical skills in the field of photochemistry & radiation, apply theories of electrochemistry to understand electrode kinetics and theoretical aspects of electrochemical application.

Course outcome:

At the end of the course, students will be able to

1. Relate the effect of solute on thermodynamic properties of solution.
2. Deduce the rate of chemical reactions to understand mechanism involved in reactions.
3. Examine the changes on molecules using radiation.
4. Determine thermodynamic properties of electrochemical cells.
5. Explain redox process at the electrode and determine the kinetics of such process.

UNIT – I: CHEMICAL THERMODYNAMICS

A general review of enthalpy, entropy and free energy concepts, Genesis of third law and its limitations – Thermodynamics of systems of variable compositions – partial molar quantities and their determination – chemical potential – Gibbs-Duhem equation – Duhem-Margules equation – Fugacity and its determinations – choice of state- Activity and activity coefficients – electrolytes and non-electrolytes – equilibrium thermodynamics - Gibbs phase rule and its application to three component systems – Introduction to non-equilibrium thermodynamics – transformations of the generalized fluxes and forces, non-equilibrium stationary states, phenomenological equations, microscopic reversibility and Onsager's reciprocity relations.

UNIT – II: CHEMICAL KINETICS – I

Simple collision theory, absolute reaction rate theory, thermodynamics treatment, potential energy surfaces, application of ARRT to simple bimolecular processes – steady state approximation, principle of microscopic reversibility & detailed balancing – chain reactions – general characteristics, study of kinetics of chain reactions like – decomposition of acetaldehyde and N_2O_4; study of H_2-O_2 explosive reactions. Theory of unimolecular reactions – Lindemann, Hinshelwood, RRKM and Slater treatments. Reactions in solutions – factors influencing reaction rate in solution, significance of dielectric constant, salt effect, and kinetic isotope effect. Oscillatory reactions.

UNIT – III: PHOTOCHEMISTRY AND RADIATION CHEMISTRY

Physical properties of the electronically excited molecules – excited state dipole moments excited state pKa, excited state redox potential. Fluorescence, phosphorescence and other deactivation process – Stern-Volmer equation and its applications. Photosensitisation and chemiluminescence. Experimental techniques in photochemistry – flash photolysis technique.

Radiation chemistry – source of high energy – interaction of high energy radiation with matter, radiolysis of water – definition of G value.Primary and secondary process, linear energy transfer – the hydrated electron and its reactions.

UNIT – IV: ELECTROCHEMISTRY – I

The nature of electrolytes –ion-ion and ion-solvent interactions. Mean ion activity-The Debye-Huckel equation – Bjerrum equation- Conductivity - transport numbers – Nernst Einstein equation - Stork Einstein equation- Debye-Huckel Onsager equation - Conductivity at high frequency and at high field strength. Determination of transport number.

Double layer-polarized and non-polarized electrodes – Lippmann equation – Models for double layer – Helmholtz, Guoy&Chapmann – Stern models – Zeta potential – Elctro-kinetic phenomena – Electro-osmosis. Streaming potential – electrophoresis.

UNIT – V: ELECTROCHEMISTRY – II

Electrode potential – Types of potential generation – Nernst equation – Hydrogen scale – other reference electrodes – concentration cells – Liquid junction potential – membrane equilibria. Butler-Volmerequation -Tafel equation – electrolysis & overvoltage – Theories of hydrogen overvoltage – Application of EMF measurements & conductivity. Batteries – fuel cells – corrosion. Zero current potentiometry - constant current potentiometry. Polarography – pulse polarography – Differential pulse polarography – stripping voltammetry. Cyclic voltammetry – electrogravimetry – colorimetric methods

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13. Spinds, T.W.T., An introduction to Radiation Chemistry, John Wily & sons, 1964.

Mapping of Bloom's Taxonomy with Course Outcome					
	Unit-I	**Unit-II**	**Unit-III**	**Unit-IV**	**Unit-V**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing		X	X	X	X
K5: Evaluating		X			
K6: Creating					

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Course	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**
PGC 5535	✓		✓	✓		✓	✓		✓	

PGC 8

SEMESTER –III **Core/ Lab**
PGC 5301 INORGANIC QUALITATIVE ANALYSIS 5 hrs/ 3 cr

Course Objective:
This is a laboratory course that deals with the principles and methods of qualitative analysis of common and less common cations present in a mixture.

Course Outcome:
After completion of the course the students will be able to:

1. Summarise the principle of distribution of common and less common cations in different groups
2. Demonstrate reactions for identification of cations
3. Develop analytical skill in the field of separation of cations from mixture.
4. List the cations present in a mixture
5. Design methods to analyze industrial effluents, antique pieces, environmental samples etc.,

Component 1: Theoretical principles

1. Classification of cations into analytical groups and classification with in each analytical group.
2. Confirmatory and spot test for cations – Chemistry of reactions

Component 2:

1. Semimicro qualitative analysis mixtures of four simple salts containing two common cations and two less common cations with non-interfering anions.

   Common cations of:

   Group I: Pb and Hg;
   Group II: Hg, Cu, Cd, Bi, Sb, As, and Sn;
   Group III: Al, Fe, and Cr;
   Group IV: Mn, Zn, Co, and Ni
   Group V: Ca, Sr, and Ba
   Group VI: Mg, K, and NH_4^+

   Less common cations of:

   Group I: W and Tl;
   Group IA: Se and Te;
   Group II: Mo;
   Group III: Be, Tl, Ce, Ti, Th, Zr, V, and U;
   Group VI: Li

   Systematic separation of cations into analytical groups followed by identification of individual cations.

2. Determination of chemical constituents in ore samples like nichrome, bronze,

References

1. V.V.Ramanujam, Inorganic Semimicro qualitative analysis, National Publishing company, Madras, 1974
2. A. I. Vogel, "Quantitative Inorganic Analysis", ELBS, 3rd Edition, 1971.
3. Vogel's Text book of Inorganic Qualitative Analysis, 4th Ed, ELBS, London, 1974

Mapping of Bloom's Taxonomy with Course Outcome					
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing				X	X
K5: Evaluating					X
K6: Creating					X

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Course	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGC 5301	✓	✓	✓	✓			✓		✓	✓

SEMESTER –III

PGC 5601 **Research Methodology Lab** **10 hr/ 6 cr**

Course Objectives:

This course will consider the application of a number of principles as applied to chemical research. This will be achieved by placing students in active research groups in the discipline of chemistry and providing them with the opportunity to carry out research activities.

Course Outcome:

Upon completion of this course, the students will be able to:

1. Assess the sources of information related to research
2. Utilize OHP and Power point presentation
3. Acquire the wide knowledge of instrumental analysis
4. Perform computer assisted analysis of data
5. Apply search engine and software tools in research

Students will do the experiments and project work on a title approved by the respective project supervisor. Students will maintain daily records and present oral reports while doing project preparation. All the above process will be duly assessed by the project supervisor. They will submit the collection of research article at the end of the semester.

Component I - Practical

1. Multistage organic synthesis
2. Purification &recrystallization techniques
3. Characterisation of compounds using UV-Vis, IR, fluorescence
4. Electrochemical study of inorganic compounds
5. Determination of the formula of a complex by spectrometry
6. Preparation and study of a super conductor
7. Thermodynamics of denaturation of bovine serum albumin (Fluorescence spectra)
8. Intermolecular H-bonding in benzyl alcohol using IR spectroscopy
9. Determination of the formation constant of iron(III)salicylate complex

Component II- Project

Evaluation

Presentation – seminar 25 marks (collective evaluation from all guides)

Project progress (includes 9 experiments) 75 marks from guide

Mapping of Bloom's Taxonomy with Course Outcome					
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering	**X**	**X**	**X**	**X**	**X**
K2: Understanding	**X**	**X**	**X**	**X**	**X**
K3: Applying	**X**	**X**		**X**	**X**
K4: Analyzing	**X**			**X**	
K5: Evaluating	**X**			**X**	
K6: Creating				**X**	

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Course	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGC 5601	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

SEMESTER –IV

PGC 5532 ORGANIC CHEMISTRY – IV 5 hrs/ 5 Cr

Course Objectives:

This is the fourth of the four semester sequential course in organic chemistry. This course deals with retrosynthesis, biologically important steroids and proteins, medicinal chemistry and supramolecular chemistry.

Course Outcome:

At the end of the course, students will be able to:

1. Identify various synthons, synthetic equivalents and design a probable synthetic strategy in disconnection of a target molecule.
2. Apply the concepts of retrosynthesis to identify selectivity in synthesis and assess various synthons for effective retrosynthetic approach.
3. Elucidate the structure of steroidal molecules and analyze the structures and functions of proteins and nucleic acids.
4. Explain the various concepts of medicinal chemistry in designing a drug.
5. Analyze the potential applications of various supramolecules and apply green chemistry to organic synthesis.

UNIT-I : Retrosynthesis-I

Synthesis – types of synthesis – rational, irrational, linear, convergent, partial, total and biosynthesis - Synthons and types – synthetic equivalent – principles of disconnections in aromatic Target molecule – Functional group interconversion – order of events – guidelines to a good disconnection -– one group and two group C – X disconnection and synthetic strategies – one group C-C disconnections in carbonyl compounds – two group disconnections I – Diels-Alder reaction – two group disconnections II : 1,2-, 1,3-, 1,4-, 1,5- and 1,6- difunctional disconnections and strategies.

UNIT-II : Retrosynthesis-II

Chemoselectivity – Stereoselectivity – Regioselectivity — Use of aliphatic nitro compounds in organic synthesis – a high light on the use of acetylenes in the synthetic chemistry – amine synthesis – alkene synthesis – Protection and deprotection of groups: alcohols, diols, amine, acids, aldehydes and ketones – Strategy of ring synthesis – small rings such as 3 and 4 membered rings - Retrosynthetic analysis of simple and complex organic molecules – Ferruginol, α-Bisabolene, Trisporic acid and multistriatin.

UNIT-III : Steroids, Proteins and Nucleic acids

Steroids – Basic skeleton – Isolation – Structure determination – Structure of cholesterol, Bile acids, Androsterone, Testosterone, Estrone, Progesterone.

Amino acids – Peptides – Proteins, Structure and function conformations of polypeptides – Ramachandran Plot -Peptide synthesis

Nucleotides and Nucleosides – laboratory synthesis of nucleotides and nucleosides – RNA and protein synthesis – Replication-Genetic code – DNA and determining the base sequence of DNA

UNIT-IV : Medicinal Chemistry

Drug design – Introduction – Analoges and Prodrugs – Concept of Lead – Factors governing Drug design – Rational approach to drug design– Isosterism and Bio-isosterism – Biopharmaceutical properties of drug substances –Functional groups as binding groups – pharmacophore – Quantitative Structure Activity Relationships –Computer aided drug design – A broad outline of different types of drugs based on pharmacology and their representative examples Host-guest chemistry – Biomimetic chemistry– Proximity effect – molecular adaptation – Transition state analogs – antibodies as enzymes – Suicide enzyme inactivators Molecular recognition and drug design.

UNIT-V : Supramolecular and Green Chemistry

Introduction to supramolecular chemistry – physical and chemical characteristics of supramolecules - self assembly into mono and multilayers – Structure, reactions and applications- Crown ethers, β - cyclodextrin, Clays, Zeolites, Dentrimers & Fullerenes.

Green chemistry-12 principles-solvent free reactions-microwave assisted reactions-role of ionic liquids ([bmim][BF_4])- super critical fluids ($ScCO_2$)

References:

1. Futhrhop, Penzlin, Organic synthesis concepts, Methods and Starting materials, Verlag chemie, 1983.
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Mapping of Bloom's Taxonomy with Course Outcome					
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X		X
K4: Analyzing	X	X	X		X
K5: Evaluating	X	X			
K6: Creating	X				

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Course	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGC 5532	✓			✓		✓	✓		✓	

PGC 12

Semester-IV **Core Theory**
PGC 5534 **INORGANIC CHEMISTRY-IV** **5 hrs/ 5 cr**

Course Objectives:

This course attempts to present an overall view of various heteroatom ring systems, their synthesis and reactivity will be discussed. Polymers of such systems and their technological application will also be introduced. It also includes the metal clusters and inorganic photochemistry. Principles and applications of various analytical techniques will also be discussed.

Course Outcome:

After completion of the course the students will be able to:

1. Formulate synthetic routes and infer the structure of boron compounds
2. Classify Si-O, P-O & P-S systems and relate the structure with properties
3. Explain the synthesis, reactions and bonding properties of P-N and S-N heterocycles and polymers
4. Establish the structural implications of metal clusters and describe the photochemistry of coordination compounds
5. Analyze the thermal data and evaluate the analytical data

UNIT – I: CHEMISTRY OF BORON HETEROSYSTEM

Boron and multicentered bonds – types of bonds – diborane – tetraborane – synthesis – chemical reactions – structure and bonding – higher boranes – $B_{10}H_{14}$ – bonding –classification by Wade's rule – topological structure – styx number – structural studies by IR and NMR – carboranes – preparation, properties – metallacarboranes – monocarboranes – carboranes with more than two cage carbon atoms.

B-N systems: borazines – comparison with benzene – N and B substituted borazines-hydrolytic stability – B-O systems – borates.

UNIT – II: Si-O, P-O, P-S SYSTEMS

Silicates: classification – asbestos minerals – Zeolites – organosilicon compounds – silicone polymer – types – preparation – uses – siloxanes – reactions – polymerisation of cyclicsiloxane – mechanism – factors influencing polymerization.

P-S rings and cages: synthesis and reactions – P-O heterocyclic compounds – preparation – reactions – linear & cyclic phosphates (Na_2HPO_4, NaH_2PO_4, $Na_3P_3O_9$)- inter conversions of various phosphates – applications – P-O compounds – preparation and reactions.

UNIT – III: P-N and S-N HETEROSYSTEMS

P-N system: $N_3P_3Cl_6$, $N_4P_4Cl_8$, $(NPCl_2)_x$ – Synthesis, uses, theories of bonding, electronic structure and aromaticity – reactions: hydrolysis, aminolysis, metathetical reactions, organometallic reagents, Friedel-Crafts substitutions, rearrangements

S-N heteroatom systems: bonding – Huckel's rule – S_4N_4: preparation, structure (Banister and Mingos mdels), properties – S_4N_3Cl, $S_3N_2Cl_2$, $S_4N_4O_4$: preparation, structure, properties – S_4N_2: preparation, structure determination – $(SN)_x$: preparation, structure, properties

UNIT–IV: METAL CLUSTER COMPOUNDS AND INORGANIC PHOTOCHEMISTRY

Metal atom clusters – high nuclearity carbonyl clusters – lower halide clusters – isoelectronic and isolobal analogy – structure implications – their synthetic utility – electron counting schemes – capping rule – compounds with M-M multiple bonds

Basic photochemical process – Photosubstitution – Adamson's rule – photoredox – ligand photo reaction – photo induced cleavage of M-M bonds-evidences– ligand field photochemistry of d^3, d^6 complexes – photochemical cleavage of water - solar energy conversion

UNIT–V: ANALYTICAL TECHNIQUES

Thermal analysis: TGA, DTA, DSC – principle, instrumentation, factors affecting - applications.

Evaluation of data: Significant figures – accuracy – precision – Gaussian distribution – Poisson distribution – confidence levels – tests of significance - F test, student t test – least square analysis – correlation coefficient – criteria for rejection of data- Q test.

References:

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Mapping of Bloom's Taxonomy with Course Outcome					
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X			X	X
K5: Evaluating	X				
K6: Creating					

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Course	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGC 5534	✓			✓	✓	✓			✓	✓

PGC 14

SEMESTER –IV *CORE/ THEORY*

PGC 5536 **PHYSICAL CHEMISTRY - IV** **5 hrs/5 Cr**

Course objectives:
The learners should be able to link microscopic properties of matter and its bulk properties, predict the population of states in systems at thermal equilibrium, acquire skills in understanding catalysis and adsorption phenomena, acquire analytical skills in understanding polymerization using latest techniques and explore the frontiers of nanoscience.

Course outcome:
At the end of the course, students will be able to

1. Assess partition functions and relate them with thermodynamic functions.
2. Compare the various statistics and their implication to different state of molecules.
3. Examine the kinetics and catalysis of reactions in solution.
4. Deduce the parameters involved in different types of polymerization and explainthe techniques for molecular weight determination.
5. Compare the types of sensors and the accesses physical effects involved in signal transduction.

UNIT – I: STATISTICAL THERMODYNAMICS – I

Concept of distribution, thermodynamic probability and most probable distribution. Ensemble averaging, postulates of ensemble averaging, Canonical, Grand canonical and microcanonical ensembles, corresponding distribution laws. Maxwell-Boltzmann statistics – Partition functions – thermodynamic properties from partition function – translational, rotational, vibrational and electronic partition functions. Partition function and equilibrium constant.

UNIT – II: STATISTICAL THERMODYNAMICS – II

Quantum statistics – Fermi-Dirac and Bose-Einstein statistics – photon gas, Bose-Einstein condensation, degeneracy and Bose-einstein condensation, application to liquid He.Electron gas, degeneracy and electron gas.Heat capacities of diatomic gases. Einstein and Debye's theory of heat capacity of solids – paramagnetism - population inversion – negative Kelvin temperature.

UNIT – III: CHEMICAL KINETICS – II AND SURFACE CHEMISTRY

Homogeneous catalysis – acid-base catalysis, acidity function – Michaelis-Menten kinetics. Fast reaction techniques – chemical relaxation methods, T-jump and P-jump methods, ultrasonic absorption techniques, reaction in a flow system, continuous and stopped flow, shock wave tube method. Micelles – surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration, factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization – reverse micelles.

Physisorption and Chemisorption – Langmuir and BET adsorption – Gibbs adsorption isotherm – insoluble surface films – electrokinetic phenomena – zeta potential – Heterogeneous catalysis – reactions and their kinetics.

UNIT – IV: POLYMER CHEMISTRY

Introduction – Classification of polymers – chemistry of polymerization – chain – - Free-Radical Polymerisation – Ionic polymerization – Coordination polymerization - Step polymerization – Polycondensation – Polyaddition polymerization – Ring-opening polymerization - polymerization techniques. Copolymerisation – Ionic – free radical – copolycondensation.

Kinetics of polymerization – Free-Radical chain polymerization – cationic polymerization – Anionic polymerization – polycondensation.Measurement of molecular weight and size.End-group analysis – colligative property measurement – light scattering – ultracentrifugation – solution viscosity and molecular size – gel permeation chromatography – polyelectrolysis.

UNIT – V: NANOSENSORS

Micro &nanosensors, Active and Passive sensors – Static characteristic - Accuracy, offset and linearity – Dynamic characteristics - First and second order sensors-Physical effects involved in signal transduction- Photoelectric effect – Photo dielectric effect – Photoluminescence effect – Electroluminescence effect – Hal effect – Thermoelectric effect – Peizoresistive effect – Piezoelectric effect – Pyroelectric effect –Magnetomechanical effect (magnetostriction).

Selectivity of Potentiometric Sensor - MeasurementwithPotentiometricSensors-SelectivityofAmperometric Sensors – MeasurementwithAmperometric Sensors - Classes of Electrochemical Biosensors. Sensors with Thermistors and Pellistors - Pyroelectric Sensors-Fibre Sensors Without Chemical Receptors& with chemical receptors.

References:

1. Laidler, Chemical kinetics, 3rd edition, Harper & Row, 1987.
2. Rajaram & Kuriacose, Kinetics and mechanism of chemical transformation, MacMillian India, 1993.
3. Kalidas, Chemical Kinetics methods, New-Age International, 1996.
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5. Bilmeyer, Jr. Textbook of polymer science, Wiley, 1984.
6. Allcock and Lampe, Contemporary polymer chemistry, Prentice-hall, 1981.
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10. W.J. Morre, Physical Chemistry 5th edition, Orient Longman, 1976.
11. Castellan, Physical Chemistry, 3rd edition, Addison Wesley, 1983.
12. Hill, Introduction to statistical thermodynamics, Addison Wesley, 1960.
13. Kourosh Kalantar – Zadeh, Benjamin Fry, "Nanotechnology- Enabled Sensors", Springer, 2007.
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16. Ramon Pallas-Areny, John G. Webster, "Sensors and signal conditioning" John Wiley & Sons, 2001.
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18. Jain, KK. Nanobiotechnology in molecular diagnostics: current techniques and applications, CRC Press, 2005.

Mapping of Bloom's Taxonomy with Course Outcome					
	Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X		X	X
K6: Creating					

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGC 5536	✓		✓	✓		✓	✓		✓	

PGC 16

SEMESTER –IV **Core/ Lab**
PGC 5302 **INORGANIC QUANTITATIVE ANALYSIS** **5 hr/ 3 cr**

Course Objectives:
This is a laboratory course that deals with the principles and various analytical methods of quantitative analysis of cations present in a mixture.
Course Outcome:

After completion of the course, the students will be able to:

1. Summarize the principle of calibration and standards
2. Perform calibration of apparatus
3. Develop analytical skill in the field of estimation of cations in mixture
4. Highlight the principle of methods of cation estimation
5. Design methods to analyze industrial effluents, antique pieces and environmental samples

Component 1:

Calibration of apparatus – Burette, Pipette, Volumetric flasks

Assessment of errors in apparatus and distribution

Component 2:

1. Estimation of Cu(II) – Iodometry & Gravimetric method
2. Estimation of Cu(II) and Ni(II) – Iodometry & Gravimetric
3. Estimation of Cu(II) and Ni(II) – Spectrophotometric
4. Estimation of Fe(II) and Fe(III) – Reduction & Redox titration
5. Estimation of Cu(II) and Zn(II) – Acidimetry with glass pH electrode/potentiometry
6. Estimation of Ca(II) and Mg(II) – Complexometric with pH control
7. Estimation of Ni(II) and Zn(II) – Complexometric/kinetic control/potentiometric
8. Estimation of Cu(II) and Ca(II) – Iodometry / reduction/ Complexometry

Component 3:

1. Determination of total hardness of water
2. Determination of Mn content in steel
3. Determination of Cu content in brass

REFERENCES

1. Jeffery, G. H.; Bassett, J.; Mendham, J.; Denney, R. C. Vogel's Textbook of Quantitative Chemical Analysis; 5th ed., ELBS" 1989.

2. Arthur I. Vogel, Textbook of quantitative inorganic analysis Theory and practice, 2nd ed., Longmans, Green and Co., 1939

Mapping of Bloom's Taxonomy with Course Outcome					
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing		X	X	X	X
K5: Evaluating					X
K6: Creating					

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Course	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**
PGC 5302		✓	✓	✓			✓		✓	✓

SEMESTER –IV

PGC 5602 **PROJECT** **10 hr/ 6 cr**

Course objectives:

This course is designed to reinforce the concepts with analytical techniques. It will provide a platform for students to have a hands-on experience with instruments and present a report on a research topic.

Course outcome:

Upon completion of this course, the students will be able to:

1. Design, conduct, analyze and interpret results of an experiment, and effectively communicate these in written reports
2. Develop interdisciplinary solutions to a variety of chemical problems.
3. Communicate effectively in a variety of forms.
4. Use terminology appropriate to the field of study correctly and contextually.
5. Extend knowledge and understanding of a variety of chemical concepts in a range of contexts.

Students will do the project work on a title approved by the respective project supervisor. Students will maintain daily records and present oral reports while doing the project. All the above process will be duly assessed by the project supervisor. They will submit the thesis at the end of the semester.

Evaluation

Project presentation	25 marks (collective evaluation from all guides)
Project progress	50 marks from guide
Thesis	25 marks from guide

Mapping of Bloom's Taxonomy with Course Outcome					
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X			X
K5: Evaluating	X	X			X
K6: Creating	X	X			X

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGC 5602	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

PG DEPARTMENT OF BOTANY (2019 ONWARDS)

S.no	COURSE TITLE	HOURS	CREDIT
	SEMESTER I		
PGB4441	Plant Diversity	6	4
PGB4443	Principles of Microbiology	6	4
PGB4445	Plant Diversity and Microbiology LAB	6(L)	4
PGB4447	Plant Cell Biochemistry	5	4
PGB4249	Biochemistry LAB	3(L)	2
PGB4331/ PGB 4333	CBCS(**Campus Ecology/ Pl. based enterprises)**	4	3
	Total	**30**	**21**
	SEMESTER II		
PGB4542	Plant Systematics	7	5
PGB4544	Plant Physiology	7	5
PGB4446	Plant Systematics &Physiology LAB	6(L)	4
PGB4448	Mycology and Pathology	6	4
PGB4330/PGB 4332	CBCS(**Trends in Agriculture/ Plants and people)**	4	3
	Total	**30**	**21**
	SEMESTER III		
PGB5641	Morphogenesis	7	6
PGB5643	Genetics and Molecular Biology	7	6
PGB5445	Gen., Mol biol. and Morpho. LAB	6 L	4
PGB5547	Environment and Bio-Resource Management	6	5
PGB5349	Analytical and Research Methodology	4	3
	Total	**30**	**24**
	SEMESTER IV		
PGB5742	Biotechnology	8	7
PGB5444	Biotechnology and Plant Tissue Culture Lab	6(L)	4
PGB5346	Nanobiology	4	3
PGB5348	Systems Biology	4	3
PGB5750	Projects	8	7
	Total	**30**	**24**

Programme Specific Outcomes (PSOs) for PG Department of Botany

1. Identify the indicators of biological diversity and conduct ecosystem health assessment to create career opportunities in healing the mother earth

2. Document, monitor, sustainably manage and share biological resources without bias and exploitative profiteering motives

3. Acquire technological and analytical skills needed for industrial support services

4. Take back biotechnological innovations to strengthen nutritional and food security

5. Forecast the forthcoming climate risks and develop combating strategies for survival

6. Handle large data using computational biology to became a partner of artificial intelligence revolution

7. Decode international governance, policies, treaties and participate in politics that protect environment and forest to become the stewards of global commons

8. Develop skills to pursue carrier in the arena related to plant sciences namely farming, forestry and floristic pursuits

9. Find scope for effective use of technology to develop new concepts and ideas to replace the old constructs that comes from myths and misjudgement of facts

10. Learn from the study of plants to continuously innovate the change according to the need and ceaselessly struggle to find a personal and collective meaning for life.

Mapping of PSO with PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10
PSO1	x	x	x	x	x	x	x	x	x	x
PSO2	x	x	x	x	x	x	x	x	x	x
PSO3	x	x	x	x	x	x	x	x	x	X
PSO4	x	x	x	x	x	x	x	x	x	x
PSO5	x	x	x	x	x	x	x	x	x	X
PSO6	x	x	x	x	x	x	x		x	x
PSO7	x		x	x	x	x	x	x	x	x
PSO 8	x	x	x	x	x				x	x
PSO9	x	x	x	x	x	x	x	x		x
PSO10	x	x	x	x	x	x	x	x	x	x

PGB 4441 **Plant Diversity** **6Hr./4Cr.**

PREAMBLE: Students will explore the stupendous variation in the organization of internal and external morphology encountered in cryptogamic plants. The complexity of these features they will unravel in the light of lines of evolution. They will appreciate the interrelationship among them. Students will learn the lessons from the past fossil history to relate it to the present.

COURSE OUTCOME

At the end of the course, the students will be able to

i. understand and realize the paleontological history of the living earth by way of studying the evolution of green plants, classification and characterization of major plant groups.
ii. comprehend the General features, classifications, biology and distribution and evolution of different algal farms with their ecology and ecological importance with their counterpart lichens.
iii. connect the link between algae with their terrestrial counterpart bryophytes through studying the features, ecology and variations of gametophytes and sporophytes and their evolutionary significance
iv. correlate the link between non vascular plants and vascular plants through analyzing the features, distribution and the significance of stele and seeds in land plants and also through the knowledge of various Indian pteridologists.
v. comprehend the importance of seed plants in terrestrial habitat while learning the origin, general features and evolution of seed plants which will pave way to understand the origin of angiosperms.

UNIT I: Paleontological History: Earth as a living planet – origin of life – evolution of green plants through ages – geological timescale – continental drift – kingdom classification – mega extinction and speciation – classification and characterisation of major plant groups – fossils and fossilization.

UNIT II: Algae: General features – criteria for various classifications – thallus organization – biology and distribution – evolution of life cycle patterns – fossil algae – ecology and economic importance – algal research in India and key contributors – algae as symbiont – biology of lichens.

Unit III: Bryophytes: General features, distribution and ecology – variations of gametophytes and sporophytes – classification and inter-relationships – trends in bryology (Sphagnales and Takkakiales) – progressive and retrogressive evolution.

Unit IV: Pteridophytes: General features and distribution – origin of land plants – evolution of stele – alternation of generations, heterospory and seed habit – structural variations in gametophytes and sporophytes – apogamy and apospory – aquatic ferns – contributions of Indian pteridologists.

Unit V: Gymnosperms: Origin and evolution of seed bearing plants – general features of Cycads, Conifers, and Gnetopsids – morphology, anatomy and reproductive biology – evolution of seed – fossil gymnosperms – origin of angiosperms.

TEXT BOOKS

1. Cavers, F.1971. The interrelationship of bryophytes. Dawsons Pallwall. ISBN -0-521-66794-1
2. Chopra, R.N.2001. Biology of Bryophytes. Narosa publishers. ISBN: 81-224-343- 9
3. Lee,R. E. 2009. Phycology. Cambridge University Press. ISBN: 978-0521-14144-42.
4. Rashid, A. 1982. An introduction to Pteridophyta. Vikas publishing Co. (repr.ed). ISBN: 81- 259-0709-2
5. Sporne, K. R. 1962. The morphology of Pteridophytes. Hutchinson University Library. California. ISBN 978009123861
6. Sporne, K.R. 1965. The morphology of gymnosperms: The structure and evolution of primitive seed plants. B. I. Publications Pvt. Ltd. ISBN 81 7225 0398. 10.
7. Stewart, W.N and Rothwell G.W. 2010 Paleobotany and the Evolution of Plants. Cambridge University Press (2nd Edn). ISBN – 10:0521126088

REFERENCE BOOKS

1. Bell, P.R. and A.R. Hemsley. 2000. Green plants, their origin and diversity. Cambridge University Press, U.K. (2nd Edn). ISBN: 0-521-64109-8
2. *Bold,* H.C. and W*ynne,* M.J. 1985. *Introduction* to the *Algae*: Structure and Reproduction. 2nd Edn. Prentice Hall. Englewood Cliffs, New Jersey. ISBN: 978-0134777467
3. Fritsch, F.E. 1945. The structure and reproduction of the algae. Vikas publishing Co. ISBN: 0-521-77051-3.
4. Ingrouille M and Eddie B 2006., Plant diversity and evolution. Cambridge Univ. Press. ISBN 0 521 79433 1.
5. Johri.R. M., Latha.S and Sharma.S. 2009. Text book of Pteridophyta. Wisdorn Press. ISBN 978 81 9086 35 82.
6. Kumar, H.D. 1988. Introductory Phycology. East West press. ISBN: 81- 859- 3896-2.
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9. Vanterpoorten, A. and Goffinet,B. 2009. Introduction to Bryophytes. Cambridge Press. ISBN: 978-0-521-70073-3.

	K1 (Recall)	K2 (Understand)	K3 (Apply)	K4 (Analyze)	K5 (Evaluate)	K6 (Create)
CO 1				**4**		
CO 2				**4**		
CO 3					**5**	
CO 4					**5**	
CO 5				**4**		

PGB4443 **PRINCIPLES OF MICROBIOLOGY** **6Hrs. /Cr 4**

PREAMBLE:

This course enables students to understand the basic concepts in microbiology and microscope as a tool to explore the microbial life. The emphasis will be given to their cosmopolitan distribution, diversity and ability to adapt in different environments. Microbes in different environmental conditions will be discussed with practical examples. Applied microbiology section will provide a glimpse on the industrially important microbes.

COURSE OUTCOME

At the end of the Semester, the Students will be able to

i. knowledge about Microbiology starting from history and basic knowledge about the microorganisms. Understand microbial diversity, ultra-structure of eukaryotic and prokaryotic cells. Assess the characters and classification of microbes through modern approach. knowledge about Microbiology starting from history and basic knowledge about the micro organisms

ii. know the techniques of microscopy, quantitative measurement of bacterial growth sterilization and disinfection, methods of isolation, and get sufficient knowledge in measurement of bacterial growth and basic pure culture techniques, maintenance and preservation of cultures.

iii. recognize the biology of bacteria and viruses, energy production, classification and reproduction. sufficient knowledge in biology of bacteria and viruses. relationship between food and microbes, techniques used in food processing. Enable the student to get sufficient knowledge in relationship between food and microbes, techniques used in food processing.

iv. sound knowledge on the air, soil and aquatic microflora, role of microbes in organic matter decomposition and bioremediation. Understand solid waste management and waste water treatment.

v. inculcate knowledge in role of micro organisms in eco system and impact created by microbes in agricultural development. gain experience in different aspects used in industrial microbiology. Understand food processing, nutrition,& food processing technology. And also study methods of refrigeration, material handling and food preservation

UNIT I: General Microbiology: History – scope – microbial diversity – extremophiles – ultra-structure of eukaryotic and prokaryotic cells – human microbiome – natural classification, phylogenetic approach – numerical taxonomy (simple match coefficient and Jaccard coefficient), modern approach – base composition – nucleic acid sequencing (RNA fingerprint – 5S rRNA and 16S rRNA) – Bergey's classification.

UNIT II: Tools and techniques: Microscopy (brightfield, darkfield, phase-contrast, fluorescence and electron microscopy) – microbial nutrition – quantitative measurement of bacterial growth – sterilization and disinfection – physical and chemical agents – methods of isolation – axenic cultures – maintenance and preservation.

UNIT III: Biology of bacteria and viruses: Energy production (anaerobic fermentation – aerobic respiration) – bacterial recombination (conjugation – transduction – transformation.) Viruses (general characteristics, structure, composition and classification of viral genomes.) bacteriophages (morphology and structure of T4 and λ phage.) – classification of viral vaccines – rabies and HIV.

UNIT IV: Environmental Microbiology: Air microflora (indoor and outdoor), soil microflora (diversity and abundance) – organic matter decomposition – biological nitrogen fixers (symbiotic and asymbiotic) – aquatic microflora (fresh and marine) – microbes in biodegradation, biodeterioration and bioremediation – potability, microbial assessment and purification of water – waste water treatment – solid waste treatment – source of food and energy.

UNIT V: Applied Microbiology: Scope – intrinsic and extrinsic factors affecting the growth of microbes – food microbiology (microbes in food, and spoilage, prevention and preservation methods – functional foods (probiotics, prebiotics, synbiotics and nutraceuticals) – dairy microbiology (microflora of raw milk, processed milk, spoilage and defects, fermented milk and microbiological standards of milk, milk products) – clinical microbiology (common pathogens, protocol for specimen collection, handling, transportation, processing, laboratory safety and infection control.) – applications of microbes in agriculture – bioinoculants – biofertilizer (types, mass production and quality control).

TEXT BOOKS

1. Dubey, R. C. and Maheswari, D. K. 2013. A Textbook of Microbiology, S. Chand & Comp. ISBN 81-219-2620-3
2. Pelczar, H.J. E.C.S. Chan and N.R. Kreig. 1996. Microbiology concepts and applications. McGraw Hill Inc. ISBN 0-07-049234-4

REFERENCE BOOKS

1. Atlas, M R. 1997. Principles of Microbiology. Wm. C. Brown Publishers. ISBN 0-8151-0889-3
2. Hull, R. 2004. Plant Virology.4th Edn. Academic Press., ISBN 0-12-361160-1
3. Madigan M.T. and Martinko, J. M. 2006. Biology of Microorganisms, 11th ed., Pearson Prentice. 9780132017848 and 0132017849
4. Perry, J. J. and Stanley, J. T. 1997. Microbiology Dynamics and Diversity. Saunders College Publishing. ISBN 0-03-053893-9
5. Prescott, M. J., Harley, J. P. and Klein, D. A. 2008. Microbiology, 7th ed. WCB McGraw Hill. ISBN 978 007-126 727 4

6. Stanier, R.Y. 1987. General Microbiology. 5th Ed. McMillan Education Ltd. ISBN 0-333-41768-2
7. Talaro, K. P. and Talaro, A. 2002. Foundations in Microbiology. McGraw Hill Publ. ISBN 0-07-232042-7

	K1 (Recall)	K2 (Understand)	K3 (Apply)	K4 (Analyze)	K5 (Evaluate)	K6 (Create)
CO1			3			
CO2				4		
CO3					5	
CO4				4		
CO5			3			

PGB 4445 PLANT DIVERSITY & MICROBIOLOGY LAB 6Hr /4Cr

At the end of the course the students will be able to

i. explore the variations in the organization of internal and external morphology and the interrelationship observed among the non flowering plants right from the unicellular to multicellular organisms in the light of lines of evolution.

ii. perform the basic microbial culture techniques, standard methods of microbial load analysis in environmental samples, staining techniques and growth studies. Can demonstrate experiments and for antagonistic studies to screen chemicals and microbes to be used in microbial control strategies.

PLANT DIVERSITY

I. ALGAE: Taxonomy, thallus organization and reproductive structures of the following taxa:

1. **Chlorophyta** – *Chlamydomonas, Volvox, Ulothrix, Oedogonium, Cladophora, Spirogyra, Fritchiella, Coleochaete, Chaetomorpha, Caulerpa, Chara.*

2. **Phaeophyta** – *Dictyota, Padina* and *Sargassum*

3. **Rhodophyta** – *Batrochospermum, Gracilaria, Polysiphonia*

4. **Sea weeds-** Collection and the identification of macro algae and agarophytes from coastal lines

II. BRYOPHYTES: Study and the evolution of the thallus organization of the sporophytic and gametophytic structures of following taxa:

5. **Marchantiales** – *Riccia, Targionia, Marchantia* **Jungermanniales**

6. **Anthoceratales** – *Porella, Anthoceros* **Bryopsida** – *Sphagnum, Funaria* and *Polytrichum*

III. Pteridophytes: Study and the evaluation of the following taxa:

7. **Psilopsida** – *Psilotum,* **Lycopsida and Sphenopsida** – *Lycopodium, Selaginella, Isoetes, Equisetum*

8. **Pteropsida and Leptosporangiate ferns** - *Marsilea, Salvinia,Azolla,Adiantum, Gleichenia and Pteridium.*

IV. Gymnosperms: Morphology and anatomy of vegetative and reproductive structures of the following types

9. **Cycadopsida :** *Cycas, Zamia*

10. **Coniferopsida :** *Pinus, Cupressus, Podocarpus, Araucaria.***Gentopsida:** *Gnetum*

11. **Fossil Pteridophytes and Gymnosperms** - Fossil cycads (*Lyginopteris oldhamia* Stem TS (*Lyginodendron*), *Lyginopteris* male (*Crassotheca*); *Lyginopteris* rachis (*Rachiopteris aspera*); *Lyginopteris* pinnae (*Sphenopteris*), *Botryopteris* root, sporangia; petiole (*Botryopteris ramosa*), TS of stem (*Botryopteris cylindrica*). *Lepidodendron* -Stem (leaf base), periderm (*Stigmaria*); Medullosa.

V. Field Visit: Field trips to the Eastern and Western Ghats to study plants in their natural habitats.

REFERENCE BOOKS

1. *Bold,* H. C. & W*ynne,* M. J. 1985. *Introduction* to the *Algae*: Structure and Reproduction. 2nd Edition. Prentice Hall. Englewood Cliffs, New Jersey. ISBN : 9780134777467
2. Cavers, F. 1971. The interrelationship of bryophytes. Dawsons Pallwall. ISBN -0-521-66794-1
3. Fristch, F. E. 1945. The structure and reproduction of the algae. Vikas publishing Co. ISBN: 0-521-77051-3.
4. Kumar, H.D. 1988. Introductory Phycology. East West press. ISBN: 81- 859- 3896-2.
5. Morris, I. 1971. An introduction to Algae. Hutchinson University Library. ISBN: 0-090-80713-8
6. Rashid, A. 1998. An introduction to Bryophyta. Vikas publishing Co ISBN: 81-259-0569-
7. Rashid, A. 1982. An introduction to Pteridophyta. Vikas publishing Co. (repr.ed). ISBN: 81-259-0709-2
8. Sporne, K. R. 1965. The morphology of gymnosperms: The structure and evolution of primitive seed plants. B.I.publications Pvt.Ltd. ISBN 81 7225 0398.

MICROBIOLOGY LAB

1. Principles of Microscopy – microbial photographs.
2. Preparation of culture media, sterilization - moist heat – dry heat- radiation- filtration.
3. Pour plate- spread plate, streak plate-serial dilution – hanging drop.
4. Microbial examination of different habitats – CFU, MPN, colony characterization.
5. Staining techniques - Smear preparation, Gram staining, endospore staining, capsular staining and fungal staining.
6. Microbial enzyme screening: amylase, protease, lipase, cellulase.
7. Growth studies: Growth curve – heamocytometry and turbidometry
8. Actinomycetes – isolation and characterization
9. Fungal endophyte study – isolation technique.
10. Type study - *Mucor*, *Rhizopus*, *Pilobolus* and *Aspergillus*
11. Macrofungal fruiting bodies - diversity
12. Disease symptoms and assessment methods - Paddy blast scale.
13. Evaluation of fungicide: Slide germination technique and inhibition zone technique
14. Biological control – Antagonistic property.
15. Visit to microbiological lab/ microbe based industry.

REFERENCE BOOKS

1. Cappuccino, J. G. and N. Sherman. 2003. Microbiology – A Laboratory Manual. Pierson Education. ISBN 81-2970265
2. Gunasekaran, P. 2000. Laboratory Manual in microbiology. ISBN 81-224- 0783-8
3. Anonymous 1983. Field problems of tropical rice. International Rice Research Institute, Philippines. ISBN 971-194-080-8

PGB 4447 **PLANT CELL BIOCHEMISTRY** **5Hr./ 4Cr.**

PREAMBLE:

This course unravels the basic construct of how organisms are hierarchically assembled from free atoms and molecules to bioorganic chemicals and cells that cell as the basic structural and functional unit of life is able provide the material as well as strategy for survival as rooted entity.

COURSE OUTCOME

At the end of the semester, students will be able to

i. look at cells as a composite organic entity made of simple atoms and molecules that can congramulate to form supra molecular complexes and macro molecules that can provide a basis for functioning of life.

ii. comprehend plant cells as a finely Owen network of continuous and discreet membranous pockets to enable a cell to live as a fundamental and structural entity.

iii. understand the basic framework of cells contributed by homo and hetero polymers of carbohydrates, amino acids and proteins that provides for the organization of the cell wall, plasma membrane, cytoskeleton and cytocavitory network.

iv. unravel the structural and functional intricacies of nucleic acids and proteins whose sequence information's prove vital to store the genetic scripts that control and regulate the expressions of hereditary traits.

v. comprehend cell as a thermodynamically competent and energy sufficient component of the plant system which by its various carbon breakdown pathways and electron transfer reactions meet out the energy requirements.

UNIT I: Molecules of life : Atoms, molecules, bonds, functional groups, periodic table, nomenclature, units of measurement – physical constants – concepts of pH and buffers – simple inorganic molecules to macromolecules, reducing power, energy rich molecules – basic design of metabolism.

UNIT 2: Cell Architecture: Concept of Cell – ultrastructure and organization of plasma membrane – cell wall – cytoskeleton nucleus – nucleolus – chromosome – chloroplasts, mitochondria – lysosome – peroxisomes – glyoxysomes – centriole – flagellum – cilium and vacuoles – cell cycle and cell division- cell as a building block

UNIT 3: Structural and Skeletal Compounds in Plant Cells: Configurational and conformational aspects of carbohydrates and lipids – structure, properties and importance of structural (cellulose and chitin) and storage polysaccharides (starch and glycogen) and Chemical nature of lipids (fatty

acids, triacylglycerol, phospholipids, waxes, spingolipids) – topology of biological membrane – fluid mosaic model – biosynthesis of membrane lipids

UNIT 4: Memory Chemicals and Cell's Makeover: Candidacy of protein, RNA and DNA as genetic material, Structure and classification, physical, chemical and optical properties of amino acid – peptides – Ramachandran Plot – porphyrin biosynthesis – amino acids metabolism (synthesis and deamination)- chemical structure and base composition – biosynthesis and break down of nucleotides – Smaller compounds and Secondary metabolites (terpenoids, alkaloids and flavonoids, vitamins).

UNIT 5: Substrates of Energy Transactions and Cell Dynamics: Carbohydrate and lipid reserves- glycolysis – pentose phosphate pathway – Krebs cycle- lipid metabolism (biosynthesis, oxidation and energy budget) β oxidation – electrochemical potential and redox reactions- – Role for enzymes - enzyme catalysis – substrate specificity – kinetics and allostearism – coenzymes-metabolic regulation.

TEXT BOOKS

1. Gerald Karp. 2013. Cell Biology. 7th edition. John Wiley & Sons. ISBN:1118318749

1.Voet, D, J. G. Voet and Pratt, C. W. 2008, Principles of Biochemistry, John Willey and Sons, Publ. ISBN 13-978-0470-23396-2

2.Devlin, T.M. 2002, Biochemistry, 5th Edn. Wiley-Liss Publ. ISBN 0-471-411361.

REFERENCE BOOKS

1. Alberts B, Johnson A, Lewis J, Raff M, Roberts K and Walter P., 2002. Molecular Biology of the Cell, 4th Edn. Garland Science Publ. ISBN 0-8153-4072-9.
2. Berg, J. M., Tymocozko, J. L. and Stryer L. 2007. Biochemistry, 6th Edn, W.H. Freeman and Company, ISBN 0-7167-8724-4
3. Dey, P. M. and Harborne, J. B. 2000. Plant Biochemistry. Harcourt Asia, Pvt. Ltd. Singapore. ISBN 0-12-214674-3 (HB)
4. Gurr, M.I., Harwood, J. L. and Frayn, K. N. 2002 Lipid Biochemistry 5th Edn. Freeman Publ. ISBN 1-4039-4876-3
5. Mathews, C.K., Van Holde, K. E. and Ahern, K. G., 2005, Biochemistry, Pearson Ed. Publ. ISBN 81-297-0215-0
6. Nelson, D. L. and Cox, M. M. 2008. Principles of Biochemistry 5th Ed., CBS Publ. ISBN 1 4292 1241 1.
7. Murray, R. K., D. K. Granner, P. A. Mayes, and V.W. Rodwell, 2000. Harpers Biochemistry, 25th Ed., McGraw Hills Pub. ISBN 0 8385 3684 0.

Mapping Cos with Bloom's taxonomy:

	K1 (Recall)	K2 (Understand)	K3 (Apply)	K4 (Analyze)	K5 (Evaluate)	K6 (Create)
CO1			3			
CO2		2				
CO3		2				
CO4				4		
CO5		2				

PGB4249 **Biochemistry LAB** **3Hr./ 2Cr.**

At the end of the course, the students will be able to

i. perform qualitative and quantitative test for all major macro molecules and file a report of chemical profile of a plant cell.

1. Carbohydrates – Qualitative and Quantitative tests.
2. Protein – Qualitative and Quantitative tests.
3. Estimation of free fatty acids and saponificaiton value.
4. Lipids – Separation of chloroplast lipids
5. Estimation of cholesterol.
6. Amino acids – Estimation of amino acids in biological samples.
7. Separation of amino acids by paper chromatography and Thin Layer Chromatography.
8. Protein separation by Polyacrylamide Gel–Electrophoresis.
9. Extraction and quantification of pigment (Lycopene & Curcumin).
10. Extraction and estimation of vitamins and phenolics.

REFERENCES

1. Cooper, T.G.1991. The tools of biochemistry, John Willey and Sons, Publ. ISBN 0 4711 7116 6.
2. Harborne, 1998. Phytochemical methods, Chapman and Hall, Publ. ISBN 0 4125 7270 2.
3. Jeyaraman, J. 1988. Laboratory Manual in Biochemistry, New Age International Pub., Ltd. ISBN 0–85226–428–3
4. Plummer, DT., 2003. An Introduction to Practical Biochemistry, 3rd Edn. Tata McGraw Hills Pub Company, ISBN 0–07–0994870
5. Sadasivam. S and A. Manickam. 2008. Biochemical methods for Agricultural Sciences, 2nd edn., New Age International Pub. Ltd., ISBN 978–81–224–2140–8
6. Willson, K. and J. Walker. 1994. Practical Biochemistry, Cambridge University Press, ISBN 0 5217 9965 1.

PGB 4331 **Campus Ecology** **4Hrs./ 3Cr.**

PREAMBLE: This course stresses the importance of ecological knowledge to preserve and protect the nature and its elements *per se* in the campus. Awareness of our own ecosystem alone can give an insight towards the conservation of our own environment. The present course aimed at giving quality education on the basics of ecosystem, in order to give a clean atmosphere within the campus. Uniqueness of the flora and fauna in the campus will tickle the young mind to broaden their vision towards the biodiversity of the campus. After the completion of the course the students will be able to understand, appreciate and conserve the nature.

COURSE OUTCOME

At the end of the Semester, the Students will be able to

i. know about the ancient history and establishment of the campus which is an important heritage marvel and the origin and history of the satellite campus and their immediate beneficiaries.
ii. understand the biodiversity abode in the campus especially the flora and fauna with their seasonal variations and the abundant exotic plants and weeds including the horticultural varieties and appreciate the reasons behind it.
iii. realize the ecoclimatic conditions prevailing in the campus which is responsible for the serenity of the campus, and efforts taken by the administration related to maintain the ecological harmony of the campus especially during the water crisis and conservation.
iv. comprehend the reason behind the cleanliness of the campus by way of solid waste disposal and also to ensure the serene atmosphere related to air, water and environment following ecological ethics.
v. conduct anywhere the quantitative experiments such as the tree cover using – quadrat analysis, tree identification, bird watching and aerobiology on their own.

UNIT I: Understanding the campus: Origin and history – departments – etymology – building designs – architecture – various facilities – organizational set up – satellite campus – origin and history – beneficiaries.

UNIT II: Biodiversity: flora and fauna – seasonal variations – exotic plants and weeds – horticultural species – arboretum – species of birds and animals – importance of flora and fauna

UNIT III: Ecoclimate: Serenity of the campus – ecological factors – rainfall – temperature – altitude – impact of plants – campus as an ecosystem – litter fall – rain water harvesting – water crisis and conservation.

UNIT IV: Waste regulation: waste disposal – litter *vs* solid waste – basics of solid waste management – pollution (air, water and environment) – ecological ethics – importance of diversity – atmospheric cleanliness – future scope.

UNIT V: Eco-watching: Tree cover – quadrat analysis (density, abundance and frequency) – basics of bird watching – tree identification – unique trees and animals – litter drop method – basics of aerobiology.

TEXT BOOKS

1. Anonymous, 2016. Green Audit Report. The American College, Madurai.
2. Odum, E. & Barrett G.W. 2005. Fundamentals of ecology. Cenage Learning India Private Limited ISBN 8131500209, 9788131500200
3. Sharma, P. D. 2017. Ecology and Environment. Rastogi Publications *ISBN*: 9789350781227.

REFERENCE BOOKS

1. Anonymous 2005. The American college Commemoratory publication SCILET
2. Bor N. L. & Raizada M.B. 2000 Some Beautiful Indian Climbers and Shrubs, Bombay Natural History Society. Bombay
3. Mc Cann, C. 1966. 100 Beautiful trees of India – A descriptive and pictorial handbook. D.B.Taraporevala Sons & Co Private Ltd, Bombay.
4. Sahni K C. 1998. The Book of Indian Trees. Bombay Natural History Society. Bombay. ISBN – 13: 978 – 0195645897
5. Santapau, H. 1966. Common trees, India land and the people, National book Trust India New Delhi. ISBN: 81 – 237 – 0288 – 4

	K1 (Recall)	K2 (Understand)	K3 (Apply)	K4 (Analyze)	K5 (Evaluate)	K6 (Create)
CO 1		**2**				
CO 2				**4**		
CO 3					**5**	**6**
CO 4					**5**	
CO 5				**4**		

PGB 4333 **Plant Based Enterprises** **4Hr./3Cr.**

PREAMBLE:

This course will survey the overall business potentiality of plants and practical aspects of food fermentation in regard to beer, wine, and cheese/dairy. Focus will be on the processes of converting source material to finished products. Students will gain a fundamental understanding of theory and technology involved in it.

COURSE OUTCOME

At the end of the Semester, the Students will be able to

i. identify trade opportunities and funding agency , build business plan, acquire talent and awareness on food certification
ii. Categorize food and practice the preparation of commercial products, cultivate and trade of medicinal plants.
iii. Use biotechnological approach to produce processed food, know the strategies to develop bakery industry.
iv. List the types of biofertilizers, learn the process of composting, design backyard composting.
v. Distinguish between edible and poisonous mushroom, develop cultivation method-evaluate the economics of marketing –practice the mushroom recipe preparation.

UNIT I: Plant trade: Trade opportunities – Becoming an Entreprenuer –guidance from MSME - Finance from banks -SME –MSMED act - plan and proposal – training in concerned field - trade license and registration marks – marketing strategies -Food safety –Food certification (FAO, EFSA) - organic shops – food centres.

UNIT II: Fresh and Dry Plant market: Fresh plant products **: F**ood – health drink – juice - ~~herbs~~ herbal drink- salad) — cut flowers usage (garland, Bonsai & Bouquet)- Nursery(cultivating and sale of ornamental plants, medicinal plants) Dried plant products: (spices, leaf plates –leaf fan - plant articles –wood work) food supplements (health mix) – beverages (tea/coffee) - raw drugs – natural dyes – Cosmetic products – awareness on narcotic plants.

Unit III: Processed food Products: Fermentation -milk and milk products –alcoholic products- Bakery products –preparation of Batter - jam – jelly – squash - pickles -pounded masala products - starting bakery unit – factors affecting the products -natural preservatives.

Unit IV: Farm Supplements: Bio-fertilizer types– microbial biofertilizer production – green manures – mass cultivation of *Azolla, BGA* – composting processes (vermi, backyard compost)

UNIT V: Mushroom Technology: Identification – characterization – collection – edible and poisonous – nutritional, medicinal and economical value –substrates, spawning and pure culture techniques – protocols for cultivation (indoor and outdoor cultivation) – harvesting, storing, packing – marketing strategies – mushroom recipes.

TEXT BOOKS

1. Bahl, N. 2000. Hand book on mushroom cultivation. 4th Ed. Oxford & IBH Publishing Co. New Delhi. ISBN: 8120413997

2. SubbaRao, N. S., 1995. Soil microorganisms and Plant Growth. Oxford & IBH Publishing Co., New Delhi. ISBN: 1886106185

3. Handbook on herbs cultivation and processing, 02004, Asia Pacific Business Press Inc. ISBN:9788178330747

REFERENCE BOOKS

1. Chang, T.S. and Hayes, W.A. 1978. The biology and cultivation of edible mushrooms. Academic Press, New York. ISBN: 9781483271149

2. Nair, M.C., Gokulapalan, C. and L. Das, 1997. Topics on mushroom cultivation. Scientific Publishers, Jodhpur, India.

3. Abu Mathur (2017) Fundamentals of Entrepreneurship, The tax and corporate laws of India publication. ISBN: 9789386882479

	K1(KNOW)	K2(UNDER)	K3(APPLY)	K4(ANALY)	K5(EVAL)	K6(SYN)
CO1						6
CO2						6
CO3						6
CO4						6
CO5						6

PGB 4542 **Plant Systematics** **7Hr./5Cr.**

PREAMBLE: The present course is aimed at giving a holistic account on the nuances of flowering plants such as history, classification and the relationship with non flowering plants. Nomenclature of higher plants is another wing of plant systematics which ought to be given importance. Teaching herbarium techniques on hand, might give the students an insight regarding the study of plant specimens and appreciate the morphology of plants better. Alternative methods of classification of plants will make the students see beyond microscope to the digital world.

COURSE OUTCOME

At the end of the Semester, the Students will be able to

i. comprehend the different flavours of evolution from the origin of species and its development in to a complex structure in its natural habitat and the ever changing physiognomy of the habitat based on their geological position with special reference to the diversity of Southern India and its conservation
ii. tread and appreciate the glimpses of botanical history right from the layman's classification to the phylogenetic classification through ages
iii. do research and also gets hands on training in herbarium taxonomy through the process of preserving the plant specimens for herbarium which is a biological tool and store house of plants for taxonomical research.
iv. understand the principles, articles and recommendations of International Code of Nomenclature and apply the rules and regulations formulated by the botanical congress while naming the plant species.
v. examine the recent developments in the field of plant systematics and reflect upon the e-learning programs related to net based applications which will make the students amused towards the subject.

UNIT I: Ascent of angiosperms: Origin of flowering plants – angiosperm phylogeny – co - evolution – basal angiosperms – ecological dominance of angiosperms – latitudinal and altitudinal zonation of floristic wealth, biomes – physiognomy and structures of forest in southern India – endemism and hotspots.

UNIT II: History of classification: Pre-Linnaean, Linnaean and post Linnaean period – contributions of Linnaeus, Bentham and Hooker, Engler and Prantle and Bessey – angiosperm phylogeny groups APG I, II, III, and IV – ethnobiological survey and classification of plants.

UNIT III: Herbarium taxonomy: Objectives and functions – herbarium preparation –collection – pressing – poisoning and drying – identification – mounting – labeling – incorporation – herbarium ethics – maintenance – important herbaria – BSI (Botanical Survey of India), and TBGRI (Tropical Botanical Garden and Research Institute) Rapinat herbarium (RAPINAT) – Kew Garden (KEW).

UNIT IV: International Code of Nomenclature: History of different codes – botanical congress – ICBN to ICN (Melbourne code 2010), IAAT (Taxon), IAPT (Rheedea) – principles of ICN – taxonomic hierarchy – active principles (priority of publication, typification, effective publication) valid names, rejection of names, author citation – botanical naming (polynomial, trinomial and binomial).

UNIT V: Trends in classification: Cladistics and biosystematics (chemo, sero and molecular taxonomy) – numerical taxonomy – Kubitzski system – use of computers – automated pattern recognizing systems – matrices, online data bases: IPNI (International Plant Names Index) – Index Kewensis and The Plant List.

TEXT BOOKS

1. Bhatacharyya, B. 2005. Systematic Botany, Narosa Pub. House Pvt. Ltd. ISBN 81-7319-542-0
2. Krishnamurthy, K.V. 2003. A text Book on Biodiversity (Principles and Practice), Science Publishers, USA. ISBN 1578083257.
3. Lawrence, G. H. M. 1964. Taxonomy of Vascular Plants. Oxford and IBH Publishers. ISBN 17-L5-5
4. Prathipalsingh, 2010. Introduction to biodiversity. Ane books Pvt. Ltd. New Delhi. ISBN 978-1-8052-185-0
5. Singh, G. 2007. Plant systematics theory and practices. Oxford and IBH Publishing Co. ISBN 81-204-1652-x
6. Sivarajan, V. V. 1999. Introduction to the principles of Plant Taxonomy. Oxford & IBH publishing co. ISBN: 81-204-0445-9.
7. Pandey, B.P. 2013. Taxonomy of Angiospherms, S. Chand Publishing, New Delhi. ISBN 9788121909327

REFERENCE BOOKS

1. Davis, P. H. & Heywood, V. H. 1972. Principles of Angiosperm taxonomy. Edinburgh, London, Publ. ISBN 0 8825 5129 8
2. Henry, A. N. and Chandrabose, M. 1979. An aid to the International Code of Botanical Nomenclature. Today and Tomorrow Publ. ISBN 8 1701 9094 0
3. Jain, S. K. and Rao R. R. 1993. A handbook of field and herbarium methods. Today and Tomorrow Publ. ISBN 8 1701 9130 0
4. Jones Jr. SB and Luchsinger AE 1987. Plant systematics. McGraw- Hill Book Company. ISBN 0-07-032796-3.
5. Stace, C.A. 1989. Plant taxonomy and biosystematics, 2nd Ed. Edward Arnold, ISBN 0-7131-2955-7
6. Simpson, M. G. 2010. Plant Systematics, 2nd Ed. Academic press ISBN 978-0-12-374380-0.

	K1 (Recall)	K2 (Understand)	K3 (Apply)	K4 (Analyze)	K5 (Evaluate)	K6 (Create)
CO 1				**4**		
CO 2				**4**		
CO 3			**3**			
CO 4						**5**
CO 5						**5**

PGB 4544 **PLANT PHYSIOLOGY** **7Hrs/5Cr**

PREAMBLE:

Students would be able to understand water as an elixir for plant life. They will scientifically explore the plumbing and pipe line system along with the ventilating system for gas exchange. The molecular mechanism of synthesis of food and its usage to derive energy are explored. The physiology of deriving nourishment from soil and its conversion to usable form too are unravelled. Plant's management of physical, chemical and edaphic factors are studied.

COURSE OUTCOME

At the end of the Semester, the Students will be able to

i. to locate water as a resource and analyze the movement of water and other substances across membranes which gets integrated with cellular chemistry and functions that the soil water-plant –atmospheric continuum provides the vibrancy needed for plants despite its sedentary habit.

ii. discover photosynthesis as a mandatory mechanism to input energy into the living world and analyze the ultra structural and biochemical variations of the photosynthetic machinery among plants and estimate the

iii. photosynthetic productivity at specific types of ecosystems

iv. understand the inside story of molecular physiology of mineral nutrient acquisition, transport and utilization involving a select list of elements with which the land plant is able to show case the dynamism of life with only a fewer macromolecules and specific secondary chemicals.

v. analyze the energy utilization pathways of photosynthetic products harnessing energy into ATP through a proton circuit mechanism and electrophysiology of membranes that the life forms are thermodynamically equipped to be self sufficient structures at normal and stressed conditions.

vi. Correlate how plants respond to environmental conditions that limits the distribution of plants and understand the challenges encountered by plants to defend themselves from these stresses.

UNIT I: Plant, water and ionic relations: Soil and atmospheric water-Physiological role of water – water potential –uptake and transport mechanisms – stomatal mechanics – gas transfer equation – malate metabolism in guard cells – potassium ions – organization of conducting tissues, Source sink relations- phloem loading and unloading-theories of translocation.

UNIT II: Carbon metabolism: Fine structure of photosynthetic machinery-light harvesting protein complex– Einstein's law of photochemical equivalent – light absorption and photosynthetic electron

transfer – Emerson's enhancement effect and synergetic functions of LHCP 1 and LHCP 2– cyclic, non–cyclic, pseudo cyclic photophosphorylation – significance of OEC and D2 proteins – C-3 cycle — C-4 and CAM metabolism – factors affecting photosynthesis- photorespiration (C-2 cycle)

UNIT III: Mineral nutrition and nitrogen metabolism: Macro, micro nutrients of plants-deficiency and toxicity symptoms – integration of nitrogen, phosphorus, Sulphur- nitrogen assimilation - GS - GOGAT path way, Hup genes nitratereductase,–leghaemoglobin, carbon economy –biological role of carotenoids and flavonoids - *nod*- hsn, gsn genes – ammonia assimilation-uride synthesis – ammonia assimilation.

UNIT IV: Respiration: respiratory substrates- Carbon break down pathways-Respiratory Quotie:Int -Electron transport and respiratory chain. Energy budget – chemi-osmotic proton circuit, ATPase complex, mechanism of ATP synthesis–cyanide resistant respiration-pentose phosphate pathway-factors affecting respiration.

UNIT V: Stress physiology: Concepts – water-drought,flooding and salt-radiation-UV-temperature-heat,frost- acidic soil, osmotic, oxygen deficit and oxidative stress – mechanism of plant responses-stress proteins – mineral and metal toxicity – stress management.

TEXT BOOKS

1. Francis.H.Witham,Robert M.Devlin 1986 Plant physiology 4 edition W.Grant press ISBN-13 978-0871507655
2. William G.Hopkins ,Norman Introduction to Plant Physiology John Wiley& Sons ISBN-13 978-0470247662
3. Irwin P.Ting Plant Physiology Addison Wesley longman Publishing Company 1982 ISBN 0 19850180 3
4. Raman, K. 1996.Transport phenomenon in plants. Narosa Publications.ISBN 978 81 319 128 2.
5. Frank B.Salisbury,CleonW. Ross and Plant physiology edition 4 wadsworth publishing company. ISBN 0534983901
6. Voet, D., J. G. Voet and Pratt, C. W. 2008. Principles of Biochemistry. John Willey and Sons, Publ. ISBN 13-978-0470-23396-2
7. Malcolm B.Wilkins, M.B. Advanced Plant Physiology. Pitman press. ISBN 0-273-01853-1

REFERENCE BOOKS

1. Alberts B., Johnson A., Lewis, J. Raff, M, Roberts, K. and Walter, P. 2002. Molecular Biology of the Cell, 4thEd. Garland Science Publ. ISBN 0-8153-4072-9.
2. Baker, R. D. J., Cartledge, T. G, Dewhurst, F. and Jenkins, R. O., 1992, Principles of Cell Energetics, Butterwoth-Heinemann Publ. ISBN 0-7506-15044
3. Berg, J. M., J. L. Tymocozko and Stryer L. 2007. Biochemistry, 6th e ed, W.H. Freeman and Company, ISBN 0- 7167-8724-4

4. Licoln Taiz,Eduardo Zeigner, Plant Physiology 5 thEd.Sinauer Inc ISBN-13 978-0878938667.
5. Gurr, M. I., Harwood, J. L. and Frayn, K. N., 2002 Lipid Biochemistry. Freeman Publ. ISBN 1-4039-4876-3
6. Lehninger, A. L., D. L. Nelson and M. M. Cox. 2008. Principles of Biochemistry. 5th Ed. CBS Publishers and Distributors. ISBN 1 4292 1241 1
7. Matthews, C. K., Van Holde, K. E. and Ahern, K. G., 2005, Biochemistry, Pearson Pub. ISBN 81-297-0215-0
8. Voet, D., J. G. Voet and Pratt, C. W. 2008. Principles of Biochemistry. John Willey and Sons, Publ. ISBN 13-978-0470-23396-2
9. Willard, H. H., L. L. Merritt, J. D. Dean, F. A. Settle. 1986. Instrumental methods of analysis. CBS Publ. ISBN 0 5340 8142 8

Mapping Cos with Bloom's taxonomy:

	K1 (Recall)	K2 (Understand)	K3 (Apply)	K4 (Analyze)	K5 (Evaluate)	K6 (Create)
CO 1				4		
CO 2		2				
CO 3				4		
CO 4		2				
CO 5				4		

PGB 4426 PLANT SYSTEMATICS & PHYSIOLOGY (LAB) 6H/4C

At the end of the course the students will be able to

i. comprehend and analyze the salient features of different families in the world of flowering plants through hands on experience and field trips to different botanically rich areas from the sea shore to the high altitude sholas which will ensure further conservation of green plants locally and globally.

ii. Critically evaluate the primary metabolic activities of plant and get hands on experiences and training on instrumental skills.

iii. Further refine their skills in presenting scientific findings and integrate their knowledge with experimental work.

PLANT SYSTEMATICS

OBJECTIVES:

1. to explore the diversity of angiosperms
2. to understand and appreciate the evolutionary trend in the plant world.
3. Hands on experience to study plant morphology and vegetative parts
4. To botanically describe and identify the species with the help of available local floras
5. to study the plants in their natural habitat through field trips

1. Morphology of flowering plants: General description and traits of taxonomic interest
2. Herbarium preparation (Traditional methods).
3. Phytography (describing plants with technical terms).
4. Construction of dichotomous keys (indented and bracketed key)
5. Identification of local plants using local floras
6. Phenological study on select tree species in the campus.
7. Characterisation of different forests in Southern India
8. Analysis of plant characters - Polypetalae
9. Analysis of plant characters - Gamopetalae
10. Analysis of plant characters - Monochlamydae
11. Analysis of plant characters - Monocots
12. Computer databases in plant identification
13. Field visit to at least three of the listed destinations -Alagar Hills, Kuttupatti, Karungalakudi, Kodaikanal, Coimbatore and Udagamandalam.

REFERENCES

1. Gamble.J. S. 1954. The Flora of Presidency of Madras. Botanical Survey of India Calcutta. ISBN 8 1211 0452 1.

2. Jain, S. K. and Rao R. R. 1993. A handbook of field and herbarium methods. Today and Tomorrow Publ. ISBN 8 1701 9130 0
3. Lawrence, G.H.M. 1964. Taxonomy of vascular plants. Oxford and IBH publ. ISBN 0 0236 8190 X.
4. Matthew,K. M. 1995. An excursion flora of central Tamilnadu. Rapinat Herbarium. ISBN 8 1204 0940 X.

PLANT PHYSIOLOGY

1. Measurement of water potential
2. Osmosis
3. Measurement of phosphate ion absorption by plant tissues
4. Extraction and estimation of chlorophylls a,b, and carotenoids in C 3 and C4 plants.
5. Isolation of chloroplast and measurement of Hill reaction
6. Estimation of Photosystem II activityC3,and C4 anatomy,C 4 subtypes.
7. Permeability changes of biomembranes (using beet root discs and RBC)
8. Measurement of enzyme activity (Nitrate reductase)
9. Factors affecting enzyme activity-substrate concentration, pH and Temperature
10. Calculation of activation energy of enzymes (NR as a model)
11. Isolation of mitochondria from potato
12. Mineral nutrition – hydroponics
13. Estimation of proline
14. Estimation phenols in plant tissues under different environmental and physiological conditions.

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1. Cooper, T. G. 1991. The tools of biochemistry, John Wiley & Sons Publ.ISBN 047117116 6
2. Jayaraman, J. 1988. Lboraory manual in biochemistry, New Age interna tional Publishers, Ltd., New Delhi. ISBN 0852264283
3. Mannar Mannan, R. 1988. Experiments in Photosyntheses: a loboratory manual. Macmillan India Ltd., Madras.
4. Plummer, D. T. 2003. An Introduction to practical biochemistry, 3rd Ed. Tata McGraw Hill Publ. ISBN 0-07-0994870.
5. Sadasivam. S and A. Manickam. 2008. Biochemical methods for agricultural sciences, 2nd ed., New age international Pub. Ltd., 978-81-224-2140-8

PGB4428 **MYCOLOGY AND PATHOLOGY** **6Hrs/4Cr.**

PREAMBLE:

The course has been designed to give basic knowledge of fungi and plant pathology. The history and development in the field of plant pathology will be traced. The uniqueness of the fifth kingdom – fungi in terms of characteristics, growth pattern and reproduction will be discussed. Host pathogen interactions and stages in disease development will help to understand the pathogen, which in turn will facilitate the strategies of disease management. Etiology and management of important fungal, bacterial, viral diseases and angiosperm parasites will be dealt.

COURSE OUTCOME

At the end of the Semester, the Students will be able to

i. comprehend the milestones in field of Plant pathology, diagnostic methods and pattern of disease development.
ii. recognize characteristic features, classification and commercial importance of fungi and their interactions.
iii. interpret the stages in disease development and various defense mechanisms in plants and suggest suitable combat measures.
iv. identify the incidence and symptoms of disease caused by: fungi, bacteria, virus, mycoplasma, nematodes and angiosperm parasites to closely monitor and control the spread of pathogens.
v. apply knowledge on epidemiology and disease forecasting tools and disease management strategies to minimize the crop loss thereby increasing productivity.

UNIT I: Fundamentals of Plant Diseases: History – classification – diagnosis and identification – Koch's postulates – gene for gene hypothesis – disease tetrahedron – pathogenesis (disease initiation, development and establishment) – parasitism (role of enzymes, toxins and growth regulators.)

UNIT II: Elements of mycology: General characters – habitat – growth pattern – nutrition types – cell wall (structure, composition) – fungal classification upto class level (Alexopolous and Mims) – modes of reproduction – parasexual cycle – fruiting bodies – fungal interactions (parasitic and symbiotic) – importance of VAM fungi – primary and secondary metabolites – commercial fungal enzymes.

UNIT III: Disease development and defense mechanisms: Disease development and influence of factors – inoculum and inoculum potential – hypersensitivity – pathogenic impacts on host physiology – host defense mechanisms - innate and induced – morphological and anatomical

defenses – biochemical (phenols, phenolic glycosides, phytoalexins) – Pathogenesis Related Proteins (PR) – Systemic acquired and Induced systemic resistance (SAR and ISR).

UNIT IV: Diseases and Disease Cycle: Study of the following diseases with reference to their incidents – symptom manifestation and control measures – fungal (rust of wheat, blast of rice, Tikka of groundnut, Red rot of Sugar cane) – bacterial (Bacterial blight, Citrus canker) – mycoplasmal (Little leaf of brinjal, *phyllody of* sesamum – viral (Yellow vein mosaic disease) – nematode (Root knot of potato) – non- parasitic diseases (*Cuscuta, Striga).*

UNIT V: Disease management: Epidemiology – disease forecasting – concepts on prophylaxis, exclusion and legislation – plant quarantine principles – eradication (crop rotation, field sanitation, elimination of alternate hosts, soil treatment and seed treatments.) –management strategies (chemical and biological) – microbial antagonists [(bacterial, fungal and viral) mode of action, mass production and field application)] – engineered resistance against fungal, viral and bacterial pathogens – Integrated disease management (IDM).

REFERENCES

Text books

1. Alexopoulos CG, Mims CW and Blackwell M. 1996. Introductory Mycology, John Wiley. ISBN 9814-12-612-8
2. Singh RS 2005. Plant Diseases. Oxford and IBH publishing. ISBN 8120416589
3. Mehrotra RS and Aggarwal.A. 2003. Plant Pathology. Tata McGraw Hill Pub. ISBN 0070473994

Reference books

1. Agrios G. N. 2006. Plant Pathology. Elsevier Publication, Academic Press. ISBN-13: 9788131206393
2. Biswas S. B. and Biswas A. 1996. An Introduction to Viruses.4th Edn. Vikas Publishing House. ISBN 0706982207
3. Chaube H. S. and Pundhir V. S. 2005. Crop diseases and their management. Prentice Hall of India. ISBN 8120326741
4. Deacon J. W. 2006. Fungal Biology. Blackwell Scientific Publ. Oxford. ISBN 14051 6953 0
5. Dickinson, M. 2003. Molecular Plant Pathology. BIOS scientific Publishers, ISBN 0-203503309
6. Mukerji, K. G. and Bhasin, J. 1972. Plant diseases of India – A source book. Tata McGraw Hill, New Delhi.
7. Vidhyasekaran, P. 2008. Fungal Pathogenesis in Plants and Crops: Molecular biology and host defense mechanisms. CRC Press. ISBN 13: 9780849398674.

Mapping Cos with Bloom's taxonomy:

	K1 (Recall)	K2 (Understand)	K3 (Apply)	K4 (Analyze)	K5 (Evaluate)	K6 (Create)
CO1				4		
CO2					5	
CO3				4		
CO4				4		
CO5			3			

PGB 4330 **Trends in Agriculture** **4Hr./ Cr.**

PREAMBLE: This course is designed for the non major students and stress would be given on the history, traditional agricultural practices and the cropping pattern practiced for generations. The period in which the production of food materials was surplus and extensive cultivation was practiced in order to cope up with the famine in india. Modern agricultural techniques have also been discussed to have a better understanding about the agricultural practices in India.

COURSE OUTCOME

At the end of the Semester, the Students will be able to

i. appreciate and get amazed in listening to the various civilization of the yesteryears along the riverbanks, primitive agricultural practices along the ganges delta and in Southern India especially the agricultural details in sangam literature.
ii. comprehend the traditional agricultural practices in India which includes the irrigation system and methods and the crop and land use patterns practiced by the early agriculturalists in India. .
iii. recognize and realize the cropping pattern which is mainly based on the soil and climatic conditions in Southern India and its conservation
iv. evaluate the history of agriculture with special reference to famines and also the governing policies for the construction of dams and application of fertilizers and development of gene and seed banks for the betterment of mankind
v. understand and develop the modern agricultural practices in order to save water and also to promote waterless agriculture, development of hybrids, and high yielding varieties.

UNIT I History of agriculture: Early civilization (Indus valley, Harappa, Mayan Inca, Egyptian, Chinese) – nomads, pastoralism, sedentism – river banks as cradle of civilization – domestication of plants – monoculture – Ganges delta farming – farming in southern India – Sangam literature – ancient crops.

UNIT II Traditional practices: Agronomy in India – irrigation methods (dam, kanmai/ oorani, ayakattu, anicut, ponds, lakes, channel, well, check dams) – irrigation systems – catchment area – reservoirs – manuring (farm, cattle, green manure) – multicropping – crop rotation.

UNIT III Cropping pattern: Weather based cropping (Kharif, rabi and zadi) – Basic soil types – soil map of southern India – soil and crop selection – top soil – soil erosion and conservation (types and methods)

UNIT IV Green revolution: History (famines in India) – government policies – construction of reservoirs – extensive cultivation – introduction of exotic varieties – fertilizers and pesticide industries – high yielding varieties – rural banks and road – seed banks – wild relatives of cultivars – contributions of Indian Scientists – IRRI, IARI, ICAR and TNAU – ecological backlash.

UNIT V Modern practices in agriculture: Mechanization (seeding, weeding, manuring, harvesting) – intensive cultivation – hybrids – water saving devices – rain water harvesting –

biofertilizers – underutilized crops for food security – organic and vertical farming – hydroponics and aquaponics – scope for agriculture in space.

TEXT BOOK

1. Anonymous, 2011. Hand book of Agriculture, 6th ed. ICAR, New Delhi. ISBN 81-7164-050-8
2. Chandrasekaran, B., K. Annadurai, and E. Somasundaram, 2010. A textbook of agronomy, New Age International (P) Limited, Publishers, ISBN (13) : 978-81-224-2859-9

REFERENCE

1. Carson, R. 1962. Silent spring, Mariner Books. ISBN 0-618-24906-0
2. Toffler, A. 1980. The Third Wave, Bantam books, United States ISBN 0-517-32719-8 (hardcover), ISBN 0-553-24698-4 (paperback)
3. Raychaudhuri, S.P. and Roy, M., 1993. Agriculture in Ancient India: A Report, ICAR Publication , New Delhi.

Mapping Cos with Bloom's taxonomy:

	K1 (Recall)	K2 (Understand)	K3 (Apply)	K4 (Analyze)	K5 (Evaluate)	K6 (Create)
CO1			3			
CO2				4		
CO3			3			
CO4				4	5	
CO5						6

PGB4332 **Plants and People** **4Hrs./3Cr.**

PREAMBLE:

The objective of the course is to highlight the importance of plants in our different facets of life. Plants have been part of human civilization from the pre historic period. The contents are divided to give an overview of plants in different aspects of human being. References of plants in scriptures and Sangam literature will be cited and relevance at the context will be discussed. Cultures are identified based on their food and dressing habits, an overview of history of Indian cuisine will be traced specially with references to south India. Plants always served us as food and medicine the important plants used in the Indian system of medical practioners also included.

COURSE OUTCOME

At the end of the semester, the students will be able to

i. spot the major events that shaped up the modern society by taking into consideration the changes adopted in terms of vocation life styles.

ii. get a glimpse of major religions and faith component of India with a special mention about the significance of plants in each system.

iii. develop a wholistic appreciation of plant references made in tamil and western literature that the learner would develop a sense of tolerance and mutual respect all faiths.

iv. food as basic necessity and composite and complementary amalgamations of inputs that are geographically relevant to health, culture and practices.

v. accept and adopt the Indian and indigenous systems of medicines (AYUSH) as a viable better alternative to allopathic practices.

Unit 1. Prehistorical evidences: Unraveling ancient civilization using plant based prehistoric evidences – cotton fabrics and dyes of prehistoric period – plants in ancient funerary rituals – pollen and paleoclimates

Unit 2. Scriptures: Forest and trees associated with Lord Buddha – plants in Bible and Quran – temple trees and sacred plants of India – sacred oil and fragrances used across the religious barriers.

Unit 3. Plants in literature: Cultural and biological diversity – Sangam landscape – Thinai concept – early livelihood strategies in Sangam literature – western literature.

Unit 4. History of Indian cuisine: Social history of food – dietary beliefs and cooking patterns of Indians – minor millets, spices and sweeteners of Indian origin.

Unit 5. Indian System of Medicine: Indian system of medicine – Siddha, Ayurveda and Unani – revitalization of indigenous medicinal practices and knowledge in south India.

TEXT BOOKS

1. Haberman, D. L. 2013. People Trees – Worship of trees in North India Oxford University Press. *ISBN*-13: 978-0199929160

2. Ahluwalia, S. 2017. Holy Herbs : Modern Connections to Ancient Plants, Fingerprint Publishers. ISBN 9788175994461

REFERENCE BOOKS

1. Achaya, K. T. 1998. Indian food: A Historical Companion, Oxford University Press, ISBN 0195644166, 9780195644166
2. Albala, K. 2013. Food: A cultural culinary history the great courses
   ISBN 10: 1598039474 ISBN 13: 9781598039474
3. **Schmithausen, L. 2009.** Plants in Early Buddhism and the Far Eastern idea of the Buddha-Nature of Grasses and Trees Published by Lumbini International Research Institute.
   ISBN 10: 9937217164, ISBN 13: 9789937217163
4. Nanditha, K. and Amirthalingam., 2014. Sacred plants of India, Penguin Books Limited
   ISBN 10: 0143066269
5. சீனிவாசன், . கு.,. .சங்க இலக்கிய தாவரங்கள், தமிழ் பல்கலைகழகம்

Mapping Cos with Bloom's taxonomy:

	K1 (Recall)	K2 (Understand)	K3 (Apply)	K4 (Analyze)	K5 (Evaluate)	K6 (Create)
CO1		2				
CO2				4		
CO3		2				
CO4				4		
CO5		2				

PGB 5641 **MORPHOGENESIS** **7 Hr / 6 Cr**

PREAMBLE: This course is to inculcate in students the appreciation of architectural marvel of plants and to explore the various developmental stages involved in it. The types of building blocks and the engineering mechanisms involved in tissue assembly and organ development would be unraveled. The innate message and its communication at the cellular level is explored. The vegetative growth and the reproductive ability of the immobile entity as plants would be studied at the experimental level.

UNIT I Organization of land plants: Exomorphic design – internal morphology and histological diversity – unique and general attributes of plant growth – plant structure viewed in terms of functions – cell as a building block – developmental potential of zygote, shoot and root meristem – embryogenic, somatic and reproductive phases of plant development.

Unit II Developmental anatomy: Uniqueness of meristematic cell – Shoot Apical Meristem (SAM)– theories and contemporary views– parenchyma as a filler and feeder – wall thickening and cytological variations in collenchyma and sclerenchyma – axial and appendicular structures – shoots – leaf differentiation and leaf expansion – plastochron – phyllotaxy – mechanism of axial and radial growth – polarity – histogenesis – lateral meristem (vascular and cork cambium) – xylem – phloem – secondary growth and anomaly – environmental control – special structures (velamen, hydathodes and laticifers).

Unit –III Growth and Development: Mechanics of cell cycle and cell division – Growth curve and relative growth rate (RGR) – growth pattern – Plant Growth Regulators: bioassay and biosynthesis – mode of action of classical hormones, Brasinosteriods, Jasmonic Acid – Phytochromes and Photoperiodism – Biological Clock – Plant Movements – Biochemical and Hormonal Integration – Signal Transduction – Genetic Control – Growth Measurement – Aging – Senescence, Abscission – Dormancy – Programmed Cell Death (PCD).

Unit IV Reproductive Biology: Organization of floral meristem – protective and generative organs of a flower – floral evocation – Control of florogenesis: ABC model – microsporogenesis and pollen development – megasporogenesis and female gametophytes – genic and cytoplasmic male sterility – Floral and extrafloral nectories – Protection and pollination behavior – pollen – pistil interactions and sexual incompatibility– syngamy, post-fertilization changes (embryo, seed, fruit development).

Unit V Experimental morphogenesis: Plant growing structures – controlled and precision farming. Nursery practices – propagation through cutting, layering, grafting – Seed science – traditional and hybrid seed production – grain filling – parthenocarpy and applications (seedless, shelf - life) – commercial dimensions of flower, seed, fruit and grain production – Case studies on rubber, tea 'banji' removal and Jasmine production.

TEXT BOOKS

1. Burgess, J. 1985. An Introduction to plant cell development. Cambridge University Press. ISBN 0 5213 0273 0.
2. Esau, K. 1977. Anatomy of seed plants. Wiley Eastern, Publ. ISBN 0 4712 4520 8.
3. Esau, K. 2002. Plant anatomy, John Wiley and Sons. ISBN 9 8141 2649 7.
4. Fahn A 1989. Plant anatomy. Pergamone Press, ISBN 0-02-946201-0
5. Johri. B. M. 1982. Experimental Embryology of Vascular Plants – Springer – Verlag, ISBN 3 5401 0334 1

REFERENCE BOOKS

1. Lyndon, R. F. 1990 Plant development: The cellular basis Unwin Hyman Publ. ISBN 00458 1032 X.
2. Maheshwari, P. 1985. An introduction to the embryology of angiosperms, Tata McGraw Hill,.ISBN 0 0709 9434 X.
3. Raghavan, V. 1986. Embryogenesis in Angiosperms, Cambridge University Press, ISBN 0 5212 6771 4
4. Raghavan, V. 1997. Molecular Basis for Plant Development, Cambridge University Press. ISBN 0 5215 5246 X.
5. Wardlaw, C. W. 1952. Plant Morphogenesis. Mac Millan & Co Ltd. London.

PGB5643 GENETICS AND MOLECULAR BIOLOGY 7Hr./ 6Cr.

UNIT I: Concepts of Heredity: Pre-Mendelian and Mendelian genetics – classical experiments in plants – phenotype and genotype variations - laws of Mendel – Genes and Alleles– application of statistics in genetics — Mendel-Fisher Controversy- Extensions of Mendelian Genetics - Penetrance — expressivity –pleiotrophy –phenocopies- Lethality – genetic heterogeneity – Gene interaction

UNIT II: Genetics in everyday life: Sex determination – linkage and crossing over – gene Maps (*Neurospora, Yeast, Caenorhabditis elegans, Drosophila melanogaster and Homo sapiens*— Sex linkage – Sex Limited and Sex influenced inheritance - Polygenic Inheritance. Gene Mapping - Structural and numerical alterations of chromosomes- types, causes and detection of mutations – Gene Mutation: biochemical loss and gain of function

UNIT III: Organization of nuclear genome: DNA as genetic material – prokaryotic and eukaryotic DNA- chromatin – chromosomes - gene, C value paradox – *Arabidopsis* and *Oryza* as genome models – transposons – evolution of DNA - Replication of DNA (Structure – types – melting curve – types of replication – enzymes in replication – formation of replication fork – synthesis of daughter strands – repair mechanisms).

UNIT IV: Genes in Action: Transcription in prokaryotes and eukaryotes (RNA synthesis – enzymology – signaling) – mechanics of initiation, elongation, termination – post–transcriptional modification and RNA splicing - regulation of gene expression (operon concept, physical and chemical factors) – RNA interference (TGS and PTGS)- Translation (genetic code – redundancy and elucidation of base composition – tRNA charging – initiation, elongation and termination) – post-translational modification – coupled transcription and translation.

UNIT V: Organelle Genome and Plant Breeding Techniques: Endosymbiotic theory – organization in chloroplast and mitochondria – synthesis and assembly of RUBPcase – interaction with nuclear genome – cytoplasmic male sterility, Plant breeding: selection (types , methods) – Hybridization techniques – heterosis – clonal selection – Types of breeding (mutation, ploidy) – introduction and acclimatization – Pros and Cons of GM crops.

TEXT BOOKS

1. Freifielder, D. 1995. Microbial Genetics. Narosa Publication. ISBN 0 8672 0248 3
2. Grierson, D. and Covey, S.N. 1984. Plant Molecular Biology. Blackie and sons ISBN 0 2169 1632 1
3. Ignacimuthu, S.J. 1997. Plant Biotechnology, Oxford & IBH Pub ISBN 81-204-0992-2

REFERENCE BOOKS

1. Alberts, B., Dennis Bay, Lewis, R. Raft, M.R. Roberts and Watson, J. F. 1994. Molecular Biology of cell. Garland Publ. ISBN 0 8153 4072 9.
2. Karp. G. 2008. Cell and Molecular Biology.5th edn. John Wiley & sons.ISBN 978 0470 169 61 2
3. Lewin 2007. Gene IX. Jones and Barlett Pub. ISBN. O 7637 5222 3

4. Old, R.N. and Primrose, S.B. 1989. Principle of gene manipulation – An Introduction to Genetic Engineering. Blackwell Scientific Publication, Oxford. ISBN 0-632-03712-1
5. Watson, J.D. et al. 2004 Molecular Biology of Gene 5th Edn. Pearson Edu. ISBN 0-321-22368-3.

PGB 5445 Genetics & Molecular biology and Morphogenesis lab. 6hr./$Cr.

Genetics

1. Verification of Mendel's laws
2. Gene interactions
4. Study of Mendelian traits in human
5. Barr bodies & Giant chromosome - Chironema
6. Blood grouping- multiple alleles
7. Probability test – beads/coin/dice
8. Chromosome mapping

Molecular Biology

1. Isolation of genomic DNA from plant tissue.
2. Estimation of Nucleic acid
3. Preparation of genomic DNA from Bacteria.
4. Isolation of plasmid DNA

5. Identification of DNA by Agarose Gel Electrophoresis.
6. Extraction of total RNA (hot phenol method).
7. PCR.

References

1. Gardner,E.J.,Simmon,M.J and Snustad .D.P. (1991) . Principles of Genetics. John Willey and Son (Asian) Ltd. Singapore. ISBN:0-471-50487-4 .
2. Stansfield,W.D. (1991). Theory and problems of Genetics. 3rd ed. McGraw Hill Inc. ISBN 0-07-060877-6
3. Palanivelu, P. (2001). Analytical Biochemistry and Separation Techniques – A laboratory manual for B.Sc. and M.Sc. Students Kalaimani Printers, Madurai.
4. Sambrook J and Russel DW, 2001. Molecular Cloning- A laboratory Manual., Cold Spring Harbour Publ. ISBN 0 8796 9577 3.
5.Theil T. Bissen S. and Lysons E.M. (2002). Biotechnology DNA to protein. A laboratory project in molecular biology, Tata McGraw Hill publishing company, Publ. ISBN 0 0711 2279 6.

MORPHOGENESIS-LAB

The morphogenesis component throws light on the exomorphic variations, anatomy of root, stem and leaf and lends insights on the pattern of primary and secondary growth. Variations that occur during the development of plant organs shall be presented through suitable examples. The technique of maceration, micrometry and the staining will be taught along with method of micro slide preparation. Due importance is also given to the embryological aspects. Histological analysis of ovular complex, different types of ovules, ovary and placentation shall be presented. Some experiments are included on experimental manipulation of plant growth.

1. Morphology and adaptations of flowering plant.
2. Growth pattern
3. Internal morphology of the monocot and dicot root and shoot (using camera lucida).
4. Investigation of secondary growth and wood anatomy.
5. Anomalous secondary growth in selected plants.
6. Study on leaf: Anatomy, Trichomes, Phyllotaxy and Stomatal apparatus.
7. Plant organs of special purpose – Floral, extra floral nectaries, laticifers.
8. Observation on primary, secondary meristems and nodal anatomy.
9. Maceration techniques and study of plant tissues.
10. Types and variations in inflorescences and flowers, floral modification.
11. Organization of anther and pollen(pollen wall patterns, pollen germination)
12. Study on ovary, ovules and their modification.
13. Isolation of plant embryos and embryonal tissues.
14. Group projects:
    1. Vegetative propagation techniques: Budding, Layering, Cuttage and graftage.
    2. Microtomy and permanent slide preparations.

Submission:

A minimum of 10 double stained permanent sections
Record and observation note book.
Wax blocks and slides mounted with wax ribbons.
Group report on a ontogenetic change in selected plant.

REFERENCES

1. Esau, K. 1977. Anatomy of seed plants. Wiley Eastern, Publ. ISBN 0 4712 4520 8.
2. Esau, K. 2002. Plant anatomy, John Wiley and Sons. ISBN 9 8141 2649 7.
3. Fahn, A. 1989. Plant Anatomy. Mac Millan Pub. New York. ISBN 008 028030 7
4. Johri. B.M. 1982. Experimental Embryology of Vascular Plants – Springer – Verlag, Nerlin. ISBN 3 5401 0334 1.
5. Maheshwari, P. 1985. An introduction to the embryology of angiosperms, Tata McGraw Hill, ISBN 0 0709 9434 X.
6. Raghavan V., 1986 Embryogenesis in angiosperms, Cambridge University Press. ISBN 0 5212 6771 4

ENVIRONMENT AND BIORESOURCE MANAGEMENT

PGB 5547 **6Hr/ 5 Cr**

Preamble: The course presents an overview on the components of environment. Students will learn about the fragility and delicate balance between the interactive variables of habitat. Various causes of pollution and will have an opportunity to get sensitized about local and global environmental issues. The course reveals various resources available in the environment and suggest management strategies and conservation techniques to prevent loss of environment.

Unit 1. Living Earth:

Elements of Nature – Biotic, abiotic and climatic factors –seasonal variations- lithosphere – atmosphere –hydrosphere – biosphere –land forms – forest - ecosystem (Structure, component and Types) –food chain &food web –ecological pyramid –energy flow – Succession – biogeochemical cycle – living organism interactions.

Unit 2. Disasters affecting Environment:

Natural disasters: earthquake – volcanic eruption – floods –cyclones – tsunami – forest fire.
Man made disasters: pollution of air (green house effect, ozone depletion, acid rain, photochemical smog) land (solid waste, chemical waste, nuclear waste) water (pacific gyre, oil spillage, thermal) - episodes (Bhopal gas tragedy, Fukushima nuclear plant disaster, Gulf war oil spill)

Unit 3. Natural resources:

Renewable resources: Land (nutrient rich soil, mineral, constructing materials, precious stones,) water (hydro power, tidel power, salt, minerals) air (wind energy, oxygen source, breeze). Non renewable resources: Fossil fuel (Natural gas – Coal- Crude oil).
Bioresources: Plants (Food, fodder, fuel, timber, Paper,fibre, NTFPs, seaweed)Animals(meat, dairy products, wool, biogas, seafood, corals) Microorganisms (antibiotics, enzymes, detritus, Nitrogen fixer)

Unit 4 .Natural resource management:

Land use planning – Land reclamation – Water management – biodiversity conservation – sustainability of (agriculture – mining – fisheries –forestry) – reintroduction of species – mimic environment afforestation and reforestation – Integrated crop management –wildlife management –ecosystem services – ecobalance –ecotourism.

Unit 5: Conservation of Bioresources:

In-situ conservation: National parks - wildlife sanctuaries – biosphere reserves – protected forests – ecosensitive zones – Unesco heritage sites – Man and Biosphere reserve – tiger reserve – conservation reserves – community reserves –Sacred groves.
Ex-situ conservation: Botanical gardens- germplasm centres – hot spots –agro forestry –seed gene bank –cryopreservation – Tissue culture bank – Long term captive breeding – zoological garden.
Environment conservation organizations- ecological movements – Government policies – Ecosensitization.

REFERENCE BOOKS

1. Kormondy,E.J. 2004. Concepts of Ecology , 4th Edi., Prentice –Hall of India Pvt. Ltd., New Delhi. ISBN- 81-203-1148-5

2. Odum, E P. 1970. Basic Ecology . Holts –Saunder Edition, CBS college Publizing, Japan . ISBN- 4-8337-0080-8

3. Sharma, P. D., 2015. Ecology and environment. Rastogi publications, New Delhi. ISBN: 978-93-5078-068-8.

4. Rana, S.V.S., 2012. Environmental studies. Rastogi publications, New Delhi. ISBN: 81-7133-728-7.

5. Sharma, P. D., 2013. Environmental biology and toxicology. Rastogi publications, New Delhi. ISBN: 978-81-7133-964-8.

6.Sharma, P. D., 2013. Ecology and utilization of plants. Rastogi publications, New Delhi. ISBN: 81-7133-861-5.

7.Bawa, K.S., Primack, R.B. and Oommen, M.A., 2012. Conservation biology. Universities press, New Delhi. ISBN: 9788173717246

TEXT BOOKS

1. Kumar H,D.,(1992), Modern concepts of Ecology, Vikas Pub. House Pvt. Ltd., New Delhi.
2. Sharma, P. D. 2017. Ecology and Environment. Rastogi Publications *ISBN*: 9789350781227.
3. Subramanyam, N.S., Sambamurty, A.V.S.S. 2000. Ecology , Narosa Pub. ISBN-817319289-8.
4. Tansley (2003) , An introduction to Plant Ecology, Discovery Pub. House , New Delhi. ISBN -81-7141-203-3
5. Verma, V. (2011) Plant Ecology, Ane Books Pvt. Ltd., New Delhi. ISBN- 978-93-8061-800-5

ANALYTICAL AND RESEARCH METHODOLOGY

PGB5349 **4Hr /3Cr**

PREAMBLE

In these days commoditization, marketization and globalization, education at tertiary level calls for personalized professional and skill development that can come only with a special emphasis on original research. This course has ingredients that would prepare the senior graduating students to get into the habit asking specific questions of exploration that would help in self-learning. The course content has emphasis on two components namely (1) ways and means to equip themselves with research methodology, and (2) to give a concise and comprehensive exposure for bioinstrumentation.

OBJECTIVE

- To make students realize importance of research in knowledge acquisition
- To train students to adapt to research methodology followed in the contemporary research
- To equip students to scientifically collect, analyze and interpret data that they generate through their personal enquires.
- To give an exposure to students on the types of field research different methods of data analysis
- To provide an overview on modern instrumentation that they would help students gain confidence to instantly commence research career and/or start entrepreneurial ventures.

UNIT I: **Analytical and Separation techniques** : Concept and working principle of pH meter– principle and protocols of centrifugation (differential, density gradient and ultra); Chromatography (TLC, Column, GLC, HPLC) -Electrophoresis (PAGE, AGE).

UNIT II: Biophysical Methods: Spectroscopy (Visible/UV, IR, AAS) - Molecular structure analysis (mass spectrometry, X-ray diffraction, NMR) FTIR, MALDI-ToF, - detection using isotopes (measurement, radiolabelling, autoradiography).

UNIT III: Materials and methods in Field study : Qualitative and quantitative parameters: plant study – (Density, frequency, abundance, basal area, canopy cover, standing biomass,Quadrat, transect, point frame)- Meteorological studies (Rain gauge, anemometer, windpane, psychrometer barometer, altimeter, thermometer, Stoke's sunshine recorder)- Aquatic studies(Secchi's disc, turbidometer)- field photography(DLR, Aerial)and remote sensing(GPS,GIS, toposheet)-Phytosociological studies

UNIT IV: Data Handling: Proposal of research- Hypothesis validation- Sampling (nature, design, size). Data sources (primary and secondary, electronic, library, database)- techniques in data collection (observation- interview- questionnaire- feed back- opinion poll) - quantification- classification- tabulation- diagrams(pictogram- cartogram- graphs- charts)- measures of central tendency (Mean, mode and Standard Deviation) - Percentages and Ratios – *f-test* & *t-tests* ANOVA)-Data interpretation.

UNIT V: Research design and Validation : Types of research publication (article, dissertation, research paper, peer- reviewed publication) - standards in publications- impact factor (SCOPUS and h-index)– plagiarism- thesis guidelines (Title of the paper, declaration, certificates, acknowledgement, contents, abbreviations, measurements, introduction, review of literature, rationale, plan of work, methodology, results, discussion, conclusion , summary, bibliography and appendices)– Presentation (oral and poster).

TEXT BOOKS

1. Datta, A. K. 2006. Basic Biostatistics & Its Applications. New Central Book Agency. ISBN 8173815038
2. Habib, M. M., Pathik, B. B., & Maryam, H. 2014. Research methodology-contemporary practices: guidelines for academic researchers. Cambridge Scholars Publishing. ISBN 1443864617
3. Jeyaraman. J. 1998. Laboratory Manual in Biochemistry, New Age International Publishers Ltd, ISBN 0852264283.
4. Kothari, C. R. 2004. Research methodology: Methods and techniques. New Age International. ISBN 8122436234.
5. Mahajan, B. K. 2002. Methods in biostatistics. Jaypee Brothers Publishers. ISBN: 9351529096
6. Nautiyal, S., Bhaskar, K., & Khan, Y. D. (2016). Biodiversity of Semiarid Landscape. Springer International Publishing. ISBN 331915463X
7. Palanivelu, P. 2009. Analytical biochemistry and separation techniques –A laboratory manual for B.Sc and M.Sc students, 21st Century Publications. Madurai.

PGB 5742 **BIOTECHNOLOGY** **8 Hr / 7 Cr**

PREAMBLE: Students will apply the knowledge gained from molecular biology and microbiology in commercial explorations. They will learn the techniques for plant transformation and its confirmation. The students will appreciate the art of tissue culture not only in micropropagation but also in genetic transformation of plants.

OBJECTIVES:

1. To make the students understand and appreciate the fundamental principles that sustains biotechnology as interdisciplinary field of research
2. To provide details about three major domains of application namely fermentation biology, rDNA technology and plant tissue culture and find their specific applications.

UNIT I: Gene manipulation : Scope - cloning strategies – restriction endonucleases – modifying enzymes (ligases, phosphatases, kinases) – gene cloning vectors – DNA library – plasmid vectors – phage vectors – expression vectors – binary vectors – shuttle vectors – poly nucleotide probe – cDNA cloning – Ti plasmids – transformation (*Agrobacterium* mediated and biolistics method) – marker and reporter genes.

UNIT II: Molecular tools and techniques: Promoters – open reading frames – linkers and adaptors – fusion protein – DNA amplification (principle and applications) – RtPCR –blotting techniques (Southern, Northern and Western blotting) – nonradioactive probe – DNA diagnostics (RFLP, AFLP, RAPD, SNP) – gene chip – DNA sequencing – restriction mapping - online resources (NCBI and EBI) – softwares (Bioedit, ClustalW, NJplot).

UNIT III: Plant Tissue Culture: Founding Principles – rationale for *in vitro* culture – techniques of asepsis –patterns of regeneration– bud and meristem culture – genetic stability and variability (spontaneous variations and somaclones) – *in vitro* mutagenesis (physical and chemical) – suspension culture – cell line selection – triploids, haploids – advantages of polyploidy – as an adjunct to plant breeding (embryo rescue and embryo culture) – limitations.

UNIT IV: Genetic improvement of crops : Importance of germplasm - crop improvement- nuances of cryoprotection – hybrid seeds – Seed certification – plant quarantine and international exchange of germplasm – gene transfer methods (direct DNA delivery, microinjection, biolisitic bombardment – electroporation) – Synthetic seeds – Case study on *glyphosate* and *Cry genes* – terminator Seed technology – gene pyramid and bioprospecting – lab to land transfer protocols – IPR – patenting – bioethics – ELSI.

UNIT 5 : Fermentation technology: Historical developments – fermentor (construction, components, types, basic functions) – media formulation – sterilization and culture methods (batch, continuous and fed–batch systems) – industrial microbes (isolation and strain improvement) – inoculum development – fermentation kinetics – fermentation scale–up , upstream and downstream

processing – fermented products (milk products, alcoholic beverages, organic acids and amino acids) – single cell proteins (bacteria, algae and fungi).

TEXT BOOKS

1. Glick, B.R. & J.J. Pasternak. 2009. Molecular biotechnology, Panima Pub. Co. ISBN: 08 4933 4454.
2. Bhojwani, S.S. & Razdan, M.K. 2004. Plant Tissue Culture, Read Elsevier India Pvt. Ltd. ISBN 81 8147 3256.
3. Islam, A.S. 1996. Plant tissue culture. Oxford & IBH Publ. ISBN 1 8861 0664 9.
4. Narayanaswamy, S. 1999. Plant cell and tissue culture. 8th edn.Tata McGraw Hill Publ. ISBN 0 0746 0277 2.
5. Prescott and Dunn's Industrial Microbiology., 2004 CBS Publ., ISBN: 81 2391 0010

REFERENCES

1. Casida Jr., L.E. 2001. Industrial Microbiology, New Age International Pub. ISBN 0-8822-6201-2
2. Chawla, H.S. 2009. Introduction to Biotechnology, 2nd edn. Oxford IBH, ISBN:978-81-204-1732-8
3. Glick, B.R. and J. J. Pasternak. 2009. Molecular biotechnology, Panima Pub. Co. ISBN: 08 4933 4454.
4. Hammond, J.C. McGarvey and V. Yusibov, 2009. Plant Biotechnology, Springer Verlag. ISBN: 81 8128 0886.
5. Dix, P. J. 1990. Plant cell line and selection. VCH Publ. ISBN 0 8957 3920 8.
6. Yeoman, J. R. M. M. 1982. Cell and tissue culture. Narosa Publ. ISBN 3 5401 1316 9.
7. Sathyanarayana, B. N. and Vergheese, D. B. 2007, Plant tissue culture- Practices and new experimental protocols, ILK Publ. ISBN 8 1898 8661 7.
8. Madigan, M.T., J. M. Martinko, J. Parker. 2003. Brook Biology of Microorganisms Prentice Hall. ISBN: 01 3123 2460 1.

BIOTECHNOLOGY AND TISSUE CULTURE (LAB)

PGB 5444 **6 Hrs / 4 Cr**

PREAMBLE: The objective of this lab course is to make the students understand the various techniques of genetic engineering, tissue culture and industrial microbiology. It deals with the procedures of extracting and estimating the nuclear material. Students will learn the techniques needed for cloning. Students will know the ways and means to use the *in vitro* procedures for crop improvement and plant propagation. The training in organ, callus, embryo, cell suspension and plant protoplast culture will help students to apply tissue culture in biotechnology. The stake holders will have the knowledge to make industrial products such as wine, alcohol, citric acid and single cell protein under lab conditions. They will have the expertise for mass production of cyanobacteria under improvised conditions. They will visit leading laboratories and institutes to get exposed to various developments that take place in biotechnology.

GENETIC ENGINEERING

1. Isolation of genomic DNA from plant tissue.
2. Estimation of Nucleic acid
3. Preparation of genomic DNA from Bacteria.
4. Identification of DNA by Agarose Gel Electrophoresis.
5. Restriction digestion
6. Polymerase Chain Reaction (PCR).

INDUSTRIAL MICROBIOLOGY

1. Production of citric acid using *Aspergillus niger* – Solid state fermentation and submerged fermentation.
2. Mass production of cyanobacteria – improvised method.
3. Fermentation and wine production.
4. Screening of microbes for antimicrobial products – Crowded plate method.
5. Immbolization of algal cells using calcium alginate.
6. Types of Fermentations- SSF and SMF

PLANT TISSUE CULTURE

1. Aseptic procedures.
2. Preparation of MS and B5 medium.
3. Callus culture techniques: model system – Carrot and Bean.
4. Maintenance of callus-subcultures and induction of regeneration responses.
5. Organ culture: Procedure for the *in-vitro* culture shoots bud and nodal buds.
6. Embryo rescue techniques and embryo cultures.
7. Culture of pollen, anther and ovary.
8. Delineating a protocol for organogenesis / embryogenesis.
9. Installation of cell suspension culture
10. Cell immobilization, Protoplast isolation and the production of new cell lines.
11. Feasibility of raising haploid and genetic variants.
12. Whole plant recovery, hardening and field plant.

REFERENCES

1. Bhojwani, S.S. & Razdan, M.K. 2004. Plant Tissue Culture, Read Elsevier India Pvt. Ltd. ISBN 0 4448 1623 3.
2. Gamborg, O. L. & Phillips, G.C. 1995. Plant cell, Tissue and organ culture. Narosa Publ. ISBN 81 7319 101 8
3. Jeyaraman, J. 1988. Laboratory manual in biochemistry. Wiley Eastern Ltd.. ISBN 0 8522 6428 3
4. Narayanaswamy, S. 1999. Plant cell and tissue culture. Tata McGraw Hill Publ. ISBN 0 0746 0277 2.
5. Palanivelu, P. 2001. Analytical Biochemistry and Separation Techniques – A laboratory manual for B.Sc. and M.Sc. Students Kalaimani Printers, Madurai.
6. Sambrook J and Russel DW, 2001. Molecular Cloning- A laboratory Manual., Cold Spring Harbour Publ. ISBN 0 8796 9577 3.
7. Sathyanarayana BN and Vargheese DB 2007, Plant tissue culture- Practices and new experimental protocols, ILK Publ. ISBN 8 1898 8661 7
8. Theil T. Bissen S. and Lysons E.M. 2002. Biotechnology DNA to protein. A laboratory project in molecular biology, Tata McGraw Hill publishing company, Publ. ISBN 0 0711 2279 6.

NANOBIOLOGY

PGB 5346 **4 Hr / 3 Cr**

PREAMBLE: This course is designed for the students to identify the nanoparticles and their usage. Students will know the awe of the diverse application of DNA, protein and lipid in the fabrication of nanowires and nanomachines.

OBJECTIVES:

1. To introduces the learners to the basic concepts and applications of nanotechnology.
2. To cover the most recent molecular diagnostic and therapeutic tools used for various diseases.

UNIT I: Basic concepts : Social background, definition – bio-nanotechnology and nanobiotechnology- timeline of nanotechnology - types, magnitude of particles, shape and phase of molecules – Moore's law - top down and bottom up approaches, delivery systems – liposome, Blood Brain Barrier.

UNIT II: Diversity in nanosystems – Carbon based nanaostructures - fullerences, nanotubes, nanoshells, buckyballs – biomolecules and nanoparticles, nanosensors, nanomaterials - Classification based on dimensionality- quantum dots, wells and wires – metal based nano materials (gold, silver and oxides) - Nanocomposites- Nanopolymers – Nanoglasses –Nano ceramics.

UNIT III: Fabrication of Nanostructures: Photolithography and its limitation-Electron beam lithography (EBL)- Nanoimprint – Soft lithography patterning, optical lithography – characterization – Bionanostructures and their properties - DNA nanowires Peptide nanowires and nanotubes - Protein nanoparticles - Bioinspired nanomaterials – DNA as a nano structure – silk protein - biomineralisation (diatoms) - lotus effect – nanomotors (ATPase, flagella).

UNIT IV : Nanobiotechnology : Nanodevices and nanomachines based on biological nanostructures - Protein and DNA nanoarrays, tissue engineering - medical applications - nanotechnology for reducing energy consumption and pollution.

UNIT V: Biophysical Applications: Solar energy conversion and catalysis, biosensors – Nanomedicine - Nanoparticles in bone substitutes and dentistry. Nanotoxicology - challenges. Nanotechnology in agriculture (fertilizer, pesticides and food), cosmetics (gels, sun-screen, shampoos and hair conditioners) – dispersions for UV protection using titanium oxide – color cosmetics - commercial exploration. Biosafety and bioethics.

TEXTBOOKS

1. Niemeyer, C. M. and Mirkin, C. A. 2004. Nanobiotechnology: Concepts, Applications, and Perspectives, Wiley-VCH, Weinheim, Germany.
2. Ratner, M. A. and Ratner, D. 2003. Nanotechnology: A gentle introduction to the next big idea, Prentice Hall Professional, New York.
3. Pradeep, T. 2012. A Textbook of Nanoscience and Nanotechnology, Tata McGraw Hill Education Pvt. Ltd.
4. Nalwa, H. S. 2002. Nanostructured Materials and Nanotechnology, Academic Press.

REFERENCES

1. Nicolini, C. 2008. Nanobiotechnology and Nanobiosciences, Pan Stanford Publishing, Singapore.
2. Boisseau, P. and Lahmani, M. 2009. Nanoscience: Nanobiotechnology and Nanobiology, Springer, UK.
3. Nabok A. 2005. Organic and Inorganic Nanostructures, Artech House.
4. Dupas C., Houdy P., Lahmani M. 2007. Nanoscience: Nanotechnologies and Nanophysics, Springer-Verlag Berlin Heidelberg.

PGB5348 **Systems Biology** **4Hrs. / 3Cr.**

PREAMBLE:

Systems biology had emerged as a field of biology in the post-genomic era due to availability of omics data. This fundamental course in system biology will introduce the concepts pertaining to the systems biology. System approach helps to understand the structure, dynamics and functional attributes from molecules, cell, tissue and organism level. The course will provide insights into holistic approach in the biological system, contrary to the reductionist approach which dominates now. High throughput techniques employed in the biological research, data collection and processing will be dealt. Expose students to system level thinking and understanding the functions at different hierarchy by integrating different databases and working with existing models. This will help the students to work parallel with the experimental, computational and theoretical research in different aspects of biology.

Unit I. Trends in biological research:

Cell – a basic unit of life – molecules involved in cellular processes - cell to organism level process in biological system – paradigm in biological research – reductionism and holistic approach– Systems biology theories and time line – challenges and future perspectives.

Unit II. Facets of Systems approach:

Hierarchies in biological system: gene, molecular, cellular and organ levels and interactions. High throughput experimental techniques - post-genomic era - omics technologies – whole genome

sequences - big data - interactome. Properties of biological system – system dynamics and control - experimental and computational biology - emergent properties.

Unit III. Network biology and their applications:

Cell as an integrated device – molecular interactions – network analytic methods – Gene, transcription and regulatory network – Biochemical reactions and metabolic pathway systems – disease pathway analysis - Signal transduction network.

Unit IV. System biology models and approaches:

Genome to life – data integration and modeling process – hypothesis testing - flux balance analysis and applications. Cell cycle models – Microbial models (Bacterial chemotaxis and Yeast) – Plant based models (plant development and plant defense system) - Ecological models (energy flow and population dynamics).

Unit V: Databases and Software for Systems Biology

Omics databases in plants - Software packages – Cytoscape, Celldesigner,Virtual cell. MetaCyc, BioCyc, KEGG pathway, Pathguide. Features of System Biology Markup Language and PYTHON.

REFERENCES

Text books

Choi,S.2007. Introduction to Systems Biology. Humana Press Inc., New Jersey. ISBN 978159745531

Klipp E, Liebermeister W, Wierling C and Kowald A. 2016.Systems Biology - A Textbook (2nd Edn.). Wiley-VCH, Germany. ISBN 9783527336364

Voit E O. 2013. A first course in Systems Biology. Garland Science, New York and London. ISBN 9780815344674

Reference books

Alon U. 2006. An Introduction To Systems Biology: Design Principles of Biological Circuits. Chapman and Hall /CRC, London,UK. ISBN 1584886420

Baginsky S and FernieA R. 2007. Plant Systems Biology. BirkhäuserVerlag, Berlin ISBN 13: 978-3-7643-7261-3

Coruzzi G M and Gutierrez R A. 2009. Plant Systems Biology. Annual Plant Reviews. Vol.35. Wiley-Blackwell Publishing Ltd. UK. ISSN 14601494

Kitano H. 2001. Foundations of System Biology. MIT Press, Cambridge.ISBN 0262112663

Voit E O. 2016. The Inner Workings of Life. Vignettes in Systems Biology.Cambridge University Press. 9781316604427

PROJECT

PGB 5750 **8H/7Cr**

PREAMBLE: Project is a component of the active learning module that teaches approach and research techniques. Students would have hands on experience in investigating a selected research problem where he/she shall be trained in framing and testing hypothesis through suitable research design.

BROAD RESEARCH AREAS

- Plant diversity and Systematics
- Plant physiology and Biochemistry
- Plant Molecular Biology and Biotechnology
- Microbiology and Plant pathology
- Environmental Biology
- Computational Biology
- Nanobiotechnology

Allocation

- Student may select their broad research area during the end of the second semester and will be guided by a suitable research supervisor in the area allotted by the HOD.
- Each research supervisor may be allotted a single student or a group (2-3 students).
- Summer vacation may be used by the students to initiate their project work.
- Staff workload will be equally shared among the guides.

Objective of the study

- Topic investigated will have defined area of study.
- Project students would have hands on experience in all the instruments and techniques to conduct his/her original research.
- Minimum of 5-10 yrs of literature will be added in the review with recent year of publication.
- Standard of the project work should be high enough to be presented in conferences or to communicate as a paper and be subjected to a peer review.

Evaluation

- Term paper (summer and third semester) and Oral presentation (work plan in outline) in the beginning of the fourth semester. Guide and HOD will evaluate.
- At the middle of fourth semester (after the first test), Interim reports shall be submitted by the students. This interim report should form the basis for the final project report and which will be evaluated by UG HOD, PG HOD and guide.
- Even at instances where research is carried out as a group, individual students will be evaluated.
- Evaluation will be based on prescribed format approved by the faculty. The format may be revisited and updated as and when needed.
- Attendance of the student for presentation and viva-voce is a must.

Final Evaluation

A department level open viva-voce will be conducted. PG &UG Head, Guide and senior most faculty functioning as project coordinator will form a panel to evaluate the dissertation work.

PG HOD will chair all the evaluation components connected to the project work.

Dissertation format

- Introduction
- Review of literature
- Materials and methods
- Result
- Discussion
- Summary
- Bibliography

PG Department of Botany (2018 -2020 batch)

S.No	COURSE TITLE	HOURS	CREDIT
	SEMESTER I		
PGB4521	Plant Diversity	7	5
PGB4523	Principles of Microbiology	7	5
PGB4425	Plant Diversity and Microbiology LAB	6(L)	4
PGB4227	Cell Biology and Genetics	3	2
PGB4229	Environmental biology	3	2
PGB4331	CBCS(**Campus Ecology/ Pl. based enterprises)**	4	3
	Total	**30**	**21**
	SEMESTER II		
PGB4522	Plant Systematics	7	5
PGB4524	Biomolecules	7	5
PGB4426	Plant Syst. & Biomolecules. LAB	6(L)	4
PGB4428	Mycology and Pathology	6	4
PGB4330	CBCS(**Trends in Agriculture/ Plants and people)**	4	3
	Total	**30**	**21**
	SEMESTER III		
PGB5621	Physiological Biochemistry	7	6
PGB5623	Morphogenesis	7	6
PGB5425	Physi. Bio. and Morpho. LAB	6(L)	4
PGB5527	Molecular Biology	6	5
PGB5329	Biol.Tech and Res.Method	4	3
	Total	**30**	**24**
	SEMESTER IV		
PGB5722	Biotechnology	8	7
PGB5424	Gen. Eng. P TC and Ind. Mic. LAB	6(L)	4
PGB5326	Nanobiology	4	3
PGB5328	Systems Biology	4	3
PGB5730	Projects	8	7
	Total	**30**	**24**

CBCS **CREDITS (21+21+24+24=90)**

Campus Ecology	SEM (I)
Plant based enterprises	SEM (I)
Trends in Agriculture	SEM (II)
Plants and people	SEM (II)

PHYSIOLOGICAL BIOCHEMISTRY

PGB 5621 **7 hrs/ 6cr**

PREAMBLE: Students would be able to understand water as an elixir for plant life. They will scientifically explore the plumbing and pipe line system along with the ventilating system for gas exchange. The molecular mechanism of synthesis of food and its usage to derive energy are explored. The physiology of deriving nourishment from soil and its conversion to usable form too are unravelled. Plant's management of physical, chemical and edaphic factors are studied.

UNIT I: Plant, water and ionic relations: Soil and atmospheric water-Physiological role of water – water potential – uptake and transport mechanisms – stomatal mechanics – gas transfer equation – physics of small pore diffusion – malate metabolism in guard cells – potassium ions – organization of conducting tissues, Source sink relations- phloem loading and unloading-theories of translocation.

UNIT II: Carbon metabolism: Fine structure of photosynthetic machinery-light harvesting protein complex– Einstein's law of photochemical equivalent – light absorption and photosynthetic electron transfer – Emerson's enhancement effect and synergetic functions of LHCP 1 and LHCP 2– cyclic, non–cyclic, pseudo cyclic photophosphorylation – significance of OEC and D2 proteins – C-3 cycle — C-4 and CAM metabolism – factors affecting photosynthesis- photorespiration (C-2 cycle).

UNIT III: Mineral nutrition and nitrogen metabolism: Macro micro nutrients of plants deficiency and toxicity symptoms – integration of nitrogen, phosphorus, Sulphur- nitrogen assimilation - GS - GOGAT path way, Hup genes nitratereductase,–leghaemoglobin, carbon economy –biological role of carotenoids and flavonoids - *nod*- hsn, gsn genes – ammonia assimilation-uride synthesis – ammonia assimilation.

UNIT IV: Mitochondria and Bioenergetics: Thermodynamic rules of energy transduction-respiratory substrates- Carbon break down pathways-Respiratory Quotient -Electron transport and respiratory chain. Energy budget – chemi-osmotic proton circuit, ATPase complex, mechanism of ATP synthesis–cyanide resistant respiration.

UNIT V: Stress physiology: Concepts – radiation, temperature, salt, osmotic, drought, flooding, UV, oxygen deficit and oxidative stress – stress proteins – mineral and metal toxicity – stress management.

TEXT BOOKS

1. Francis.H.Witham,Robert M.Devlin 1986 Plant physiology 4 edition W.Grant press ISBN-13 978-0871507655
2. William G.Hopkins ,Norman Introduction to Plant Physiology John Wiley& Sons ISBN-13 978-0470247662
3. Irwin P.Ting Plant Physiology Addison Wesley longman Publishing Company 1982 ISBN 0 19850180 3
4. Raman, K. 1996.Transport phenomenon in plants. Narosa Publications.ISBN 978 81 319 128 2.

5. Frank B.Salisbury,CleonW. Ross and Plant physiology edition 4 wadsworth publishing company. ISBN 0534983901
6. Voet, D., J. G. Voet and Pratt, C. W. 2008. Principles of Biochemistry. John Willey and Sons, Publ. ISBN 13-978-0470-23396-2
7. Malcolm B.Wilkins, M.B. Advanced Plant Physiology. Pitman press. ISBN 0-273-01853-1

REFERENCE BOOKS

1. Alberts B., Johnson A., Lewis, J. Raff, M, Roberts, K. and Walter, P. 2002. Molecular Biology of the Cell, 4thEd. Garland Science Publ. ISBN 0-8153-4072-9.
2. Baker, R. D. J., Cartledge, T. G, Dewhurst, F. and Jenkins, R. O., 1992, Principles of Cell Energetics, Butterwoth-Heinemann Publ. ISBN 0-7506-15044
3. Berg, J. M., J. L. Tymocozko and Stryer L. 2007. Biochemistry, 6th e ed, W.H. Freeman and Company, ISBN 0- 7167-8724-4
4. Licoln Taiz,Eduardo Zeigner, Plant Physiology 5 thEd.Sinauer Inc ISBN-13 978-0878938667.
5. Gurr, M. I., Harwood, J. L. and Frayn, K. N., 2002 Lipid Biochemistry. Freeman Publ. ISBN 1-4039-4876-3
6. Lehninger, A. L., D. L. Nelson and M. M. Cox. 2008. Principles of Biochemistry. 5th Ed. CBS Publishers and Distributors. ISBN 1 4292 1241 1
7. Matthews, C. K., Van Holde, K. E. and Ahern, K. G., 2005, Biochemistry, Pearson Pub. ISBN 81-297-0215-0
8. Voet, D., J. G. Voet and Pratt, C. W. 2008. Principles of Biochemistry. John Willey and Sons, Publ. ISBN 13-978-0470-23396-2
9. Willard, H. H., L. L. Merritt, J. D. Dean, F. A. Settle. 1986. Instrumental methods of analysis. CBS Publ. ISBN 0 5340 8142 8

MORPHOGENESIS

PGB 5623 **7 Hr / 5 Cr**

PREAMBLE: This course is to inculcate in students the appreciation of architectural marvel of plants and to explore the various developmental stages involved in it. The types of building blocks and the engineering mechanisms involved in tissue assembly and organ development would be unraveled. The innate message and its communication at the cellular level is explored. The vegetative growth and the reproductive ability of the immobile entity as plants would be studied at the experimental level.

OBJECTIVE:

1. To introduce developmental biology as functional and happening science
2. To unravel the intricacies of structural change as influenced by molecular and biochemical alterations
3. To provide a knowledge based training to the students to pursue plant involved vocations

UNIT I Organization of land plants: Exomorphic design – internal morphology and histological diversity – unique and general attributes of plant growth – plant structure viewed in terms of functions – cell as a building block – developmental potential of zygote, shoot and root meristem – embryogenic, somatic and reproductive phases of plant development.

Unit II Developmental anatomy: Uniqueness of meristematic cell – Shoot Apical Meristem (SAM)– theories and contemporary views– parenchyma as a filler and feeder – wall thickening and cytological variations in collenchyma and sclerenchyma – axial and appendicular structures – shoots – leaf differentiation and leaf expansion – plastochron – phyllotaxy – mechanism of axial and radial growth – polarity – histogenesis – lateral meristem (vascular and cork cambium) – xylem – phloem – secondary growth and anomaly – environmental control – special structures (velamen, hydathodes and laticifers).

Unit –III Growth and Development: Mechanics of cell cycle and cell division – Growth curve and relative growth rate (RGR) – growth pattern – Plant Growth Regulators: bioassay and biosynthesis – mode of action of classical hormones, Brasinosteriods, Jasmonic Acid – Phytochromes and Photoperiodism – Biological Clock – Plant Movements – Biochemical and Hormonal Integration – Signal Transduction – Genetic Control – Growth Measurement – Aging – Senescence, Abscission – Dormancy – Programmed Cell Death (PCD).

Unit IV Reproductive Biology: Organization of floral meristem – protective and generative organs of a flower – floral evocation – Control of florogenesis: ABC model – microsporogenesis and pollen development – megasporogenesis and female gametophytes – genic and cytoplasmic male sterility – Floral and extrafloral nectories – Protection and pollination behavior – pollen – pistil interactions and sexual incompatibility – syngamy, post-fertilization changes (embryo, seed, fruit development).

Unit V Experimental morphogenesis: Plant growing structures – controlled and precision farming. Nursery practices – propagation through cutting, layering, grafting – Seed science –

traditional and hybrid seed production – grain filling – parthenocarpy and applications (seedless, shelf - life) – commercial dimensions of flower, seed, fruit and grain production – Case studies on rubber, tea 'banji' removal and Jasmine production.

TEXT BOOKS

1. Burgess, J. 1985. An Introduction to plant cell development. Cambridge University Press. ISBN 0 5213 0273 0.
2. Esau, K. 1977. Anatomy of seed plants. Wiley Eastern, Publ. ISBN 0 4712 4520 8.
3. Esau, K. 2002. Plant anatomy, John Wiley and Sons. ISBN 9 8141 2649 7.
4. Fahn A 1989. Plant anatomy. Pergamone Press, ISBN 0-02-946201-0
5. Johri. B. M. 1982. Experimental Embryology of Vascular Plants – Springer – Verlag, ISBN 3 5401 0334 1

REFERENCE BOOKS

1. Lyndon, R. F. 1990 Plant development: The cellular basis Unwin Hyman Publ. ISBN 00458 1032 X.
2. Maheshwari, P. 1985. An introduction to the embryology of angiosperms, Tata McGraw Hill,.ISBN 0 0709 9434 X.
3. Raghavan, V. 1986. Embryogenesis in Angiosperms, Cambridge University Press, ISBN 0 5212 6771 4
4. Raghavan, V. 1997. Molecular Basis for Plant Development, Cambridge University Press. ISBN 0 5215 5246 X.
5. Wardlaw, C. W. 1952. Plant Morphogenesis. Mac Millan & Co Ltd. London.

PHYSIOLOGICAL BIOCHEMISTRY AND MORPHOGENESIS (LAB)

PGB 5425 **6Hr / 4Cr**

PREAMBLE: This practical component is to inculcate in students a questioning mind and to find an answer for the various processes that happen and defense mechanism for pathogens that plants have. The principles of the instruments that help in analyzing these processes and mechanisms too are demonstrated. The morphogenesis component throws light on the exomorphic variations, anatomy of root, stem and leaf and lends insights on the pattern of primary and secondary growth. Variations that occur during the development of plant organs shall be presented through suitable examples. The technique of maceration, micrometry and the staining will be taught along with method of micro slide preparation. Due importance is also given to the embryological aspects. Histological analysis of ovular complex, different types of ovules, ovary and placentation shall be presented. Some experiments are included on experimental manipulation of plant growth.

PHYSIOLOGICAL BIOCHEMISTRY

1. Measurement of water potential
2. Osmosis
3. Measurement of phosphate ion absorption by plant tissues
4. Extraction and estimation of chlorophylls a,b, and carotenoids in C 3 and C4 plants.
5. Isolation of chloroplast and measurement of Hill reaction
6. Estimation of Photosystem II activityC3,and C4 anatomy,C 4 subtypes.
7. Permeability changes of biomembranes (using beet root discs and RBC)
8. Measurement of enzyme activity (Nitrate reductase)
9. Factors affecting enzyme activity-substrate concentration, pH and Temperature
10. Calculation of activation energy of enzymes (NR as a model)
11. Isolation of mitochondria from potato
12. Mineral nutrition – hydroponics
13. Estimation of proline
14. Estimation phenols in plant tissues under different environmental and physiological conditions.

REFERENCES

1. Cooper, T. G. 1991. The tools of biochemistry, John Wiley & Sons Publ.ISBN 047117116 6
2. Jayaraman, J. 1988. Lboraory manual in biochemistry, New Age interna tional Publishers, Ltd., New Delhi. ISBN 0852264283
3. Mannar Mannan, R. 1988. Experiments in Photosyntheses: a loboratory manual. Macmillan India Ltd., Madras.
4. Plummer, D. T. 2003. An Introduction to practical biochemistry, 3rd Ed. Tata McGraw Hill Publ. ISBN 0-07-0994870.
5. Sadasivam. S and A. Manickam. 2008. Biochemical methods for agricultural sciences, 2nd ed., New age international Pub. Ltd., 978-81-224-2140-8

MORPHOGENESIS - LAB

1. Morphology and adaptations of flowering plant.
2. Growth pattern
3. Internal morphology of the monocot and dicot root and shoot (using camera lucida).
4. Investigation of secondary growth and wood anatomy.
5. Anomalous secondary growth in selected plants.
6. Study on leaf: Anatomy, Trichomes, Phyllotaxy and Stomatal apparatus.
7. Plant organs of special purpose – Floral, extra floral nectaries, laticifers.
8. Observation on primary, secondary meristems and nodal anatomy.
9. Maceration techniques and study of plant tissues.
10. Types and variations in inflorescences and flowers, floral modification.
11. Organization of anther and pollen(pollen wall patterns, pollen germination)
12. Study on ovary, ovules and their modification.
13. Isolation of plant embryos and embryonal tissues.
14. Group projects:
    1. Vegetative propagation techniques: Budding, Layering, Cuttage and graftage.
    2. Microtomy and permanent slide preparations.

Submission:

A minimum of 10 double stained permanent sections
Record and observation note book.
Wax blocks and slides mounted with wax ribbons.
Group report on a ontogenetic change in selected plant.

REFERENCES

1. Esau, K. 1977. Anatomy of seed plants. Wiley Eastern, Publ. ISBN 0 4712 4520 8.
2. Esau, K. 2002. Plant anatomy, John Wiley and Sons. ISBN 9 8141 2649 7.
3. Fahn, A. 1989. Plant Anatomy. Mac Millan Pub. New York. ISBN 008 028030 7
4. Johri. B.M. 1982. Experimental Embryology of Vascular Plants – Springer – Verlag, Nerlin. ISBN 3 5401 0334 1.
5. Maheshwari, P. 1985. An introduction to the embryology of angiosperms, Tata McGraw Hill, ISBN 0 0709 9434 X.
6. Raghavan V., 1986 Embryogenesis in angiosperms, Cambridge University Press. ISBN 0 5212 6771 4

PGB 5527 **MOLECULAR BIOLOGY** **6 Hr / 5 Cr**

PREAMBLE: This course aims to provide knowledge on the expanse of molecular biology and genetic engineering. Students are introduced to rapid contemporary changes witnessed in plant molecular biology. Basic organization of genetic material and the realms of events associated with replication and gene expression will be examined. Topics like genome organization, transcription and translation are also given due importance.

UNIT I: Organization of genome: Nuclear DNA organization – prokaryotes and eukaryote – DNA, chromatin, chromosomes, telomere - genome – C-value paradox– transposable elements – mutation, recombination, evolution – Organelle genome – plastome and chloroplast biogenesis– plant mitochondrial DNA and cytoplasmic male sterility. *Arabidopsis* and *Oryza* as genome models.

UNIT II: Replication: Prokaryotic model – modes of replication. Eukaryotic machinery: Enzymology – mechanism of replication – melting curve –role of enzymes in replication– formation of replication fork – synthesis of daughter strands – repair mechanisms.

UNIT III: Transcription: Transcription in prokaryotes and eukaryotes - RNA synthesis – enzymology – signaling (promoters, auxillary proteins, trans activators) – initiation, elongation, termination – post–transcriptional modification (capping and tailing) – RNA splicing (tRNA, rRNA and mRNA) – RNA interference (TGS and PTGS).

UNIT IV: Translation: Translation machinery – ribosomes – composition and assembly – genetic code – redundancy and elucidation of base composition – tRNA charging – initiation, elongation and termination – post-translational modification – coupled transcription and translation.

UNIT V: Gene Expression and Gene Families: Regulation of gene expression in prokaryotes– Operon concept – *lac* operon – *trp* operon– attenuation; Gene regulation in development and differentiation – Eukaryotes– Britten-Davidson model. Gene families- Simple and complex multigene families.

TEXT BOOKS

1. Freifielder, D. 1995. Microbial Genetics. Narosa Publication. ISBN 0 8672 0248 3
2. Grierson, D. and Covey, S.N. 1984. Plant Molecular Biology. Blackie and sons ISBN 0 2169 1632 1
3. Ignacimuthu, S.J. 1997. Plant Biotechnology, Oxford & IBH Pub ISBN 81-204-0992-2

REFERENCE BOOKS

1. Alberts, B., Dennis Bay, Lewis, R. Raft, M.R. Roberts and Watson, J. F. 1994. Molecular Biology of cell. Garland P. ISBN 0 8153 4072 9.
2. Karp. G. 2008. Cell and Molecular Biology.5th edn. John Wiley & sons.ISBN 978 0470 169 61 2
3. Lewin 2007. Gene IX. Jones and Barlett Pub. ISBN. O 7637 5222 3

4. Old, R.N. and Primrose, S.B. 1989. Principle of gene manipulation – An Introduction to Genetic Engineering. Blackwell Scientific Publication, Oxford. ISBN 0-632-03712-1
5. Watson, J.D. et al. 2004 Molecular Biology of Gene 5th Edn. Pearson Edu. ISBN 0-321-22368-3.

BIOLOGICAL TECHNIQUES AND RESEARCH METHODOLOGY

PGB5329 **4Hr /3Cr**

PREAMBLE

In these days commodification, marketization and globalization, education at tertiary level calls for personalized professional and skill development that can come only with a special emphasis on original research. This course has ingredients that would prepare the senior graduating students to get into the habit asking specific questions of exploration that would help in self-learning. The course content has emphasis on two components namely (1) ways and means to equip themselves with research methodology, and (2) to give a concise and comprehensive exposure for bioinstrumentation.

OBJECTIVE

- To make students realize importance of research in knowledge acquisition
- To train students to adapt to research methodology followed in the contemporary research
- To equip students to scientifically collect, analyze and interpret data that they generate through their personal enquires.
- To give an exposure to students on the types of field research different methods of data analysis
- To provide an overview on modern instrumentation that they would help students gain confidence to instantly commence research career and/or start entrepreneurial ventures.

UNIT I: Analytical and Separation techniques : Concept and working principle of pH meter– principle and protocols of centrifugation (differential, density gradient and ultra); Chromatography (TLC, Column, GLC, HPLC) -Electrophoresis (PAGE, AGE).

UNIT II: Biophysical Methods: Spectroscopy (Visible/UV, IR, fluorescence, circular dichroism, AAS) - Molecular structure analysis (mass spectrometry, X-ray diffraction, NMR, ESR, surface plasmon resonance) FTIR, MALDI-ToF, FISH- detection using isotopes (half-life, radioactivity, measurement, radiolabelling, immunolabeling, autoradiography).

UNIT III: Materials and methods in Field study : Qualitative and quantitative parameters: plant study – (Density, frequency, abundance, basal area, canopy cover, standing biomass,Quadrat, transect, point frame)- Meteorological studies (Rain gauge, anemometer, windpane, psychrometer barometer, altimeter, thermometer, Stoke's sunshine recorder)- Aquatic studies(Secchidisc, turbidometer)- field photography(DLR, Aerial)and remote sensing(GPS,GIS, toposheet)- Phytosociological studies.

UNIT IV: Data Handling: Proposal of research- Hypothesis validation- Sampling (nature, design, size). Data sources (primary and secondary, electronic, library, database)- techniques in data collection (observation- interview- questionnaire- feed back- opinion poll) - quantification- classification- tabulation- diagrams(pictogram- cartogram- graphs- charts)- measures of central tendency (Mean, mode and Standard Deviation) - Percentages and Ratios – *f-test* & *t-tests* ANOVA)-Data interpretation.

UNIT V: Research design and Validation : Types of research publication (article, dissertation, research paper, peer- reviewed publication) - standards in publications- impact factor (SCOPUS and h-index)– plagiarism- thesis guidelines (Title of the paper, declaration, certificates, acknowledgement, contents, abbreviations, measurements,introduction, review of literature, rationale, plan of work, methodology, results, discussion, conclusion , summary, bibliography and appendices)– Presentation as oral and poster.

TEXT BOOKS

1. Datta, A. K. 2006. Basic Biostatistics & Its Applications. New Central Book Agency. ISBN 8173815038
2. Habib, M. M., Pathik, B. B., & Maryam, H. 2014. Research methodology-contemporary practices: guidelines for academic researchers. Cambridge Scholars Publishing. ISBN 1443864617
3. Jeyaraman. J. 1998. Laboratory Manual in Biochemistry, New Age International Publishers Ltd, ISBN 0852264283.
4. Kothari, C. R. 2004. Research methodology: Methods and techniques. New Age International. ISBN 8122436234.
5. Mahajan, B. K. 2002. Methods in biostatistics. Jaypee Brothers Publishers. ISBN: 9351529096
6. Nautiyal, S., Bhaskar, K., & Khan, Y. D. (2016). Biodiversity of Semiarid Landscape. Springer International Publishing. ISBN 331915463X
7. Palanivelu, P. 2009. Analytical biochemistry and separation techniques –A laboratory manual for B.Sc and M.Sc students, 21st Century Publications. Madurai.

BIOTECHNOLOGY

PGB 5722 **8 Hr / 7 Cr**

PREAMBLE: Students will apply the knowledge gained from molecular biology and microbiology in commercial explorations. They will learn the techniques for plant transformation and its confirmation. The students will appreciate the art of tissue culture not only in micropropagation but also in genetic transformation of plants.

OBJECTIVES:

1. To make the students understand and appreciate the fundamental principles that sustains biotechnology as interdisciplinary field of research
2. To provide details about three major domains of application namely fermentation biology, rDNA technology and plant tissue culture and find their specific applications.

UNIT I: Gene manipulation : Scope - cloning strategies – restriction endonucleases – modifying enzymes (ligases, phosphatases, kinases) – gene cloning vectors – DNA library – plasmid vectors – phage vectors – expression vectors – binary vectors – shuttle vectors – poly nucleotide probe – cDNA cloning – Ti plasmids – transformation (*Agrobacterium* mediated and biolistics method) – marker and reporter genes.

UNIT II: Molecular tools and techniques: Promoters – open reading frames – linkers and adaptors – fusion protein – DNA amplification (principle and applications) – RtPCR –blotting techniques (Southern, Northern and Western blotting) – nonradioactive probe – DNA diagnostics (RFLP, AFLP, RAPD, SNP) – gene chip – DNA sequencing – restriction mapping - online resources (NCBI and EBI) – softwares (Bioedit, ClustalW, NJplot).

UNIT III: Plant Tissue Culture: Founding Principles – rationale for *in vitro* culture – techniques of asepsis –patterns of regeneration– bud and meristem culture – genetic stability and variability (spontaneous variations and somaclones) – *in vitro* mutagenesis (physical and chemical) – suspension culture – cell line selection – triploids, haploids – advantages of polyploidy – as an adjunct to plant breeding (embryo rescue and embryo culture) – limitations.

UNIT IV: Genetic improvement of crops : Importance of germplasm - crop improvement-nuances of cryoprotection – hybrid seeds – Seed certification – plant quarantine and international exchange of germplasm – gene transfer methods (direct DNA delivery, microinjection, biolisitic bombardment – electroporation) – Synthetic seeds – Case study on *glyphosate* and *Cry genes* – terminator Seed technology – gene pyramid and bioprospecting – lab to land transfer protocols – IPR – patenting – bioethics – ELSI.

UNIT 5 : Fermentation technology: Historical developments – fermentor (construction, components, types, basic functions) – media formulation – sterilization methods culture methods (batch, continuous and fed–batch systems) – industrial microbes (isolation and strain improvement) – inoculum development – fermentation kinetics – fermentation scale–up ,

upstream and downstream processing – fermented products (milk products, alcoholic beverages, organic acids and amino acids) – single cell proteins (bacteria, algae and fungi).

TEXT BOOKS

1. Glick, B.R. & J.J. Pasternak. 2009. Molecular biotechnology, Panima Pub. Co. ISBN: 08 4933 4454.
2. Bhojwani, S.S. & Razdan, M.K. 2004. Plant Tissue Culture, Read Elsevier India Pvt. Ltd. ISBN 81 8147 3256.
3. Islam, A.S. 1996. Plant tissue culture. Oxford & IBH Publ. ISBN 1 8861 0664 9.
4. Narayanaswamy, S. 1999. Plant cell and tissue culture. 8th edn.Tata McGraw Hill Publ. ISBN 0 0746 0277 2.
5. Prescott and Dunn's Industrial Microbiology., 2004 CBS Publ., ISBN: 81 2391 0010

REFERENCES

1. Casida Jr., L.E. 2001. Industrial Microbiology, New Age International Pub. ISBN 0-8822-6201-2
2. Chawla, H.S. 2009. Introduction to Biotechnology, 2nd edn. Oxford IBH, ISBN:978-81-204-1732-8
3. Glick, B.R. and J. J. Pasternak. 2009. Molecular biotechnology, Panima Pub. Co. ISBN: 08 4933 4454.
4. Hammond, J.C. McGarvey and V. Yusibov, 2009. Plant Biotechnology, Springer Verlag. ISBN: 81 8128 0886.
5. Dix, P. J. 1990. Plant cell line and selection. VCH Publ. ISBN 0 8957 3920 8.
6. Yeoman, J. R. M. M. 1982. Cell and tissue culture. Narosa Publ. ISBN 3 5401 1316 9.
7. Sathyanarayana, B. N. and Vergheese, D. B. 2007, Plant tissue culture- Practices and new experimental protocols, ILK Publ. ISBN 8 1898 8661 7.
8. Madigan, M.T., J. M. Martinko, J. Parker. 2003. Brook Biology of Microorganisms Prentice Hall. ISBN: 01 3123 2460 1.

Genetic engineering, Tissue Culture and

Fermentation technology (lab)

PGB 5424 **6 Hrs / 4 Cr**

PREAMBLE: The objective of this lab course is to make the students understand the various techniques of genetic engineering, tissue culture and industrial microbiology. It deals with the procedures of extracting and estimating the nuclear material. Students will learn the techniques needed for cloning. Students will know the ways and means to use the *in vitro* procedures for crop improvement and plant propagation. The training in organ, callus, embryo, cell suspension and plant protoplast culture will help students to apply tissue culture in biotechnology. The stake holders will have the knowledge to make industrial products such as wine, alcohol, citric acid and single cell protein under lab conditions. They will have the expertise for mass production of cyanobacteria under improvised conditions. They will visit leading laboratories and institutes to get exposed to various developments that take place in biotechnology.

GENETIC ENGINEERING

1. Isolation of genomic DNA from plant tissue.
2. Estimation of Nucleic acid
3. Preparation of genomic DNA from Bacteria.
4. Identification of DNA by Agarose Gel Electrophoresis.
5. Restriction digestion
6. Polymerase Chain Reaction (PCR).

INDUSTRIAL MICROBIOLOGY

1. Production of citric acid using *Aspergillus niger* – Solid state fermentation and submerged fermentation.
2. Mass production of cyanobacteria – improvised method.
3. Fermentation and wine production.
4. Screening of microbes for antimicrobial products – Crowded plate method.
5. Immbolization of algal cells using calcium alginate.
6. Types of Fermentations- SSF and SMF

PLANT TISSUE CULTURE

1. Aseptic procedures.
2. Preparation of MS and B5 medium.
3. Callus culture techniques: model system – Carrot and Bean.
4. Maintenance of callus-subcultures and induction of regeneration responses.
5. Organ culture: Procedure for the *in-vitro* culture shoots bud and nodal buds.
6. Embryo rescue techniques and embryo cultures.

7. Culture of pollen, anther and ovary.
8. Delineating a protocol for organogenesis / embryogenesis.
9. Installation of cell suspension culture
10. Cell immobilization, Protoplast isolation and the production of new cell lines.
11. Feasibility of raising haploid and genetic variants.
12. Whole plant recovery, hardening and field plant.

REFERENCES

1. Bhojwani, S.S. & Razdan, M.K. 2004. Plant Tissue Culture, Read Elsevier India Pvt. Ltd. ISBN 0 4448 1623 3.

2. Gamborg, O. L. & Phillips, G.C. 1995. Plant cell, Tissue and organ culture. Narosa Publ. ISBN 81 7319 101 8

3. Jeyaraman, J. 1988. Laboratory manual in biochemistry. Wiley Eastern Ltd.. ISBN 0 8522 6428 3

4. Narayanaswamy, S. 1999. Plant cell and tissue culture. Tata McGraw Hill Publ. ISBN 0 0746 0277 2.

5. Palanivelu, P. 2001. Analytical Biochemistry and Separation Techniques – A laboratory manual for B.Sc. and M.Sc. Students Kalaimani Printers, Madurai.

6. Sambrook J and Russel DW, 2001. Molecular Cloning- A laboratory Manual., Cold Spring Harbour Publ. ISBN 0 8796 9577 3.

7. Sathyanarayana BN and Vargheese DB 2007, Plant tissue culture- Practices and new experimental protocols, ILK Publ. ISBN 8 1898 8661 7

8. Theil T. Bissen S. and Lysons E.M. 2002. Biotechnology DNA to protein. A laboratory project in molecular biology, Tata McGraw Hill publishing company, Publ. ISBN 0 0711 2279 6.

NANOBIOLOGY

PGB 5326 **4 Hr / 3 Cr**

PREAMBLE: This course is designed for the students to identify the nanoparticles and their usage. Students will know the awe of the diverse application of DNA, protein and lipid in the fabrication of nanowires and nanomachines.

OBJECTIVES:

1. To introduces the learners to the basic concepts and applications of nanotechnology.
2. To cover the most recent molecular diagnostic and therapeutic tools used for various diseases.

UNIT I: Basic concepts : Social background, definition – bio-nanotechnology and nanobiotechnology- timeline of nanotechnology - types, magnitude of particles, shape and phase of molecules – Moore's law - top down and bottom up approaches, delivery systems – liposome, Blood Brain Barrier.

UNIT II: Diversity in nanosystems – Carbon based nanaostructures - fullerences, nanotubes, nanoshells, buckyballs – biomolecules and nanoparticles, nanosensors, nanomaterials - Classification based on dimensionality- quantum dots, wells and wires – metal based nano materials (gold, silver and oxides) - Nanocomposites- Nanopolymers – Nanoglasses –Nano ceramics.

UNIT III: Fabrication of Nanostructures: Photolithography and its limitation-Electron beam lithography (EBL)- Nanoimprint – Soft lithography patterning, optical lithography – characterization – Bionanostructures and their properties - DNA nanowires Peptide nanowires and nanotubes - Protein nanoparticles - Bioinspired nanomaterials – DNA as a nano structure – silk protein - biomineralisation (diatoms) - lotus effect – nanomotors (ATPase, flagella).

UNIT IV : Nanobiotechnology : Nanodevices and nanomachines based on biological nanostructures - Protein and DNA nanoarrays, tissue engineering - medical applications - nanotechnology for reducing energy consumption and pollution.

UNIT V: Biophysical Applications: Solar energy conversion and catalysis, biosensors – Nanomedicine - Nanoparticles in bone substitutes and dentistry. Nanotoxicology - challenges. Nanotechnology in agriculture (fertilizer, pesticides and food), cosmetics (gels, sun-screen, shampoos and hair conditioners) – dispersions for UV protection using titanium oxide – color cosmetics - commercial exploration. Biosafety and bioethics.

TEXTBOOKS

1. Niemeyer, C. M. and Mirkin, C. A. 2004. Nanobiotechnology: Concepts, Applications, and Perspectives, Wiley-VCH, Weinheim, Germany.
2. Ratner, M. A. and Ratner, D. 2003. Nanotechnology: A gentle introduction to the next big idea, Prentice Hall Professional, New York.
3. Pradeep, T. 2012. A Textbook of Nanoscience and Nanotechnology, Tata McGraw Hill Education Pvt. Ltd.
4. Nalwa, H. S. 2002. Nanostructured Materials and Nanotechnology, Academic Press.

REFERENCES

1. Nicolini, C. 2008. Nanobiotechnology and Nanobiosciences, Pan Stanford Publishing, Singapore.
2. Boisseau, P. and Lahmani, M. 2009. Nanoscience: Nanobiotechnology and Nanobiology, Springer, UK.
3. Nabok A. 2005. Organic and Inorganic Nanostructures, Artech House.
4. Dupas C., Houdy P., Lahmani M. 2007. Nanoscience: Nanotechnologies and Nanophysics, Springer-Verlag Berlin Heidelberg.

PGB5328 **Systems Biology** **4Hrs. / 3Cr.**

PREAMBLE:

Systems biology had emerged as a field of biology in the post-genomic era due to availability of omics data. This fundamental course in system biology will introduce the concepts pertaining to the systems biology. System approach helps to understand the structure, dynamics and functional attributes from molecules, cell, tissue and organism level. The course will provide insights into holistic approach in the biological system, contrary to the reductionist approach which dominates now. High throughput techniques employed in the biological research, data collection and processing will be dealt. Expose students to system level thinking and understanding the functions at different hierarchy by integrating different databases and working with existing models. This will help the students to work parallel with the experimental, computational and theoretical research in different aspects of biology.

Unit I. Trends in biological research:

Cell – a basic unit of life – molecules involved in cellular processes - cell to organism level process in biological system – paradigm in biological research – reductionism and holistic approach– Systems biology theories and time line – challenges and future perspectives.

Unit II. Facets of Systems approach:

Hierarchies in biological system: gene, molecular, cellular and organ levels and interactions. High throughput experimental techniques - post-genomic era - omics technologies – whole genome sequences - big data - interactome. Properties of biological system – system dynamics and control - experimental and computational biology - emergent properties.

Unit III. Network biology and their applications:

Cell as an integrated device – molecular interactions – network analytic methods – Gene, transcription and regulatory network – Biochemical reactions and metabolic pathway systems – disease pathway analysis - Signal transduction network.

Unit IV. System biology models and approaches:

Genome to life – data integration and modeling process – hypothesis testing - flux balance analysis and applications. Cell cycle models – Microbial models (Bacterial chemotaxis and Yeast) – Plant based models (plant development and plant defense system) - Ecological models (energy flow and population dynamics).

Unit V. Databases and Software for Systems Biology:

Omics databases in plants - Software packages – Cytoscape, Celldesigner,Virtual cell. MetaCyc, BioCyc, KEGG pathway, Pathguide. Features of System Biology Markup Language and PYTHON.

REFERENCES

Text books

Choi,S.2007. Introduction to Systems Biology. Humana Press Inc., New Jersey.

ISBN 978159745531

Klipp E, Liebermeister W, Wierling C and Kowald A. 2016.Systems Biology - A Textbook (2nd Edn.).

Wiley-VCH, Germany. ISBN 9783527336364

Voit E O. 2013. A first course in Systems Biology. Garland Science, New York and London. ISBN 9780815344674

Reference books

Alon U. 2006. An Introduction To Systems Biology: Design Principles of Biological Circuits. Chapman and Hall /CRC, London,UK. ISBN 1584886420

Baginsky S and FernieA R. 2007. Plant Systems Biology. BirkhäuserVerlag, Berlin

ISBN 13: 978-3-7643-7261-3

Coruzzi G M and Gutierrez R A. 2009. Plant Systems Biology. Annual Plant Reviews. Vol.35. Wiley-Blackwell Publishing Ltd. UK. ISSN 14601494

Kitano H. 2001. Foundations of System Biology. MIT Press, Cambridge.ISBN 0262112663

Voit E O. 2016. The Inner Workings of Life. Vignettes in Systems Biology.Cambridge

University Press. 9781316604427

PROJECT

PGB 5730 **8H/7Cr**

PREAMBLE: Project is a component of the active learning module that teaches approach and research techniques. Students would have hands on experience in investigating a selected research problem where he/she shall be trained in framing and testing hypothesis through suitable research design.

BROAD RESEARCH AREAS

- Plant diversity and Systematics
- Plant physiology and Biochemistry
- Plant Molecular Biology and Biotechnology
- Microbiology and Plant pathology
- Environmental Biology
- Computational Biology
- Nanobiotechnology

Allocation

- Student may select their broad research area during the end of the second semester and will be guided by a suitable research supervisor in the area allotted by the HOD.
- Each research supervisor may be allotted a single student or a group (2-3 students).
- Summer vacation may be used by the students to initiate their project work.
- Staff workload will be equally shared among the guides.

Objective of the study

- Topic investigated will have defined area of study.
- Project students would have hands on experience in all the instruments and techniques to conduct his/her original research.
- Minimum of 5-10 yrs of literature will be added in the review with recent year of publication.
- Standard of the project work should be high enough to be presented in conferences or to communicate as a paper and be subjected to a peer review.

Evaluation

- Term paper (summer and third semester) and Oral presentation (work plan in outline) in the beginning of the fourth semester. Guide and HOD will oversee.
- At the middle of fourth semester (after the first test), Interim reports shall be submitted by the students. This interim report should form the basis for the final project report and which will be evaluated by UG HOD, PG HOD and guide.
- Even at instances where research is carried out as a group, individual students will be evaluated.
- Evaluation will be based on prescribed format approved by the faculty. The format may be revisited and updated as and when needed.
- Attendance of the student for presentation and viva-voce is a must.

Final Evaluation

A department level open viva-voce will be conducted. PG &UG Head, Guide and senior most faculty functioning as project coordinator will form a panel to evaluate the dissertation work.

PG HOD will chair all the evaluation components connected to the project work.

Dissertation format

- Introduction
- Review of literature
- Materials and methods
- Result
- Discussion
- Summary
- Bibliography

PFS 5518 CLINICAL NUTRITION AND DIET THERAPY (5+1=6h/wk) (5cr)

This course provides knowledge on the importance of diet and their modifications along with the insights of nutrient and drug interactions.

Course Outcomes:

Upon successful completion of the project the students will be able to

i. Explain the physiological and metabolic role of various nutrients and their interactions in human nutrition
ii. Discuss the principles of diet and nutrient modifications for cancer and AIDS
iii. Plan the diet for Surgery, convalescence, burns and trauma patients
iv. Compile diet management for eating disorders
v. Select or alter diet for the management of allergy, nervous system disorders and bone health disorders.

1.Introduction to dietetics and dietary management in critically ill patients Definition and history of dietetics - Dietitian - Nutritional status assessment of the critically ill patients - Recent advances in techniques and feeding substrates - Enteral Nutrition support - Site, Different tube sizes, Different types of feeds, Composition and Delivery methods and its complications. Parenteral Nutrition - Type of access, Parenteral nutrition solutions/composition - Administration methods, Monitoring & complications; Code of ethics

2.Dietary management of cancer & AIDS Types, Etiology, Signs and symptoms, and diagnosis of cancers - Cancer therapy and its complications - Chemotherapy, Radiation therapy and Surgery. Dietary management to cancer patients.

Definition, Etiology, metabolic aberrations, signs and symptoms, phases of HIV, dietary modification, nutritional problems and its management through diet.

3.Dietary management in Surgery Nutrition in wound healing - Stage of Convalescence - Dietary management for pre and post- surgical diets.

Dietary management in Burns Classification and Complications - Metabolic changes in protein and electrolytes - Dietary management & mode of nutrition support for burns and wound management of burns.

Dietary management in Trauma Physiological, metabolic and hormonal response to injury - Dietary management in trauma Dietary management in Sepsis - Definition and Dietary management of Sepsis with or without Multiple Organ Dysfunction Syndrome (MODS)

4. Dietary management in Eating disorders Definition - Signs and symptoms and Complications/health risks - Diagnostic criteria and nutrition management in Anorexia Nervosa and Bulimia Nervosa.

5. Dietary Management in Nervous System Disorders Etiology and Clinical features and Dietary management for – Parkinson's disease and Alzheimer's disease

Dietary Management in Bone Health disorders Prevalence, Types and Etiology and Role of Calcium, Phosphate & Vitamin D in Osteoporosis and Osteomalacia - Measurement of Bone Mass Using Bone Mineral Density (BMD) and Peak Bone Mass (PBM).

References:

1. Swaminathan S.: Advanced Textbook On Food & Nutrition Vol. 1 & N (2nd Ed. Revised _ Enlarged) Bapp Co. 1985.

2. Mahan L.K., Sylvia Escott-Stump (2000): Krause"s Food Nutrition and Diet Therapy 10th Edition, W.B. Saunders Company London.

3. B. Srilakshmi, (2007): Dietetics, published by K.K. Gupta For New age International Pvt. Ltd. New Delhi.

4. Antia F.P. And Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company.

5. Gopalan C., Ram Sastri B.V. And BalSubramaniam S.C., (2006) Nutritive Value of Indian Foods, Hydrabad, National Institute of Nutrition, Indian Council of Medical Research.

6. Passmore P. And M.A. East Wood: Human Nutrition And Dietetics, Churchill Living Stone.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO 1	1	2	3			
CO 2		2	3	4	5	
CO 3		2	3	4	5	
CO 4		2	3	4	5	
CO 5	1	2	3			

Mean = 3

MCA 1

Department of Master of Computer Application

COURSE CODE	COURSE TITLE	Hrs/ Credit	Marks	COURSE CODE	COURSE TITLE	Hrs	Marks
SEMESTER I				**SEMESTER II**			
MCA 4441	Mathematical Foundation for Computer Applications	4	80	MCA 4442	Design and Analysis of Algorithm	4	80
MCA 4443	Digital principles & Computer Organization	4	80	MCA 4444	PYTHON PROGRAMMING	2+2	80
MCA 4445	Advanced Programming in C	4	80	MCA 4446	C++ & OOP	4	80
MCA 4647	Operating Systems (TL)	4+2	120	MCA 4648	Advanced DBMS (TL)	4+2	120
MCA 4449	Web Programming (TL)	2+2	80	MCA 4450	Embedded System Programming	2+2	80
MCA 4451	System Software	4	80	MCA 4452	Essentials of Management	4	80
MCA 4453	Lab I - C	4	80	MCA 4454	Lab II - C++	4	80
SEMESTER III				**SEMESTER IV**			
MCA 5441	Computer Oriented Numerical Method & Statistics	4	80	MCA 5442	Optimization Techniques	4	80
MCA 5443	OOAD & UML	4	80	MCA 5444	Adv Software Engineering	4	80
MCA 5445	Programming in JAVA	4	80	MCA 5446	J2EE Programming (TL)	2+2	80
MCA 5647	Computer Graphics (TL)	4+2	120	MCA 5648	Computer Networks (TL)	4+2	120
MCA 5449	LINUX Programming (TL)	2+2	80		Elective I	4	80
MCA 5451	Accounting & Financial Management	4	80		Elective II	4	80
MCA 5453	Lab III - Java	4	80	MCA 5454	DATA SCIENCE	4	80
SEMESTER V				**SEMESTER VI**			
MCA 6441	Distributed and Cloud Computing	4	80	MCA 6640	PROJECT – VIVA VOCE		200
MCA 6443	Data Mining & Warehousing	4	80				
MCA 6645	.NET	6	120				
MCA 6447	Artificial Intelligence	2+2	80				
	Elective III	4	80				
	Elective IV	4	80				
MCA 6453	Lab V – .Net	4	80				

Electives

MCA 0429 Advanced Networks Standards and Protocols
MCA 0430 Advanced Web Programming
MCA 0431 Android Programming
MCA 0432 Big Data Analytics
MCA 0433 Biometrics
MCA 0434 Compiler Design
MCA 0435 Computer Hardware Components
MCA 0436 Multimedia and Applications
MCA 0437 Organizational Behaviour
MCA 0438 Parallel Computing using Open CL
MCA 0439 Soft Computing

PROGRAMME SPECIFIED OUTCOMES (PSOs):

MCA programme has been designed to prepare graduates for attaining the following program outcomes:

1. An ability to apply knowledge of mathematics, computer science and management in practice
2. An ability to identify, critically analyse, formulate and develop computer applications
3. An ability to select modern computing tools and techniques and use them with dexterity
4. An ability to design a computing system to meet desired needs
5. An ability to make realistic constraints such as safety, security and applicability
6. An ability to devise and conduct experiments, interpret data and provide well informed conclusions
7. An ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development
8. An ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude
9. An ability to communicate effectively
10. An ability to appreciate the importance of goal setting and to recognize the need for life-long learning.

MCA 3

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
MCA 4441	✓	✓	✓	✓		✓	✓			
MCA 4443	✓	✓	✓	✓	✓	✓				
MCA 4445	✓	✓	✓	✓	✓			✓		
MCA 4647	✓	✓		✓	✓		✓		✓	
MCA 4449	✓	✓	✓	✓	✓				✓	
MCA 4451	✓	✓	✓	✓	✓	✓				
MCA 4453	✓	✓	✓	✓	✓	✓		✓		
MCA 4442	✓	✓	✓	✓		✓	✓			
MCA 4444	✓	✓	✓	✓	✓			✓		
MCA 4446	✓	✓	✓	✓	✓			✓		
MCA 4648	✓	✓	✓	✓	✓	✓				
MCA 4450	✓	✓	✓	✓	✓	✓				
MCA 4452		✓				✓	✓	✓	✓	✓
MCA 4454	✓	✓	✓	✓	✓			✓		
MCA 5441	✓	✓	✓	✓		✓	✓			
MCA 5443	✓	✓	✓	✓		✓	✓			
MCA 5445	✓	✓	✓	✓	✓			✓		
MCA 5647	✓	✓	✓	✓	✓	✓			✓	
MCA 5449	✓	✓		✓	✓		✓		✓	
MCA 5451		✓				✓	✓	✓	✓	✓
MCA 5453	✓	✓	✓	✓	✓	✓		✓		
MCA 5442	✓	✓	✓	✓		✓	✓	✓		
MCA 5444	✓	✓	✓	✓		✓	✓	✓		
MCA 5446	✓	✓	✓	✓	✓	✓				
MCA 5648	✓	✓		✓	✓		✓		✓	
MCA 5454	✓	✓	✓	✓	✓		✓	✓	✓	
MCA 6441	✓	✓	✓		✓	✓	✓			
MCA 6443	✓	✓	✓	✓	✓	✓				
MCA 6645	✓	✓	✓	✓	✓	✓				
MCA 6447	✓	✓	✓	✓	✓		✓	✓	✓	
MCA 6453	✓	✓	✓	✓	✓	✓				
MCA 6640	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MCA 0429	✓	✓	✓	✓	✓	✓				
MCA 0430	✓	✓	✓	✓	✓				✓	
MCA 0431	✓	✓	✓	✓		✓	✓			
MCA 0432	✓	✓	✓	✓		✓	✓			
MCA 0433	✓	✓		✓	✓		✓		✓	
MCA 0434	✓	✓	✓	✓	✓	✓				
MCA 0435	✓	✓	✓	✓	✓	✓				
MCA 0436	✓	✓	✓	✓	✓	✓			✓	
MCA 0437		✓				✓	✓	✓	✓	✓
MCA 0438	✓	✓	✓	✓	✓	✓			✓	
MCA 0439	✓	✓	✓	✓	✓	✓			✓	

MCA 4

Mapping Programme Outcome (POs) for Post graduation with MCA (PSOs)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
PSO 1		✓								
PSO 2		✓								
PSO 3					✓					
PSO 4									✓	
PSO 5					✓					
PSO 6	✓		✓							
PSO 7	✓							✓		
PSO 8	✓						✓		✓	✓
PSO 9						✓				
PSO 10				✓						

MCA 4441 Mathematical Foundation for Computer Applications 4Hrs/4cr

This course will enable the students to know the logic and relation, graph theory and automata. Theorems are discussed with examples.

Upon completing the course students will be able to

1. Natural language encoded to proposition calculus and predicate calculus.
2. Mathematical model design by Relations and lattice.
3. Recurrence and characteristic function used for solving problem
4. Real world problem describe by diagram by means of vertex and edges and analyze the properties
5. Analyze abstract machines and automata, as well as the computational problems that can be solved using them.

UNIT I :THEORY OF STATEMENTS

LOGIC-Connectives –Normal Form - Rules of Inference Theory in Statement Calculus - Predicate Calculus.

UNIT-II : RELATIONS

Relation – Equivalence Relation- Partial Order Relation - Relational Matrix - Relational Graph – Partition-lattice

UNIT III :FUNCTIONS

- Function – Recurrence Function –Characteristic Function.

UNIT IV:ALGORITHMS

GRAPH – Walk – Path – Tree - Binary Tree - Kurskal Algorithm - Prims Algorithm – Connectivity- Planner Graph -Coloring

UNIT V:FINITE AUTOMATA

Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata - Languages – Grammars - Push Down Automata.

TEXT :

1. Tremblay JP, Manohar R, "Discrete Mathematical Structures with application to Computer Science", McGraw HillPublication, 2012.

REFERENCE:

1. Narsingh Deo, "Graph Theory with applications to Engineering and Computer Science", Prentice Hall India, 2012.
2. HopcroftJEullman, JD, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, 2013.
3. AR Vasishtha, KiranVasishtha, "Modern Algebra", Krishna Prakashan Mandir Publication, 2013.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5					5	

Mean = 15/5=3

MCA 4443 Digital Principles and Computer Organization 4Hrs/4cr

This course is to give the students with basic ideas regarding digital hardware components at the level of Gate and realization of sequential circuits and combinatorial circuits. This course will enable the students to design digital systems employing the techniques and also give better insights into the basic digital hardware building blocks.

Upon completion of this course students will be able to:

- Understand the need for digital system & perform conversion and arithmetic calculations on Numbers system.
- Gain knowledge to apply digital principles to Create and synthesize combinatorial logic circuits and simplify problems using Boolean algebra and K-map.
- Evalulate and Design the Data Processing Circuits & various types of Flip flops.
- Design and synthesize the Sequential Logic circuits.
- Acquire knowledge on Memory subsystem organization and different types of memory.

UNIT I: DIGITAL SYSTEM CONCEPTS

Introduction to digital systems and computers – Applications of digital systems Number systems and Codes - Conversion Binary to Decimal – Hexa decimal – octal – Representation of Negative Numbers, Complements in other Number systems 1's Complement – 2's Complement _ BCD Representation. ASCII, Excess_3, Gray, Weighted and unweighted codes

UNIT II: Basic Building Blocks

Introduction to logic circuits – Basic building blocks - Boolean algebra - Universal gates - De Morgan's Law - Truth tables - Boolean Expressions –Sum of products - Products of sum methods - Karnaugh map – Don't care conditions

UNIT III: Data Processing Circuits & Sequential Logic Circuits

Multiplexers - De_Multiplexers - Decoder- Encoder - Introduction to Flip Flops -RS Flip-flop - Clocked Flip Flop – D Flip Flop - JK Flip Flop -JK Master - Slave Flip Flop.

UNIT IV: Memory Element & Basic Computer Organization

Introduction to Registers -Types of Registers - Introduction to Counters – Counter Design - Basic computer Organization – System buses – instruction cycles. CPU Organization

UNIT V: Memory Subsystem Organization

Memory subsystem organization – Types of memory – memory subsystem configuration – I/O Subsystem Organization.

TEXT:

1. Malvino AP & Leach DP, "Digital Principles and Applications", Tata McGraw Hill Publications, 6th Edition 2002.
2. John D Carpinelli, Computer systems Organization & Architecture, Pearson Education, 1st Edition, 2012

REFERENCE:

1. TC Bartee, "Digital Computer Fundamentals", Tata McGraw Hill, 6th Edition, 2011.
2. Morris Mano, "Digital Design", Prentice Hall of India Pvt. Ltd, 2012.
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, 2nd Edition, 2013.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1	2				
CO2			3	4	5	6
CO3			3	4		
CO4		2	3	4		
CO5		2				

MEAN= 39/12=3.25

MCA 4445 **Advanced Programming in C** **4 Hrs/4cr**

This course introduces programming concepts and helps them to write programs in an advanced level. It introduces control structures, arrays, functions, pointers, file handling. Also, gives Introduction to TSRs programs and interfaces programming using C.

Upon completing the course students will be able to

1. Classify data types, operators and Functions.
2. Build code using Pointers and Arrays.
3. Discover the role of pointers in DMA and examine its usage in OOP.
4. Implements Structure and Data Files.
5. Categorize BIOS functions and examines network and low level programming.

UNIT I

C introduction – Operators and expressions – Data types – Arithmetic expressions - I/O statements – Control statements – Looping statements – Arrays – Strings and string functions – Procedures – Functions – User defined functions – Built-in-functions including all graphics commands

UNIT II

Introduction to pointers – Operators - expressions, passing on addressing to a function, function returning pointers. Pointers and Arrays – Passing an array element to a function – Multidimensional Arrays - array of pointers.

UNIT III

Pointers and strings – Strings – Standard library functions - array of pointers to string - limitation of array of pointers - Pointers and structures – array of structure -structure pointer - dynamic memory allocations - Pointers and miscellaneous – Pointers to function - Command line arguments – Near, far and huge pointers

UNIT IV

Structure definition - processing a structure, user defined data types –typedef array of structures – Self referential structures – More about structures – Union – Files – C pre-processor

UNIT V

Advanced concepts – pointers and type casting - ROM-BIOS Functions –Basics of TSR – Introduction to Network programming and Interface – introduction to Low level programming

TEXT BOOK:

1. Yashwant Kanetkar, "Understanding C pointers", BPB Publications, New Delhi, 2009.

REFERENCE:

1. Henry Mullish Herbert L. Cooper, "The Spirit of C", Jaico Publishing House, 1987.
2. Les Han Cock, Morris Kriger, "C primer", 3rd Edition, Tata McGraw Hill, 1991.
3. Yashwant Kanetkar, "Writing TSRs through C", BPB Publications, 1995.
4. Barry Nance, "Network Programming in C", PHI, New Delhi, 2002.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3		2				
CO4			3		5	
CO5				4		6

Mean: 23/7=3.28

MCA 4647 **Operating Systems** **6Hrs /6cr**

The aim of this course is to learn the evolution of Operating systems and to understand the organization and strategies of the Operating Systems. This course makes the student to create an environment in which a user can execute programs in a convenient manner.

Upon completing the course students will be able to

1. Understand the structure and functions of OS.
2. Learn about processes and threads.
3. Implementing the principles of concurrency scheduling algorithms and deadlocks.
4. Learn and Implement the different memory management schemes.
5. Understand and Implement the different Input, Output and file management schemes.

UNIT I: INTRODUCTION

Architecture of OS (Ex. Monolithic, Microkernel, Layered, Exokernel) - Virtual Computers, Interaction of O. S. & hardware architecture - Evolution of operating systems, Batch, multiprogramming. Multitasking - Multiuser, parallel, distributed & real –time O.S. Computers and Software – Operating System Strategies – The abstract model of computing- resources – processes – threads – Operating System Organization – Device Management – Process Management – Storage Management-Scheduling-Computing Environment-Mobile Operating system.

UNIT II: PROCESSES AND THREADS – Functions of various Operating System

Basic Synchronization principles – Interacting and Coordinating Processes, Semaphores - High-level synchronization – Monitors - Interprocess Communication – Deadlock – Memory Management – Virtual Memory – Paging, Segmentation and algorithms - Operating System Services- Operating System Structure-System calls and its types- Operating System Design and Implementation-Virtual Machines- Operating System Generation-System Boot.

UNIT III: CONCURRENCY AND SCHEDULING

Threads-Multithreads-Thread Libraries-Models File Management – Protection and Security – Remote Files – Distributed Computing-CPU Scheduling-Deadlocks-Three Memory Management (Main Memory, Virtual Memory, Secondary Memory) - Storage Management.

UNIT IV: MEMORY AND INPUT/OUTPUT AND FILE SYSTEMS

Introduction to UNIX and the Shell – UNIX Directories and Pathnames - Working with UNIX files – Shell Programming -User and system administration – pipelining – Communicating with other user and systems – Accessing other Unix systems on the network or Internet – Accessing Unix from windows – Unix and the internet-Production and Security(Cryptography, Firewall)-Distributed File System-Seven Special-Purpose Systems(Real Time and Multimedia)

UNIT V: CASE STUDIES

Case Studies on LINUX, WINDOWS, MAC-OS, ANDROID and IOS- protection and security.

TEXT BOOK:

1. Gary Nutt, "Operating Systems a Modern Perspective", Pearson Education Asia, 2010.

REFERENCE:

1. Deital, "Operating Systems", Addison Wesley publications, 2013.
2. Milan Milenkovic, "Operating Systems", Tata McGraw Hill, 2012.
3. Tennenbaum, "Operating systems", Tata McGraw Hill, 2011.
4. W. Richard stovens, Stephen A. Rago – "Advanced programming in the Unix environments", second Edition – Addison Wesley publication.
5. Steart E. Madnick, John J. Donovan – "Operating Systems" – Tata McGraw-Hill-2009 edition.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		6
CO5					5	

Mean = 21/6= 3.5

MCA 4449 **WEB PROGRAMMING** **4hrs/4cr**

Students will gain theoretical skills and practical experience required for designing web pages and use variety of latest technologies to create responsive websites.

Upon completing the course students will be able to

1. Recall Web Basics and history of Internet
2. Restate HTML tags, attributes and write simple web pages
3. Apply DHTML to web pages and make it dynamic
4. Compare XML with HTML and develop xml documents.
5. Build interactive web pages using Java Script.

UNIT I: Web Basics

Introduction, Concept of Internet- History of Internet, Protocols of Internet, World Wide Web, URL, Web Server, Web Browser.

UNIT II: HTML

Introduction, History of HTML, Structure of HTML Document: Text Basics, Structure of HTML Document: Images and Multimedia, Links and webs, Document Layout, Cascading Style Sheet- HTML 4 style sheet features, Creating Forms, Frames and Tables.

UNIT III: Dynamic HTML

Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models.

UNIT IV:XML Introduction

Introduction of XML- Some current applications of XML, Features of XML, Anatomy of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes, Document Type Definition (DTD), types.

Unit V: Java Script

JAVA SCRIPT – Introduction – Usage of variables – operations – control structures – looping structures – predefined keywords – arrays – predefined functions – user defined functions – arrays and functions – mathematical functions – string functions – objects – expressions –pattern matching using RegEXp Class – String Class – Exception Handling – Built–in objects – Bgcolor/Fgcolor – Date Object – Events and Event Handling – Validations – Window – Confirmation, alert message.

TEXT BOOK:

1. "HTML5 Black Book: Covers CSS3, JavaScript, XML, XHTML, Ajax, PHP and Jquery", Kogent Learning Solutions Inc.

REFERENCE:

1. Ecky Putrady, "Practical Web Development with Haskell: Master the essential skills to build fast and scalable web applications", !st edition , Apress, 2018
2. Danny Goodman, "Dynamic HTML" 3rd Edition, O'reilly, 2006.

3. Media Paul Colton, R Allen Wyke, Richard Wagner, "JavaScript Unleashed", Sams Publication, 3rd Edition, 2000.
4. Eric. C Richardson, "Programming web server", Galgotia Publications, 1996.
5. Joe Fawcett, Danny Ayers, Liam R.E Quin, "Beginning XML", 5th Edition, Wrox, 2012

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3				4		
CO4			3			
CO5					5	

Mean = 15/5=3

MCA 4451 **SYSTEM SOFTWARE** **4hrs/4cr**

To make students understand the design concepts of various system software like Assembler, Linker, Loader and Macro pre-processor and Compiler.

Upon completing the course students will have developed the ability to

1. Define different software into different categories and architecture of SIC, SIC/EX machines.
2. Describe Assembler and its functions.
3. Illustrate the functioning of Loader and Linker.
4. Analyse the Macro processor features
5. Relate Language processing with working of a Compiler.

Unit I: Introduction to System Software

Introduction to System Software, Application Software - Different System Software– Assembler, Linker, Loader, Macro Processor, Text Editor, Debugger, Device Driver, Compiler, Interpreter, Operating System. Machine Structure, Instruction set and operation modes for various systems like SIC, SIC/XE – CISC, RISC machines.

Unit II: Assembler

Basic Functions of Assembler. Assembler output format – Header, Text and End Records- Assembler data structures, Two pass assembler algorithm, Hand assembly of SIC/XE program, Machine dependent assembler features. Assembler design options: Machine Independent assembler features – program blocks, Control sections, Assembler design options- Algorithm for Single Pass assembler, Multi pass assembler, Implementation example of MASM Assembler

Unit III: Loader and Linker

Loaders and Linkers: Basic functions: absolute loader, simple bootstrap loader; Machine dependent features: relocation, program linking, algorithms and data structures for a linking

loader; Machine-dependent features: automatic library search, loader options; Design options: linkage editors, dynamic linking, bootstrap loaders

Unit IV : Macro Processor

Macro processors - Basic macro processor functions – machine dependent and independent macro processor features – Macro processors design – Recursive, general purpose and macro processing with language translators.

Unit V : Compiler Design

Language Processor: Fundamentals of Language Processing and language Specification, Grammar and Types of Grammar, Finite Automata: DFA and NFA, Conversion of NFA into DFA. Basic compiler functions: grammars, lexical analysis, syntactic analysis, code generation, intermediate form of program, Scanning and Parsing: Top Down Parsing, Bottom up Parsing Scanning.

TEXT BOOK:

1. LL Beck, "System Software an Introduction to System Programming", Addison Wesley Co, 2013.

REFERENCEs:

1. John J Donavan, "System Programming", Tata McGraw Hill Intl., 2011.
2. Damhere, "Introduction to System Software", Tata McGraw Hill Publication, 2011.
3. Aho. A.V. Sethi R. and Ulman J.D, Compilers, Principles, Techniques and Tools, Pearson.
4. Srimanta Pal, Systems Programming, Oxford University Press.
5. Das, Compiler Design Using Flex and Yacc, PHI.
6. Hop croft, "Introduction to Automata Theory, Languages, and Computation" 3rd Edition, Pearson Education India, 2008

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5					5	

Mean = 15/5=3

MCA 4453 **Laboratory – I (C Lab)** **4 Hrs/4cr**

The aim of this course is to train the students in the developing the following programs and enable them to develop a mini project.

Upon completing the course students will be able to

1. Apply different types of User Defined Functions and Arrays.
2. Summarize application software using pointers on different Data Types.
3. Create code using Structure and Union.
4. Solve problems using File Handling Techniques.
5. Design TSR and simple Network Programs.

1. I/O Statements and Control Structures
2. Arrays and strings
3. Functions
   - i) Call by Value
   - ii) Call by Reference
   - iii) User defined
   - iv) Built-in
4. Pointers
   - i) Operators & expressions
   - ii) Pointers and arrays
   - iii) Pointers and strings
   - iv) Pointers and structures
   - v) Pointers to function
5. Structures and Unions
6. C Preprocessors, Command line arguments

9. File Handling
10. TSR programs
11. Simple network programming
12. Program to implement Client / Server concepts
13. Interface programming

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3				4		
CO4			3			
CO5					5	

Mean = 15/5=3

MCA 4442 **Design and Analysis of Algorithm** **4 Hrs/4cr**

This course introduces elementary data structures, concepts like Divide and Conquer, Greedy method and Dynamic programming, Graph Algorithms and Back Tracking and will enable the students to analyse algorithms.

Upon completing the course students will be able to

1. Design, analyse and find solution of the problem using algorithm,
2. Understand the concepts of data types, data structures and linear structures analyse linear data sorting
3. Sort the algorithms based on divide and conquer
4. Study the property of Binary Search tree and R-B tree.
5. Checks the feasibility of a set. Obtain minimal spanning tree

UNIT I

Introduction – Algorithm as technology – Analysing an algorithm – designing an algorithm – Asymptotic notations – standard notations and common functions -Elementary Data Structures –Stacks- Queues

UNIT II

Linked Lists – Implementing pointers and objects - Trees – Hashing - Direct Address tables – Hash Tables – Hash Functions – Open Addressing .Linear- Time Sort– Counting Sort – bucket Sort - General Method – Heap Sort – Building Heap and Heap sort algorithm-selection Sort

UNIT III

Divide and Conquer-Merge sort – Quick Sort – performance of quick sort – randomized version of quick sort
binary search tree – Insertion and deletion in Binary search tree – Red Black Trees – Properties-Rotations – Insertion – Deletion.

UNIT IV

Greedy Method- Optimal Storage on Tapes – Knapsack Problem – Minimum Spanning Trees – Single Source Shortest Path- Bellman-Ford algorithm – Dijkstra's algorithm

UNIT V

Dynamic Programming - General Method – Multistage Graphs – Optimal Binary Search Trees – 0/1 Knapsack – Reliability Design – Travelling Sales Man Problem --Eight queen problem-backtracking

TEXT BOOK:

1. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, "Introduction to algorithms", 2nd Edition,PHI, 2011.

REFERENCE:

1. Ellis Horowitz, SartajSahni, "Fundamentals of Computer Algorithms", Galgotia Publications, 2010.
2. Donald E Knuth, "Fundamental algorithms -The art of computer programming", PearsonEducation, 3rd Edition, 2002.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1				5	
CO2		2				
CO3			3			
CO4				4		
CO5						6

Mean =21/6=3.5

MCA4444 **Python Programming (2T+2L)** **4hrs/4cr**

This course is to enable the students to learn program and concepts acquiring programming skills in python. Itcovers expressions, variables, functions, logic, and conditionals, which are foundational concepts, File Handling and Regular Expressions.

Upon completing the course students will be able to

1. Built-in Data Types, introduces you to Python built-in data types
2. How to control the flow of code by inspecting conditions, applying logic, and performing loops. And teaches you how to write functions.
3. Explain the modules and its features.
4. Ability to done testing ,GUI and script
5. Describe the Data Science, explain a few key concepts and a very special tool, the Jupyter Notebook..

Unit I: Python Basics

Introduction to Python – Why it is so relevant today? – Setting up the environment – Running python program – Built-in data types

Unit II: Control Statements

Iterations – Conditional Programming – Looping - Functions - User Defined function – defining function-calling function-types of functions – arguments –anonymous functions – global and local variables

UNIT III: Modules

modules- importing module -Math module - Random module Packages - Composition

Unit iV: EXceptions

Testing – Profiling – Dealing with Exceptions – GUIs and Scripts

Unit V: Data Science

Data science - Setting up note book- preparing data- cleaning data-creating data frame-saving data frame – to file –getting result

Text Book:

1. Introduction to Computing and Problem Solving Using Python, Balagurusamy,McGraw Hill Education India Private Limited; First edition ,2017

Reference books:

1. Think Python: How to Think Like a Computer Scientist, Allen B. Downey, Updated for Python 3, Shroff/O'Reilly Publishers,2nd edition, 2016.
2. Core Python Programming , R. NageswaraRao ,Dreamtech Press,2016
3. An Introduction to Python – Revised and updated for Python 3.2, Guido van Rossum and Fred L. Drake Jr, Network Theory Ltd., 2011

Websites:

1. www.learnpython.org
2. www.codecademy.com/learn/learn-python

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5					5	6

Mean =21/6=3.5

MCA 4446 C++ and Object Oriented Programming 4 Hrs/4cr

This course is to enable the student to understand the fundamental concepts of Object-Oriented programming and enable them to apply the concepts into the Real world problems using c++. It introduces the object oriented concepts such as objects, constructors, inheritance, overloading of operator and functions, polymorphism, and templates.

Upon completing the course students will be able to

1. Summarize the features of features and advantages of OOP.
2. Build application software using different types of user defined functions.
3. Interpret application software using Reusability techniques, Early and Late bindings.
4. Implements Data Files in OOP.
5. Design OOP model using Class and Function Templates.

UNIT I

Introduction – Programming Paradigms - advantages and applications of OOP – Features of OOP – objects - classes- Data Abstraction-User Defined Types-Concrete Types – Namespace -Abstract Types- Friend function-Virtual Functions - C++ console I/O.

UNIT II

Constructor and destructor functions – Overloading Constructor Functions - Inline Functions –Automatic In-lining. Assigning objects – passing objects to functions – returning objects from functions –references –passing references to objects – returning references independent

references and restrictions – using pointers to objects – the this pointer – using new and delete functions.

UNIT III

Operator overloading – Overloading unary and binary operators-using friend for operators – using friend for operator functions – type conversions - Functions overloading – Inheritance - levels of inheritance – multiple inheritance – multilevel inheritance – hierarchical inheritance - hybrid inheritance - virtual base classes - pointers to derived classes – virtual functions - applying polymorphism

UNIT IV

Formatted I/ O – I/O Manipulators – File Handling – File I/O Basics – Binary I/O – Random access – checking the I/O status – customized I/O and files .

UNIT V

Templates and exception handling - class templates-function templates-member function templates-template arguments – exception handling - Advanced Casting Operators

TEXT BOOK:

1. Herbert Schildt, "C++ Complete reference, Osborne McGraw Hill", 2nd Edition, 2012.

REFERENCE:

1. Robert Latfore, "Object Oriented Programming in Microsoft C++", Galgotia publication, 2009.
2. E Balagurusamy, "Object Oriented programming with C++", PHI 6th Edition
3. Y.P. Bhave, S.A.Patekar, "object Oriented Programming with C++", Pearson Education (Singapore) Pvt Ltd., 2004
4. Debasish Jana, "C++ and Object Oriented Programming Paradigm", PHI, NewDelhi, 2010.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2	3			
CO3			3			
CO4				4		
CO5					5	

Mean =18/6=3

MCA 4648 Advanced Database Management Systems 6Hrs (4T+2L) 6hrs/6cr

This course is to train the students to design databases in an efficient manner.In this course an introduction to fundamental concepts in DBMS, Data models, and relational algebra concepts are discussed. Hands on training is given using ORACLE.

Upon completion of this course students will be able to:

1. Obtain basic knowledge on database, relational database, data Models and ER model.
2. Demonstrate the DDL, DML, TCL using SQL constructs.
3. Apply PL/SQL using Programming language constructs.
4. Understand the Data Management concepts to organize the data.
5. Understand and Design Advanced Databases systems.

UNIT I: Introduction to DBMS

Introduction to DBMS – Data Models – Database Languages – Database System Structures – ER Model – Relational Model

UNIT II: Introduction to RDBMS

Introduction to RDBMS-SQL – Introduction to ORACLE – Data types - DDL – DML – TCL – QBE. Sub queries – Functions and Procedures – Triggers.

UNIT III: PL/SQL

Packages - Types – Objects – Methods – Collectors – PL/SQL – Built in Functions – Programming constructs – Cursors – Error Handling-normalization.

UNIT IV: Data management

Data Storage and Indexing – File Organizations – Query Optimization – Security - Transaction Management – Concurrency Control – Crash Recovery.

UNIT V: Introduction to Advanced Databases systems

Introduction to: Parallel and Distributed Databases – Internet Databases – Decision Support - Data Mining – Object Database Systems – ORDBMS – OODBMS.

2. 1. Silberschatz, Sudharshan and Korth, "Database System Concepts", McGraw Hill Publications, 6th Edition, 2010.

TEXT BOOK:

1. Silberschatz, Sudharshan and Korth, "Database System Concepts", McGraw Hill Publications, 6th Edition, 2010.

REFERENCE:

1. Ramakrishnan and Gehrke, "Database Management Systems", McGrawHill, 3rd Edition, 2012.
2. Loney and Koch, "ORACLE 9i - The Complete Reference", Tata McGraw Hill Edition, 2010.

3. Urman, "ORACLE PL/SQL programming", Tata McGraw Hill, 1997.
4. McFadden, Hoffer and Prescott, "Modern Database Management", Pearson Education, 5th Edition, 2001.
5. Nilesh Shah , **Database Management Systems using Oracle**, Pearson Education, 2015.
6. Arun Majumdar & Pritimoy Bhattacharya, **Database Management systems**, TMH publications,2007.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2	1					
CO3		2		4		
CO4			3	4		
CO5					5	6

Mean =26/8=3.25

MCA 4450 **Embedded System Technology** **4 Hrs/4cr**

This course facilitates to gain an understanding of the overall system architecture involving hardware and software components as well as of its complex communication structures, enabling them to understand the underpinnings of modern design methodology.

Upon completing the course students will be able to

1. Understanding the concepts and development of microprocessor
2. Exploring the Tasm / MASM / NASM
3. To know Microcontroller based system design and applications
4. Exploring advanced micro processor
5. Knowledge upgradation on recent trends in digital design for embedded systems

UNIT I

Microcomputer architecture- The IntelCPU's-8086/8088 CPU components: Bus interface unit-execution unit - 8086 CPU registers- instruction set: addressing modes. Programmable peripheral Interface-8279 Programmable keyboard / display interface-8254 Timer – 8251A Communications interface-DMA – Interrupts - A Simple Micro Controller – Parallel I/O Ports – Serial I/O Interface – Counter Timer – Interrupt Control Mechanism - Assembly Language Programming For Micro Controllers - Micro Controllers For Embedded Systems

UNIT II

Assembly language fundamentals: segment and end directives—data definition directives – the assume directives - Input/output services - interrupts – Dos function calls - Assembly language program development tools - editor – assembler (MASM/TASM) – linker – loader – debugger - simple assembly programs - Interfacing Assembly Language Routines to High Level Language Programmes

UNIT III

Introduction to ES-What is ES, Examples of ES-Inside ES : processor, memory, peripherals, software.- Embedded Processors , Memories &Peripherals ,Microcontrollers 8051 -Discrete processors : 8-bit architecture, 16/32 bit CISC, RISC, DSP-Integrated processors : ARM RISC-Choosing a processor-Memory systems : types (SRAM, DRAM, FLASH), organization, access-time, validating the contents of memory-Basic peripherals : parallel ports, timers, clocks

UNIT IV

Advanced Microprocessors - EDA tools – Coprocessors: Math Coprocessor(8087) – Microcontrollers: introduction – architecture – addressing modes. Case study: X86 compatiableVIA C7, Via Nano, AMD's Geode, Athlon Neo, Intel Atom.

UNIT V

Case study on strain sensors, Temperature sensors, Pressure sensors, Humidity sensors, Accelerometers, Gyroscopes, RF MEMS Switch, phase shifter and smart sensors. Case study of MEMS pressure sensor Packaging – real time interfacing with raspberrypi -arduino board.

TEXT BOOK:

1. Barry B Brey, "The Intel Microprocessor 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro Processor: Architecture, programming and Interfacing", 4th Edition, Prentice Hall of India 2011.

REFERENCE:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky , "Computer Organization", McGraw Hill Higher Education, Fifth Edition, 2013.
2. Douglas V Hall, "Microprocessor and Interfacing – Programming and Hardware", McGraw-Hill, 2011.
3. Muhammad Ali Mazidi, Janice GillispieMazidi, "The 8051 Micro controller and Embedded systems", Pearson Education Asia, 2002.
4. Christian Hill, Learning Scientific Programming with Python, Cambridge university press, 2016.
5. Internet Sites: www.chips.ibm.com, www.intel.com, www.nexgen.co

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3		2				
CO4			3			
CO5			3	4		6

Mean =21/7=3

MCA 4452 **Essentials of Management** **4Hrs /4Cr**

The aim of this course is to introduce the basic Management processes in organizations.It introduces students to the environment of management and covers the basic management Functions like planning, organizing, leading and controlling. Further, it develops an Understanding of the development of management thoughts ages and its applications. This course intends to familiarise the students with the theories and practices of management so as to develop basic managerial way of thinking.

Upon completing the course students will be able to

1. Comprehend the crux of management and the importance of a manager in an enterprise.
2. Plan viably to keep the goals achieved.
3. Assimilate Organizing capacity.
4. Develop communication skills and be a goo
5. Exercise effective control over the situations.

UNIT I: INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

Definition of Management – Science or Art – Manager Vs Entrepreneur – types of managers – managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current trends and issues in Management.

UNIT II: PLANNING

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III: ORGANISING

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management.

UNIT IV: DIRECTING

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

UNIT V: CONTROLLING

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TEXT BOOK:

1. K Natarajan & K P Ganesan, "Principles of Management", Himalaya Publishing House Pvt. Ltd., 2018

REFERENCE:

1. Koontz and Weihrich, "Essentials of Management: An International perspective", 7th Edition, Tata McgrawHill Publications, 2007.
2. Koontz and O Donnel, "Management – A Global Perspective", 10th Edition, Tata McgrawHill Publications.
3. Drucker, "Management Challenges for the 21stcentury", Utterworth-Heinemann Ltd, 2ndEdition, 2007.
4. Stephen P Robbins, Mary Coulter, "Management", Prentice Hall, 2009.
5. Andrew J Dubrin, "Essentials of Management", Thomson South Western, 2010.
6. VSP Rao and VH Krishna, "Management", Excel Books, 2008.
7. Harold and HeinezWeihrich, "Essentials of Management", Tata McGraw Hill, 2009.
8. Joseph and Massie, "Essentials of Management", Prentice Hall, 2009.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3		2	3			
CO4			3	4		
CO5				4	5	

Mean =24/8=3

MCA 4454 **Laboratory II (C++)** **4 hrs/4cr**

The aim of the course is to train the students to develop the following programs and enable them to develop a mini project.

Upon completing the course students will be able to

1. Explain different types of User Defined Functions through OOP.
2. Create code using Reusability Techniques.
3. Categorize different types of Polymorphism.
4. Solve problems using File Handling Techniques.
5. Design Class and Function Templates and Exception Handling methods.

1. I/O statements
2. Function Overloading
3. Functions with default arguments
4. Constructors and Destructors
    a. Constructors without parameters

b. Constructors with parameters

c. Overloaded Constructors

d. Copy Constructors

5. Passing objects to functions

a. By Value and By Reference

b. Friend functions and Inline functions

c. Call by Reference and Return by Reference

6. Operator overloading

b. Overloading binary operators

c. Overloading unary operators

d. Overloading logical operators

7. Inheritance

a. Single Inheritance

b. Multilevel inheritance

c. Multiple inheritance

d. Hierarchical inheritance

e. Hybrid inheritance

8. Pointers

a. Pointers to objects

b. This pointer

9. Virtual functions

10. Formatted I/O

11. Files (Formatted and Unformatted)

12. Templates and Exception Handling

13. Writing Programs to implement the concepts Algorithms (Data Structure)

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3		2	3			
CO4				4	5	
CO5				4	5	

Mean =26/8=3.25

MCA 5441 Computer Oriented Numerical Methods and Statistics 4 Hrs/4cr

This course explores various techniques in numerical methods for solving different mathematical models such as linear and non-linear equations, system of linear equations, interpolation, differentiation, integration and ordinary differential equations. It also enables to solve the various statistical methods such as Distribution of Random variables, Distributions, Sampling theory and Hidden Markov Models.

Upon completing the course students will be able to

1. Find the solution for algebraic and tragen dental
2. Solve the system of equations
3. Find the unknown values from known values
4. Illustrate the characterization of probability density functions
5. Test and analyses mean and variance of small and large samples

UNIT I

Solutions of Non-Linear Equations : Roots of an equation- - Methods for finding roots of linear and non-Linear equations - Bisection Method- False Position Method- Iterative Method and Newton-Raphson Method

UNIT II

System of linear equations- Gauss-Elimination Method, Gauss-seidel Method –Gauss- Jordan method.

UNIT III

Interpolation – Newton Forward and Backward differences interpolation methods – Lagrange Interpolation – Newton divided difference interpolation – Numerical Differention – Integration - Solving first order ordinary differential equations

UNIT IV

Distributions of Random Variables – probability set function – Distribution function – probability models – mathematical expectations – Some special mathematical Expectations – Conditional probability -marginal and conditional distributions

UNIT V

Sampling theory - confidence intervals for means – confidence intervals for difference of variance – Hypothesis – Examples and Definitions – T_Tests – Chi_square Tests – F_Test – The Analysis of Variance

TEXT BOOK:

1. Freund, "Mathematical Statistics", 5th Edition, Prentice Hall India, 1997.

REFERENCE:

1. S.C. Gupta & VK Kapoor Sultan Chand, "Elements of Mathematical Statistics", New Delhi, 1992.
2. M.K.Jain, S.R.K. Iyengar, R.K. Jain, "Numerical Methods Problems and Solutions", New Age International, 2008.
3. EBalagurasamy, "Numerical Methods", Tata McGraw Hill, 2012.
4. Robert J Elloit, LakhdanAggous and John B Moore, "Hidden Markov Models: Estimation and Control", Springer Verlog, Newyork, 1995.

5. Geoffrey Mclachlan, "Finite Mixture Models -Wesley Series in probability and statistics",Wiley-Interscience, 2000

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3		2	3			
CO4				4		
CO5						6

Mean =18/5=3

MCA 5443 Object Oriented Analysis and Design and UML 4 Hrs/4cr

This course is to train the students to understand the existing system and to provide practical guidance on construction of Object-Oriented Systems. In this course the basic concepts in system analysis and design are introduced. More Emphasis is on Object-Oriented Analysis and Design. UML is used for the realization of OOAD. In UML the basic structural, behavioural and architectural modellings are discussed.

Upon completion of this course students will be able to:

- Understand and apply the software development life cycle concepts.
- Design and Analyse system using the design principles.
- Understand and Design using the Object Oriented Methodology.
- Understand and Apply UML for visualizing, specifying, constructing, and documenting information about software-intensive systems.
- Model the structure of the run-time system and their physical hardware elements.

UNIT I: INTRODUCTION TO SYSTEMS

Systems - Role of System Analyst - SDLC – Feasibility Analysis – Fact Finding Techniques – SSAD - ER Diagrams – DFD – Decision Table – Decision Trees – Structured English – Case Study

UNIT II: System Design

System Design - Application Architecture and Modeling – Database Design - Input and Output Design - User Interface Design – System Construction and Implementation – System Operations and Support – Case Study

UNIT III: System Modelling

OOAD - Comparison of SSAD and OOAD - Modelling as a Design Technique – Object Modelling – Dynamic Modelling - Functional Modelling – Object Design – OOD Design Process – Case Study

UNIT IV: Introduction to UML

Introduction to UML – Basic Structural Modelling – Classes – Relationships Common Mechanisms – Class Diagrams – Behavioural Modelling – Interaction – Uses cases - Architectural Modelling

UNIT V: UML Diagrams

Component Diagrams – Deployment Diagrams – Collaboration - Case Study

TEXT BOOK:

1. Sen, "System Analysis and Design", Tata McGraw Hill, 1989.

REFERENCE:

1. Jeffrey, "Structured System Analysis and Design", Tata McGraw Hill 2002.
2. Rumbaugh, Blaha, Premerlani, Eddy and Lorensen, "Object-Oriented Modeling and Design", PHI, 1997.
3. Booch, Rumbaugh and Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2003.
4. Jason, "UML - A Beginners Guide", Tata McGraw Hill, 2003.
5. Yourdon, "Object-Oriented Analysis", Pearson Education, 2nd Edition, 2001.
6. Object- Oriented Analysis and Design with Applications, Addison-Wesley Professional, 2nd Edition, 2007.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1	2	3	4	5	6
CO2		2	3	4		6
CO3		2	3			6
CO4		2	3	4		6
CO5		2	3	4		6

Mean =77/21=3.6

MCA 5445 **Programming in JAVA** **4Hrs/4cr**

OBJECTIVE:

The aim of the course is to train the students in Java Programming and make them to develop applications for the industry standard.

Learning Outcome

Upon completion of this course students will be able to

1. Develop simple java programs to demonstrate OOPs concepts.
2. Gain knowledge to create interfaces, packages, identify and fix errors in the code and develop programs.
3. Demonstrate how to develop event driven window based applications using AWT controls and Applets.
4. Understand JFC and Swing concept and develop applications.
5. Acquire knowledge to achieve database connectivity using JDBC.

UNIT I

Java fundamental,Constructors and inheritance : Introduction -Genesis of Java- Types of Java applications – Java Virtual Machine - Data types, Variables - Control statements - Arrays – String – Classes and Objects - Methods – Constructors - Inheritance

UNIT II

Interfaces, Packages,Exception Handling and Multithreading : Interfaces - Packages – Exception Handling - Multithreading– Input/Output – Files –Collections – Serialization.

UNIT III

AWT and Applets: Introduction to AWT - Java Applets- Life Cycle Of An Applet – AWT controls -– Building GUI Event Delegation Model – Exceptions – Event Classes – Listener Interfaces – Containers And Layout Managers – Frames –Dialogs – Java Applets In Web Page Creation.

UNIT IV

JFC and Swing: Introduction to Java Foundation Classes(JFC) - Swings – Adding Controls – Adding Tooltips And Icons – Popup Menus – Tabbed Panes – Sliders –Progress Bars – Tables – Images.

UNIT V

Java database connectivity : JDBC Overview – JDBC architecture - JDBC implementation - JDBC classes – Connection class – Statements - Establishing connectivity - Working with statements-Creating and executing SQL statements-Working with Result Set.

TEXT BOOK:

1. Patrick Naoghton and Herbert Schidt, "The Complete Reference - JAVA" 9th Edition Tata McGraw Hill, 2014.

REFERENCE:

1. Ken Arnold and James Gosling, "The Java Programming language", Addison Wesley, 4th Edition, 2005.
2. Kathy Sierra and Bert Bates, Head First Java, O'Reilly Media,Inc.,,2nd Edition, 2005
3. Maydene Fisher, Jon Ellis, Jonathan Bruce, "JDBC API Tutorial and Reference", 3rd Edition, Addison-Wesley Professional,2003
4. S Kathy Sierra, Bert Bates, "Head First Java" by O'Reilly Publications, 2008.
5. Kogent Learning Solutions Inc, "JAVA 7 Programming- Black Book", Wiley India Publications.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1	2				
CO2			3			6
CO3			3		5	6
CO4			3		5	6
CO5		2			5	6

Mean =53/13=4.07

MCA 5647 **Computer Graphics** **6hrs/6cr**

To provide knowledge and understanding in the fundamental principles of Computer Graphics and Mathematical concepts related to Computer graphical operations. To provide in-depth knowledge of display systems, image synthesis and shape modeling of 3D applications.

Upon completion of this course students will be able to

1. Recall display devices, Line and circle drawing algorithms
2. Interpret 2d transformations and clipping on images
3. Apply 3D concept on objects and surface.
4. Analyse 3D transformation and Projection
5. Create a real life picture with fractals

UNIT I: Computer Graphics Algorithms

Introduction to Computer Graphics: Display devices - Hard copy devices – Interactive input devices Graphics System, Application of computer graphics - Line Drawing Algorithms- Circle Generating Algorithms- ellipse generating -Scan-Line Polygon

UNIT-II: 2D Transformations and Clipping

Two dimensional Geometric Transformations - Composite Transformations -Transformations between Coordinate Systems Raster methods for Transformations- Two Dimension Viewing. TWO-Dimension Viewing- Clipping- Line Clipping- Polygon Clipping – Text Clipping

UNIT III: 3D Representation

Three Dimensional Concepts- Three Dimensional Display Methods viewing – Three Dimensional Object Representations – Polygon Surfaces- Polygon Tables-Polygon Meshes-Bezier Curves - Bezier Surfaces- Sub Division Method – Octrees - BSP Trees

UNIT IV: Projections

Three Dimensional Transformations – Projection - Parallel Projection - Perspective Projection Hidden Surface and Hidden – Line Removal-Classification of Algorithms – Back Face Removal – Depth Buffer Method – Scans Line Method-

Unit V: Fractals

Fractals : Fractals and Self similarity – Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals – Overview of Ray Tracing – Intersecting rays with other primitives – Adding Surface texture – Reflections and Transparency – Boolean operations on Objects

Text Book:

1. Computer Graphics by Donald Hearn and M Pauline Baker PHI Publications 2013.

REFERENCE:

1. Principles of Interactive computer graphics – William M. Newman & F Sproull.
2. Steven Harrington. Computer Graphics McGraw Hill International Edition 2nd Edition, 1987.
3. Edward Angel, Dave Shreiner, "Interactive Computer Graphics: A Top Down Approach with Webgl", 7th Edition, Pearson, 2014
4. Steven J Gortler, "Foundations of 3D Computer Graphics", 1st edition, MIT Press 2012.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5						6

Mean =16/5=3.2

MCA 5449 **Linux Programming** **4 Hrs/4cr**

This course would enable the students to design the Linux Operating System with respect to security and automation. This makes them to emphasize on Linux Shell Programming, Kernels, File Systems, Systems Administration, Web Environments, Socket Programming, and other business applications for Linux Systems.

Upon completion of this course students will be able to:

1. Various Linux platform can be managed and exploring the kernel part of Linux.
2. Making them to understand to host various servers in Linux.
3. Graphics tool kit package implementation and Linux based python is exposed.
4. Publishing e-materials in Linux.
5. Providing an introductory understanding of the ethical questions surrounding data creations, analysis and representation .

UNIT I

Introduction to Linux - Why Linux is the Best OS – Linux Packages -GNOME and KDE Desktop - Linux Installation – Basic Shell commands, shell programming, Linux administration commands - YUM - RPM: Red Hat Package Manager

UNIT II

System Admin - Networking and configuration - Adding a Network Interface - Linux Web Server Configuration - Linux Security - Linux Server Security Audit and Tools - System Recovery and Boot Disk Creation - Managing User and Groups - Init/Boot process - File system quotas - Open LDAP Directory Services - NIS Services - DHCP server services - System Optimization - MP3 Audio Streaming - Real Media Streaming - Tomcat and Apache

UNIT III

Inter process communication - GTK+ Programming – TUTORIAL -GNOME GDK Threads – TUTORIAL - GTK.org - GTK examples - Gnome apis/Reference- gtmmm.org - Gtk- - sysadmin guide - gtkperl - pygtk - Python/Gtk GUI

UNIT IV

Word Processing LATEX-LDAP Basics - Open Source- PHP – PYTHON – Data Management -File Locking - Databases - MYSQL - Accessing MYSQL Data from PHP - Linux Firewall

UNIT V

Introduction to Linux GIS – defining GIS – components of GIS – Introduction to spatial data, maps and their influence on their character of spatial data - basic spatial entities-characteristics of spatial data - sources of spatial data – connecting GPS with MySql-Docker-kubernets – ballerino- distributed transactions - reliable messaging – stream processing – workflows – container management .

TEXT BOOK

1. Richard Stones, Beginning, "Linux Programming", Wrox Press 2011.

REFERENCE:

1. Jonathan Corbet, Alessandro Rubini, Greg Kroah-Hartman, "Linux DeviceDrivers",
   a. 3rdEdition, O'Reilly, 3rd Edition 2005.
2. Robert Love, "Linux System Programming",2013.
3. Robert Love,"Linux Kernel Development", Third Edition, Pearson Education, 2010.
4. "Linux: The Complete Reference", 6th Edition, 2008.
5. Ian Heywood, Sarqah Cornelius and steve carver, "Introduction to geographical
   a. information systems", Person Education, 4th Edition, 2012
6. DeMers, M.N., "Fundamentals of Geographic Information Systems", 4th Edition,
   a. Wiley Press, 2012
7. http://www.server-world.info/en/
8. http://www.linuxhomenetworking.com/

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5					5	

Mean =15/5=3

MCA 5451 Accounting and Financial Management 4 Hrs / 4 Cr

The aim of this course is to impart knowledge of basic principles of accountancy and the principles of financial management so as to enable the students to apply them in areas of computerization of accounting procedures and for data processing.

Upon completion of this course students will be able to:

1. Excel in the basic accounting principles from recording transactions to derivation of profit or loss.
2. Analise and interpret financial statements for performance evaluation.
3. Adopt financial decision-making techniques for effective running of enterprise.
4. Ascertain cost from various operations and take cost-based decisions.
5. Prepare budgets for financial forecasting.

UNIT I

Accounting Principles, Concepts and conventions – Double entry book-keeping – Journal, Ledger, Trial balance, Final accounts of sole-trader concern and company

UNIT II

Analysis and interpretation of financial statements – Accounting ratios - Advantage and Limitations.

UNIT III

Fund Flow and Cash Flow Analysis – Meaning and need – Preparation of Fund Flow and Cash Flow statements – Uses and limitations.

UNIT IV

Basic Cost concepts – Meaning of cost accounting – Objectives – Elements of Cost – Cost Sheet - Inventory management – Purchase procedure – E.O.Q – Stock levels – ABC analysis and V.E.D analysis, Marginal costing – Meaning – Applications of marginal costing – Advantages and limitations – Break Even Analysis

UNIT V

Budgeting – Meaning – Merits and demerits – Difference between budget and forecast – Kinds of budgets (Cash budget & Flexible budget)

Note: The students will be exposed to some accounting packages E.g. Tally

TEXT BOOK:

1. T.S. Grewal, "Double entry Book-keeping", Sultan Chand and Sons, New Delhi, 2002.

REFERENCE:

1. S.N.Maheshwari, "Principles of Financial management", Sultan Chand & Sons, New Delhi, 2003.
2. M.C. Shukla and T.S. Grewal, "Advanced Accounts", Sultan Chand and ons, New Delhi, 2000.
3. R.L. Gupta and M.Radhasamy, "Advanced Accountancy Vol I", Sultan Chand and Sons, New Delhi, 2001.
4. M.Y. Khan and P.K.Jain, "Financial Management", Tata McGraw Hill Publications, New Delhi 1999.
5. M.N.Arora, "Cost Accounting, Principles and practice", Vikas Publishing House Ltd., New Delhi 2001.
6. Manmohan and Goyal, "Principles of Management accounting", Sahitya Bhavan, Agra 1999.
7. S.P. Jain and K.L. Narang, "Cost Accounting", Sultan Chand and Sons, New Delhi, 1999.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1			3			
CO2				4		
CO3				4		
CO4			3			
CO5				4		

Mean =18/5=3.6

MCA 5453 **JAVA PROGRAMMING LAB** **4 hrs/4 cr**

This course is to train the student to develop problem solving abilities and facilitate them to build the necessary skill set and analytical abilities for developing java based software for real life problems.

Upon completion of this course students will be able to:

1. Develop simple java programs to demonstrate OOPs concepts.
2. Construct programs using constructor, method overloading and static function.
3. Examine reusability through inheritance, abstract class and interface concept in real time application development
4. Develop packages and understand how to fix errors using exception handling.
5. Construct window based applications using Applet, Swing and achieve database connectivity using JDBC.

Lab Components

1. Implementation of Array and flow control statement.
2. Write a Java program to count the letters, spaces, numbers and other characters of an input string.
3. Demonstrate the use of constructor or destructor.
4. Working with command line arguments.
5. Write a Java Program to implement array of objects.
6. Implementation of Single inheritance.
7. Implementation of Multilevel inheritance.
8. Write a java program to implement method overriding.
9. Write a java program to demonstrate the implementation of abstract class.
10. Write a java program to implement interface concept.
11. Create a package, add the necessary classes and import the package in java class.
12. Implementing Thread based applications & Exception Handling.
13. Write a java program to copy the contents from one file to other file.
14. Checking Minimum Bank Balance using user defined exception.
15. Working with Dialogs and Menu control.
16. Working with Panel and Layout control.
17. Database Creation for storing e-mail addresses and manipulation..
18. Creation of applet and passing parameter to applet.
19. Calculation of Electricity bill using JDBC and Applet.
20. Creation of Employee pay bill using JDBC and Swings.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1					5	
CO2			3	4		6
CO3		2			5	6
CO4						6
CO5						6

Mean =43/9=4.7

MCA 5442 **Optimization Techniques** **4Hrs/4cr**

This course would enable the students to solve the formulate Linear programming problem and solve it .To optimize the transportation problem, assignment problem and also help to understand network modeling for planning and scheduling the project activities and different models on queuing theory.

Upon completion of this course students will be able to:

1. Management problems convert to L.P.P and find the optimum solution for it.
2. Find the minimum cost for transportation problem and Assignment problem
3. Non integer values in optimal table of L.P.P convert to integer
4. Construct network diagram and obtain critical path and project length.
5. Identify and analyse queue model and find the different values.

UNIT I

Mathematical Formulation - Graphical Solution of linear programming models – Simplex method –Artificial variable Techniques- Two Phase Method

UNIT II

Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution –optimum solution - degeneracy – Mathematical formulation of assignment models – Hungarian Algorithm

UNIT III

Formulation – Gomory's IPP method – Gomory's mixed integer method – Branch and boundtechnique

UNIT IV

Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling

UNIT V

Characteristics of Queuing Models – Poisson Queues - (M / M / 1) : (FIFO / ∞ /∞), (M / M / 1) : (FIFO/ N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞) models.

TEXT BOOK:

1. Taha H.A., "Operations Research: An Introduction", 8th Edition, Pearson Education, 2008.

REFERENCE:

1. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, "Operations Research", Pearson Education, Asia, 2005.
2. Prem Kumar Gupta, D.S. Hira, "Operations Research", S.Chand& Company Ltd, New Delhi, 3rdEdition , 2008.
3. John W. Chinneck "Feasibility and Infeasibility in Optimization Algorithms and Computational Methods", Springer, 2008
4. Ravindran, Phillips, Solberg, "Operations Research: Principles And Practice", 2nd Edition, John Wiley & Sons, 2007.
5. Ibe, O.C. "Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1stIndian Reprint, 2007.
6. Gross, D. and Harris, C.M., "Fundamentals of Queuing Theory", Wiley Student, 3rdEdition, New Jersy, 2004

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2					5	
CO3			3			
CO4				4	5	
CO5						6

Mean =24/6=4

MCA 5444 **Advanced Software Engineering** **4 Hrs/4cr**

This course is to train the students to analyse, estimate and design new software with quality standards. In this course the Essentials in Software Engineering, software processes and the various software engineering paradigms are introduced. Software testing methods and quality maintenance strategies are included.

Upon completion of this course students will be able to:

- Define diverse software application domains with different process models used in software development.
- Elucidate the need for software specifications and requirements with their gathering techniques.
- Transform requirements model into design model and demonstrate software and UI design principles.
- Differentiate SCM and SQA models, classify testing strategies and tactics and evaluate them.
- Generate project schedule and construct, design and develop network diagram for different type of Projects.

UNIT I: Introduction to Software and Software Engineering

Software and Software Engineering – TheNature of Software – The Unique Nature of WebApps – Software Engineering - The Software Process- Software Engineering Practice – Software Myths – **THE SOFTWARE PROCESS: Process Models:** A Generic process Model – Process Assessment and improvement - Prescriptive process Models – Specialized Process Models- Unified process - personal and team process models.

UNIT II: MODELING: Principles that Guide Practice

MODELING: Principles that Guide Practice: Software Engineering Knowledge – Core Principles – Principles that guide Each Framework Activity. **Understanding Requirements:** Requirements engineering Establishing the Groundwork – Eliciting Requirements – **Requirements Modeling: Scenarios, Information, and analysis Classes:** Requirements Analysis- Scenario-Based Modeling - UML Models that supplement that use case – Data Modeling Concepts – Class-Based Modeling.

UNIT III: Design Concepts

Design Concepts: Design with the Context of software Engineering – The Design Process – Design Concepts – The design Model. **Architecture Design:** Software Architecture- Architecture Genres – Architecture Styles - Architecture Design. **QUALITY MANAGEMENT: Quality Concepts**: What is quality? – Software Quality –The Software Quality Dilemma – Achieving Software Quality.

UNIT IV: Software Testing Strategies

Software Testing Strategies – A Strategic Approach to Software Testing- Strategic Issues – Test Strategies for Conventional Software – Validation Testing – System Testing – **Testing Conventional Applications:** Software Testing Fundamentals – Internal and

External Views of Testing – White Box Testing – Basis Path Testing – Control Structure Testing - Black Box Testing.

UNIT V: MANAGING SOFTWARE PRODUCTS

MANAGING SOFTWARE PRODUCTS: Project Management Concepts: - The Management Spectrum – People – The Product –The Process – The Project – The W5HH Principle – Critical Practices. **Project Scheduling:** Basic Concepts - Project Scheduling – Scheduling. **Risk Management:** Reactive versus Proactive Risk Strategies - Software Risks – Risk Identification - Risk Projection – Risk Refinement.

TEXT BOOK:

1. **"Software Engineering a Practitioners Approach",** Roger S. Pressman, McGraw – Hill International Edition, Seventh Edition 2013.

REFERENCE:

1. Roger S Pressman, " Software Engineering -A Practical Approach" Tata McGraw Hill, 7th Edition, 2013
2. Stephen R Schach, " Object Oriented and Classical Software Engineering", Tata McGraw Hill, 8th Edition,2010
3. Watts S Humphrey, "A Discipline for Software Engineering", Pearson Education, 2001.
4. Boriz and Beizer, "Software Testing Techniques", DreamTech, 2nd Edition, 2000.
5. "Software Engineering", Ian Sommer Ville, Pearson Education, Nineth Edition, 2011.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1	2	3			
CO2		2	3	4	5	6
CO3			3	4	5	6
CO4		2	3	4		
CO5	1	2	3	4	5	

Mean =68/20=3.4

MCA 5446 **J2EE Programming (TL)** **4hrs/4cr**

This course is to train the students in developing Web Applications using Java Servlet, JSP in J2EE Platform and also create database connectivity using JDBC.

Upon completion of this course students will be able to:

1. Define Web Basics and Java Servlets
2. Explain Java Server Page features
3. Perform database connectivity using JDBC
4. Analyse Enterprise architecture
5. Create Java Applications using the features learnt.

UNIT I: Introduction to Java Servlet

Java Server Technologies - Basics of Web Application, Architecture and challenges of Web Application, Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment , Descriptor (web.xml), Handling Request and Response. Tracking Session.

UNIT II: Understanding JSP

JSP Architecture ,JSP Standard / Implicit Objects, JSP Page Implementation Class, JSP Basics & Syntax, JSP Directive Tags, JSP Action Tags, JSP Script related Tags, Using Java Beans from JSP, UseBean Tag, setProperty Tag, getProperty Tag, JSP Custom Tag Library.

UNIT III: Using Database connectivity

Database Programming using JDBC Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC, Connecting to non-conventional Databases.

UNIT IV: J2EE Architecture

J2EE Platform Introduction -Enterprise Architecture Styles - J2EE Architecture - J2EE Technologies -Developing J2EE Applications - Naming and directory services - Application Servers - Implementing the J2EE Specifications - J2EE packaging and Deployment - J2EE packaging overview - Configuring J2EE packages

UNIT V: STRUCTS

Basics of Struts, Core Components, Struts Action, Struts Configuration, Interceptors, Struts Validation, Aware Interfaces, Zero Configuration, Struts with Tiles2, Hibernate with Struts, spring with Struts, Project Development in Struts

TEXT BOOK:

1. John Hunt and Chris Loftus, "Guide to J2EE: Enterprise Java", 2nd Edition, Springer, 2012

REFERENCE:

1.Santosh Kumar K., Kogent Solutions Inc., Santosh Kumar K. And Kogent Solutions Inc, "Jdbc Servlets, And Jsp Black Book," New Edition (With Cd) , Dreamtech Press, 2008
2. Bryan Basham, Kathy Sierra, Bert Bates, "Head First Sevlets and JSP: Passing the Sun Cetified Web Component", 2nd edition, O'Reilly Media, 2008
3. Kogent Solutions Inc, "JAVA SERVER PROGRAMMING , JAVA EE5", 1st edition, Dreamtech Press, 2008

4. Ted Husted Cedric Dumoulin, "Structs in Action", 1st edition, Manning – Dreamtech Press, 2007.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5						6

Mean =16/5=3.2

MCA 5648 **Computer Networks** **6hrs/4cr**

In order to play role in this era network-based computing. Student must have a thorough understanding of these emerging networking technologies and applications.

Upon completion of this course students will be able to:

1. Basic Networking Concepts
2. Fundamental Radio Propagation Waves
3. Basic wireless networking concepts: Wifi, MAC protocols, mobile networking, 5G MILLI METER WAVES, ULTRA DENSE NETWORKS.
4. Network function virtualization and software defined networking
5. Machine Learning Assisted Networking.

UNIT I

Uses of computer networks – Network hardware – Network software – Reference models – The OSI Reference models – The TCP / IP Reference– A comparison of the OSI and TCP Reference models – Example networks – Novell NetWare, The ARPANET – NSFNET – The Internet – X.25 networks – network standardization

UNIT II

Fourier analysis – Bandwidth limited signals – The maximum data rate of a channel – Transmission media –Wireless transmission – The telephone system – Structure of the telephone system – The local loop – Cellular radio – Communication Satellites

UNIT III

The channel allocation problem – Multiple accesses protocols – IEEE standard for LANS and MANS – Bridges – High speed LANS – Satellite networks - Data link layer design issues – error detection and correction elementary data link protocols. Network layer design issues – Routing algorithms –congestion control algorithms-internetworking- Internet layer in the internet

UNIT IV

The transport – The transport service – Elements of transport protocols – A simple transport protocol - Network security – Domain Name system – Electronic Mail – USENET NEWS – The World Wide Web – Multimedia - Distributed processing

UNIT V

Connectivity of vehicles : protocols AND frameworks – Security trust safety and privacy - Information Security –homomarphic encryption for cloud computing – Adhoc and deterministic network for mobility challenges and limitations relating to VANET and MANET- Sensor technologies and networks – ambient Intelligence in

REFERENCE:

1. Andrew S Tanenbaum, "Computer Networks", Prentice Hall of India private Ltd., New Delhi 3rd edition, 2013.
2. John Freer Pitman, "Computer Communication and Network", Computer system series, 2010.
3. Sitnie, "Computer Network (TCP/IP), Tata McGraw Hill, 2011.
4. Willams Stallings, "Data & computer communications", Pearson Education Asia, Sixth Edition, 2012.
5. RS Rajesh, KS Easwarakumar, R Balasubramanian, "Computer Networks-Fundamentals and Applications", 12th Edition, Vikas Publications, NewDelhi, 2012.

LAB EXERCISES

1. Implementing a simple client/server application using sockets and TCP/IP
2. Using of open SSH
3. Port forwarding
4. Sniffing
5. Proactive filtering of weak pass words and salting passwords
6. Using open SSH for communication confidentiality and integrity
7. Using open SSL to set up a simple certifying authority
8. Issuing and verifying certificates to avoid MITM attacks
9. Setting up of a firewall
10. Setting up of IP Sec virtual private network (VPN)
11. Packet capturing and packet replay attack
12. ARP spoof, DNS spoof attacks- man in the middle attacks demonstration
13. Logic for brute force attacks
14. Program that using hashing technique. Encryption and Decryption of file program.

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5					5	

Mean =15/5=3

MCA 5444 **Data Science (T+L)** **4hrs/4cr**

This course is to enable the students to under the concepts of Data Science, the skills required to become data scientist, different kind of analytics with hands-on in Python.

Upon completion of this course students will be able to:

1. Understand basic and key concept of data science . [understand)
2. Describe the skill required for data science on different analytic (Rembering)
3. Ilustrate classification and importantance data science . (applying)
4. Discuss the manipulation and interaction data By python(Evaluating)
5. Investigate the data with Python (Analyze)

Unit I

Introduction to Data Science – Why it is so relevant today? – Industries using Data Science, 2019 Trends – Roadmap to become Data Scientist and Learning path - Key Concepts: Data Science, Machine Learning & Artificial Intelligence

Unit II

Skills required for Data Science – Deep Dive of Analytics – Descriptive Analytics – Diagnostic Analytics – Predictive Analytics – Prescriptive Analytics

UNIT III

Classification – Forecasting – Recommendations – Optimization – Simulation – Why Mathematics is important for Data Science: Linear Algebra and Statistics

Unit IV

Hands on Data Analysis with Python – Manipulating Data Streams - Working with flat files - Working with unstructured files - Interacting with relational databases – Interacting with web-based data

Unit V

Exploratory Data Analysis and Visualization with Python – Creating basic graph – Adding measurements – Graph with styles and color – Graph with annotations and legends

Reference books:

1. Python for Data Science for Dummies – by Luca Massaron and John Paul Mueller

Bloom's Taxonomy	K1 Remembering	K2 Understanding	K3 Applying	K4 Analyzing	K5 Evaluating	K6 Creating
CO1		2				
CO2	1					
CO3			3			
CO4					5	
CO5				4		

Mean =15/5=3

MCA 6441 **Distributed and Cloud Computing** **4Hrs/4cr**

The Aim of this course is to introduce Distributed computing and the broad perceptive Cloud Architecture model, and to understand the concept of Virtualization and design of cloud Services, and be familiar with the lead players in cloud, and to explore the features of cloud simulator, and to employ different cloud programming model as per need.

Upon completion of this course students will be able to

1. Acquire the basic knowledge on distributed computing, Network types and Protocols.
2. Describe the cloud computing, Virtualization concepts and its types.
3. Understand the Architectural Design of Compute and Storage Clouds.
4. Discuss the Parallel & Distributed Programming Paradigms and Cloud Software Environments
5. Understand the security overview and Security Challenges and Risks

UNIT I

Definition of distributed computing system – evolution – models-issues in designing a distributed Operating System - Introduction to Distributed Computing Environment – Introduction to Network types - LAN,WAN technologies - Communication Protocols - ATM technologies

UNIT II

Cloud Computing –NIST Cloud Computing Reference Architecture - Cloud Models: - Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand - Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms

UNIT III

Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation. Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT IV

Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments - Eucalyptus, Open Nebula, Open Stack, Aneka, Cloud Sim

UNIT V

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control– Autonomic Security.

TEXT BOOK:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing", Parallel, 2012.

REFERENCE:

1. Kai Hwang, Jack Dongarra, Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing - Processing to the Internet of Things", Morgan Kaufmann Publications, 2012.
2. John W.Rittinghouse, James F.Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", Tata McGraw Hill, 2011.
4. Kumar Saurabh, "Cloud Computing – insights into New-Era Infrastructure", Wiley India, 2011.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud", O'Reilly, 2009.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1	2		4		
CO2	1	2			5	
CO3	1		3			6
CO4		2		4		
CO5	1				5	6

Mean =43/14=3.07

MCA 6443 **Data Mining and Warehousing** **4 Hrs/4cr**

Outcome:

The aim of the course is to help the students to understand the basic concepts of data mining and its classification along with its applications.

This course introduces data mining and data warehousing and its architectures, Tasks under data mining, Association Rules, Classifications of data mining and Application in data mining.

Learning outcomes:

Upon completion of this course students will be able to:

- Understand the basic functionalities and concepts of data mining and data warehousing.
- Analyse the need for data pre-processing and various steps involved in it.
- Categorize the methodologies and algorithms and be familiar with association rule mining techniques and constraint based association mining.

- Analyse the usages of Decision tree Algorithm, Bayesian Classification and Back Propagation techniques.
- Understand Clustering and Outline the applications and trends in Data mining.

UNIT I: Introduction to Data mining & Data warehousing

Introduction – Data mining – Data mining functionalities – kinds of patterns can be mined – classification – major issues. Data warehouse – A multidimensional data model – Data warehouse architecture – Data warehouse implementation – From data warehouse to data mining

UNIT II: Data pre-processing

Data pre-processing – Data cleaning – Data Integration and Transformation – Data Reduction – Discretization and concept hierarchy generation – Data mining primitives – Data mining Task – A data mining query language - Architecture of Data mining systems – Characterization and comparison

UNIT III: Association Rule Mining

Association Rule Mining – Mining single dimensional Boolean association rules from transactional databases – mining multilevel association rules from transaction databases- mining multidimensional association rules from Relational databases and Data warehouses – From association mining to correlation analysis

UNIT IV: Classification and prediction

Classification and prediction – Issues regarding classification and prediction – classification by decision Tree Induction – Bayesian Classification – Classification by Back propagation –classification based on concepts from association rule mining – prediction – classifier accuracy

UNIT V: Clustering & Trends in Data Mining

Clustering – Introduction to types of Clustering - Applications and Trends in Data Mining – Data mining system products and Research prototypes – Additional themes on Data mining – Social Impacts of Data Mining – Trends in Data mining

TEXT BOOK:

1. Jiawei Han, Michelien Kamber, "Data Mining Concepts and Techniques", 3rd Edition, 2014.

Reference books:

1. Arun K. Pujari, "Data Mining Techniques", Universities Press (India) Limited,2 nd Edition, 2013.
2. Alex Berson, Stephen j Smith , Data Warehousing ,Data mining and OLAP (Data warehousing / Data Management) , McGraw Hill 2012.
3. George M Marakas, Modern Data warehousing, Mining and Visualization: core concepts, Prientice Hall , First Edition, 2002
4. John Wang, Encyclopaedia of Data warehousing and Mining, Idea Group Publishing, 2009.
5. Shawkat Ali A B M, Saleh A. Wasimi, "Data Mining: Methods and Techniques ,Third Indian Reprint, Cengage Learning, 2010.

6. Soman K. P., ShyamDiwakar, Ajay V. "Insight into Data Mining Theory and Practice" , Fifth Printing, PHI Learning, 2011.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1	2				
CO2		2	3	4		
CO3		2	3	4		
CO4			3	4		
CO5			3	4		6

Mean =41/13=3.1

MCA 6645 **Dot Net Programming** **6hrs/6cr**

The aim of the course is to understand the fundamental concepts of .NET framework and its merits over other languages, it will enable the students to develop desktop applications and web applications.

Upon completion of this course students will be able to:

1. Define .net technology and its salient features
2. Explain the attributes of vb.net and write programs.
3. Perform database connectivity with vb.net and ado.net
4. Compare the properties of C# with vb.net and c++.
5. Create simple application systems using .net.

UNIT I:.NET TECHNOLOGY

Introduction - .Net revolution - Building blocks of .Net, overview of .Net applications .Net framework and its architecture Intermediate Language(IL), Common Language Runtime (CLR), JIT Compilation, Common Type System (CTS), Common Language System (CLS), Assemblies –Components of Assembly – DLL hell and Assembly Versioning

UNIT II: VB.NET

Introduction to VB.Net – and features of VB.NET- Arrays - procedures –scope – built-in functions – classes and objects – features of oops –constructors and destructors – creating property procedures – creating events – namespaces – import keyword - Inheritance , Polymorphism and Interfaces – overriding methods and properties – MyBase Keyword – MyClass Keyword – Abstract Base Classes – Shared members.

UNIT III: ADO.NET

Working with forms – Inheritance in windows forms – loading and showing forms –visual inheritance – adding controls – layout enhancement properties of controls – working with simple controls – adding menus – context menus - delegates -overview of ADO.Net –

ADO.NET Architecture – ADO.NET Components – Using ADO.NET – Data form wizard Components and Interoperability.

UNIT IV: C#.NET

Overview to C# - C # Compilation and Execution Process – C# Fundamentals (Data types, Operators, Programming constructs) –Inheritance –Sealed Classes – Interface - Polymorphism – Method Hiding – C# Property –Exception Handling

UNIT V: ASP.NET

ASP.Net- IIS - ASP.Net Page Life Cycle – ASP Vs ASP.Net - HTML Controls Vs Server side Controls –Validation Controls – Data binding in ASP.Net – Caching – Configuration in ASP.Net (web.config) –Session management – View State in ASP.Net.

Text book:

1. Kogent Learning Solutions Inc., ".NET 4.5 Programming 6-in-1, Black Book", 1 st edition, Dreamtech Press , 2013.

REFERENCE:

1. Evangelos Petroutsos, "Mastering Visual Basic .NET" 3d Edition, SYBEX, 2006
2. Bill Hamilton, "ADO.NET 3.5 Cookbook: Building Data Centic .net Applications", 2nd edition , O'Reilly, 2008.
3. Joseph Albahari, Ben Albahari, "C# 7.0 in a nutshell: The Definitive Reference", 1st edition, O'Reilly Media, 2017.
4. Dino Esposito, "Programming ASP.NET Core (Developer Reference)", 1st edition, Microsoft Press, 2018.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5					5	6

Mean =21/6=3.5

MCA 6447 **Artificial Intelligence** **4 hrs/4cr**

Upon completion of this course students will be able to:

1. Formulate the AI problem using strategies
2. To solve different problems using AI algorithm
3. Formulate a given problem in the language/framework of different AI methods.
4. Illustrate knowledge base system
5. Classify the expert systems

UNIT I: Introduction to AI

Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics - Specialized production system.

UNIT II: AI Algorithms

Problem solving methods – Problem graphs, Matching, Indexing and Heuristic functions - Hill Climbing-Depth first and Breath first, Constraints satisfaction – Related algorithms, Measure of performance and analysis of search algorithms

UNIT III: Knowledge Representation

Game playing – Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

UNIT IV: Rules of Inference

Knowledge representation -Production based system, Frame based system. Inference – Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning – Certainty factors, Bayesian Theory-Bayesian Network-Dempster – Shafer theory.

UNIT V: Expert Systems

Expert systems – Architecture of expert systems, Roles of expert systems – Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems – MYCIN, DART, XOON, Expert systems shells.

TEXT BOOK:

1. Stuart Russel and Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education, 2010.

REFERENCE:

1. David W. Rolston, "Principles of Artificial Intelligence and Expert System Development", McGraw Hill Book Company, 1988.
2. Elaine rich, Kevin Knight, "Artificial Intelligence", Tata McGraw Hill.
3. Carl Townsend, "Introduction to Turbo Prolog", 2nd Edition, Sybex Inc, 1987.

4. Stamations V. Kartalopous, "Understanding Neural Networks and Fuzzy Logic", Wiley Press, 1995.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5					5	6

Mean =21/6=3.5

MCA 6453 **.NET Lab** **4hrs/4cr**

Upon completion of this course students will be able to:

1. Recall simple programs and write programs on various concepts of VB.NET
2. Restate VB.NET forms
3. Apply ADO.NET on VBNET forms
4. Illustrate OOPS concepts in C#.net
5. Design web pages in ASP.NET

UNIT II: VB.NET

1. Create Simple application using web controls
2. Use of calendar control, Tree view control & Validation controls
3. Query textbox and Displaying records & Display records by using database
4. Write a Program to generate the factorial operation.
5. Write a Program to perform Money Conversion
6. Write a program using Constructor and Destructor
7. Write a program to implement Single Inheritance
8. Write a program to illustrate Overloading and Overriding
9. Write a program to demonstrate MyBase and MyClass keywords
10. Write a program to demonstrate Shared Members (variables and methods)

UNIT III: ADO.NET

1. Display data from a table
2. Data binding using data list control.
3. Data binding using data grid & Data grid control template
4. Inserting record into a database & Deleting record from a database
5. Create a complete system for student database

UNIT IV: C#.NET

1. Write a program to implement Inheritance
2. Write a program to implement friend function
3. Write a program to illustrate Operator overloading
4. Write a program to demonstrate Polymorphism
5. Write a program to handle user defined exceptions.

UNIT V: ASP.NET

1. Write a Program to create a simple web page.
2. Write a Program to create an Advertisement.
3. Write a Program to display the Holiday in calendar
4. Write a Program to perform data connectivity and handle database.
5. Write a Program to perform validation operation.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1	2				
CO2		2	3			
CO3			3	4		
CO4				4	5	
CO5					5	6

MCA 6640 **Project** **6cr**

The course is designed to give a real time industry experience and develop a software product.

Upon successful completion of the course the students will be able to

- Identify the software requirement.
- Analyse and design the system
- Develop the coding for the system
- Test the software
- Implement the system.

Each student shall be required to take up a Project work in the sixth semester. The Director shall assign the Guide at the end of the fifth semester and each student in consultation with the respective Guides shall choose their topic and company for which he/she shall do the project. Two copies of the Dissertation shall be submitted to the Director on or before the due date fixed by the Director.

Each student shall be required to appear for the viva voce in support of the Project report. The Dissertation will be evaluated both by the External examiner nominated by the Director and Internal Guide.

The marks for the Project work would be as follows.

Project Guide : max 150 (Continuous assessment -100: Viva voce – 50)
External Viva voce : max 50

Total : max 200

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1		2				
CO2				4		
CO3				4		
CO4					5	
CO5						6

Mean=21/5=4.2

MCA 0429 COMPUTER NETWORK STANDARDS AND PROTOCOLS 4 Hrs /4cr

This course introduces the basics of current computer networking protocols. The topics covered include TCP/IP, switching, routing, congestion control, Ethernet and applications protocols.

Upon completion of this course students will be able to:

1. Make them to Understand the basics of current computing protocols
2. Exploring networks protocols with various tools.
3. Making them to know network communication using socket programming
4. Network media and topologies
5. Network management, subneting and virtual LANS

UNIT I

Review of Basic Concepts - Network Architecture – Protocol Hierarchies, Layered model, services, interface - Reference Models - Underlying Technologies - LAN's (Ethernet, Token Ring, Wireless) , Point-to-Point WAN's -Switched WAN's (X.25, Frame Relay, ATM), Connecting devices -Addressing (Physical, Network, Transport) - The Internet Layer Protocols

UNIT II

IP- Datagram, fragmentation and reassembly- ICMP- types of messages, error reporting, ICMP Package -Bootstrap and Auto configuration.-BOOTP and DHCP Routing Protocols-Interior and Exterior Routing – RIP, OSPF, BGP - Multicast Routing - Unicast , Multicast and Broadcast, Multicasting, Multicast trees

UNIT III

The Transport Layer-The transport Service- Services provided, Service primitives, Sockets-Process-to-Process Communication – Port addresses- Elements of transport protocols – addressing, connection establishment, connection release, flow control and buffering, multiplexing, crash recovery - UDP

UNIT IV

Introduction, Remote Procedure Call-TCP – Service model, Protocol, frame format, connection establishment, release, connection management, Silly Window Syndrome - Nagle's - algorithm, error control, congestion control, state transition diagram-Sockets and Client-Server Model-Client-Server Model – Concurrency, Processes-Socket Interface – Sockets, Byte Ordering, Socket System Calls, Connectionless and Connection Oriented applications-Implementation of Sockets (C/Java etc)

UNIT V

Mobile IP - Mobility, routing and addressing, characteristics, operation, foreign agent discovery, registration and communication, two crossing problem, communication with computers on the home front.Introduction to Network Security-Cryptography, Symmetric key algorithms, Public Key Algorithms-Digital Signatures, Certificates, IPSec, Firewalls-Virtual Private networks, Network Address Translation, Authentication Protocols, Social Issues

TEXT BOOK

1. BehrouzForouzan, "TCP/IP Protocol Suite, 2nd Edition, Tata McGraw Hill

REFERENCES:

1. Andrew S Tanenbaum , "Computer Networks", 4th Edition, Prentice Hall
2. Douglas E. Comer, "Internetworking with TCP/IP, Vol. 1, Principles, Protocols and Architecture", 5th Edition, Prentice Hall, 2000.
3. William Stallings, "Data and Computer Communications", 7th Edition, Pearson.
4. Douglas E. Comer, "Internetworking with TCP/IP, Vol. 2, Design, Implementation and Internals", Prentice Hall.
5. Douglas E. Comer, "Internetworking with TCP/IP, Vol. 3, Client-server Programming and Applications", Prentice Hall Publisher.
6. Richard Stevens, "TCP/IP Illustrated, Vol. 1", Addison Wesley.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2		2				
CO3				4		
CO4			3			
CO5					5	

Mean= 15/5=3

MCA 0430 **ADVANCED WEB PROGRAMMING** 4hrs/4cr

Students can enhance their web development skills by learning PHP, MYSQL, AJAX, RUBY, RAILS and Angular Js. This paper will help in developing web pages quickly as well as dynamic.

Upon completion of this course students will be able to:

1. Define PHP commands and write programs.
2. Explain database connectivity in the context of PHP
3. Use Ajax Components on web pages to demonstrate dynamism
4. Analyse web development using Ruby and Rails
5. Create web page with Angular JS.

UNIT I: PHP

Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT II: PHP and MySQL

Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHPMyAdmin and database bugs.

UNIT III: AJAX Introduction

Introduction, AJAX Introduction, AJAX Components, Handling Dynamic HTML with Ajax, CSS to Define Look and Feel, Understand the XML Mark-up, XML HttpRequest.

UNIT IV: RUBY on RAILS

Introduction to Ruby, Features, Operators, Variables, Data Types, Control Statements, Class – Object, methods, blocks, modules, Strings, Arrays, , Oops concept,
Introduction to Rail, Rail MVC, Rails Layout, Session, Scripts, Filters, Validations.

UNIT V: ANGULAR JS

Introduction to Angular JS, Expressions, modules, Directives, data binding, services, tables, Events, forms, API, SQL, DOM

TEXT BOOK

1. Moulding, Peter, "PHP Black Book", Dreamtech Press Ltd, 2001.
2. David Flanagan, "The Ruby Programming Language", 1st edition, O'Reilly Media, 2008

REFERENCE:

1. Jon Duckett, "PHP & MYSQL Server side development", 1st edition 2019.
2. Thomas Powell, "Ajax: The Complete Reference" 1st edition , 2008
3. David A.Black, " The Well Grounded Rubyist", 2nd edition, Manning Publications, 2014
4. Nathan Murray, Felipe Coury, "Ng Book: The Complete guide to Angular", 5th edition, Createspace Independent Publishing Platform, 2018.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5						5

Mean= 15/5=3

MCA 0431 **Android programming (2T+2L)** **4hrs/4cr**

The aim of this course is to understand the theory as well as practical knowledge of mobile computing using android.

Upon completion of this course students will be able to:

1. Describe thefeaturs of the WAP
2. Discuss the Introduction to Android
3. construct the different buttons and menues
4. Illustrate different types of layout
5. creating different type of view

Unit I
Overview of the WAP – Components of WAP standard – WAP architecture – Design principles-difern

Unit II
Introduction to Android – Android architecture –Features – Applications - Versions – Flavors - Building the project.

Unit III
User Interface Architecture –Activity life cycle - Intents – Services – Content providers - UI Widgets – Text controls –Button controls – Toggle buttons – Menus – Options menu – Context menu – popup menu.

Unit IV
Layout manager – Relative layout – Linear layout - Table layout – Grid layout – Adaptor – Array adaptor – ArrayList adaptor – Base adaptor – Lists.

Unit V
View – Grid view – Web view – Scroll view – Search view – Dynamic list view – Expanded list view – Working with data storage – Shared preferences – Preferences activity – Files access – database connectivity using SQLite.

TEXT BOOK:

1. Learning Android, Marko Gargenta, Masumi Nakamura, O'Reilly, 2nd edition, 2014.

REFERENCE:

1. Principles of Mobile Computing, UweHansmann, LotharMerk, Martin S.Nicklous and Thomas Stober , Springer Professional Computing, 2nd Edition, 2008.
2. Mobile Computing Theory and Practice, KumKumGarg, Pearson Education, illustrated edition, 2010.
3. Mobile Computing and Wireless Communications, Amjad Umar, NGE Solutions, 2004.

Websites:

1. www.edunotes.in/mobile-computing
2. www.tutorialspoint.com/android.
3. www.javapoint.com/android.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2		2				
CO3			3	4		
CO4					5	
CO5						

Mean= 15/5=3

MCA 0419 **BIG DATA ANALYTICS** **4Hrs/4cr**

OBJECTIVE:

The aim of the course is to explore the fundamental concepts of Big Data Analytics, and enable them to analysis the big data using intelligent techniques, and facilitate them to understand various search methods and visualization techniques, and help them to employ the various techniques for mining data stream, and understand the applications using analytics tools to solve big data problems.

COURSE OUTCOME:

Upon completion of this course students will be able to:

- Explain the challenging nature big data and differentiate it with existing technologies.
- Design strategies to collect, manage, store, query, and analyze various datasets.
- Develop hands-on experience on large-scale analytics tools to solve big data problems.
- Understand the impact of big data in business decisions and strategy designing.
- Exhibit New skills in Big data analytics

UNIT I: Big Data in the Enterprise

Big Data in the Enterprise: Search at Scale- Multimedia Content-Sentiment Analysis-Enriching and Contextualizing Data- Data Discovery or Exploratory Analytics- Operational Analytics or Embedded Analytics- Realizing Opportunities from Big Data- Taming the "Big Data". **The New Information Management Paradigm:** What Is Enterprise Information Management?- New Approach to Enterprise Information Management for Big Data-Implications of Big Data to Enterprise IT.

UNIT II: Big Data Implications for Industry

Big Data Implications for Industry: The Opportunity- Big Data Use Cases by Industry Vertical. **Emerging Database Landscape:** The Database Evolution- The Scale-Out Architecture- Database Workloads- Database Technologies for Managing the Workloads-Columnar Databases- Requirements for the Next Generation Data Warehouses- Polyglot Persistence: The Next Generation Database Architecture.

UNIT III: Application Architectures for Big Data and Analytics

Application Architectures for Big Data and Analytics: Big Data Warehouse and Analytics-Big Data Warehouse System Requirements and Hybrid Architetures-Enterprise Data Platform Ecosystem- BDW and EDW- How Does Traditional Data Warehouse processes map to tools in Hadoop Environment- How Hadoop Works- The Hadoop Suitability Works- Additional Considerations for Big Data Warehouse- Big Data and Master Data Management- Data quality Implications for Big Data- Putting it all Together- A Conceptual BDW Architecture.**Data Modeling Approaches for Big Data and Analytics Solutions:** Understanding Data Integration Patterns- Big Data Workload Design Approaches- Map-Reduce Patterns, Algorithms, and Use Cases- No SQL Data Modeling Techniques.

UNIT IV: Big Data Analytics Methodology

Big Data Analytics Methodology: Challenges in Big Data Analysis- Big Data Analytics Methodology- Analyze and Evaluate Business Use Case- Develop Business Hypotheses. **Extracting Value from Big Data: In Memory Solutions, Real Time Analytics, And Recommendation Systems:** Building a Recommendation System.

UNIT V: Data Scientist

Data Scientist: The New Skill: Data Scientist- The Big Data Workflow- Design Principles for Contextualizing Big Data- A Day in the Life of a Data Scientist.

TEXT BOOKS:

1. **"Big Data Principles and best practices of scalable real time data systems"** Nathan Marz, James Warren Dreamtech Press Edition, 2015.
2. **"Big Data Analytics: Disruptive Technologies for changing the game",** Dr. Arvind Sathi, Elsevier, 2013, ISBN 978-1-58347-380-1.

REFERENCE:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", 1st Edition, Tata McGrawHill, 2012.
3. Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

4. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
5. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007.
6. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
7. Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, "Intelligent Data Mining", Springer, 2007.
8. Michael Minelli (Author), Michele Chambers (Author), Ambiga Dhiraj (Author), Big Data, "Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1	2				
CO2	1	2	3			
CO3		2	3	4		6
CO4		2	3	4	5	
CO5			3			6

Mean= 47/15=3.1

MCA 0433 **Biometrics** **4 Hrs/4cr**

The aim of this course is to enable the student to understand the security and authentication methods available in biometrics techniques such as finger prints, hand print, face, Iris, Retina, and voice recognition and the technology behind them.

Upon completion of this course students will be able to:

1. Exploring the biological characteristics
2. Individual physically and behaviourally distinctive in a number of ways
3. Making them to understand technology uses and applications
4. Exploring with the scientific basis of biometrics
5. Enhancing the security by combining more than one

UNIT I

Biometrics – Introduction- Verification vs Identification – Applications – Facts other common Biometric characteristics. Finger print technology - Technical Description – Finger print security characteristics – Technology uses and applications increased or decreased costs.

UNIT II

Face Technology – Technical Description – Face Recognition security characteristics – Face Technology uses - Face Technology considerations – Network product commonalities. Iris and Retina Vascular Pattern Technology – Technical Description- Technology uses and applications- Implementation criteria – Increased or Decreased costs – Sample product.

UNIT III

Other Physical Biometrics – Hand Scan Geometry – Hand Print Biometrics – DNA Biometrics – Signature And Hand Writing Technology – Technical Description – Classification – Technology Uses And Applications

UNIT IV

Voice Recognition – The speaking voice and factors to consider – How vowels are formed – Rules for modifying vowels – Spectral Analysis – Factors influencing fundamental frequency – Voice qualities and Recognizing Distinctiveness

UNIT V

Multi-biometrics and Two factor authentication – Executive decision – Establish goals – Need analysis – Selection criteria – Ripple security logic – Selection process – Implementation Plan

TEXT BOOK:

1. John D Woodward Jr, Nicholos M Orlans and Peter T Higgins, "Biometrics", Osborne Publications, 2003.

REFERENCE:

1. Julian Ashbourn, "Practical Biometrics: From Aspiration to Implementation", Springer Professional Computing, 2001.
2. RundBolleJohnathan, H. Connell, Nalini K Ratha, "Guide to Biometrics" Springer Professional Publications, 2000.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2		2				
CO3			3	4		
CO4					5	
CO5						

Mean= 15/5=3

MCA0434 **Compiler Design** **4 Hrs /4cr**

This course is to enable the students to understand the basic concepts in compiler construction. Fundamental concepts in compilers, structure of the compiler and the tools to write compilers are introduced. Internal process mechanism in a compiler is included. Parsing techniques and Translation schemes are introduced.

Upon completion of this course students will be able to:

1. Understand the different phases of compiler.
2. Design a lexical analyzer for a sample language.
3. Apply different parsing algorithms to develop the parsers for a given grammar.
4. Describd syntax-directed translation and run-time environment.
5. Discuss to implement code optimization techniques and a simple code generator.

UNIT I

Introduction To Compilers – Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.

UNIT II

Parsers – Shift-reduce parsing – Operator-precedence parsing – Top-down parsing – Predictive parsers – LR Parsers – The canonical collection of LR (0) items- Constructing SLR parsing tables – Constructing canonical LR parsing tables – Constructing LALR parsing tables – Using ambiguous grammars – An automatic parser generator – Implementation of LR parsing tables – Constructing LALR sets of items.

UNIT III

Syntax-directed translation schemes – Implementation of syntax-directed translators – Intermediate code – Postfix notation

UNIT IV

Three-addresses code, quadruples and triples – Postfix translations – The contents of a symbol table – Data structures for symbol tables – Representing scope information

UNIT V

Errors – Lexical-phase errors – Syntactic-phase errors – Semantic errors – The principal sources of optimisation – Loop optimization – The DAG representation of basic blocks – Object programs – Problems in code generation – A simple code generator – peephole optimization

TEXT BOOK

1. Aho AV, Ullman JD, Principles of Compiler Design, Narosha Publications, 1999.

REFERENCE:

1. William A Bar, RM Bates, DA Gustaf, John D. Couch, "Compiler Construction", Galgotia Publications.
2. V. Raghavan, Principles of Compiler Designl, Tata McGraw Hill Education Publishers, 2010.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2		2				
CO3				4		
CO4			3			
CO5					5	

Mean= 15/5=3

MCA 0428 **Computer Hardware Components** **4hrs/4cr**

The aim of the course is to identify each sub-assembly, expansion boards, and connectors. Get some insights into CPU evolution and capabilities. The principles of PC-TV boards - Upgrading a PC

This course will enable students to gain confidence with the PC hardware by way of assembling, disassembling, installing both the hardware and software and upgrading and thereby help them to cut a better edge over others.

Upon completion of this course students will be able to:

- Gain insights into the Inside of a PC
- Understand the functioning of the Disks and Discs drives.
- Develop hands-on experience on Memory installation practices.
- Understand the functioning of Modem.
- Understanding the PC sound and TV boards

UNIT I: Inside of a PC

Enclosure: Layout of a typical desktop PC – Layout of typical tower PC. Switching Power Supplies: Connecting the Power Supply: AT-style power connections – Drive power connections – ATX/NLX style power connections – Voltage tolerances - Motherboard: Socket 7, Socket 8, or Slot 1. AT, ATX, and NLX – Layout and Connector pin-outs of Intel motherboard – Connector layout of a typical back panel - Intel Pentium Chipsets - The Intel CPU's

UNIT II: Disk and Disc Drives

Floppy Drives: Magnetic-Storage Concepts – Media – Data and disk organization – Drive electronics – Physical Interface. Hard Drives: Platters and media – Airflow and head flight – Tracks, sectors, and cylinders. IDE/EIDE features and architecture – Drive electronics – Read / Write Heads - CD-ROM and CD-R Drives: CD Media – CD data EFM and data storage –

CD-ROM standards – CD-ROM mechanics – CD-ROM electronics - DVD Drives: Specifications and Standards – DVD Media – Inside the DVD Drive

UNIT III: Memory Concepts

Essential Memory Concepts – Memory signals – Memory Package styles and structures – Memory Types – Memory Techniques: Memory Installation and Options VIRUS- Firewalls

UNIT IV: Modem Construction and Operation

Basic Modem Construction and Operation: The internal modem - The external modem – Advanced modem features – Understanding Signal Modulation – Signalling Standards

UNIT V: Understanding the PC sound and TV boards

Sound Boards: Recording and Playback process – MIDI - Video Capture / PC-TV Boards: Understanding PC-TV Boards

TEXT BOOK:

1. Stephen J Bigelow, "Troubleshooting, Maintaining & Repairing PCs", Tata McGraw Hill, Second Edition, 2004.

REFERENCE:

1. Craig Zacker & John Rourke, "PC Hardware: The Complete Reference", Tata McGraw-Hill, 2001.
2. Govindarajalu B, "IBM PC and Clones: Troubleshooting and Maintenance", Tata McGraw Hill, 2002.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1	2				
CO2	1	2	3			
CO3			3	4		
CO4		2	3		5	
CO5		2	3		5	6

Mean= 42/14=3

MCA 0436 **Multimedia and Applications** **4Hrs/4cr**

This course gives a detailed study of the multimedia systems and the technologies that support the components of multimedia. Hands on training will be given on multimedia applications with the help of Sound Forge, Movie Maker and macro media FlashMX. Advanced concepts of action script in flash will be implemented.

At the end of the course the student will be able to:

1. Recall Distributed Multimedia Systems and the components of Multimedia.
2. Summarize the need and requirements of Continuous Multimedia Systems.
3. Develop Audio and Video applications using Authoring Tools.
4. Create interactive media applications using basic animation techniques in Flash.
5. Build interactive Forms using Action Script and the Objects in Flash.

UNIT I

Uses of multimedia information – Architectures and issues for distributed multimedia systems – Digital Audio representation and processing - Video Technology - Digital video and Image Compression - Time based media representation and delivery

UNIT II

Operating System support for continuous media applications – Middleware system services - Architecture - Multimedia file systems and information models - Multimedia services over the public network – Knowledge based Multimedia systems.

UNIT III

Introduction to Sound Forge - Non-linear editing: meaning and process -sequencing -Audio Editing Tools - Process of equalization -Applying effects to sound - Audio Mixing - Introduction to Movie maker- Design, create and edit a movie using Movie maker - import audio clips into Movie Maker

UNIT IV

Introduction to Flash MX - Animation Techniques in Flash MX - Action Scripts - constructs – Functions - Objects – Understanding Text usage - Predefined objects.

UNIT V

Using and building Components – Data driven Flash solutions – scrolling, dragging, making menus, dynamic drawing, Using Forms

TEXT BOOK:

1. John F Koegel Buford, "Muiltimedia Systems", Pearson Education, 2001.

REFERENCE:

1. James E Shuman, "Multimedia in Action", Vikas Publications, 2001.
2. Robert Reinhardt and Joey Lott, "Flash Action Script Programming Bible", John Willey Dream Tech Publications, 2002.
3. "Macro Media Director 8.5 Shockwave studio user manual", Macromedia Publications, 2002.
4. Derek Franklin and Jobe Makar, "Flash MX Action scripting training from the source", Macromedia Press, 2003.
5. Colin Moock, "Action Script for Flash MX", Oreilly publications 2nd Edition, 2002.

6. Gary Rosenweig, "Special Edition Using Macromedia Director MX", QUE Publications, 2003.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2		2				
CO3			3			
CO4						6
CO5						6

Mean = 18/5=3.6

MCA 0437 **Organizational Behaviour** **4Hrs/4cr**

At the end of the course, students will be able to

1. Practice the various organizational behaviour models.
2. adopt various motivation and leadership theories.
3. Evaluate various types of groups and group decision making techniques.
4. Nurture the factors influencing organizational climate.
5. Manage the causes for conflict and coping techniques of stress handling.

UNIT I

Management Concepts and Organisational Behaviour: Concepts and its significance, Introduction to OB, Relationship between management and organizational behaviour. Individual Behaviour: Theories of values and attitudes, Personality, Perception, Learning, theories of motivation.

UNIT II

Group Dynamics and Team Development: Definition, importance, types of groups, Group formation, Group development, Group composition, Group performance factors-principle, centred approach to team development.

UNIT III

Leadership: Concept, Styles, Theories: Trait theory, behavioral theory, contingency theory, situation theory, Power and authority.

UNIT IV

Organizational Conflict: Dynamics and Management, sources, patterns, levels and types of conflict, traditional and modern approaches to conflict, functional and dysfunctional organizational conflicts, resolution of conflict, transactional analysis.

UNIT V

Organisational Change and Development: concept, need for change, resistance to change, theories of planned change, Organisational diagnosis, OD intervention. Organisational climate and change.

Text Books:

1. Fred Luthens, Organisational Behaviour Mc. Graw Hill International Edition, 12th edition, 2010.
2. Aswathappa. K, Organisational Behaviour, Himalaya Publishing House, 12th Revised Edition, 2017

References:

1. Keith Davis and John. W. Newstrom (8th Edition) Human Behaviour at work, McGraw Hill, International Edition 2000
2. Stephen. P. Robbins, Organisational behaviour, PHI Pvt. Ltd., 9th Edition 2011
3. Chandan, Organisational Behaviour, TBH Publishers, 2003
4. Koontz, Harold, Cyril O'Donnell, and Hienz Weirich: Essentials of Management Tata Mc GrawHill, New Delhi.2013

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2		2				
CO3				4		
CO4			3			
CO5					5	

Mean = 15/5=3

MCA0438 **Parallel computing using OpenCL** **4Hrs/4cr**

The aim of the course is to enable the students to understand OpenCL standard for programming heterogeneous computers built from CPUs, GPUs and other processors. Using OpenCL to write task-based and data-parallel programs to realize the advantage of these different types of processors in a single system.

Upon completion of this course students will be able to:

1. Exploring the parallel computing knowledge
2. Making them to design software using suitable searching technique.
3. Exploring Graph algorithm to speed up the processing.
4. Students to develop program compatible to any gadgets.
5. Develop to optimize the memory usage.

UNIT I

Introduction - Need for Parallel Computing - Scope of Parallel Computing – Issues in Parallel Computing - Models of Parallel Computing - Taxonomy of Parallel Architectures - Dynamic Interconnection Networks - Static Interconnection Networks - Message Transfer - Reduction, Parallel Prefix - GPU thread model

UNITII

Performance Modelling - Metrics - Granularity - Scalability – Overhead - Isoefficiency - Matrix Algorithms - Matrix Partitioning - Matrix Transposition - Matrix Vector Multiply - Matrix Multiply - CUDA, vector add, matrix multiply, sequence alignment -Linear Equations - LU(P) Decomposition-Searching and Optimization - The knapsack problem -Branch and Bound -Dynamic Programming -Sorting - Types of sorters -Sorting networks - Radix / Bucket sorts

UNIT III

Graph algorithms -Minimum Spanning Tree - Single Source Shortest Paths -All Pairs Shortest Paths - Fast Fourier Transforms - Fourier Series, basis functions, Euler - Discrete and Fast Fourier Transforms - Convolution, roots of unity, divide and conquer - Evaluation and Interpolation -Recursive, bit reversal, iterative Cooley - Tukey FFT - Pease FFT, locality

UNIT IV

Introduction to OpenCL - OpenCL Architecture - Programming Model - Getting Started - Software Development Environment and Tools - Debugging tools -Getting into OpenCL Details - OpenCL Kernel Programming - Data Types and Type Checking-GPU - specific Features-Advanced OpenCL - Developing applications on Heterogeneous devices - OpenCL Images - API Features – Graphics API Bindings

UNIT V

Generic Application tuning - Evaluating Application Performance - Performance Tuning Tips - Optimizations on Multi - Core CPUs-Optimization on Many - Core Architectures - GPU architectures - GPU Threading Concepts - GPU Memory Hierarchy - ATI GPU Architecture - Nvidia GPU Architecture

TEXT BOOK:

1. Kai Hwang and Zhi.WeiXu, "Scalable Parallel Computing", Tata McGraw-Hill, New Delhi, 2003.

REFERENCE:

2. David E. Culler &Jaswinder Pal Singh, "Parallel Computing Architecture: A Hardware/Software Approach", Morgan Kaufman Publishers, 1999.
3. Michael J. Quinn, "Parallel Programming in C with MPI &OpenMP", Tata McGraw-Hill, New Delhi, 2003.
4. Kai Hwang, "Advanced Computer Architecture" Tata McGraw-Hill, New Delhi, 2003.
5. David B. Kirk, Wen-mei W. Hwu. Programming Massively Parallel Processors: A Hands-on Approach. Morgan Kaufmann, 2010.
6. http://amd.developers.opencl/

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2		2				
CO3			3			
CO4				4		
CO5					5	

Mean = 15/5=3

MCA 0439 **Soft Computing** **4 Hrs/4cr**

The aim of this course is to provide the basic idea about Fuzzy sets and fuzzy logics. It also discusses the operations and applications of fuzzy logics.
This course also introduces various ANN structures such as feed forward with back propagation, Counter propagation networks, Hopfield nets, BAM structure and ART architecture.

At the end of the course the student will be able to:

1. Recall the difference between Crisp and Fuzzy sets and recognize Fuzzy Operations.
2. Design Fuzzy Based Applications.
3. Compare and contrast Biological and Artificial Neurons and explain the basic ANN algorithm.
4. Assess different ANN training algorithms.
5. Design Recurrent Networks and Elaborate ART architecture.

UNIT I

Soft Computing: Meaning and Features - Introduction to Fuzzy Logic - Fuzzy set – Fuzzy Set versus Crisp set – Operation on Fuzzy Sets – Fuzzy Arithmetic - Fuzzy relations

UNIT II

Constructing Fuzzy Sets and Operations on Fuzzy Set – Fuzzy rule based system: Fuzzy propositions – formation - decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.

UNIT III

Why Neural Networks? - Characteristics of ANN – Training of ANN – Activation function – Multilayer networks - Back Propagation – The training algorithm, Forward pass, reverse pass, Adjusting weights – Advanced Algorithms – Applications.

UNIT IV

Counter Propagation Networks – Network Structure – Kohonen layer – Training, Interpolative Mode - The Grossberg Layer – An Application. Statistical methods – Training applications - Boltzmann Training - Cauchy Training.

UNIT V

Hopfield Nets – Recurrent Network Configuration, Stability, Associative Memory BAM - Adaptive Resonance Theory – ART Architecture

TEXT BOOK:

1. Phillip D Wasserman – Neural Computing Theory and Practice – Van Nostrand Reinhold Publications, Newyork, 1989.

REFERENCE:

1. Valluru Rao, Haya Griva Rao and Valluru B Rao – C++ Neural Networks and Fuzzy Logic – Addison Wesley, 1999.
2. Stamastios V Kartalopoulos – Understanding Neural Networks and Fuzzy Logic Basic Concepts and Applications – IEEE press, PHI publications, 1996.
3. Klir, GJ, Youan Bo, "Fuzzy Sets and Fuzzy Logic", Prentice Hall, 2012.

Bloom's Taxonomy	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1	1					
CO2						6
CO3		2				
CO4					5	6
CO5						

Mean = 20/5=4

Curriculum for M.Phil Tamil

Proposed Curriculum Plan for Research programmes Tamil For the Academic year 2019-20

Semester	Code	Title	Hours	Credits	Marks
I	MPT 6607	ஆய்வு நெறிமுறைகளும் ஆய்வுப் பயிற்சியும்	6	6	120
	MPT 6609	தமிழ் இலக்கண - இலக்கியப் போக்குகள்	6	6	120
II	MPT 6608	இயக்கங்களும் இலக்கியமும்	6	6	120
	MPT 6610 & MPT 6611	ஆய்வேடு	-	12	240

MPT 2

Programme Specific Outcomes (PSOs) for Research Programmes

நிறை நிலை (எம்.ஃபில்) கற்ற மாணவர்கள் பின்வரும் திறன்களைப் பெற்றிருப்பர் (கற்றலின் விளைவு):

1. தமிழ்மொழியின் செவ்வியல் கூறுகளையும், இன்றைய தமிழின் நவீனக் கூறுகளையும் உருவ மற்றும் உள்ளடக்க நிலையில் - ஆராய்ச்சி முறையில் அணுகி, இரண்டிற்கும் உள்ள வேர்களையும் மொழிக்குள் இயங்கும் அறுபடாத மரபுத் தொடர்ச்சியையும் இனம்காணும் திறன் பெற்றிருப்பர்.

2. தமிழ் இலக்கணமும் இலக்கியமும் ஒன்றுடன் ஒன்று இயைந்து இருப்பதை இனங்கண்டும், அவை காலந்தோறும் சமூக, அரசியல் மற்றும் பொருளாதாரச் சூழலால் தாக்கங்களுக்கு உள்ளாவதையும் ஆராய்ச்சி மனப்பான்மையுடன் அணுகும் திறன் பெற்றிருப்பர்.

3. தமிழ்மரபில் தோன்றிய கோட்பாடுகளையும், மேலைத் தேயத்துக் கோட்பாடுகளையும் பிரதியுடன் பொருத்தியும், விவாதித்தும் ஆய்வை அடுத்தக்கட்ட வளர்ச்சியை நோக்கி நகர்த்திச் செல்லுகிற திறனைப் பெற்றிருப்பர்.

4. ஆய்வு மனப்பான்மையுடன் படைப்பை அணுகும் திறத்தையும், தொடர்ந்து வாசிக்கும் பழக்கத்தையும் கொண்டிருப்பதால், புதுமையான மெய்மைகளை வெளிக்கொணர்ந்து சிறந்த ஆய்வாளராகும் பேறு பெற்றிருப்பர்.

5. ஆய்வுக்குத் தொடர்பான தரவுகளையும், சான்றாதாரங்களையும் தொகுக்கவும் மற்றும் பகுக்கவும் அறிந்திருப்பதால், அவற்றின் மூலம் ஆய்வின் நோக்கத்தை நிறைவேற்றும் ஆய்வாளராகும் திறன் பெற்றிருப்பர்.

6. கண்டறிந்த ஆய்வின் மெய்மைகளைக் காலத்திற்கேற்பப் புதுமையாக்கிக் கொண்டு அவற்றின் மூலம் சமூக முன்னேற்றத்திற்கும், தொழில் நுட்ப வளர்ச்சிக்கும் பயன்படுத்துகிற திறன் பெற்றிருப்பர்.

7. தகவல் தொடர்புச் சாதனங்களைப் பயன்படுத்தும் திறன் மூலம் பேட்டி, நேர்காணல், வினாநிரல், பட்டியல் போன்றவற்றைத் தயாரித்து ஆய்வுக்கேற்ப அவற்றை வடிவமைக்கும் திறன் பெற்றிருப்பர்.

8. இலக்கண மற்றும் இலக்கிய மரபுகளின் வழியாகவும், பல்வேறு கோட்பாடுகளின் வழியாகவும் பெற்ற கருத்துக்களைக் கொண்டு, ஆய்வுக்கேற்ற, நேர்த்தியான கருதுகோளை வடிவமைக்கவும், சோதித்தறியவும், வரையறை செய்யவுமாகிய திறன் பெற்றிருப்பர்.

9. பலவிதப்பட்ட அணுகுமுறைகளை மற்றும் கோட்பாடுகளைக் கொண்டு, தமக்கான ஆய்வுச் சிக்கலை, உயிரோட்டமான ஆய்வுத் தலைப்பைத் தேர்வு செய்கிற திறன் பெற்றிருப்பர்.

10. ஆய்வுக்குரிய விதிமுறைகளைப் புரிந்து கொண்டு, ஆய்வு முடிவுகளை முன் வைத்து ஆய்வுக் கட்டுரைகள் எழுதவும், அவை தொடர்பாகப் பேசவும், விவாதிக்கவுமான திறன் பெற்றிருப்பர்.

MPT 3

Mapping of Courses Outcomes (COs) with Programme Specific Outcomes (PSOs)

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
PGT 6607	√	√	√	√				√	√	√
PGT 6609	√		√	√					√	√
PGT 6608				√	√	√	√	√	√	√

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
PSO 1		√	√	√	√			√		√
PSO 2		√	√	√			√		√	
PSO 3			√	√	√		√		√	
PSO 4	√	√		√	√		√	√		
PSO 5		√		√				√	√	√
PSO 6		√	√	√	√					√
PSO 7		√				√	√			
PSO 8	√	√			√				√	
PSO 9				√				√	√	√
PSO 10	√	√			√		√	√	√	√

MPT 4

MPT 6607 ஆய்வு நெறிமுறைகளும் ஆய்வுப் பயிற்சியும் 6Hrs/6Cr

நோக்கம்:

ஆய்வு நெறிமுறைகள் பற்றிய அறிமுகத்தைப் பெறுவதோடு, தெரிவு செய்த தலைப்பில் ஆய்வேட்டினை உருவாக்குதல் இப்பாடத்தின் நோக்கங்களாக அமைகின்றன.

கற்றலின் பயன்:

1. ஆய்வைப் பற்றி வரையறுக்கவும் விவரிக்கவும் பேசவுமான திறன்களைப் பெற்றிருப்பர்.

2. ஆய்வு எது? ஏன், எப்படி? என்று அடையாளங்கண்டு ஆராயும் திறனைப் பெற்றிருப்பர்.

3. ஆய்வை எழுதுவதற்கான முறையைத் திட்டமிட்டு, முடிவு செய்து எழுதும் திறனைப் பெற்றிருப்பர்.

4. ஆய்வைப் பல்வேறு துறைகளோடு இணைத்து எழுதும் திறனைப் பெற்றிருப்பர்.

5. ஆய்வுத் தலைப்பைத் தெரிவு செய்த பின்னர், அதனைத் திட்டமிட்டு வடிவமைப்புச் செய்து, முழுமையாக எழுதும் திறனைப் பெற்றிருப்பர்.

கூறு:1

ஆய்வின் தேவையும் நோக்கமும்: ஆய்வு விளக்கம் - ஆய்வு நாகரிகம் - ஆய்வுக் கள அறிமுகம் - தமிழின் ஆய்வு மரபு - உரையாசிரியர்களின் ஆய்வு முறை - ஆய்வாளரின் பண்புகள்.

கூறு:2

ஆய்வேட்டின் அமைப்பு: ஆய்வு நோக்கில் நூலை வாசிக்கும் முறை - தலைப்புத் தெரிவு - கருதுகோள் - தகவல் சேகரிப்பு - கள ஆய்வு - தகவல் திரட்டல் - குறிப்பெடுத்தல் - அறிக்கை தயாரித்தல். - அடிக்குறிப்பு - மேற்கோளாட்சி - துணை நூற்பட்டியல் - பின்னிணைப்பு - படங்கள் அட்டவணைகள்.

MPT 5

கூறு:3

ஆய்வு அணுகுமுறைகள்: விளக்க முறை ஆய்வு - சமூகவியல் ஆய்வு - ஒப்பீட்டியல் ஆய்வு - வரலாற்று முறை ஆய்வு - அமைப்பியல் ஆய்வு - மொழியியல் ஆய்வு - உளவியல் ஆய்வு, பெண்ணிய, தலித்திய ஆய்வுகள், நவீனத்துவ, பின்நவீனத்துவ, பின்காலனிய ஆய்வு முறைகள் குறித்த விளக்கங்கள்.

கூறு:4

ஆய்வும் பிறதுறைகளும்: இலக்கியவியல் - நாட்டுப்புறவியல் - மானிடவியல்- தொல்லியல் முதலியன குறித்து விளக்குதல்.

கூறு:5

ஆய்வேட்டை உருவாக்குதல்: ஆய்வுக்கட்டுரை மற்றும் ஆய்வேடு எழுதப் பயிற்சி அளித்தல் - சிற்றிதழ்கள் சார்ந்த ஆய்வுமுறையியலை அறிமுகப்படுத்தி நிறுவனம்சார் ஆய்வுகளுடன் பொருத்திக்காட்டுதல்.

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Bloom's Taxonomy	K1	K2	K3	K4	K5	K6
CO1		**2**				
CO2			**3**			
CO3				**4**		
CO4					**5**	
CO5						**6**

MEAN : 4

MPT 7

MPT 6609 **தமிழ் இலக்கண - இலக்கியப் போக்குகள்** **6Hrs/6Cr**

நோக்கம்:

காலந்தோறும் தமிழ் இலக்கண - இலக்கியங்கள் உருவ, உள்ளடக்க நிலையில் அடைந்த மாற்றங்கள், வளர்ச்சிப் போக்குகள் முதலியன பற்றி அறிமுகம் பெறுதலும், இவற்றினூடேயுள்ள ஆய்விற்குரிய தளங்களை உற்றுநோக்கி அறிந்துகொள்ளுதலும் இப்பாடத்தின் நோக்கங்களாக அமைவுபெறுகின்றன.

கற்றலின் பயன் :

1. தொல்காப்பியத்தின் தாக்கம் நன்னூல், புறப்பொருள் வெண்பாமாலை போன்ற பிற்கால இலக்கண நூல்களில் தொழிற்பட்டுள்ளமையை இனங்கண்டு, பொருத்திப் பார்க்கும் திறன் பெற்றிருப்பர்.

2. தொல்காப்பியம் உருவாக்கியுள்ள அகம் மற்றும் புறக் கோட்பாடுகளைப் புரிந்து கொள்வதோடு, அது காலந்தோறும் செலுத்தி வருகிற செல்வாக்கைப் பற்றி ஆய்வு நோக்குடன் வெளிப்படுத்துகின்ற திறனைப் பெற்றிருப்பர்.

3. காலந்தோறும் எழுந்த காப்பியங்கள், பக்தியிலக்கியங்கள், சிற்றிலக்கியங்கள் ஆகியனவற்றைப் பற்றிப் புரிந்து கொள்வதோடு, அவற்றை வகைப்படுத்துகிற திறனையும் பெற்றிருப்பர்.

4. இலக்கண - இலக்கிய உரையாசிரியர்களிடையே உள்ள கருத்தியல் சார்ந்த, பிரதிசார்ந்த வேறுபாடுகள் பற்றி விவாதிக்கும் திறனைப் பெற்றிருப்பர்.

5. மரபுக் கவிதையிலிருந்து நவீனக் கவிதை, உரைநடை ஆகியனவற்றைப் பிரித்துப் பார்க்கின்ற திறனையும் சுயமாக இவற்றைப் பற்றித் திறனாய்ந்து எழுதும் திறனையும் பெற்றிருப்பர்.

கூறு:1

தொல்காப்பிய இலக்கண அமைப்பு - தொல்காப்பியத்தை அடியொற்றி எழுந்த நன்னூல் - நம்பியகப்பொருள் - புறப்பொருள் வெண்பா மாலை - யாப்பருங்கலக காரிகை - தண்டியலங்காரம் முதலிய இலக்கண நூல்களை இனங்காட்டுதல்.

MPT 8

கூறு:2

தொல்காப்பரின் அக, புறக் கொள்கைகள் - சங்க இலக்கியங்களில் அகப், புற கருத்துகள் மையமாகும் நிலை - சங்க மருவிய கால இலக்கியங்கள் - காப்பியங்கள்-பக்தி இலக்கியங்கள் - சிற்றிலக்கியங்கள் - தற்கால இலக்கியங்கள் வரைக்கும் அதன் தாக்கத்தை விளக்குதல்.

கூறு:3

அற இலக்கியத் தோற்றம் - காப்பிய இலக்கிய வடிவம் - காப்பியத்தில் மையமாகும் சமண, பௌத்தக் கருத்தியல் - பக்தி இலக்கியத் தோற்றம் எழுச்சி - வைதீகக் கருத்தியல் - சிற்றிலக்கியங்களின் தோற்றம் - உருவ, உள்ளடக்க மாற்றத்தைச் சுட்டிக்காட்டுதல்.

கூறு:4

உரைமரபு - உரையாசிரியர்களின் காலச்சூழல் - தொல்காப்பியம் முதல் சிற்றிலக்கியக் காலம் வரைக்குமான உரையாசிரியர்களின் பங்களிப்பு உரையாசிரியர்களின் பிரதி சார்ந்த வேறுபாட்டை விளக்கிக் கூறுதல்.

கூறு:5

ஐரோப்பியர் வருகை - மரபிலக்கிய மாற்றச் சூழல் - கவிதை இலக்கியம்: மரபுக்கவிதை - வசன கவிதை - புதுக்கவிதை - நவீன கவிதை; உரைநடை இலக்கியம்: சிறுகதை-நாவல் - நாடகம் ஆகிய இலக்கியங்களின் நுட்பங்களை உணர்த்துதல்.

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MPT 9

10. கா.சிவத்தம்பி - பண்டைத் தமிழ்ச் சமூகம்வரலாற்றுப் புரிதலை நோக்கி, மக்கள் வெயீடு, 2003.

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Bloom's Taxonomy	K1	K2	K3	K4	K5	K6
CO1		**2**				
CO2			**3**			
CO3				**4**		
CO4					**5**	
CO5						**6**

MEAN : 4

MPT 11

MPT 6608 இயக்கங்களும் இலக்கியமும் 6Hrs/6Cr

நோக்கம்:

இலக்கியங்களில் மையமாகும் சிந்தனைப் போக்கைக் கோட்பாடாக வாசித்துப் புரிந்து கொள்ளுதலும், தமிழ்ச் சமூகம், அரசியல், சமயம், பண்பாடு சார்ந்த காரணிகளின் வழியாக உருப்பெற்ற இயக்கங்களானவை, இலக்கியங்களைப் பாதித்த முறையினை விளங்கிக் கொள்ளுவதும் இப்பாடத்தின் நோக்கங்களாகும்.

கற்றலின் பயன் :

1. சங்க, சங்க மருவிய இலக்கியங்களுக்குள் இருக்கும் கோட்பாடுகளை அடையாளம் காணும் திறன் பெற்றிருப்பர்.

2. காப்பிய, பக்தி இலக்கியங்களிலும் சமண, பௌத்த, இஸ்லாம், கிறித்துவம் போன்ற சமயத் தத்துவங்களிலும் உள்ள மனித மதிப்பீடுகளை அறிந்து கொள்ளும் திறனைப் பெற்றிருப்பர்.

3. கவிதை இலக்கியத்தைப் பல்வேறு கோட்பாட்டின் பின்னணியில் வாசிக்கும் திறன் பெற்றிருப்பர்.

4. தமிழ்ப் புனைகதை இலக்கியங்களை நவீனக் கோட்பாடுகளுடன் இணைத்து வாசிக்கும் திறனைப் பெற்றிருப்பர்.

5. தமிழ்ச் சமூகத்திற்குள் அரசியலோடு உருவான இயக்கங்களை அடையாளங்கண்டு அவற்றைக் குறித்து எழுதும் திறனைப் பெற்றிருப்பர்.

கூறு:1

சங்கச் செவ்விலக்கிய மரபு: செவ்வியல் கோட்பாடு-திணைக் கோட்பாடு - குறியீட்டியல் மற்றும் படிமவியல் கோட்பாடுகள்.

கூறு:2

தமிழில் காப்பிய, பக்தி இலக்கிய மரபு: சமணம் - பௌத்தம் - இஸ்லாம் - கிறிஸ்தவம் - அத்வைதம் - துவைதம் - விசிஷ்டாத்வைதம் - சைவம் - வைணவம் - ஆகிய தத்துவங்கள் மற்றும் சிந்தனைகளை இலக்கியங்களின் வழிப் பொருத்திப் புரிந்து கொள்ளுதல்.

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கூறு:3

தமிழில் கவிதை மரபு : புனைவியல் - இயற்பண்பியல், நடப்பியல் - மிகை நடப்பியல் - இருத்தலியல் - முதலான சில கோட்பாடுகள் பயின்று வரும் முறையினை இனங்காட்டுதல்

கூறு:4

தமிழில் புனைகதை மரபு - நவீன, அதி நவீனக் கோட்பாடுகளின் வழி நவீன இலக்கியங்களை வாசித்தல் : அமைப்பியல், நவீனத்துவம், பின் அமைப்பியல், பின் நவீனத்துவம், மாந்திரிக எதார்த்தவாதம் முதலான சில கோட்பாடுகள் மட்டும்.

கூறு:5

சமூக இயக்கங்களும் உரைநடையும் : மார்க்சியம் - காந்தியம் - திராவிட இயக்கம் -தனித்தமிழ் இயக்கம் - தலித்தியம் - பெண்ணியம் - அகதியம் - மூன்றாம் பாலினம் சார்ந்த சிந்தனைகளை முன்வைத்து அணுகுதல்.

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Bloom's Taxonomy	K1	K2	K3	K4	K5	K6
CO1		**2**				
CO2			**3**			
CO3				**4**		
CO4					**5**	
CO5						**6**

MEAN : 4

MPT 14

MPT 6610 & 6611 **ஆய்வேடு** **12 Cr**

ஆய்வாளர் தமக்கு விருப்பமான ஆய்வுத் தலைப்பை, ஆய்வு நெறியாளரின் வழிகாட்டிதலின் மூலம் தேர்வு செய்யலாம். ஆய்வுத் தலைப்பானது, ஆய்வுலகத்திற்குப் புதுமையான, குறிப்பிடத்தக்க ஒன்றாக அமைதல் வேண்டும்.

ஆய்வேடு : அக மதிப்பீட்டுமுறை (மொத்த மதிப்பெண்கள் : 100)

ஆய்வேடு அகமதிப்பீடு, புறமதிப்பீடு என இரண்டு பகுதிகளாக அமையும்

1. முதல் பருவத்தின் கடைசி வாரத்தில் ஆய்வின் முதற்கட்டச் செயல் முறை வடிவத்தை (ஆய்வுத் திட்டம்) எழுத்து வடிவத்தில் கொடுக்க வேண்டும். இதற்கு 20 மதிப்பெண்கள் வழங்கப்படும்.

2. ஆய்விற்கெனத் தேர்ந்துகொண்ட முதற்கட்டச் செயல் முறை வடிவத்தை ஆய்வுக் குழுவில் (துறைத்தலைவர், ஆய்வு நெறியாளர், துறைப் பேராசிரியர்கள்) விவாதித்துப் படைத்தல் வேண்டும். இதற்கு 20 மதிப்பெண் வழங்கப்படும். இது இரண்டாம் பருவத்தின் 4-ஆம் வாரத்தில் தரப்படுதல் வேண்டும்.

3. இரண்டாம் பருவத்தின் இறுதியில், முழுமையான ஆய்வேட்டை எழுத்து வடிவத்தில் ஆய்வுக் குழுவின் கலந்துரையாடலுக்குக் கொண்டு வருதல் வேண்டும். இதற்கு 60 மதிப்பெண்கள் வழங்கப்படும்.

ஆய்வேடு - புற மதிப்பீட்டு முறை: (மொத்த மதிப்பெண்கள் : 100)

ஆய்வுக் காலத்தின் இறுதியில், புறத் தேர்வாளர் ஆய்வேட்டுக்கு 60 மதிப்பெண்ணில் மதிப்பீடு செய்ய, மீதமுள்ள 40 மதிப்பெண்கள் வாய்மொழித் தேர்வு நடைபெறும். ஆக, ஆய்வேடு 200 மதிப்பெண்களுக்கு மதிப்பீடு செய்யப்படும். அனைத்துத் தாட்களுக்கும் தேர்ச்சி விழுக்காடு 50 மதிப்பெண்கள் என்கிற வகையில் அமையும்.

குறிப்பு : முதல் மூன்று பாடத்தாள் தேர்வுகளுக்கான மதிப்பீட்டு விவரம்:

அகமதிப்பீடு, புறமதிப்பீடு என இரு பகுதிகளாக அமையும்

அக மதிப்பீட்டுத் தேர்வு மொத்த மதிப்பெண்கள் - 100

இரு தேர்வுகள்	2 x 30 - 60	மதிப்பெண்
பயிற்சிக் கட்டுரை எழுதுதல்	- 20	மதிப்பெண்
கருத்தரங்கில் படைத்தல்	- 20	மதிப்பெண்

புற மதிப்பீட்டுத் தேர்வு - 100 மதிப்பெண்கள்

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Curriculum for MPhil English
(w.e.f. from 2019-2020)

Programme Grid
(w.e.f. June 2019 onwards)
(Outcome Based Education for MPE 19 series onwards)

Sem	Course Code	Course Titles	Hour	Credit	Mark
I	MPE 6613	Rhetoric and Research Methodology	6	6	120
	MPE 6615	Modern Criticism & Theories	6	6	120
II	MPE 6612	Contemporary English Fiction	6	6	120
II	MPE 6614	English Language Teaching	6	6	120
I & II	MPE 6610 & 6611	Dissertation	12	12	240
	Total		**30**	**30**	**720**

Programme Specific Outcomes for MPhil/PhD in English

On completion of the research programmes, scholars will be able to

1. define a clear research objective and break it down effectively into smaller objectives;
2. formulate research questions & problems, and hypotheses;
3. design research experiment and critically deconstruct texts;
4. synthesize language/literary theories with the issues of investigation;
5. adopt diligently MLA/APA Style sheets;
6. structure academic research articles and theses;
7. think logically, write coherently, and reorganize intellectually textual properties;
8. problematize English language teaching methods and approaches, language policies, and language assessment methods;
9. employ research and statistical tools and activity resources in both qualitative and quantitative research; and
10. report fluently and flawlessly research findings in international journals and conferences.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
MPE 6613	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MPE 6615				✓		✓	✓	✓		
MPE 6612			✓	✓			✓	✓		
MPE 6614			✓	✓	✓	✓	✓	✓		
MPE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Programme Outcomes (POs) for Research Programmes

Research programmes at MPhil and PhD levels are expected to have developed in research scholars the following graduate attributes:

1. Research Contribution: To propose innovative and original research.
2. Research Recognition: To locate information, critically read and evaluate data and primary & secondary sources.
3. Research as Ongoing Process: To integrate new research within previous research framework.
4. Research as Product: To design, apply and disseminate research.
5. Multidisciplinary Approach: To connect research across disciplines.
6. Theoretical Sophistication: To critically evaluate methods and theory.
7. Higher Order Thinking Skills: To think outside the box.
8. Research Reading Skills: To read as quickly, easily, and effectively as possible a lot of scientific papers, analyse, structure, record, and remember their contents.
9. ICT Skills: To analyze and grasp sophisticated IT Tools.
10. Presentation Skills: To present fluently and flawlessly research findings both in standard written and spoken English.

Mapping of Programme Specific Outcomes (PSOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	✓	✓	✓	✓		✓	✓			
PSO2	✓	✓	✓	✓		✓	✓			
PSO3		✓	✓	✓	✓	✓	✓	✓		
PSO4		✓	✓	✓	✓	✓	✓	✓		
PSO5						✓	✓	✓	✓	
PSO6			✓	✓		✓	✓	✓		✓
PSO7		✓	✓	✓		✓	✓	✓		✓
PSO8						✓	✓	✓	✓	✓
PSO9				✓	✓		✓		✓	✓
PSO10		✓				✓	✓	✓	✓	✓

MPE 6613 RHETORIC & RESEARCH METHODOLOGY 6Hrs./6Cr.

This course aims at introducing research scholars to four aims of language and literary research: a) advancement of knowledge, b) sharpening the critical acumen, c) creation of a genuine and intelligent interest in language and literature, and d) inculcation of the sense that researcher is a member of a collaborative community.

At the end of the course, scholars will be able to

i. adapt to the different kinds of literary research: bibliography, textual criticism, biographical, theoretical and interpretive,
ii. integrate the basic principles of literary theories with methods of textual analysis,
iii. compile and process the art of research work,
iv. produce MLA documentation & citation skills, and
v. evaluate the ELT issues in the Indian context for action research appropriately applying the APA style

Unit 1 **Research and Research Methods**
Research and Literary Research, Types of Research, Types of Research methods

Unit 2 **Research Design and Conduct of Research**
Research Design, Problems, Questions, Hypothesis, Research Proposal, Conducting Research, Review of Literature

Unit 3 **Crafting the Thesis**
Thesis Structure, Thesis Writing, Drafts, Editing and proof reading

Unit 4 **Documentation Style – MLA**
Background History of the MLA handbook, Documentation styles, Mechanics of Writing, Works Cites

Unit 5 **Documentation Style: APA**
Overview of the History of the APA, APA Citation Rules,

References

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Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1						6
CO2						6
CO3						6
CO4						6
CO5						5

Mean: 5.8

MPE 6615 **MODERN CRITICISM & THEORY** **6Hrs/6Cr.**

This advanced level course on contemporary literary theory aims at familiarizing scholars with ten major critical trends in reading and interpreting literary texts and facilitating them to apply theories to reading literary texts of their own choice.

At the end of the course, scholars will be able to

i. assess structuralist and poststructuralist poetics
ii. compare and contrast the principles of deconstruction and psychoanalysis
iii. prepare the characteristics of postmodernism, new historicism & ecocriticism
iv. discriminate the ideologies of feminism, masculine studies, & postcolonialism
v. evaluate the application of theories to the interpretation of literary texts

Unit 1 **Formalist, Structuralist & Poststructuralist Poetics**

Victor Shklovsky	Art as Technique
Roman Jacobson	Linguistics and Poetics
Gerard Genetter	Structuralism and Literary Criticism

	Roland Barthes	The Death of the Author
	Michael Foucault	What is an Author?
Unit 2	**Deconstruction & Psychoanalysis**	
	Jacques Derrida	Structure, sign and Play in the Discourse of the Human Sciences
	Paul de Man	The Resistance to Theory
	Jacques Lacan	The Insistence of the Letter in the Unconscious
	Geoffrey Hartman	The Interpreter's Freud
Unit 3	**Postmodernism, New Historicism, & Ecocriticism**	
	Fredric Jameson	The Politics of Theory: Ideological Positions in the Postmodern Debate
	Terry Eagleton	Capitalism, Modernism and Postmodernism
	Stephen Greenblatt	The Circulation of Social Energy
	William Rueckert	Literature and Ecology: an Experiment in Ecocriticism
Unit 4	**Feminism, Masculine Studies, & Postcolonialism**	
	Elaine Showalter	Feminist Criticism in the wilderness
	Helen Cixous	Sorties
	Raewyn Connel	The Social Organization of Masculinity
	Edward Said	Crisis (from *Orientalism*)
	Homi Bhabha	Of Mimcry and Man: the Ambivalence of Colonial Discourse
Unit 5	**Application**	
	Gayatri Chakravorty Spivak	"Draupadi" by Mahadsweta Devi
	Shoshana Felman	The Case of Poe: Applications/Implications of Psychoanalysis
	Elaine Showalter	Representing Ophelia: Women, Madness, and the Responsibilities of Feminist Criticism
	Stephen Grenblatt	The Cultivation of Anxiety: King Lear and His Heirs
	Alan Sinfield	*Macbeth*: History, Ideology and Intellectuals

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Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1					5	
CO2					5	
CO3						6
CO4					5	
CO5					5	

Mean: 5.2

MPE 6612 CONTEMPORARY FICTION IN ENGLISH 6Hrs./6Cr.

This course aims at introducing research scholars to wide reading of the 21st century fiction of both the east and the west and to the different elements of fictional techniques. It also enables scholars to comprehend the complementary relationship between Orientalism and Occidentalism and to use the appropriate research tools available in the emerging scholarship.

At the end of the course, scholars will be able to

i. evaluate the trends and techniques in contemporary literary texts from the east and the west;
ii. analyse the cultural issues pertaining to the emerging twenty first century;
iii. differentiate the thought processes of the novelists of these two spheres;
iv. explain the emerging epistemes available through the novelists of this century; and
v. integrate cultural formation and diversity seen in the emerging world.

Unit 1 **Pakistan & Bangladesh**
Kamila Shamsie *House Fire* (2017)
Taslima Nasreen *The French Lover* (2002)

Unit 2 **Indonesia & Malaysia**
Eke Kurniawan *Beauty is a Wound* (2016)
K. S. Maniam *Between Lives* (2003)

Unit 3 **Sri Lanka & West Indies**
Shyam Senvadurai *The Hungry Ghosts* (2012)
Sam Selvon *The Lonely Londoners* (2006)

Unit 4 **South Africa & Africa**
Ronnie Govender *Black Chin, White Chin* (2007)
Chmamanda Ngozi Adichie *Purple Hibiscus* (2003)

Unit 5 **Canada & Australia**
Margaret Atwood *Hag-Seed* (Retelling of *The Tempest*) (2016)

Markus Zusak *The Book Thief* (2006)

References

David, Herman. *The Cambridge Companion to Narrative*. Cambridge University Press, 2007.
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Grave, Paul--. *The New English Literatures: Cultural Nationalism in a Changing World.* McMillan, 1980.
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Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1					5	
CO2				4		
CO3				4		
CO4				4		
CO5						6

Mean: 4.6

MPE 6614 ENGLISH LANGUAGE TEACHING 6hrs/6cr.

The course aims at familiarizing scholars with contemporary issues and trends in teaching, learning, and researching English as a second language in India. The issues are related to language policies, approaches to teaching, lesson planning and classroom management, syllabus design, learning strategies, language skills, assessment, and professional development.

At the end of the course, scholars will be able to

i. evaluate language polices in India
ii. appraise language skills
iii. devise assessment techniques
iv. explore continuous professional development
v. develop instructional materials and technologies

Unit 1 English Language Policies pre- and post-independent India

Krishnaswamy & Sriraman	"Story of English in India"
Govt. of India	University Education Commission Report 1948-9
Govt. of India	Secondary Education Commission Report 1950-51
Govt. of India	Kothari Commission 1964-66

	Govt. of India	New Education Policy 1986
	Govt. of India	Knowledge Commission 2009

Unit 2 **Approaches to Teaching & Classroom Dynamics**

Jack C. Richard	"Theories of Teaching in Language Teaching"
David Nunan	"Second Language Teaching"
Amy Tsui	"Classroom Interaction"
Alan Maley	"Literature in the Classroom"
Marilyn Lewis	"Classroom Management"

Unit 3 **Lesson Planning & Designing Instructional Materials**

Thomas S.C. Farrell	"Lesson Planning"
Denise Finney	"The ELT Curriculum: A Flexible Model for a Changing World"
Brian Tomilson	"Materials Development"
Michael P. Breen	"Syllabus Design"
Diane Larsen-Freeman	"Grammar"
Michael Swan	"Seven Bad Reasons for Teaching Grammar—and Two Good Ones"
David Beglar & Alan Hunt	"Implementing Task-based Language Teaching"

Unit 4 **Teaching/Learning Listening, Speaking, Reading, Writing**

David Nunan	"Listening in Language Learning"
Michael Rost	"Listening"
Wai King Tsang & Matilda Wong	"Conversational English: An Interactive, Collaborative, and Reflective Approach"
Martin Bygate	"Speaking"
William Grabe	"Dilemmas for the Development of Second Language Reading Abilities"
Catherine Wallace	"Reading"
Randi Reppen	The Writing Process and Process of Writing"
Joy Reid	"Writing"

Unit 5 **Learning Strategies, Assessment, Technologies, & Professional Development**

Rebecca L. Oxford	Language Learning Strategies in a Nutshell: Update and ESL Suggestions"
Geoff Brindley	"Assessment"
Ana Huerta-Marcias	"Alternative Assessment: Responses to Commonly Asked Questions"
Elizabeth Hanson-Smith	"Computer-assisted Language Learning"
Mark Warschauer & P. Fawn Whittaker	"The Internet for English Teaching: Guidelines for Teachers"
Penny Ur	"The English Teacher as Professional"
Joanne Pettis	"Developing Our Professional Competence: Some Reflections"

References

Richards, Jack C. & Renandya, Willy A. Eds. 2002. Methodology in Language Teaching. New Deli: CUP.
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Krishnaswamy, N. & Sriraman, T. English Teaching in India. Chennai: T.R. Publications.

Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO1					5	
CO2					5	
CO3						6
CO4						6
CO5						6

Mean: 5.6

MPE 6610 & MPE 6011 **DISSERTATION** **6 Cr.**

The Dissertation aims at enabling scholars to make a new, original and significant contribution to the area of research (Literatures & ELT) by identifying the epistemological gaps in the existing research findings, by applying theories to research or by evolving theories as an outcome of research.

After completing research, scholars will be able to

i. prepare the reviews of literatures,
ii. hypothesize research problems & issues and thesis statements,
iii. conduct experiments & deconstruct literary texts,
iv. write original research papers/chapters in books, and
v. structure dissertation.

Unit 1 Introduction chapter in dissertation
Unit 2 Conduct of experiments/explication of literary texts
Unit 3 Discussion and development of thesis statement/hypotheses
Unit 4 Documentation and citation styles of MLA/APA
Unit 5 Work-in-Progress sessions and defence in public viva voce

Mapping of the Course Outcomes (COs) with Bloom's Taxonomy

	K1	**K2**	**K3**	**K4**	**K5**	**K6**
CO1						**6**
CO2						**6**
CO3						**6**
CO4						**6**
CO5						**6**

Mean: 6

Administrative Steps to Follow

Institutional intervention is crucial in effectively guiding the students and therefore the following administrative steps can be considered:

1. Encourage scholars to involve themselves in both language and literature (action) research with a view to producing original knowledge.
2. Translation of critical-theoretical writings and critical study of different translations of creative writings along with the original can be encouraged.
3. Scholars are encouraged to explore unexplored contemporary texts/writers.
4. Each scholar is expected to have presented at least three research papers in the chosen area for presentation at national/international conferences, and published at least one article in journals of reputation.
5. All the faculty members of the Research Department who are recognised as PhD guides by Madurai Kamaraj University are eligible to be supervisors.
6. They can guide candidates either in language or in literature; it is better to inform the scholars about the area of specialization/interests of the faculty supervisors.
7. Guides will be chosen by candidates through lots after identifying their area of research—language and literature.
8. Scholars can seek the help from supervisors outside the regular working hours.
9. There shall be three stages across the project period.
    i. Stage 1: The scholar should submit the dissertation proposal by the end of the semester one.
    ii. Stage 2: The scholar should present a work-in-progress seminar with a focus on the theoretical framework and the research design by the fourth week of semester two.
    iii. The scholar should submit two copies of the dissertation in 80 pages by the end of semester two or the date fixed by the Research Committee.
    iv. The scholar should submit two copies of the synopsis in five pages.
10. CIA Weight for the Dissertation: 20% for topic defence, 20% for work-in-progress sessions, and 60% for the final version of the dissertation to be awarded by the supervisor.
11. EOS Weight for the Project: 60% for the thesis and 40% for viva voce.
12. The external examiner shall be an outstanding researcher with active research history is to be recommended by the Research Committee to the Controller of Examinations of the College.
13. The external examiner will assess the dissertation for 60 marks and evaluate the performance of the scholar in the public viva voce for 40 marks.
14. The viva voce board shall consist of the Research Head as chairperson, external examiner, faculty supervisor, and all other eligible guides.
15. The viva date is the date for the award of the degree.

Rubrics for the Evaluation of the Dissertation

Weight	Item	85% & above	84%-75%	74%-70%	69-60%	59%-50%
20	Title Topic Objectives Contextualization Problem statement	Innovative & original Defined & contextually grounded	Original	Adequately defined & contextualized	Satisfactorily defined but originality	Defined but inadequately contextualized, little or no originality
10	Review of Literature	Excellent knowledge, coverage, interpretation & application of relevant literature	Authoritative knowledge	Adequate knowledge	Minor shortcomings in interpretation & application	With limited coverage, interpretation & application
20	Research Methodology	Demonstrating advanced control, deep understanding & insight, and applying relevant methodology, techniques & analysis	Good control & understanding	Understanding the significance of research & effective application	Adequate knowledge & good organization	Satisfactory understanding, reasonably effective interpretation & application
40	Structure & Progression from Objectives to Findings	Systematic, well-structured, excellent in coherence, chapters interwoven	Clearly argued and well-presented	Structured satisfactorily	Greater part of work sufficiently covered, text well-organized & clearly argued	Inadequate coherence, lack of insight & understanding, lack of coherence
10	Works Cited/References	Documentation style scrupulously followed	Good	Satisfactory	With some deviations	Not adequately followed

M.Phil Programme in Chemistry

PROGRAMME OBJECTIVES

The M.Phil program is focused to equip scholars with skills to understand and appreciate chemistry. It is also aimed at helping the students to realize the importance of research work, develop skills to interpret. This programme can also be extended to PhD studies by the addition of one year's worth of research.

PROGRAMME STRUCTURE

Semester	Course code	Title of the course	Credits	Total Marks
I	MPC 6600	Dissertation	6	-
	MPC 6611	Research Methodology	6	120
	MPC 6613	Advanced topics in Chemistry	6	120
	MPC 6615	Indepth study	6	120
II	MPC 6600	Dissertation	6	240
			30	**600**

MPC 6611 **RESEARCH METHODOLOGY** **6hrs/6cr**

Course Objectives:

- To learn the computer application skill for teaching and research
- To understand the principles of research, literature survey and writing research paper and thesis writing
- To create the awareness on laboratory hygiene and safety
- To gain some knowledge about the statistical analysis of data which will be highly helpful for research
- To expose them in nano sample analysis

Course outcome:

At the end of the course, scholars will be able to:

1. explain different routes to carry out literature survey and apply digital platform for the same.
2. illustrate various terminology involved in scientific publication and design a scientific publication
3. illustrate data collection and presentation. Assess error and suggest solution for its minimization.
4. prescribed safe laboratory practices in handling glassware and chemicals
5. apply techniques for sample analysis

UNIT –I Literature survey

Print : Sources of information – Primary, Secondary, Tertiary sources – Journals – Journal abbreviations – Abstracts – Current titles – Reviews – Monographs – Dictionaries – Textbooks – Current contents – patent- Introduction to Chemical Abstracts and Beilstein – Subject Index, Substance Index, Author Index, Formula Index and other Indices with examples.

Digital : Web resources – E–Journal – Journal access – TOC alerts – Hot articles – Citation index – Impact factor – H–Index – E–Consortium – UGC infonet – E–Books – Internet discussion groups and communities – Blogs – Preprint server – Search engines, Scirus, Google Scholar, ChemIndustry, Wiki – Databases, ChemSpider, ScienceDirect, SciFinder, Scopus

UNIT II: Methods of writing scientific papers

On writing scientific papers – justification for scientific contributions, bibliography, justice and courtesy in decisions, description of methods, conclusions, the need for illustration, style, publications of scientific works,

Writing methods – Writing the first draft, revising the first draft on content and structure, revising the second draft on style, writing a thesis, writing review article and book reviews, preparing research proposals for grants– funding agencies

UNIT III: Data Analysis

Types of Error – Accuracy, precision, significant figures, use of calculation in the estimation of errors – Frequency distribution, the binomial distribution, the Poisson distribution and normal distribution – describing Data, population and sample, mean, variance, standard deviation, way of quoting uncertainty, robust estimators, repeatability and reproducibility of measurements – Hypothesis testing, levels of confidence and significance, test for an outlier, testing variances, means t–Test, paired t–Test – Analysis of variance (ANOVA) – Correlation and Regression – Curve fitting, Fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals – General polynomial fitting, linearizing transformations, exponential function fit – r and its abuse – Basic aspects of multiple linear regression analysis.

UNIT IV: Chemical Safety, Ethical Handling of Chemicals

Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation, Safe storage and use of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards, procedures for working with gases at above or below atmospheric pressures – safe storage and disposal of waste chemicals , recovery , recycling and reuse of laboratory chemicals, procedure for laboratory disposal of explosives , identification , verification and segregation of laboratory waste , disposal of chemicals in the sanitary sewage system , incineration and transportation of hazardous chemicals

UNIT V : Instrumentation techniques and computer packages

Scanning electron microscopy (SEM) – instrumentation – applications – surface area analysis, particle size determination – Scanning Probe Microscopes – Scanning Tunnelling microscope (STM) and Atomic Force Microscope (AFM) – Principles and applications. Diffraction techniques – single crystal - powder XRD, Neutron and electron diffraction – principles and applications. Emission spectrography and flame spectroscopy – Atomic absorption, atomic emission and atomic fluorescence spectroscopy

Applications of some computer packages like MS–Excel, Origin, ChemDraw, Sciplot, ISIS draw, ChemSketch and SPSS.

References:

1. http://www.pubs.acs.org
2. http://www.inflibnet.ac.in
3. http://rsc.org
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6. Maeve O'Connor, 'Writing successfully in science' Chapman and Hall, London, 1995.
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8. J. Topping, 'Errors of Observation and Their Treatment', Fourth Edn., Chapman Hall, London, 1984
9. S. C. Gupta, 'Fundamentals of Statistics', Sixth Edn., Himalaya publ. House', Delhi, 2006
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12. Chemical safety matters–IUPAC –IPCS, Cambridge Univ. Press, 1992.
13. For computer applications any commonly available books as well as common materials available in the web.
14. D.A. Skoog and J.J. Leary, Principles of Instrumental Analysis, 4th Edn., Saunders College Publishing, 1992.
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16. A.K. Cheetham, P.Day, Solid State Chemistry: Techniques, Oxford University Press, Oxford, 1987.
17. G. E. Bacon, Neutron diffraction, Oxford Universtiy Press, Oxford, 1975.
18. R.S. Drago, Physical Methods in Chemistry, Saunders, 1999.

MPC 4

Mapping of Bloom's Taxonomy with Course Outcome					
	Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X		X
K3: Applying		X	X		X
K4: Analyzing		X	X		X
K5: Evaluating			X		X
K6: Creating					

MPC 6613 **ADVANCED TOPICS IN CHEMISTRY** **6hrs/6cr**

Course Objectives:

- To appreciate the applications of Organometallic and Bioinorganic chemistry
- To study the theoretical concepts and applications of Green Chemistry
- To learn the theories of Molecular machines
- To analyse spectral data
- To apply various Electro analytical Techniques

Course outcome:

At the end of the course, scholars will be able to:

1. appraise the various concepts of Organometallic and Bioinorganic that govern modern day research.
2. rationalize the usage of particular green approach for a reaction.
3. discuss the application of Molecular machines.
4. articulate the importance of all spectral information and solve conjoint spectra
5. describe the importance of potentiometry and electro analytical techniques and interpret the chemistry behind them

Unit –I Organometallic and Bioinorganic

The sixteen and eighteen electron rule - and bonded complexes-synthetic methods-Agnostic interaction-changes in ligand reactivity on Coordination- activation of small molecules-catalytic mechanism in industry-Olefin metathesis - metallacycles.

Metallo enzymes as acid, Base and redox catalyst-metallo proteins-ligand carriers- Metal carriers and metal storage proteins-metal ions as structure formes, structure robes and charge carriers – model systems –metals for diagnosis and chemotherapy -metal toxicity and environmental hazards.

Unit –II Green Chemistry

Need for green chemistry – solvent free reactions –microwave assisted synthesis-role of ionic liquids in green chemistry-cleaner technology with super critical fluids - catalytic approach to green chemistry (use of zeolites, clays, mesoporons materials) waste water treatment by oxidation technology at ambient conditions – remediation methods for textile effluents-bio catalytic reaction.

Unit –III Molecular and Supramolecular machines

Concept of a machine at the molecular level-definition-natural molecular machines-artificial molecular machines – interlocked molecules as prototypes - pseudorotaxanes based on conformational motions – photochemically induced conformational motions – electrochemically induced conformational motions- photochemically controllable complexes – molecular shuttles - chemically, photochemically controllable shuttles.

Digital processing with molecular switches – Gates - YES, NOT, OR logic operations – molecular gates for YES, NOT, OR, NAND, NOR, XOR and XNOR operations.

Unit –IV Spectral techniques

Application of spectral techniques like UV-Vis, fluorescence, IR, NMR, CD studies, Mass Spectrometry with thrust in problem Solving skills, related to organic molecules (instrumentation not necessary)

UNIT V: Electro analytical Techniques

Potentiometric sensors– criteria for choosing these sensors, selective electrodes– primary ion–selective electrodes encompassing crystalline and non–crystalline electrodes– membrane ion–selective electrodes including gas–sensing and enzyme substrate electrodes– all solid state ion–selective electrodes – Voltammetric sensors. Chronoamperometry– potential sweep techniques (cyclic Voltammetry including study of reaction mechanisms)– step and pulse techniques– Normal pulse and differential pulse Voltammetry– square wave Voltammetry– AC techniques– stripping Voltammetry (anodic and cathodic)– stripping analysis.

References

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9. Willam Kemp, Organic Spectroscopy, Palgrave, 3rd edition, 1991.
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14. Daniel C. Harris, "Quantitative Chemical Analysis", Third Edition., W.H. Freeman and Company New york, 1996.
15. A.J. Bard L.F. Faulkner, Electrochemical methods – Fundamentals and Applications, Second Edition., Wiley–VCH, 1998.
16. Journal of Chemical Education, "State of Art Sympoisum: Electro Chemistry" Vol.60, issue No.4, 1983.
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Mapping of Bloom's Taxonomy with Course Outcome					
	Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X			X	X
K5: Evaluating				X	X
K6: Creating					

MPC 6615 INDEPTH STUDY OF RELATED LITERATURE

Course objective

- To gain knowledge in the proposed/relevant area of research and apply in their projects

This paper is based on the project work proposed by the guide for each student. Guide shall select 10 research articles including review related to the project work from reputed international journals. A written test will be conducted for 3 hours and evaluated by the guide. The students are expected to give a seminar which would be jointly evaluated by all guides. There will be no end of semester examination

MPC 6600 DISSERTATION

Dissertation work is a two semester sequential course. The objective of this course is to enable the scholar to carry out the project selected in the first semester supplemented by experimental investigations. The scholar may be given an option to carry out investigation or analysis in CSIR laboratories, NITs and universities.

- Progress report: the first progress report should be presented to the department before the 60^{th} working day of the second semester.
- Preview of dissertation: the scholar will present the preview of the dissertation by the 75^{th} working day of the semester to the department
- Submission of the dissertation: the scholar has to submit 4 hard copies of the dissertation by the 85^{th} working day of the second semester to the department. A copy of this dissertation will be sent to the external examiner for review.
- Evaluation of the dissertation: the Head of the PG department will be the Chairman and the convener of the research committee. Internal valuation will be done by the guide. The Viva -Voce examination will be conducted by panel of examiners, which consists of chairman, external examiner (who valued the dissertation) and the guide, during the examination period of the second semester and the results will be announced

MPB 1

CURRICULUM FOR M.Phil PROGRAM IN BOTANY

Semester	Course Code	Subject	Hrs/ Week	Total Hours	Credit	Marks
I	MPB6601	Research Methodology	6	90	6	120
I	MPB6603	Trends In Botany	6	90	6	120
I	MPB6605	SPECIAL PAPER (Any ne)	6	90	6	120
I	MPB6600	Project	12	-	12	240
II	MPB6600	Dissertation Studies	30			
		Viva - voce				

Special Paper 1. Plant Tissue Culture
Special Paper 2. Bioprocess Engineering
Special Paper 3. Mycology
Special Paper 4. Plant Pathology

MPB 2

M Phil in BOTANY

Department of Botany had it long felt dream of upgrade fulfilled in the academic year 2018-19 and in the forthcoming 2019-20. The department is elated in commencing its first ever M Phil course with scope for about 6 scholars joining the department. Offering a holistic and meaningful courses in plant sciences all these years, the Department had carved out its MPhil program in for two semester with total of 30 credits assigned for 3 theory papers (2 must do papers and the third optional one, from one of the four specialization areas in which the given student will be pursuing his/ here research.

MPB6601 RESEARCH METHODOLOGY 6Hrs/Week

Learning objectives

- Defending the use of Research Methodology
- Judging the reliability and validity of experiments
- Being able to perform exploratory data analysis
- Using parametric and non-parametric hypothesis tests (and interpreting their results).
- Being able to draw conclusions from categorical data
- Using computer-intensive methods for data analysis
- Drawing conclusions from statistical test results
- Being able to compare statistical models
- Being able to argue when to use Bayesian vs Frequentist statistics

These objectives will be achieved by means of lectures, discussions in the lectures, assignments and blogs.

UNIT: 1 HOW DOES RESEARCH WORK?

Concept of research- the role of research, research process overview-importance of research- types of research- sources- attitude of a researcher- selection of research problem- evaluation of the problem- defining the problem.

UNIT: 2 METHODS OF RESEARCH

Science and its functions, What is theory?, and The meaning of methodology Experimental- Historical- Case study- Survey- Focus Group Discussion- Ethanography- Participatory Rural Apprasial- Methods of literary research- Econometric methods.

MPB 3

UNIT: 3 RESEARCH DESIGN

Understanding Concepts, Constructs, Variables, and Definitions- components of research- hypothesis and its value- Sampling- the nature of sampling, Probability sampling design, Nonprobability sampling design, Determination of sample size.

UNIT: 4 DATA INTERPRETATION

1. ***COLLECTION OF DATA***- Source (primary and secondary, electronic, library, note cards)- techniques in data collection (observation- interview- questionare- schedule- scales)
2. ***QUANTIFICATION OF DATA***- Classification of data- tabulation- diagrams- one dimensional- two dimensional- pictogram- cartogram- graphs- charts.
3. ***DATA ANALYSIS***- Statistics-Summarizing and describing a collection of data - Univariate and bivariate analysis- Mean, mode and standard deviation- Percentages and Ratios- Histograms- Identifying randomness and- uncertainty in data.

UNIT: 5 REPORT WRITING

Guidelines- stages- preliminaries- main body- reference material- foot notes- abbreviation- bibliography- Publication. Structure and Content, Presentation, Referencing and Appendices

References

- Adèr, H. J., & Mellenbergh, G. J. (Eds.). (1999). *Research Methodology in the Social, Behavioural and Life Sciences: Designs, Models and Methods*. Sage.
- Sahu, P. K. (2013). *Research methodology: A guide for researchers in agricultural science, social science and other related fields* (p. 432). New Delhi: Springer.
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- Walliman, N. (2017). *Research methods: The basics*. Routledge.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.
- O'Leary, Z. (2017). *The essential guide to doing your research project*. Sage.

MPB 4

MPB6603 **TRENDS IN PLANT SCIENCES** 6Hrs/Week

Preamble

This common course for all scholars focuses on providing a glimpse of the ongoing research at least in certain selected frontiers of botanical sciences. Topics and concepts touched here are by no means claimed complete. The intent is to inform learners about the trends in the domains where the research supervisors suggest candidates the topics for investigation. Besides the general glimpse on how botanical enquiries have progressed over time, ideas on metabolic and developmental regulation, methods in molecular biology, nanobiology, system biology and ideas on the intricacies of plants in environment are covered.

UNIT 1: Introduction

Facets of Botanical investigations: exploration; experimentation: expansive and intrusive approaches and interdisciplinary initiatives. Biophysical and chemical narratives, computational and statistical approaches - Metabolic & Developmental Integration: Principal events and plant circuitry; symplastic and apoplastic connectivity; hormonal coordination: signal perception & transduction- Calmodulin and protein kinases - Initiation and regulation of reproductive development (florogenesis, fertilization, seed and fruit formation).

UNIT 2: Molecular biology and Genetic engineering

Fine structure and organization of chromatin network – DNA as a hereditary element – Gene concept: exons, introns, cistrons – lac and Trp operons. Post transcriptional and translational modifications – Molecular cloning- vectors- gene transfer methods - rDNA technology and transgenics - protein expression- fusion proteins- site directed mutagenesis- gene knockout- nucleic acid sequencing- molecular markers- protein sequencing - hybridoma technology- detection of molecules.

UNIT 3: Nanobiology

Designs and templates from nature- self assembly- molecular references of bioprocesses: Biomimetics - nucleic acids, amino acids, proteins, lipids & polysaccharides as inputs in modern biomaterials- Bionanomachines: ATP synthetase, Actin and Myosin, Antibodies and Collagen- Quantum dots, quantum well, nanotubes, nanowires - Nanotechnology in agriculture: plant nutrition and crop protection, Designer proteins, Peptide nucleic acids, Nanomedicine; Drug delivery, DNA computing, Molecular design using biological selection, Biosensors - Future directions.

UNIT 4: Systems biology

Post *Omics* realization: *sum of parts is not whole*- reductionism vs Holism – biological big data - Networks concepts : gene and gene regulatory network - Metabolomics: Interconnection of

pathways; enzymes in metabolic regulation; Molecular modeling tools: Modelling process - Graphic visualization; structure and functional prediction; Protein folding prediction; homology modeling, Docking simulation and Computer assisted molecular design- Translating biochemical networks into linear algebra - system biology softwares and platforms.

UNIT 5: Plant and Environment

Spatial and temporal components of plant life- Response to plant pathogens- Plant defence systems - response to abiotic stresses- water deficit, osmotic adjustment, drought, oxidative and heat stress- molecular physiology of mineral nutrient acquisition & utilization- climate change and plant productivity.

References:

- Systems Biology: Definitions and perspectives by L.Alberghina H.V.westerhoff, 2005, Springer.
- Computational systems biology by A.Kriete, R.Eils, 2005, Academic press.
- Systems Biology in practice: Concepts, Implementation and applications by E.Klipp. R.Herwig, A.Kowlad, C.Wierling and H.Lehrach, 2005, Wiley InterScience.
- Niemeyer.C.M. Mirkin C. A "Nanobiotechnology: Concepts, Applications and Perspectives", Wiley – VCH, 2004.
- Buchanan, Bob B., Wilhelm Gruissem, and Russell L. Jones, eds. *Biochemistry and molecular biology of plants*. John Wiley & Sons, 2015.

MPB – 6605 **PLANT TISSUE CULTURE** **6Hrs/Week**

PREAMBLE:

The idea of this special paper is to help the researcher to a get glimpse of the genesis and historical account of this discipline and review the fundamentals of the in vitro methodology harping on its academic and applied avenues. Despite the omission of certain topics of industrial implications, intricacies of cell, tissue and organ culture and opportunities vested with manipulations of soma and the generative organs of the flower, and basics of secondary metabolite production finds special mention.

UNIT 1: The concept and idea of Plant Tissue culture

Introduction to plant tissue culture- cellular totipotency, cytological, cytochemical and vascular differentiations- terms and definitions, historical background, scope- applications-laboratory organization, tools and techniques, aseptic conditions – labelling and data collections.

UNIT 2: Media and Culture Preparation

Role of micro and macro nutrients, vitamins and carbon source - media preparations- pH, temperature, solidifying agents, slant preparations, plant growth regulators and mode of action, effects on *in vitro* culture and regeneration; molecular basis of plant organ differentiation, maintenance of cultures, environmental conditions, explants characteristics. culture techniques- explants selection, methods of sterilization and inoculation; economics of micropropagation projects.

UNIT 3: Cell, Tissue and Organ Culture

Micropropagation – bud cultures: shoot tips and nodal buds- Tissues as explants and organs for culture -- formation of callus, shoots and roots using various explants, production of virus free plants by meristem and shoot-tip culture. Hardening and planting in field. Factors affecting morphogenesis and proliferation rate; Technical problems in micropropagation.

UNIT 4: Somatic Embryogenesis and Genetic Enhancement in cultures Process of somatic embryogenesis, structure, stages of embryo development, factors affecting embryogenesis; production of artificial seeds; Embryo rescue and wide hybridization; Protoplast culture: protoplast fusion, cybrids, asymmetric hybrids- somaclonal variations- Cryopreservation of plant germplasm - Invitro Fertilization - Techniques and significance of androgensis and gynogenesis (ovary, ovule, egg, synergids culture)

UNIT 5: Application of Cell Culture Systems in Metabolic Engineering

Cell suspension cultures: Batch & Continuous cultures; cell, tissue and organ culture as source of secondary metabolites; hairy root cultures; screening of high yielding cell lines; procedures for extraction of high value industrial products, fractionation, bioassays; growth and production kinetics of cell cultures; scale-up procedures in bioreactors, types of bioreactors for plant cell cultures; Manipulation in production profile by biotic and abiotic elicitation; biotransformation.

References:

- Anis, M., & Ahmad, N. (Eds.). (2016). ***Plant Tissue Culture: Propagation, Conservation and Crop Improvement.*** Singapore: Springer.
- Bhojwani S.S., Razdan M. K (2005) ***Plant tissue culture: Theory and Practice, Studies in Plant Science*** 5,North Holland, Elsevier, New Delhi
- George, E. F., Hall, M. A., & De Klerk, G. J. (Eds.). (2007). ***Plant propagation by tissue culture****: volume 1. the background*(Vol. 1). Springer Science & Business Media.

- Gupta, S. D., & Ibaraki, Y. (Eds.). (2006). ***Plant Tissue Culture Engineering*** (Vol. 6). Springer Science & Business Media.
- Neumann, K. H., Kumar, A., & Imani, J. (2009). ***Plant Cell and Tissue Culture-A tool in Biotechnology: Basics and Application.*** Springer Science & Business Media.
- Smith R.H (2000) ***Plant Tissue Culture: Techniques and Experiments***, Second edition, Academic Press, USA
- Taji, A., Kumar, P. P., & Lakshmanan, P. (2002). ***In vitro Plant Breeding***. food products Press.

MPB – 6605 Bioprocess Engineering 6Hrs/Week

Preamble:

In this course the scholar(s) would be able to define, understand the integration of physicochemical processes of cells and tissues and grow them in contamination free environment in bioprocess and develop concepts to scale-up bioprocess, analyze and formulate mechanisms for enzymatic reactions, Analyze metabolic network and metabolic flux and design bioreactors for the production of various products. Specify required technologies to effectively utilize genetically engineered microorganisms for bioprocessing.

UNIT: 1 Introduction : Interaction between chemical engineering, Microbiology and Biochemistry. History of fermentation, fermentation processes, microbial culture selection, media formulation, sterilization processes - Richard's rapid methods and process optimization. Stoichiometry of cell growth. Monod's Growth kinetics, fermentation classification - Gaden's, design and operation of fermenters, Basic concepts for selection of a reactor and types of fermentors, scale up of bioreactor.

Unit 2 : Down Stream processing: Recovery of particulate matter, product isolation, distillation, centrifugation, whole broth processing, filtration, aqueous two-phase separation, solvent extraction, chromatography and electrophoresis. Product synthesis kinetics, Instrumentation and control. Bioprocess economics, regulation and fermentation economics.

Unit 3 : Bioprocess: Regulatory constraints, steps in bioprocess development, major products of biological processing, bioprocess control methodologies and problems on scale-up methods. Role of diffusion in Bioprocessing, Convective mass transfer, Gas-liquid mass transfer, Oxygen uptake in cell cultures.

Unit 4: Modelling and simulation of bioprocesses : Study of structured models for analysis of various bioprocess – compartmental models, models of cellular energetics and metabolism, single

cell models, plasmid replication and plasmid stability model. Dynamic simulation of batch, fed batch, steady and transient culture metabolism.

Unit 5: Recombinant cell cultivation : Different host vector system for recombinant cell cultivation strategies and advantages. *E.coli, yeast, Pichia pastoris/ Saccharomyces cereviseae*, Animal cell cultivation, plant cell cultivation, process strategies, reactor considerations in the above system.

References :

- Biely, J.E. and Ollis D.F. Bio Chemical Engineering Fundamentals (1986) Megraw Hills. Rehm, H.J. and Reed G (ed), Biotechnology, Vol 1-2, Verlag chemie.
- Stanbury, P.E. and Whitaker A., Principles of Fermentation Technology (1984) Pergamon Press.
- Pirt, S.J. Principles of Microbial and Cell Cultivation. Blackwell Scientific Publication, London.
- Moo-young M. Comprehensive Biotechnology Vol. 1-4 Pergamon Press Oxford.
- Principles Of Fermentation Technology Paperback – 2008 by P F Stanbury Dr. A Whitaker (Author) Elsevier; 2 edition (2008)
- Bioprocess Engineering Principles Paperback – 2009 by Pauli. M (Author) Elsevier (2009)
- Bioprocess Engineering Principles Paperback – 2012 by Doran (Author) Elsevier; Second edition
- Pauline Doran,2010.Bioprocess Engineering Principles, Elsevier, UK.
- John Villadsen, Jens Nielsen, Gunnar Lidén. (2011) Bioreaction Engineering Principles, 3rd Edition. Springer Science & Business Media.
- Jens Nielson, John Villadsen and Gunnar Liden, "Bioreaction engineering principles", 2nd Edition, Kulwer Academic, 2002

MPB6605 **Mycology** **6Hrs/Week**

Preamble

This course will provide scientific knowledge on fungi and related organisms. Scholars will learn the unique biological characteristics that distinguish Fungi from other organisms, with the knowledge gained he/she will be able to comprehensively view the diversity of fungi and evaluate its ecological and academic significances. They will be able to screen the fungal resource for commercial value and potential molecules to be used as drug.

UNIT 1. Unique attributes of kingdom Fungi:

Historical perspective in mycology – characteristics of fungi — cell wall components and architecture – Nutrient requirements: carbon, energy sources, mineral nutrients – metabolic profile – mechanism of apical growth - optimum growth conditions - overview of energy yielding pathways – secondary metabolism – storage products – contemporary trends in Indian mycology.

UNIT 2. Fungal Diversity and Systematics:

Fungal diversity – fungal classification: conventional and modern approaches; molecular and phylogenetic system – nomenclature – occurrence, general characters and lifecycle of Myxomycetes, Oomycetes, Zygomycetes, Ascomycetes and Basidiomycetes – form class concept of Deuteromycetes - macrofungal diversity.

UNIT 3. Fungal Reproduction and Genetics

Reproductive biology – lifecycle patterns - heterokaryosis and parasexulaity – sex hormones - Origin and evolution of sex in fungi including hormonal control - genetics – genome sequences – spore germination – evolution and phylogeny.

UNIT 4. Fungal Ecology and Interactions

Fungi as saprotrophs and parasites - decomposers and nutrient cycling - symbiotic relationships: mycorrhizae: types, host range and ecological significance. Lichens : mycobiont, types, ecology and significance. Endophytic association: types, fungal endophytes, importance to host. Fungus - insects associations - necrotrophic and biotrophic plant pathogens - wood rot fungi.

UNIT 5. Applied and Industrial Mycology

Fungi in human welfare - food borne fungi – mycotoxins - pharmaceuticals – edible fungi -fungal metabolites - enzyme production – Fermentation industry: alcoholic production, bakery and cheese production – Agriculture: mycorrhizae, biological control agents.

References:

- Alexopolous, C.J., Mims, C. W. and Blackwell, M. 2002. Introductory Mycology (4th Ed.), John
- Wiley & Sons, Inc., New York, USA. ISBN: 9814-12-612-8
- Deacon,J.2006. Fungal Biology. (4th Ed.). Blackwell Publishing House, United Kingdom.
- ISBN 978-1-4051-6953-0
- Kavanagh K. 2006. Fungi: Biology and Applications. John Wiley and Sons, Ltd. UK. ISBN: 0-
- 470-86701-9
- Mueller G. M., Bills G.F., Foster M. S. 2004. Biodiversity of Fungi. Inventory and
- Monitoring Methods. Elsevier Academic Press, New York. ISBN 0-12-509551-1
- Webster J, Weber R.W.S. 2007. Introduction to Fungi. Cambridge University Press.
- ISBN-13 978-0-521-01483-0

MPB6605 Plant Pathology 6Hrs/Week

Preamble:

This course is designed to inculcate the students to have a panoramic view on plant diseases, at all levels of biological organization from molecular to populations, and plants pathogenic and related agents. It focuses on how hosts, pathogens and environment interact to cause plant diseases and on understanding finds ways to control it. Exploring a plant pathogen, their disease etiology, disease cycles, economic impact, resistance, and management of plant diseases will be dealt. Averting a plant, free from pathogens is a key component of sustainable management strategies against plant pests and diseases.

UNIT I: Fundamentals of Plant Diseases: History – classification – diagnosis and identification – Koch's postulates – gene for gene hypothesis – disease tetrahedron – pathogenesis (disease initiation, development and establishment) – Disease development and influence of factors – inoculum and inoculum potential – hypersensitivity – pathogenic impacts on host physiology – host defense mechanisms - innate and induced – morphological and anatomical defenses – biochemical (phenols, phenolic glycosides, phytoalexins) – Pathogenesis Related

Proteins (PR) – Systemic acquired and Induced systemic resistance (SAR and ISR) - parasitism (role of enzymes, toxins and growth regulators).

UNIT II: Diseases and Disease Cycle: Study of the following diseases with reference to their incidents – symptom manifestation and control measures – fungal (rust of wheat, blast of rice, Tikka of groundnut, Red rot of Sugar cane) – bacterial (Bacterial blight, Citrus canker) – mycoplasmal (Little leaf of brinjal, *phyllody of* sesamum – viral (Yellow vein mosaic disease) – nematode (Root knot of potato) – non- parasitic diseases (*Cuscuta, Striga).*

UNIT III: Disease Management: Principles of plant disease management by cultural, physical, biological, chemical, organic amendments and botanicals methods of plant disease control, integrated control measures of plant diseases. Disease resistance and molecular approach for disease management. Foliage, seed and soil application of chemicals, spreaders and other adjuvants, health vis-a-vis environmental hazards, residual effects and safety measures. History of fungicides, bactericides, antibiotics, concepts of pathogen, immobilization, chemical protection and chemotherapy, nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals.

UNIT IV: Post-Harvest Diseases: Concept of post-harvest diseases, definitions, importance with reference to environment and health, principles of plant disease management as preharvest and post-harvest - Factors governing post harvest problems (biotic and abiotic), role of physical environment, agro-ecosystem leading to infection, operational mechanisms and cultural practices - pathogens antagonist relationship - merits and demerits of chemical ,biological / phytoextracts in controlling post-harvest diseases - improving the shelf life of produce - application and monitoring for any health hazard.

UNIT V: Biocontrol agents in plant diseases and Integrated Disease Management: Concept of biological control – importance – principles of plant disease management with bioagents – history, merits and demerits –Types of biological interactions– operational mechanisms and cultural practices in biological control of pathogens – biocontrol agents – control of soil-borne and foliar diseases– compatibility of different bioagents –commercial production of antagonists, their delivery systems, application and monitoring. Integrated Disease Management (IDM) – concept and tools of disease management – development of IDM, basic principles – IPM and organic farming system– biopesticides available in market– quality control system of biocontrol agents.

References:

- Agrios GN. 2005. Plant Pathology. 5th Ed. Academic Press, New York.

- Ainsworth GC, Sparrow FK & Susman HS. 1973. The Fungi ñ An Advanced Treatise. Vol. IV (A & B). Academic Press, New York.
- Alexopoulos CJ, Mims CW & Blackwell M.2000. Introductory Mycology. 5th Ed. John Wiley & Sons, New York.
- Bindra OS & Singh H. 1977. Pesticides - An Application Equipment. Oxford & IBH, New Delhi.
- Campbell R. 1989. Biological Control of Microbial Plant Pathogens. Cambridge Univ. Press, Cambridge.
- Fokkemma MJ. 1986. Microbiology of the Phyllosphere. Cambridge Univ. Press, Cambridge.
- Gibbs A & Harrison B. 1976. Plant Virology - The Principles. Edward Arnold, London.
- Gnanamanickam SS (Eds). 2002. Biological Control of Crop Diseases. CRC Press, Florida.

PROJECT WORK / DISSERTATION

The second semester is fully devoted for course work. The research guide shall give research topic for the project work/Dissertation. The project work shall be evaluated for 200 marks during Viva-Voce examination by external and internal examiners. :

Semester I.

1. Pre VIVA 50 Marks

Semester II.

1. Oral presentation 50 Marks
2. Dissertation 50 Marks
3. Viva – Voce 50 Marks

MPZ 1

THE AMERICAN COLLEGE, MADURAI
(An Autonomous Institution affiliated to Madurai Kamaraj University)
POSTGRADUATE & RESEARCH DEPARTMENT OF ZOOLOGY

PROGRAMME FOR M. Phil. ZOOLOGY (2019-2020 onwards)

Mission statement: The M. Phil. program is focused to equip students with skills to understand and appreciate Zoology. It is also aimed at helping the student to realize the importance of research work, develop skills to interpret and present results pertaining to research.

SEM	S. No.	Course code	Course Title	Hours	Credits	Max marks
I	1	MPZ 6621	Research Methods	4	6	120
I	2	MPZ 6623	Biological techniques	4	6	120
Project paper						
I	3	MPZ 6625	Environmental Science & Biotechnology	4	4	80
I	4	MPZ 6627	Immunology			
I	5	MPZ 6629	Insect Diversity			
I	6	MPZ 6631	Applied Microbiology			
I	7	MPZ 6633	Probiotics			
I	8	MPZ 6671	Research Project-I	18	6	**
			Total	30	22	320
II	9	MPZ 6672	Research Project-II	30	6	240
			Grand Total	60	28	560

**Valued continuously till the end of Second Semester

MPZ 2

M. Phil. Zoology

PROGRAMME SPECIFIC OUTCOMES

Upon completion of this Programme, the scholars will be able to:

1. Utilize biological techniques which can be applied in Zoological research.
2. Design and solve a research problem in any of the disciplines in Zoology.
3. Contribute to the accumulation of knowledge and information relevant to Zoology.
4. Analyze the concepts and developments in Zoology with an aptitude for continued selfdirected learning.
5. Perform experiments, collect data related to animals and document them as a thesis and imbibe skills of communication and problem solving.
6. Use literature relevant to Zoological research using different sources and relate information relevant to their field of research.
7. Assess the principles, working methods and applications of equipments used in Biology research.
8. Compute and analyze data statistically using packages.
9. Create new concepts and publish their findings in conferences and journals which may be of use to the scientific society.
10. Assess the developments across the disciplines of Zoology.

MPZ 3

Mapping of Courses with Programme Specific Outcomes (PSOs)

Course Code	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
MPZ 6621	✓						✓	✓	✓	✓
MPZ 6623	✓			✓			✓	✓	✓	✓
MPZ 6625	✓	✓	✓			✓	✓	✓	✓	✓
MPZ 6627	✓	✓	✓	✓	✓	✓	✓		✓	✓
MPZ 6629	✓	✓	✓	✓	✓	✓	✓	✓		✓
MPZ 6631	✓	✓	✓	✓	✓	✓	✓		✓	✓
MPZ 6633	✓	✓	✓	✓	✓	✓	✓			✓
MPZ 6671	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MPZ 6672	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Mapping of Programme Specific Outcomes (PSOs) with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	✓	✓	✓	✓		✓		✓	✓	✓
PSO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PSO3	✓	✓		✓	✓	✓	✓		✓	✓
PSO4	✓	✓	✓	✓	✓		✓		✓	✓
PSO5	✓	✓	✓	✓	✓	✓				✓
PSO6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PSO7	✓	✓		✓		✓	✓	✓	✓	✓
PSO8	✓			✓	✓	✓		✓	✓	✓
PSO9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PSO10	✓	✓	✓	✓		✓	✓	✓	✓	✓

MPZ 4

MPZ 6621 **Research Methods** **(4hrs/wk) (6cr)**

This course gives an overall view on the techniques in modern biology. It gives a comprehensive understanding of the methodology involved in biochemical, radiolabelling, biophysical, immunotechniques and statistical methods.

Course Outcomes

Upon completion of this course, students will be able to:

i. Compare and analyze the various biophysical methods.
ii. Assess the principle and methodology in biochemical methods.
iii. Explain the importance and applications of radiolabelling techniques. iv. Rate the applications of immunotechniques in the field of biology.
v. Compute biological data using statistical methods.

I. **Biophysical methods:** pH metry & colorimetry, ultra and density gradient centrifugation, UV/ visible spectrophotometer, IR, mass spectroscopy, UV/visible fluorescence, NMR & ESR , ICP, AAS, X-ray diffraction, flame photometer.

II. **Biochemical methods:** Quantification of carbohydrates, proteins, amino acids, and lipids. Pharmacological testing – Paper, TLC, column, ion exchange, affinity chromatography, GC-MS and HPLC.

III. **Radiolabelling techniques:** Radiation dosimetry, radioactive isotopes, autoradiography, GM & scintillation counter, molecular image of radioactive material - safety guidelines.

IV. **Immunotechniques:** Antibody generation, ELISA, RIA, immunopreciptation, immunodiffusion, immunoelectrophoresis. Flow cytometry, immunofluorescence microscopy, immunoblotting, FISH, GISH.

V. **Statistical methods:** Sampling, data collection, measures of central tendency & dispersion, probability, Binomial, Poisson and Normal distributions. Regression & correlation, ANOVA, t-test, Chi-square test - confidence levels, errors and levels of significance.

References

Own JA, Puntt J and Starnford S (2013) Kuby Immunology. 7th Edition, Freeman Company, New York

Sheehan C (1999) Clinical Immunology. 2nd Edition, Lippincott Raven Publications, Philadelphia.

Srivatsava SC and Srivatsava S (2003) Fundamental Statistics, Anmol Publications. New Delhi

Upadhyay A, Upadhyay K and Nath N (1998) Biophysical Chemistry Principles & Techniques. 2nd Edition, Himalaya Publishing house, New Delhi.

Wilson K and Walker J (1994) Principles and Techniques of Biochemistry & Molecular Biology. 7th Edition Cambridge University Press, London.

Zar JH (2006) Biostatistical Analysis, 4th Edition, Pearson Education, New Delhi.

MPZ 5

	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1				4		
CO2					5	
CO3			3			
CO4					5	
CO5			3			

Mean = 4

MPZ 6623 **Biological Techniques** **(4hrs/wk) (6cr)**

This course gives an overall view on the techniques in modern biology. It gives a comprehensive understanding of the methodology involved in microscopy, molecular & rDNA methods, field biology and statistical methods.

Course Outcomes

Upon completion of this course, students will be able to:

i. Identify the techniques used in Microscopy.
ii. Evaluate the role of molecular techniques in various areas of research. iii. Discuss the techniques and intricacies involved in rDNA methods. iv. Explain and evaluate field biology methods.
v. Analyze biological data using bioinformatics tools.

I. **Microscopy:** Fixation and staining. Resolving power, Light microscope, phase contrast microscope, SEM, TEM, STEM, AFM, freeze fracture methods, image processing methods, micrometry.

II. **Molecular techniques:** Analysis of DNA, RNA and proteins - Electrophoresis, 2-D and isoelectric focusing. Blotting techniques, microarray, MALDI-TOF, RFLP, RAPD and AFLP.

III. **Recombinant DNA methods:** Cloning strategies – Bacteria, Eukaryotes – gene libraries, cDNA cloning. Expression of cloned DNA molecules. DNA sequencing – PCR - types - Site directed mutagenesis.

MPZ 6

IV. **Field biology methods**: Estimating population density of plants and animals - diversity indices, indirect & remote observations - sampling methods - behavioural study, ground and remote sensing methods.

V. **Bioinformatics**: Basics of bioinformatics, databases, Pair-wise and Multiple sequence alignment, phylogenetic analysis, tools for primer design and drug designing.

References

Attwood TK and Parry-Smith D (2001) Introduction to Bioinformatics. Pearson Education, New Delhi

Chandler DE and Oberson RW (2009) Bioimaging: Current concepts in light and electron microscopy. Jones & Bartlet Publishers, USA.

Giese AC (1963) Cell Physiology. 2nd Edition, WB Saunders Co., Philadelphia.

Hoppert M (2003). Microscopic Techniques in biotechnology, Weinheim, Germany.

Huntingford F (1984) The Study of Animal Behaviour. Springer Netherlands.

Old RW and Primrose SB (1994) Principles of Gene Manipulation, 5th Edition, Blackwell Scientific Publications, New Jersey.

Pevsner J (2015) Bioinformatics and functional genomics. 3rd Edition. Wiley Blackwell, New York

Rastogi SC, Rastogi P and Mandiratta N (2008) Bioinformatics methods and applications: Genomics, Proteomics and Drug discovery. 3rd Edition. PHI learning, New Delhi.

Thenkabail PS (2015) Remote sensing of water resources, Disasters & Urban studies, CRC press. New York

	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1		2				
CO2					5	
CO3				4		
CO4					5	
CO5				4		

Mean = 4.0

MPZ 7

MPZ 6625 **Environmental Science and Biotechnology** **(4hrs/wk) (4cr)**

This project paper is designed to impart current knowledge to the students who choose their research career in areas related to environmental science and environmental biotechnology. The basic aspects concerned with ecosystem, natural resources will be dealt along with biotechnology principles related to Bioremediation, Bioproducts and sustainability.

Course Outcomes

Upon completion of this course, students will be able to:

i. Assess the importance of environmental resources and identify the problems related to environment.
ii. Plan strategies for biodiversity conservation. iii. Utilize biotechnology principles in monitoring and restoring the quality of environment.
iv. Design eco-friendly bio-products and utilize them to solve energy crisis and pollution problems.
v. Discuss unsustainability problems related to food, energy and environment.

I. **Ecosystem and Natural resources:** Structure and Function - Major ecosystems - Energy flow - Role of microbes – Ecological stress and its Management. Natural resources, environmental effects of resource extraction - Monoculture, Crop rotation. Urbanization - Environmental Impact Assessment, Geographical Information System.

II. **Environmental and Biodiversity Conservation:** Conservation of aquatic systems and forests. Nature Parks and Sanctuaries - Wildlife conservation. Biodiversity - Concept, types and values. Biosphere reserves - IUCN - Measurement - Inventory and documentation. Hot spots - Threats and Conservation - Management Strategies.

III. **Biodegradation and Bioremediation:** Xenobiotics – Recalcirtants – Detoxification – Microbial transformation of pesticides – Biotreatment – Biofilters – Bioscrubbers – Biospargers – Bioventing – Immobilized enzymes – Root zone treatment – Role of GMOs – Bioremediation – types – methods – Influencing factors – Phytoremediation. Biosorption – mechanism, factors, equilibrium models and biosorbents.

IV. **Bioproducts and Bioengineering:** Biofertilizers – Vermicomposting – Microbial biopesticides – Integrated Pest Management – Biofuels. Bioleaching – Bioplastics – Biopulping – Biomonitoring – Bioindicators – Biosensors.

V. **Sustainability and Human Development:** Sustainability and Resources – Energy Sources, Uses and Conservation. Waste disposal methods. Urban Problems – Food and Agriculture – Environmental Education and Environmental Policy – International Treaties and Conventions – Environmental Legislation.

References

Chatterji AK (2005) Introduction to Environmental Biotechnology. Prentice-Hall of India Pvt. Ltd., New Delhi, xv+179pp.

Cunningham WP and Cunningham MA (2002) Principles of Environmental Science: Inquiry and Application. McGraw Hill, New York, USA. 418pp.

Kormondy EJ (2006) Concepts of Ecology. 4th Edition, Prentice-Hall of India Pvt. Ltd., New Delhi, xvi+559pp.

Murugesan AG and Rajakumari C (2006) Environmental Science and Biotechnology: Theory and Techniques. MJP Publishers, Chennai, 460pp.

Odum EP and Barrett GW (2005) Fundamentals of Ecology. 5th Edition, Thomson Brooks/Cole, Australia, xviii+598pp.

Rittmann BE (2001) Environmental Biotechnology: Principles and Applications. McGraw Hill, New York, xiv+754pp.

Scragg A (2005) Environmental Biotechnology. 2nd Edition, Oxford University press, Oxford. 447pp.

	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1				4		
CO2			3			
CO3			3			
CO4				4		6
CO5					5	

Mean = 4.1

MPZ 9

MPZ 6627 **Immunology** **(4hrs/wk) (4cr)**

The project paper on Immunology deals with antibody structure, Major Histocompatibility Complex, antigen-antibody interactions, HLA polymorphism, serological methods in histocompatibility testing and molecular typing methods. Emphasize is also given to cell and antibody mediated immunity, autoimmunity, transplantation and tumour immunity. In the last section immunodeficiency diseases, vaccines, animal experimental systems, stem cells are also included.

Course Outcomes

Upon completion of this course, students will be able to:

i. Revise the structure of antibody and its functions.

ii. Discuss HLA genetics & polymorphism, tissue & molecular typing. iii. Explain the mechanisms involved in CMI, tolerance and hypersensitivity. iv. Critique about autoimmunity & immune response to tumors.

v. Evaluate the role of vaccines, transgenic animals and stem cells in combating immunodeficiency diseases.

I. **Antigen, Antibody and Major Histocompatability Complex:** Molecular structure of antibody – Monoclonal antibodies – Antibody engineering – Antigen-Antibody interactions – MHC – Antigen Presentation.

II. **HLA Polymorphism and Typing:** HLA genetics – HLA polymorphism and nomenclature – inheritance – serological methods in histocompatibility testing – tissue typing by lymphocytotoxicity tests. Molecular typing methods – gene amplification – SSP – SSOP typing – SBT - HLA typing for allogeneic transplantation.

III. **Cell & Antibody Mediated Immunity, Control Mechanisms and Hypersensitivity reactions**: B and T cell activation and differentiation – Antibody Mediated and Cell Mediated Effector Functions – Major Pathways for Complement activation – Tolerance – Hypersenstivity reactions.

IV. **Autoimmunity, Transplantation and Tumor Immunology:** Organ specific and systemic autoimmunity – Graft rejection – Immunosuppressive therapy – Immune response to tumour – Immunotherapy.

V. **Immunodeficiency Diseases, Vaccines and Animal Experimental Systems:** Primary and Secondary immunodeficiency diseases – Vaccines – Inbred Strains – Congenic strains – adoptive transfer system – Transgenic animals – Knock-in and Knock-out technologies – the *cre/lox* systems – Cell culture systems – Stem cells.

MPZ 10

References

Coico R and Sunshine G (2015) Immunology – a short course. 7th Edition, Wiley Blackwell, New York.

Delves PJ, Martin SJ, Burton DR and Roitt IM (2011) Roitt's Essential Immunology. 12th Edition, Wiley-Blackwell, New York.

Owen JA, Punt J and SA Stranford (2013) Kuby Immunology 7th Ed. W.H. Freeman and Company, New York

Parslow G, Stites DP, Terr AI and JB Imboden (2001) Medical Immunology, 10th Ed. McGraw Hill Company, New York.

	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1				4		
CO2		2				
CO3		2				
CO4			3	4		
CO5					5	

Mean = 3.1

MPZ 11

MPZ 6629 **Insect Diversity** **(4hrs/wk) (4cr)**

This project paper is aimed to acquaint students with the basics of insect morphology, physiology and systematics. It is designed to impart knowledge on the ecology, abundance and their role in ecosystem. It will help to develop strong foundation in entomology by understanding the importance of insects to human society, concern related to disease, insecticide, their use in forensics and in biotechnology.

Course Outcomes

Upon completion of this course, students will be able to:

i. Outline the morphology and physiology of insects.

ii. Assess the role of insects in an ecosystem. iii. Analyze the importance of agricultural and forest pests. iv. Identify and apply the procedures following in industrial entomology.

v. Evaluate the role of pesticides, regulators, parasitoids in pest management.

I. **Insect Morphology, Taxonomy and Physiology**: External morphology of insect- head, thorax, abdomen, appendages - function. Insect taxonomy – principles of systematics, classification, apterygotes, exopterygotes, endopterygotes. Digestive, circulatory, respiratory, excretory, nervous, sensory, reproductive system and endocrine glands.

II. **Insect Ecology and Biotechnology**: Population dynamics, factors, dispersal, migration, seasonality, diapause, prey–predator interaction, mimicry, coloration, life history strategies, bees, butterflies - Pollinators, decline, conservation, attracting native pollinators. Genetic engineering in insects, insect vectors, transgenic mosquitoes, rDNA technology in sericulture.

III. **Agricultural and Forest Entomology**: Pest- biology, damage, life history, control - paddy, sugarcane, cotton, vegetables. Insects and trees - diet, defence, coevolution, outbreak, pest of forest seed, nursery, standing trees and timber.

IV. **Industrial, Medical and Forensic Entomology**: Sericulture, apiculture, lac culture, insects as human food, predators, diseases, stored product pest. Medically important insects - Diptera, Anoplura, Mallophaga, Hemiptera, biology & ecology of mosquitoes - control. Insects of forensic importance - life cycle.

V. **Insect Toxicology and Pest Management**: Insect growth regulators, microbial-botanical insecticides, insect resistance, Probit analysis, evaluvation of insect toxicity, pesticide appliance, toxicity to beneficial insects. Biological control, biodiversity of biocontrol agents, parasitoids, predators and advances in IPM.

MPZ 12

References

Chapman (1998) The Insects Structure and Function, 4th Edition Cambridge University Press London.

David BV and Kumarasamy T (1982) Elements of Economic Entomology, Popular Book Depot Chennai.

David BV and N Ramamurthy (2016) Elements of Economic Entomology, 8th Edition, Brillion Publishing.

Fennermore PG and Alkaprakash (1992) Applied Entomology, Wiley Eastern Ltd New Delhi.

Kunte K (2000) Butterflies of Peninsular India, University Press, Hyderabad.

Richards OW and Davies RG (2013) Imms General Textbook of Entomology Vol. 1 & 2, 10th Edition, Springer Science & Business media.

Srivastava KP and Dhaliwal N (2015) Textbook of Applied Entomology, Kalyani Publications New Delhi.

Wigglesworth VB (2012) Principles of Insect Physiology, 7th Edition, Springer Science & Business media.

	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1		2				
CO2		2				
CO3			3	4		
CO4				4	5	
CO5					5	6

Mean = 3.8

MPZ 13

MPZ 6631 **Applied Microbiology** **(4hrs/wk) (4cr)**

This research project paper is designed to promote the interest of research in basic and applied areas of microbiology such as industrial, food, medical, environmental and agricultural microbiology.

Course Outcomes

Upon completion of this course, students will be able to:

i. Discuss the origin and compare archaebacterial cells with modern microbial organisms.
ii. Evaluate the bacterial growth and metabolism. iii. Assess the microbial diversity and microbial interaction with other lives. iv. Explain the importance of food preservation, microbial spoilage and food borne diseases.
v. Identify the problems related to public health and evaluate the control measures.

I. **General Microbiology and Taxonomy:** Members of microbial world and microbial evolution – Origin of microbiology - Bacterial and Archaebacterial cells - Taxonomy ranks – techniques for determining microbial taxonomy - Phylogenic trees, concept of microbial species - Bergey's classification of bacteria - Classification of algae, fungi, protozoa and viruses.

II. **Microbial Physiology and Biochemistry:** Nutritional types – Growth curve – Culture media – Bacterial cell cycle – Measurement of microbial growth – Pattern of microbial death – Physical, chemical and biological control of microorganisms - Chemotaxis and endospore formation – Microbial metabolism - Oxidation-reduction reactions.

III. **Microbial Ecology and Soil microbiology:** Biogeochemical cycles - Global climate changes, Assessing microbial diversity, Microbial community activity, Water as a microbial habitat, Marine and freshwater ecosystems and Coliform analysis, Soil as a microbial habitat, Normal microbiota of human body, Plant-microbe association - mycorhizza. Water purification and sanitary analysis - Waste water treatment - Biodegradation, Bioremediation and Bioaugmentation - Sewage treatments and recycling wastes.

IV. **Food and Industrial Microbiology:** Types of food for microbial growth spoilage and preservation of foods – food borne diseases – detection of food borne pathogens - microorganisms as food and food amendments – SCP and applications of microbial products in human welfare – Microorganisms used in industry - Downstream processing Production strains - Production of antibiotics, Vitamins, enzymes and vinegar – Primary, secondary screening of microbes and scale up fermentations - Types of fermentors - raw materials.

V. **Medical microbiology & Public Health:** Types of causative agents, disease and control measures – Development of chemotherapy and general characteristics of antimicrobial drugs – Drug effectiveness and Antibiotic resistance - Epidemiology - infectious diseases

in population – Nosocomial infections - Control of epidemics - Bioterrorism - Global health considerations – Airborne, Zoonotic, Prion, Direct, Contact and Opportunistic diseases.

References

Kingsbury, D.T., Wagner. G.E. (1990) Microbiology, NMS (series). 2nd edition. National medical series.

Kapil, A., Bhaskaran, C.S. (2013) Ananthanarayan and Paniker's Textbook of Microbiology. 9th Edition. University Press.

Willey, J.M., Sherwood, L.M., Woolverton, C.J. (2016) Prescott's Microbiology. 10th edition. McGraw Hill International publication.

	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1		2				
CO2					5	
CO3				4		
CO4			3			
CO5				4	5	

Mean = 3.8

MPZ 6633 **Probiotics** **(4hrs/wk) (4cr)**

This course is designed to understand and apply various strains of probiotics, their identification and their role in animal and human health. This course gives an idea for role of probiotics in immune response and stress. It also includes the application of probiotics in animal husbandry and aquaculture.

Course Outcomes

Upon completion of this course, students will be able to:

i. Identify and classify beneficial microbes and their biological role.

ii. Describe the procedure for commercial probiotic production and consumption. iii. Apply probiotics in animal physiology and human health. iv. Analyze the role of probiotics in immune response and stress.

v. Explain the effect of beneficial microbes in animal husbandry and aquaculture.

MPZ 15

Biological role, Classification and Identification of Microbes: History of probiotics – FAO guidelines-contribution of probiotics and prebiotics- Identification of individual strains. – Selection of strains for human use – Beneficial microbes and their role in human health and animal husbandry.

I. **Commercial Production of Strains and Consumption:** Various processes in commercial production- Registration procedures-EFSA- Identity – and quality safety and efficacy – ethical and approval - dosage and product formulation- sensory additives – nutritional additives digestability enhancer and gut microflora stabilizer.

II. **Probiotics in Animal Physiology and Human Health:** Beneficial effects on mineral metabolism-Increasing boro density and stability reduction in metabolic disorder-Enhancement of gut microflora balance- Feed efficacy enrichment - Improvement of digestive health and comfort- cancer prevention.

III. **Probiotics in immune response and stress:** Probiotic effect on innate and acquired immunity- Reduction in food borne pathogen carriage-modification in immunoglobulin synthesis – reduced impact during stress – Impact of stress related hormones and probiotics.

IV. **Probiotics in animal husbandry and aquaculture:** Probiotic role in animal health- effect on intestinal microflora- Immune protection of digestive tract- growth promoters- therapeutic agents – mechanism of probiotics in fish and shrimp culture- developing probiotics for aquaculture.

References

Fraunhofer JAV (2012) Prebiotics and Probiotics. Create Space Independent Publishing Platform.

Michail S and Shermen PM (2009) Probiotics in Pediatric Medicine (Nutrition and Health). Humana Press.

Otles S (2013) Probiotics and Prebiotics in food, Nutrition and Health. CRS Press.

	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1						6
CO2			3			
CO3		2				
CO4					5	
CO5			3			

Mean = 3.8

MPZ 16

MPZ 6671, 6672 **Research Project I and II** **(18hrs/wk + 30hrs/wk) (6cr+6cr=12cr)**

This is a two semester sequential course. It aims at training the students in collecting, analyzing and interpreting the data for drawing valid conclusions. The students are allowed to choose the problems in the five subject areas of the project paper. The student's initiative and inventiveness in designing experiments are encouraged. The research project sequentially spread over the first and second semesters will be evaluated at the end of the second semester.

The students have to submit 4 typed copies of the dissertation to the department at the end of the second semester. A copy of dissertation will be sent to the external examiner for review. Internal valuation will be done by the guide. A viva-voce examination will be conducted by a panel of examiners which includes the external examiners also.

Course Outcomes

Upon completion of this course, students will be able to:

i. Design a research project and do literature survey.
ii. Plan experiments and collect data. iii. Analyze collected data statistically to arrive at conclusions. iv. Demonstrate ability to do independent research.
v. Create new applications and prepare project proposals.

	K1: Remembering	K2: Understanding	K3: Applying	K4: Analyzing	K5: Evaluating	K6: Creating
CO1						6
CO2			3			
CO3		2				
CO4					5	
CO5			3			

Mean = 3.8

VAQ 1

B.voc in aquaculture

THE AMERICAN COLLEGE, MADURAI- 625002

Sem	Course No	Course Title	Hrs/ wk	Cr.
I	**General Education**			
	EVS 3401	Environmental studies	4	4
	LSV 3401	Entrepreneurship development	4	4
	CSV 3401	Information and communication technology	4	4
	Skill Component			
	VAQ 3401	Fish microbiology and biotechnology	4	4
	VAQ 3403	Intensive and integrated fish farming	4	4
	VAQ 3113	Lab -V	10	10
	Job Training			
	VAQ 3415	Internship V	120/sem	4
		Total		**34**
II	**General Education**			
	VEV 3402	Youth in the global context-value education	4	4
	LSV 3402	Soft skills	4	4
	CSV3402	Data base management system	4	4
	Skill Component			
	VAQ 3402	Mariculture	4	4
	VAQ 3404	Aquatic animals health management	4	4
	VAQ 3114	Lab -VI	10	10
	Job Training			
	VAQ 3416	Internship --VI	120/sem	4
		Total		**34**

- **Theory / Lab courses - 1 credit = 15 hours/Semester**
- **Internship – 1 credit = 30 hours/Semester**

VAQ 2

The American college

Approved by UGC

B.Voc -degree program in aquaculture

Programme specific outcomes

1. Apply the knowledge of aquaculture in various aspects of environment / industry.
2. Identify and analyze problem related to aquaculture.
3. Designing solution for problems arise in aquaculture practice and environment, society.
4. Connecting investigations to solve the problems arise aquaculture practice and environment.
5. Adapting procedure for laboratory analysis in biochemistry, molecular biology, biotechnology and microbiology.
6. Apply the concepts aquaculture to benefit of society.
7. Contribute the sustainable development of aquaculture to save the environment.
8. Development ethical and working concept of environmental friendly and aqua practice based on inputs of biotechnology, microbiology and genetics.
9. Develop communications skills through seminar and oral presentation.
10. Integrate to individual and teamwork projects and laboratory work.

VAQ 3

Mapping of Courses Outcome (COs) with Programme Specific Outcomes (PSOs)

Courses	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
DAQ 1409	√	√	√				√	√		
DAQ 1411		√				√		√		
DAQ 1113	√	√		√			√		√	
DAQ 1410	√	√		√			√			
DAQ 1412	√	√	√							
DAQ 1114	√	√			√					
AAQ 2405	√	√								
AAQ 2407	√	√	√							
AAQ 2903		√	√		√		√			
AAQ 2406	√	√		√						
AAQ 2408	√	√					√			
AAQ 2904			√		√	√				
VAQ 3401	√	√					√			
VAQ 3403	√	√	√				√			
VAQ 3113			√	√	√	√				
VAQ 3402	√	√					√			
VAQ 3404	√	√	√				√			
VAQ 3114	√	√			√		√			

EVS 3401 **Environmental Studies** **(4h/wk) (4Cr)**

This course is designed to develop environmental awareness to the students. It deals with the natural resources, ecosystems and the impact of human activity on them. This course also imparts the biodiversity and its conservation. It also sensitizes the students on the environmental issues and abatement of pollution and gives suggestion for sustenance.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Discuss the terminology commonly used in environmental science and to identify renewable and non renewable resources and its proper usage and conservation
ii. Explain the concept , structure, function of ecosystem and to analyze the interaction of organism at different ecosystem
iii. Evaluate the adverse human impact on abiotic and biotic community and sustainable strategies to mitigate the impact
iv. Create knowledge on biodiversity and its conservation and utilize advances in environmental science to resolve issues and anticipate implications.
v. Assess the consequences of environmental disasters and its remedy

1. **Introduction to environmental studies:** Concept and Scope – importance of sustainability and sustainable development. The Atmosphere, the Hydrosphere, the Lithosphere and the Biosphere. Concept of Renewable and Non-renewable resources:

2. **Ecology and Ecosystems:**Concept of ecology and ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology; ecological succession. Characteristic features of the following- Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (ponds, lakes, rivers, oceans)

3. **Environmental Pollution:**Pollution -Definition - Causes, effects and control measures of - Air pollution - Water pollution -Soil pollution - Marine pollution -.Noise pollution - Thermal pollution - Nuclear hazards . Solid waste Management: Causes, effects and control measures. Role of an individual in prevention of pollution. Natural Disasters and their Management: floods, earthquake, cyclone and landslides.

4. **Biodiversity and its conservation:**Definition: genetic, species and ecosystem diversity. Biogeographical classification of India- values Biodiversity at global, National and local levels. India as a mega-diversity nation - Hot-spots of biodiversity. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, manwildlife conflicts.. Conservation of biodiversity: In-situ and Ex-situ method of conservation.

5. **Social Issues and the Environment:**Water conservation- rain water harvesting, watershed management. Wasteland reclamation. Afforestation. Management and Wildlife conservation. Climate change - Greenhouse effect - global warming - acid rain, ozone layer depletion. Environmental Laws : Environment Protection Act, 1986 ; The Water

Act, 1974, The Air Act, 1981 and The Wildlife (Protection) Act, 1972 , Forest Conservation Act .Issues involved in enforcement of environmental legislation. Public awareness.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X			X	
K2: Understanding	X	X			
K3: Applying			X		
K4: Analyzing					
K5: Evaluating					X
K6: Creating				X	

LSV 3401 Entrepreneurship Development (4h/wk) (4 Cr)

To give an overview about the real concepts of entrepreneurship and to impart knowledge about the various sources for a small business and hence motivate the students to become a job providers.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Cite the meaning of entrepreneurship and identify the role of entrepreneurs.
ii. Identify different types of entrepreneurs and the problems faced by them
iii. Identify the various sources of small business and capable of starting a business by creating own business plan.
iv. Identify the various institutes and their functions that support entrepreneurs
v. Identify and utilize the various incentives available for small scale business.

1. **Entrepreneur:** Definition - Characteristics - Functions - Competencies - Entrepreneur vs Entrepreneurship - Role of Entrepreneur in Economic Development.

2. **Types of Entrepreneurs:** Innovative - Adaptive - Fabian - Drone; Entrepreneur vs Intrpreneur, Copreneur; Women entrepreneur - Types - Problems.

3. **Strating a small Business:** Steps; **Project Report:** Contents – Importance.

4. **Institutional Support to Entrepreneurs:** SIDCO - TCOs - DIC - TIIC - SIDBI - Commercial Banks.

5. **Incentives for Small Scale Business:** Subsidy - Tax Concessions - Assistance - Export Assistance - Technical Assistance.

Text Book

E. Gordan & K. Natarajan, Entrepreneurship Development, Himalaya Publishing House, 2017.

References

1. Holt, Entrepreneurship: New Venture Creation, Prentice-Hall, 2018.
2. R. V Badi& A. V Badi, Entrepreneurship, Vrinda Publication (p) Ltd, New Delhi 2010
3. K. Ramachandran, Entrepreneurship Development, Tata McGraw Hill, New Delhi, 2017.
4. Dr. Radha, Entrepreneurial Development, Prasanna and Co, Chennai. 2019

LSV 3401 **Entrepreneurship Development**

Bloom's Taxonomy	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	X				
K3: Applying					X
K4: Analyzing		X		X	
K5: Evaluating					
K6: Creating			X		

CSV 3401 **Information Communication Technology (4hr/wk) (4Cr)**

This course aims at enabling the student to know the role of ICT resources in modern applications and presenting its environment. This course also makes a student familiar with Web environment and its applications in providing utilization and communication of Information.

Course outcomes:

At the end of the course the student will be able to:

i. Explain the progress of information and communication technology and their role in modern world.
ii. Identify the difference between Operating Systems and application software.
iii. Examine different kinds of software and their working.
iv. Utilize computer and similar electronic devices suitably for data processing.
v. Use Internet safely and explore different kinds of information available on the Internet.

Unit I: Accessing the web –Introduction to the browser and browsing Accessing the web II – Introduction to the web familiarity with IOT environment – Connections and Connectors – Inputting in Indian Language – Font and Keyboard

Unit II: Creating with ICT – Handling Text – Handling Data – Handling Media – Operating Systems and it Requirement – Bringing together Hardware and Software

Unit III: Internet t access Information – Exploring Web resources – ICT in class room

Unit IV: Hardware and Software – Assistive Technologies – Working with Data I – Exploring spread sheet- Working with Data II – Exploring with spread sheet.

Unit V: E-mail and Web based Forums –Transacting through the web – Exploring E-commerce applications – Execution and peer evaluations –Evaluation and portable submission.

References

1. Brilliant Ideas for using ICT in the inclusive class room, II Edition, Sally McKeown, Angela McGlashon
2. Introducing Computing: A guide for teachers Edited by Lawrence Williams.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering		X			
K2: Understanding	X				
K3: Applying				X	X
K4: Analyzing			X		
K5: Evaluating					
K6: Creating					

VAQ 3401 **Fish microbiology and biotechnology** **4h/wk-4credits**

This theory course deals with the various areas of biotechnology in aquaculture include use of
Synthetic hormones, enzymes and vaccines. It covers spoilage of fresh fish, micro organisms and processed to sea foods microbiological safety concept of quality management.

Specific learning outcome: At the end of the course students will be able to

- Describe the scope of biotechnology in fisheries and fish feed.
- Understand the types of probiotics, bioactive compounds used in aquaculture
- Explain the role of microbes in fish food
- Gain the knowledge from principles of fish preservation and processing.

Unit I. Aquaculture biotechnology

Scope of biotechnology in fisheries – transgenic – principles and application in fisheries – feed biotechnology – single cell proteins –nutraceuticals.

Unit II. Probiotics and prebiotics

Types of probiotics and prebiotics with their use- immunostimulants used in aquaculture – bioremediation in aquaculture system – culture of primary cell and secondary culture – development of cell lines and their applications.

Unit III. Recombinant DNA

Proteins of commercial importance – enzymes – hormones –bioactive compounds – therapeutic proteins- bioremediations- treatment of waste water –vaccines in fishes.

Unit VI. Role of microbes in food

Microbes in nature and food – microbes in fish – parameters that affect microbial – psychrophiles, halophiles and thermophiles nd their role in spoilage and food poisoning.

Unit V. Principles of fish preservation and processing.

Food pathogen, infection and in toxification – types of fish spoilage, microbes in processed and semi processed fisheries product – concept of quality ,management – TQM, GMP, HACCP and ISO.

References

1. Felix.s. 2007: molecular diagnostic biotechnology in aquaculture, Daya publ. house.
2. Nair. PR: 2008: Biotechlnologyandgenetics in fisheries and aquaculkture, Dominants publ.
3. Reddy. PUG,Ayyappan.S., Thampy.DM. and Gopalakrishnan 2005: Text book pf fish genetics and biotechnology ICAR.
4. Pandian TJ., Strussmann. CA. and marian., M.P 2005: fish genetics and aquaculture biotechnology .sciences.publ.
5. Robinson. R.K1985: microbiology of frozen food. Elsevier applied sciences publishers.
6. Devadasan. K., mukundan, MK., Antony P.D., and jose joseph 1997. Nutrients and bioactive substsnces in aquacutic organisms. Soft (I).
7. CIFT- training manual.2011: seafood quality assurance CIFT, Cochin.

VAQ 10

Fish microbiology and biotechnology

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Outline the principles and application in biotechnology in aquaculture.	PSO2
Unit II	Analyse the types of probiotics and prebiotics with their application	PSO7
Unit III	Explain the role of recombinant DNA in enzymes and hormone synthesis in fishes and describe the bioremediation natural process.	PSO1
Unit IV	Describe the role of microbes in nature food and their role in spoilage and food poisoning	PSO2
Unit V	Discuss the types of food pathogen, food spoilage and concept of quality management	PSO2

Blooms taxonomy for Fish microbiology and biotechnology

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand			2	2	
K3: Applying					
K4: Analyzing	4	4			4
K5: Evaluating					
K6: Creating					

Mean: 3.2

VAQ 3403 **Intensive and integrated fish farming** **4h/wk-4credits**

This course is reviewed the various integrated practices, integrated management and comprehensive use of aquaculture, agriculture and livestock, with an emphasis of aquaculture. In the last section deals with integrated multi topic aqua cultural system are discussed in detail.

Specific learning outcome: At the end of the course students will be able to

- Explain the status and future for intensive fish forming
- Describe the commercially important fishes, water quality maintenance and monosex seeds.
- Understand the agri based integrated, poultry and duck cum fish culture practices

Unit I. Intensive farming

Status and future for catfishes and tilapia in India –need and development for intensive farming- diseases and control measures.

Unit II. Cat fish and Tilapia

Commercially important fishes – intensifying catfish and tilapia culture –poly culture- water quality maintenance and feeding – sex reversal techniques for tilapia – mass culture of monosex seeds and hybrids in tilapia red tilapia production.

Unit III.Agribased integrated Integrated farming

Rice cum fish culture horticulture, mushroom and sericulture- cattle cum fish culture – waste water recycling- manuaring – polyculture.

Unit IV. Poultry and Duck cum fish culture

Designing and construction of integrated fish ponds – monitoring water quality and recycling – feeding and monitoring- sampling and harvesting.

Unit V. Integrated multi – Topic aquaculture system (IMTA)

Selection of species- organic case studies- benefits- prospects.

References

1. Jhingran. UG. 1991: Fish and fisheries of India. Hindustan pibl.corp.
2. Shepered. J. and Brommage. N.1990. Inytensivefigsh farming B.S.P professional books.
3. Bardach. E.J. Rhyther, J.H nad MC. / larney. W.O. 1972: Aquaculture. The farming and Husbandry of fresh water and marine organisms. John Wiley & sons.
4. Pillay TVR. 1990: aquaculture, principles and practices fishing news books.
5. Jayaram. K.C. 2006. Catfishes of india .narendra publ. house.

VAQ 12

Intensive integrated fish farming

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Discuss the need, status and uses of intensive farming in India	PSO2
Unit II	Identify the commercially important fishes and their production techniques	PSO7
Unit III	Analyse the agri based integrated fish farming like mushroom culture and sericulture cum fish culture.	PSO7
Unit IV	Designing and construct integrated fish pond and techniques involves in sampling and harvesting.	PSO3
Unit V	Explain the integrated multi tropic agriculture system and its benefits	PSO1

Blooms taxonomy for basic of aquaculture

Intensive integrated fish farming

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand					2
K3: Applying					
K4: Analyzing			4		
K5: Evaluating	5				
K6: Creating		6		6	

Mean: 4.6

VAQ 13

Lab-V **10h/wk-10credits.**

Fish microbiology and biotechnology, Intensive and integrated fish farming

The laboratory component includes exercises for fish microbiology and biotechnology with their techniques.

Specific learning outcome: At the end of the course the students will be able to

- Identify the procedure for isolating and preparing chromosomes in fishes
- Study of pathogenic microbes involved in fish spoilage
- Gain knowledge by visiting nearby tilapia and catfish breeding form
- Prepare feed for catfish and tilapia

1. Isolation and quantification of DNA
2. Preparation of chromosomes from embryo and young fish
3. Ploidy determination by RBC measurements.
4. Practical on gene bank sequence data bases.
5. Study of microbes associated with fish.
6. Isolation of pathogenic microbes like salmonella, listeria.
7. Effects of chemicals and physicals preservations on fish spoilage.
8. Study of aerators and air blowers.
9. Visiting nearby hybrid tilapia and catfish breeding farm.
10. Formulation of feeds for catfish and tilapia.

Suggested reading.

1. Gilbert .B. 1990: aquaculture vol II Ellis Harwood
2. Rath. P.K. 2000: fresh water aquaculture. Scientific publ.
3. Felix. S. 2007. Molecular diagnostic biotechnology in aquaculture. Daya publ. house.
4. Pandian. TJ., strussmam C.A and marian. M.P. 2005 fish genetics and aquaculture biotechnology. Science publ.

VAQ 14

Lab- 5

Fish microbiology and biotechnology, Intensive and integrated fish farming

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Outline the procedure isolating chromosomes and DNA	PSO5
Unit II	Access the DNA sequence by using bioinformatics centers	PSO4
Unit III	Study the types of pathogenic microbes involved in fish spoilage	PSO5
Unit IV	Analyzing the designs and working principles of aerators and blowers	PSO3
Unit V	Explain the procedure for commercial hybrid *Tilapia* and *Catfish* cultivation	PSO6

Blooms taxonomy for

Fish microbiology and biotechnology, Intensive and integrated fish farming

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand	2		2		
K3: Applying					
K4: Analyzing		4		4	
K5: Evaluating					
K6: Creating					6

Mean: 3.6

VAQ 15

YOUTH IN THE GLOBAL CONTEXT

VAL 3402 **4hrs /4 credits**

Objective: *To make the students understand the meaning and implications of globalization. To acquaint them about new challenges world is facing due to globalization. The good side and the sad size of globalization – To enlighten them about the need to learn family values and practice them to cope up with the newly arising challenges.*

Unit - I UNDERSTANDING KEY CONCEPTS OF GLOBALISATION

Free market Economy and Global Market Network - Communication and transport - Technology and Global Production System - Global Capital and investments - Culture of over consumption - Human needs - Over exploitation of resources

Unit – II EDUCATION IN GLOBALISED CONTEXT

Differential access to Education at the Primary, Secondary and Tertiary level- Problem of Quality Addressing deficiencies – need for communication and other Social skills - need for equitable and quality universal education

Unit - III GLOBALISATION AND EMPLOYMENT

New aspirations and the demands placed on youth - Changing structure of Employment and working norms related to time and remuneration - New Forms of insecurities - Cultural alienation -Youth and Consumerism - Distinguishing successful and meaningful life

Unit - IV YOUTH AND FAMILY VALUES

Mobility of Youth - Fragmentation of family structure - Issues relating to Marriage and Marital harmony; Addressing the growing rate of divorce and separation - Family related values

Unit - V GLOBALISATION AND OTHER SOCIO POLITICAL ISSUES

Poverty and Marginalization under Globalization – Terrorism - Rise of religious fundamentalis and Cultural Chauvinism – Corruption – Democracy - civil society issues – Social Values: Honesty, Hard Work, Trustworthiness

Books for refer

Study Materials will be provided.

Course outcomes: At the end of this course, the students will be able,

CO1: To explain what is globalization and their important aspects

CO2: To assess the conditions of education in their society

CO3: To predict the new challenges arise in the society due to globalization

CO4: To analyze the emerging trends in employment and cope up with them

CO5: To apply the values in their lives amidst the changing scenario

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering			X		
K2: Understanding	X				
K3: Applying					X
K4: Analyzing				X	
K5: Evaluating		X			
K6: Creating					

LSV 3402 **Soft Skills** **(4h/wk) (4Cr)**

The learner will gain the skills required for the corporate world that would enhance one's employability and to provide an exposure to the students regarding the soft skills required for the job market.

Course outcomes:

At the end of this course, the students will be able to:

i. Cite the meaning and define soft skill and also to identify the different types of soft skills.
ii. Identify different types of communication and overcome the barriers for effective communication.
iii. Develop and exhibit a good body language and enhance their personality.
iv. Exhibit a polite behaviour in society or among members of a particular profession or group and enrich their public speaking skill.
v. Enhance their writing skill and face interviews without fear.

VAQ 17

Unit I - Soft Skill: Definition - Importance of soft skills - Types of soft skills.

Unit II - Communication: Definition - Process - Types - Verbal, non-verbal - Uses - Barriers of effective communication.

Unit III - Inter Personal Relation Skills: Body Language and personality.

Unit IV- Etiquettes or Manners: Art of Public Speaking - Chracteristics of a good speech - Planning to speak.

Unit V- Writing Skills: Importance - Types **Interview:** Types - Selection - Appraisal - Exit.

Text Book

Rajendra Pal & J. S. Korlahalli, Essentials of Business Communication, Sultan Chand & Sons, New Delhi, 2016.

References

N.S.Raghunathan&B.Santhanam, Business Communication, Margham Publications, Chennai, 3rd Edition 2018.

Reddy, Appannnaih& Raja Rao, Essentials of Business Communication, Himalaya Publishing House, Mumbai, 2017.

Rizvi, M. Ashraf - Effective Technical Communication, Tata McGraw Hill, 2011

Blundell J. A & Middle N. M. G.: Career – English for the Business and Commercial World, Oxford University Press, 2009

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering					
K 2: Understanding	X				
K 3: Applying		X	X		
K 4: Analysing				X	
K 5: Evaluating					X
K 6: Creating					

VAQ 18

Database management system (4h/wk) (4Cr)

This course is intended to familiarize the students with the concept and significance ofdatabase maintenance and management. Moreover, the course would orient the studentsabout the various aspects involved need for systematic retention of database involved intheir respective vocations.

Course outcomes

At the end of the course the student will be able to:

i. Identify the database approach and the database applications
ii. Apply relational expressions for queries.
iii. Examine the database design by normalization.
iv. Build a table and manipulate the data using SQL Commands.
v. Summarize the transactions, its properties and the concurrency controls.

Unit I: Databases and database users: Introduction – Characteristics of the database approach – Advantages of using the DBMS approach – A brief history of Database Applications.

Unit II: Database System Concepts and Architechture – Data Models, Schemas and Instances.

Unit III: Database Languages and Interfaces: The Database System Environment – Centralized and Client / Server Architecture for DBMSs – Classification of Database Management System.

Unit IV: Relational Model Concepts: Relational model Constraints and Relational Database Schemas, Update Operation, Transaction and dealing with Constraints violations.

Unit V: Database Recovery Concepts - Caching(Buffering) of Disk blocks – Write-ahead Logging, Steal / No-Steal and Force / No-Force - Checkpoints in the System Log and Fuzzy Check pointing – Transaction rollback

References

1. "Database Management System" – Raghu Ramakrishnan and Johannes Gehrke – 3rd edition, McGraw-Hill, 2003.
2. "DBMS a Practical Approach", E.R.Ragiv Chopra, S Chand Publications.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering	X				
K 2: Understanding					X
K 3: Applying		X		X	
K 4: Analysing			X		
K 5: Evaluating					
K 6: Creating					

VAQ 3402 **Mariculture** **4h/wk-4credits**

This course is designed to introduce the culture of marine organism both plants and animals in an aquatic medium. Learn to form fish crustaceans and shellfish in salt water and also explain the use and production and aquatic algae.

Specific learning outcome: At the end of the course students will be able to

- Outline the different mariculture practices and their demand
- Explain the procedure commercial production of finfish, crustaceans and molluscs
- Describe the techniques involved in seaweed culture, agar, algin and carrageen species cultivation.
- Learn to plan and manage the mariculture practices.

Unit I. Mariculture products and demand

Different farming system- cage and pen culture, types, site selection, construction and specification-factors affecting mariculture in India.

Unit II. Cultivable fin fishes

Biology, seed collection, nursery rearing culture technique- problem and prospects, seabars, milkfish, mullets, pearlspot, seabreams, rabbit fih, grapers, cobia and salmon.

Unit III. Culture of marine mollucs and echinoderm

Present status and scope- species cultured (mussels, oysters, pearloyster, scallops, cockles and sea cucumber) – distribution, biology and practices – farming methods.

Unit IV. Culture of crustaceans

Shrimp farming- pond construction preparation and managements- harvesting and handling-production of sopt shell crabs and mud crab fattening- lobster and cry fish culture.

Unit V. Sea weed culture

Commercially important seaweed spaces methods of culture- farming of agar, algin, carrageen species emerging trends and integration with other farming system.

References

1. Bardach. E.J. Rhyther JH & MC larney wo 1972. Aquaculture the farming and husbsmdary of fresh water and marine organisms John wiley& sons.
2. ICAR 2006. Handbook pf fisheries and aquaculture ICAR. Pillay TUR &kutty MN 2005.aquaculture: principles and practices 2nd edition. Black well.

VAQ 20

Mariculture

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Describe the need and demand for mariculture products and factors affecting it.	PSO2
Unit II	Analyse the culture practice in finfishes and shell fishes through mariculture.	PSO7
Unit III	Outline procedure for marine mollusks and echinoderm cultivation	PSO2
Unit IV	Explain the procedure for construction preparation management in marine crustacean culture.	PSO1
Unit V	Discuss the involved in it sea weed culture methods and techniques.	PSO2

Blooms taxonomy for Mariculture

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand				2	
K3: Applying			3		
K4: Analyzing		4			
K5: Evaluating	5				5
K6: Creating					

Mean : 3.8

VAQ 3404 **Aquatic animals health management** **4h/wk-4credits**

This course is designed to introduce the defense mechanism and immune system and inflammation response to disease. The second section deals with the parasitic and micotic diseases. The third section deals with infection bacterial and viral diseases. The last section deals with the health management techniques and seed certification.

Specific learning outcome: At the end of the course students will be able to

- Describe the immune mechanism involved against infectious diseases
- Explain the character, diagnosis, prevention and treatment for parasitic, mycotic, bacterial and viral infection.
- Analyse the diagnosis of nutritional deficiency diseases and the health management techniques.

Unit I: Defence mechanism

Specific and non specific mechanisms in fish and shell fish- Immune cells, immune system- Innate, aquaired and inflammation response to diseases

Unit II: Parasitic and mycotic diseases

General characterizes- Epizootiology - Diagnosis, Prevention and treatment

Unit III: Infections bacterial and viral diseases

Symptoms and diagnosis- prevention and treatment- EHNV, KHV, SVCV, VNNV- white spot and Taura syndrome

Unit IV: Non – infectious diseases

Nutritional diseases- Environmental parameters and their effect on fish health diseases in hatchery- Vaccines and adjuvant –administration and mode of action

Unit V: Health management techniques

Microbial, hematological, histopathological, immunological techniques – diseases surveillance and reporting – Diseases control and management – Fish health and quarantine system – Seed certification.

References

1. Andrews C. Excell. A. Carrington N. 1988: The manual of fish health. Salamander books.
2. Sindermannn CJ. 1990 Principal Diseases of marine fish and shell fish. Vol I, II, 2nd Ed. Academic press.
3. Felix. S. Raji John. K Prince Jwyaseelen MJ. And Sundaraj V. 2001: Fish diseases diagnosis and health management. Fisheries College and Research Institute, T.N
4. Vetineray and animal sciences university. Thoothukudi.

Aquatic animals and health management

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Discuss the immune mechanism against infectious diseases in fish and shell fishes	PSO2
Unit II	Outline the general characterizes parasitic, and mycotic diseases along with prevention and treatment method	PSO3
Unit III	Explain the diagnostic patterns for various bacterial and viral diseases, prevention and treatment.	PSO1
Unit IV	Identify causes and diagnosis of the non infectious diseases and environmental factors that influence.	PSO7
Unit V	Describe the health management techniques and diseases surveillance.	PSO2

Blooms taxonomy for Aquatic animals and health management

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand			2		
K3: Applying		3		3	
K4: Analyzing					
K5: Evaluating	5				5
K6: Creating					

Mean : 3.6

VAQ 23

Lab – VI **10h/wk-10credits.**

Mariculture and Aquatic animals and health management

The laboratory component includes exercise for using microscope sampling preparation of media and culture of pathogenic bacteria. Histopathological studies, assessment of seed quality prophylactic and quarantine measures are studied.

Specific learning outcome: At the end of the course students will be able to

- Analyze the infected part of fish by using histopathological studies
- Estimate the dose of chemicals and drugs for treating common diseases
- Identification of cultivatable seaweeds, marine finfish and shellfish
- Gain knowledge through visiting coastal aquarium and assessing the seed quality.c

1. Analysing infected parts of fish by using microscope
2. Histopathological studies on infected fish
3. Determination of dosages of chemicals and drugs for treating common diseases
4. Identification of cultivatable marine fin fishes and shell fishes
5. Identification of cultivatable sea weeds
6. Designing of different farming system - cages, pens, raffles.
7. Visiting coastal aquarium
8. Assessment of seed quality – stress test
9. Taxonomy and identification of fish parasites
10. Sampling, preparation of media and culture of pathogenic bacteria
11. Prophylactic and quarantine measures

References

1. Shankar KM & Mohan CU 2002. Fish and shell fish health management UNESCO publ.

2. Woo PTK & Bruno DW (Eds) 1999. Fish diseases and disorders. Vol III. Viral, bacterial and fungal infection CABI.

VAQ 24

Lab -6

Mariculture and aquatic animals health management

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Analyzing infected area of fish by using diagnostic tests	PSO2
Unit II	Identify the character of various sea weeds, fin fishes and shell fishes	PSO1
Unit III	Design the structure of cages, pens and raffles	PSO7
Unit IV	Assess the character of good seeds by observation	PSO2
Unit V	Explain the procedure for sampling and culture for pathogenic microbes	PSO5

Blooms taxonomy for basic of aquaculture

Mariculture and aquatic animals health management

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand					2
K3: Applying				3	
K4: Analyzing	4				
K5: Evaluating		5			
K6: Creating			6		

Mean: 4

The American College, Madurai -625002

B.Voc in Medical Laboratory Technology

Program Specific Outcome

1. Understand the functions of organs and systems in human body.
2. Acquire skills on medical laboratory principles and procedures in diagnosis.
3. Receive knowledge on clinical significances of test results.
4. Develop skills to recognize discrepant results and analyze case study.
5. Develop passion to promote health awareness in society.
6. Derive strategies to promote quality laboratory services.
7. Competent to take up careers in academic, private medical laboratories, hospitals and research projects.
8. Gain employment in central, state government sectors.
9. Design their own laboratory to offer health services in line with national health policies.
10. Coordinate or work in collaboration with national and international medical laboratory services in promoting global health.

B.Voc in Medical Laboratory Technology
Third Year

(B.Voc Degree in Medical Laboratory Technology)

THE AMERICAN COLLEGE, MADURAI – 625 002

Sem	Course No	Course Title	Hrs/wk	Cr.
V		**General Education**		
	EVS 3401	Environmental Studies	4	4
	LSV 3401	Entrepreneurship Development	4	4
	CSV 3401	Information and Communication Technology	4	4
		Skill Component		
	VML 3401	Geriatric Care	4	4
	VML 3403	Parasitology	4	4
	VML 3113	Lab - V	10	10
		Job Training		
	VML 3415	Internship - V	120/sem	4
		Total		**34**
VI		**General Education**		
	VEV 3402	Youth In the Global Context – Value Education	4	4
	LSV 3402	Soft Skills	4	4
	CSV 3402	Data Base Management System	4	4
		Skill Component		
	VML 3402	Metabolic Disorder and Molecular Diagnostics	4	4
	VML 3404	Special Hematology	4	4
	VML 3114	Lab - VI	10	10
		Job Training		
	VML 3416	Internship - VI	120/sem	4
		Total		**34**

- **Theory / Lab courses - 1 credit = 15 hours/Semester**
- **Internship – 1 credit = 30 hours/Semester**

EVS 3401 **Environmental Studies** **(4h/wk) (4Cr)**

This course is designed to develop environmental awareness to the students. It deals with the natural resources, ecosystems and the impact of human activity on them. This course also imparts the biodiversity and its conservation. It also sensitizes the students on the environmental issues and abatement of pollution and gives suggestion for sustenance.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Discuss the terminology commonly used in environmental science and to identify renewable and non renewable resources and its proper usage and conservation
ii. Explain the concept , structure, function of ecosystem and to analyze the interaction of organism at different ecosystem
iii. Evaluate the adverse human impact on abiotic and biotic community and sustainable strategies to mitigate the impact
iv. Create knowledge on biodiversity and its conservation and utilize advances in environmental science to resolve issues and anticipate implications.
v. Assess the consequences of environmental disasters and its remedy

1. **Introduction to environmental studies:** Concept and Scope – importance of sustainability and sustainable development. The Atmosphere, the Hydrosphere, the Lithosphere and the Biosphere. Concept of Renewable and Non-renewable resources:

2. **Ecology and Ecosystems:** Concept of ecology and ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology; ecological succession. Characteristic features of the following- Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (ponds, lakes, rivers, oceans)

3. **Environmental Pollution:** Pollution -Definition - Causes, effects and control measures of - Air pollution - Water pollution -Soil pollution - Marine pollution -.Noise pollution - Thermal pollution - Nuclear hazards . Solid waste Management: Causes, effects and control measures. Role of an individual in prevention of pollution. Natural Disasters and their Management: floods, earthquake, cyclone and landslides.

4. **Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity. Biogeographical classification of India- values Biodiversity at global, National and local levels. India as a mega-diversity nation - Hot-spots of biodiversity. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts.. Conservation of biodiversity: In-situ and Ex-situ method of conservation.

5. **Social Issues and the Environment:** Water conservation- rain water harvesting, watershed management. Wasteland reclamation. Afforestation. Management and Wildlife conservation. Climate change - Greenhouse effect - global warming - acid rain, ozone layer depletion. Environmental Laws : Environment Protection Act, 1986 ; The Water Act, 1974, The Air Act, 1981 and The Wildlife (Protection) Act, 1972 , Forest

Conservation Act .Issues involved in enforcement of environmental legislation. Public awareness.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X			X	
K2: Understanding	X	X			
K3: Applying			X		
K4: Analyzing					
K5: Evaluating					X
K6: Creating				X	

LSV 3401 **Entrepreneurship Development** **(4h/wk) (4 Cr)**

To give an overview about the real concepts of entrepreneurship and to impart knowledge about the various sources for a small business and hence motivate the students to become a job providers.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Cite the meaning of entrepreneurship and identify the role of entrepreneurs.
ii. Identify different types of entrepreneurs and the problems faced by them
iii. Identify the various sources of small business and capable of starting a business by creating own business plan.
iv. Identify the various institutes and their functions that support entrepreneurs
v. Identify and utilize the various incentives available for small scale business.

1. **Entrepreneur:** Definition - Characteristics - Functions - Competencies - Entrepreneur vs Entrepreneurship - Role of Entrepreneur in Economic Development.

2. **Types of Entrepreneurs:** Innovative - Adaptive - Fabian - Drone; Entrepreneur vs Intrpreneur, Copreneur; Women entrepreneur - Types - Problems.

3. **Strating a small Business:** Steps; **Project Report:** Contents – Importance.

4. **Institutional Support to Entrepreneurs:** SIDCO - TCOs - DIC - TIIC - SIDBI - Commercial Banks.

5. **Incentives for Small Scale Business:** Subsidy - Tax Concessions - Assistance - Export Assistance - Technical Assistance.

Text Book

E. Gordan & K. Natarajan, Entrepreneurship Development, Himalaya Publishing House, 2017.

References

1. Holt, Entrepreneurship: New Venture Creation, Prentice-Hall, 2018.
2. R. V Badi & A. V Badi, Entrepreneurship, Vrinda Publication (p) Ltd, New Delhi 2010
3. K. Ramachandran, Entrepreneurship Development, Tata McGraw Hill, New Delhi, 2017.
4. Dr. Radha, Entrepreneurial Development, Prasanna and Co, Chennai. 2019

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	X				
K3: Applying					X
K4: Analyzing		X		X	
K5: Evaluating					
K6: Creating			X		

CSV 3401 Information Communication Technology (4hr/wk) (4Cr)

This course aims at enabling the student to know the role of ICT resources in modern applications and presenting its environment. This course also makes a student familiar with Web environment and its applications in providing utilization and communication of Information.

Course outcomes:

At the end of the course the student will be able to:

i. Explain the progress of information and communication technology and their role in modern world.
ii. Identify the difference between Operating Systems and application software.
iii. Examine different kinds of software and their working.
iv. Utilize computer and similar electronic devices suitably for data processing.
v. Use Internet safely and explore different kinds of information available on the Internet.

Unit I: Accessing the web – Introduction to the browser and browsing Accessing the web II – Introduction to the web familiarity with IOT environment – Connections and Connectors – Inputting in Indian Language – Font and Keyboard

Unit II: Creating with ICT – Handling Text – Handling Data – Handling Media – Operating Systems and it Requirement – Bringing together Hardware and Software

Unit III: Internet t access Information – Exploring Web resources – ICT in class room

Unit IV: Hardware and Software – Assistive Technologies – Working with Data I – Exploring spread sheet- Working with Data II – Exploring with spread sheet.

Unit V: E-mail and Web based Forums –Transacting through the web – Exploring E-commerce applications – Execution and peer evaluations –Evaluation and portable submission.

References

1. Brilliant Ideas for using ICT in the inclusive class room, II Edition, Sally McKeown, Angela McGlashon
2. Introducing Computing: A guide for teachers Edited by Lawrence Williams.

Bloom's Taxonomy	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering		X			
K2: Understanding	X				
K3: Applying				X	X
K4: Analyzing			X		
K5: Evaluating					
K6: Creating					

VML 3401 **Geriatric Care** 4hrs/wk 4 Cr

This course is designed to equip students with the knowledge and skills required to meet the unique health care needs of the aged in urban and rural areas. This also deals with intervention methods of government and NGOs in regards to policies, program, social welfare schemes and legislation.

At the end of this course student will be able to:

1. Explain aging and define aging in urban and rural context with psychoanalysis.
2. Discuss about the personality, social and psychological changes, living arrangements and gender discrepancies in elders.
3. Relate and rate diet related degenerative changes in elders and their physical activities.
4. Outline various kinds of physical and mental disorders in elders and explain how they can come out from such conditions.
5. Discuss health risk in old age, intervention methods in acute health crisis. Critique old age care initiative policies and programmes.

Unit – I Geriatrics

Geriatrics: Meaning and need; ageing: Meaning - Ageing categories - Physiology and age related changes - Ageing in rural and urban context – Theories of Ageing: Disengagement theory –Psychoanalytical theory and theory, psychological aspects of ageing.

Unit – II The Plight of the Aged

Psychological theories - Personality and Social changes, gender discrepancies, living arrangement - Depression and coping with psychological changes of ageing - Establishing and maintaining good inter personal relationship and communication with family - Guidance and counseling.

III Nutritional requirements of older adults

Need of dietary alteration, energy needs of old, Formulation of diet for elderly, Diet related degenerative changes and physical activities.

Unit – IV Common conditions/diseases and disorders of the elderly

Fever, Anemia, Syncope, Vertigo, Anorexia, Loss of memory - Respiratory, heart, kidney diseases – Stroke – Metabolic, musculoskeletal disorders – CNS

related health problem, digestive problem – Vision, hearing and sleep problems – Per menopausal and Genitourinary problems – Cancer.

Unit – V Risks and Prevention

Health risk in old age: Smoking, alcohol, Social issues, Abuse/neglect, dependency, physical inactivity, Fall, Accident, Deafness, Low vision - Health promotion: Nutrition, exercise, screening, prevention of accidents, prevention of substance use-alcohol, drugs etc, smoking cessation.

Unit – VI Intervention

Definition and type of intervention - Care in Acute pain, chronic pain, chest pain, Diabetes, Stroke, Dementia, Active intolerance - Role of government and its policies, program, welfare schemes and legislation – Role of NGOs in providing assisted living facilities, Nursing home, Hospices and Old age home.

Reference books:

1. Rao, A. Venkoba (1989) Psychiatry of Old Age in India, Torrent Laboratories Pvt Ltd, Ahmadabad.
2. Biswas, S.K (1987) Aging in Contemporary India, The Indian Anthropological society, Calcutta.
3. Ishwar Modi(2001) Ageing Human Development, Rawat Publication, New Delhi.
4. Sudhir M.A (2005) Ageing in Rural India: Perspective and Prospectus, Indian Publishers Distribution, Delhi.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1					X			X		
CO2					X			X		
CO3					X			X		
CO4					X			X		
CO5					X			X		

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating					

Mean: 4.1

VML 3403 **PARASITOLOGY** 4hrs/wk 4 Cr

This course is designed to impart knowledge on diseases caused by parasites in human body and the principles involved in the laboratory diagnosis. This also equips students to develop and create awareness program against parasitic infections.

At the end of this course student will be able to:

1. Explain and classify parasites, host and discuss the distribution of parasites in clinical samples and their pathogenesities.
2. Compare the morphology, life cycle of blood and intestinal parasites and their laboratory findings.
3. Comment on blood, muscle and intestinal nematodes its morphology, life cycle and their pathogenesity.
4. Describe the morphology of eggs, segments, scolexes of tape worm and their pathogenesity.
5. Discuss about the distribution of flat worm infections and their morphology and pathogenesity.

Unit-I Introduction to Parasitological

Definition, types and classification parasites, host and distribution of parasites in clinical samples - Diseases caused by Parasites – Collection, preservation and transportation of clinical samples for examination - Principles and methods employed in the processing of samples - Direct wet saline and Direct wet Iodine smears, concentration technique, flotation technique, microscopy, night blood collection and 2% White saponin concentration technique for malarial parasites and microfilaria and immune techniques.

Unit – II Protozoans

Blood, C.S.F, Bone marrow intestinal Parasites: Morphology , developmental stages, life cycle and pathogenesity of Species: Plasmodium, leishmania and schistosoma, entamoeba histolytica, entamoeba coli - Difference between the amoeba and cystic forms and difference between amoebic and bacillary dysentery – Trophozoite and cystic forms of Giardia lamblia, Chylomastric mesnili, Balandidium coli and Trichomonas vaginalis.

Unit – III Helminths: Nematodes

Blood, muscle and intestinal nematodes: Morphology, stages in the life cycle, larva of Wuchereria bancrofti, Brugia malayi, Loaloa, Onchocerca volulus, Trichenella spiralis, Ascaris lumbricoides, Anchylostoma duodenale, Nicator americanus, Trichuris trichura, Strongyloid stercoralis and Dracunculus medinensis.

Unit – IV Helminths : Cestodes and Trematodes

Cestodes: Scolex, gravid segments, life cycle and pathogenesity of Taenis saginata,Taenia solium, Echinococus granulose and its Hydatid cyst –cisticercus – Hymenolepsisnana and Diphylobothrium latum. **Trematodes**: Morphology of adult worm, its ova, life cycle and pathogenesity of Paragonimus westermani, Fasiola hepatica, Schistosoma mansoni, Schistosoma japonicum and Taxoplasma gondi.

Text Book:

Arora,R and Arora Brij Bala(2013). Medical Parasitology – Fourth edition,CBS Publishers & Distributors Pvt Ltd, Delhi.

Reference Book:

1. Robert, H. Carman (2016) Hand book of Medical Laboratory Technology, CMAI Publication, New Delhi.
2. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
3. Cheesbrough,Monica(2007) District Laboratory Practice in Tropical Countries Part 1&2,Cambridge University Press, United Kingdom

4. Raja, S and Christ Selvi,R(2015) Experimental Procedures in Life Science, CBS Publishers & Distributors Pvt Ltd, Delhi.
5. Talib, V.H(2014)Practical Text Book on Laboratory Medicine, CBS Publishers & Distributors Pvt Ltd, Delhi.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2	X	X	X	X	X	X	X	X	X	X
CO3	X	X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

VML 3115 **Lab – V** 10 hrs/ Wk 10 Cr

This course is designed to impart skill to perform laboratory investigation on clinical samples for the diagnosis of parasitic diseases.

At the end of this course student will be able to:

1. Identify the mental, physical, and social and risk behaviors in elders. Formulate diet and agenda for their healthy life.
2. Assist, programme and advocate for the cause of elders with socio economic and spiritual values.
3. Identify adult worms. Prepare smears and perform microscopy for identifying ova, cysts, flagellates, larva, scolex, segments..
4. Prepare smears and perform staining techniques for identifying malarial parasites, microfilaria and Leishmania specie.
5. Design and demonstrate awareness programmes for prevention and control of parasitic infections.
6.

I. Examination of Faeces for Parasites

1. Saline wet smear preparation for ova, cyst and amoeba
2. Iodine wet smear preparation for ova, cyst and amoeba
3. Formol – Ether Concentration Technique
4. Flotation Technique (28% Zinc Sulphate solution)
5. Perianal swab for pin worms and microscopy

II. Examination of Blood for parasites.

6. Thin smear for malarial parasites
7. Field A & Field B Staining Technique
8. Leishman's Staining technique
9. Wet cover slip preparation from night blood for microfilaria
10. Concentration technique (2% White Saponin) for thick smear – Malarial parasite and microfilaria.

III. Examination of adult worms and their head and segments.

11. Examination of tape worm segments – Indian ink preparation.

IV. Staining techniques in Parasitology

12. Methylene blue staining technique.
13. Wet Urine smear and Methylene blue staining: Trichomonas vaginalis.
14. Indian ink staining smear: Gravid segments of Taenia saginata and Taenia solium.

V. Spotters.

15. Microfilaria of Wuchereria bancrofti .
16. Plasmodium Species
17. Lieshmania Species.

References

1. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
2. Cheesbrough,Monica(2007) District Laboratory Practice in Tropical Countries Part 1&2,Cambridge University Press, United Kingdom
3. Talib, V.H (2014) Practical Text Book on Laboratory Medicine, CBS Publishers & Distributors Pvt Ltd, Delhi.
4. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
5. Godkar PB and Godkar DP. (2002). A Text Book for Medical Lab Technology, 2nd Ed, Bhalami Publishing House, Mumbai.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10

CO1	X	X	X	X	X	X	X	X	X	X
CO2	X	X	X	X	X	X	X	X	X	X
CO3	X	X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

VML 3415 **Internship - V** **120Hrs/Sem-4Cr**

Job Training: A work-based learning experience that enables the student to apply specialized occupational theory, skills and concepts.

YOUTH IN THE GLOBAL CONTEXT

VAL 3402 **4hrs /4 credits**

Objective: To make the students understand the meaning and implications of globalization. To acquaint them about new challenges world is facing due to globalization. The good side and the sad size of globalization – To enlighten them about the need to learn family values and practice them to cope up with the newly arising challenges.

Unit - I UNDERSTANDING KEY CONCEPTS OF GLOBALISATION

Free market Economy and Global Market Network - Communication and transport - Technology and Global Production System - Global Capital and investments - Culture of over consumption - Human needs - Over exploitation of resources

Unit – II EDUCATION IN GLOBALISED CONTEXT

Differential access to Education at the Primary, Secondary and Tertiary level- Problem of Quality Addressing deficiencies – need for communication and other Social skills - need for equitable and quality universal education

Unit - III GLOBALISATION AND EMPLOYMENT

New aspirations and the demands placed on youth - Changing structure of Employment and working norms related to time and remuneration - New Forms of insecurities - Cultural alienation -Youth and Consumerism - Distinguishing successful and meaningful life

Unit - IV YOUTH AND FAMILY VALUES

Mobility of Youth - Fragmentation of family structure - Issues relating to Marriage and Marital harmony; Addressing the growing rate of divorce and separation - Family related values

Unit - V GLOBALISATION AND OTHER SOCIO POLITICAL ISSUES

Poverty and Marginalization under Globalization – Terrorism - Rise of religious fundamentalis and Cultural Chauvinism – Corruption – Democracy - civil society issues – Social Values: Honesty, Hard Work, Trustworthiness

Books for refer

Study Materials will be provided.

Course outcomes: At the end of this course, the students will be able,

CO1: To explain what is globalization and their important aspects

CO2: To assess the conditions of education in their society

CO3: To predict the new challenges arise in the society due to globalization

CO4: To analyze the emerging trends in employment and cope up with them

CO5: To apply the values in their lives amidst the changing scenario

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering			X		
K2: Understanding	X				
K3: Applying					X
K4: Analyzing				X	
K5: Evaluating		X			
K6: Creating					

LSV 3402 **Soft Skills** **(4h/wk) (4Cr)**

The learner will gain the skills required for the corporate world that would enhance one's employability and to provide an exposure to the students regarding the soft skills required for the job market.

Course outcomes:

At the end of this course, the students will be able to:

i. Cite the meaning and define soft skill and also to identify the different types of soft skills.
ii. Identify different types of communication and overcome the barriers for effective communication.
iii. Develop and exhibit a good body language and enhance their personality.
iv. Exhibit a polite behaviour in society or among members of a particular profession or group and enrich their public speaking skill.
v. Enhance their writing skill and face interviews without fear.

Unit I - Soft Skill: Definition - Importance of soft skills - Types of soft skills.

Unit II - Communication: Definition - Process - Types - Verbal, non-verbal - Uses - Barriers of effective communication.

Unit III - Inter Personal Relation Skills: Body Language and personality.

Unit IV- Etiquettes or Manners: Art of Public Speaking - Chracteristics of a good speech - Planning to speak.

Unit V- Writing Skills: Importance - Types **Interview:** Types - Selection - Appraisal - Exit.

Text Book

Rajendra Pal & J. S. Korlahalli, Essentials of Business Communication, Sultan Chand & Sons, New Delhi, 2016.

References

N.S.Raghunathan & B.Santhanam, Business Communication, Margham Publications, Chennai, 3rd Edition 2018.

Reddy, Appannnaih & Raja Rao, Essentials of Business Communication, Himalaya Publishing House, Mumbai, 2017.

Rizvi, M. Ashraf - Effective Technical Communication, Tata McGraw Hill, 2011

Blundell J. A & Middle N. M. G.: Career – English for the Business and Commercial World, Oxford University Press, 2009

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering					
K 2: Understanding	X				
K 3: Applying		X	X		
K 4: Analysing				X	
K 5: Evaluating					X
K 6: Creating					

CSV 3402 **Database management system** **(4h/wk) (4Cr)**

This course is intended to familiarize the students with the concept and significance of database maintenance and management. Moreover, the course would orient the students about the various aspects involved need for systematic retention of database involved in their respective vocations.

Course outcomes

At the end of the course the student will be able to:

i. Identify the database approach and the database applications
ii. Apply relational expressions for queries.
iii. Examine the database design by normalization.
iv. Build a table and manipulate the data using SQL Commands.
v. Summarize the transactions, its properties and the concurrency controls.

Unit I: Databases and database users: Introduction – Characteristics of the database approach – Advantages of using the DBMS approach – A brief history of Database Applications.

Unit II: Database System Concepts and Architechture – Data Models, Schemas and Instances.

Unit III: Database Languages and Interfaces: The Database System Environment – Centralized and Client / Server Architecture for DBMSs – Classification of Database Management System.

Unit IV: Relational Model Concepts: Relational model Constraints and Relational Database Schemas, Update Operation, Transaction and dealing with Constraints violations.

Unit V: Database Recovery Concepts - Caching(Buffering) of Disk blocks – Write-ahead Logging, Steal / No-Steal and Force / No-Force - Checkpoints in the System Log and Fuzzy Check pointing – Transaction rollback

References

1. "Database Management System" – Raghu Ramakrishnan and Johannes Gehrke – 3rd edition, McGraw-Hill, 2003.

2. "DBMS a Practical Approach", E.R. Ragiv Chopra, S Chand Publications.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering	X				
K 2: Understanding					X
K 3: Applying		X		X	
K 4: Analysing			X		
K 5: Evaluating					
K 6: Creating					

VML 3402 **Special Hematology** 4 hrs / Wk 4 Cr

This course is designed to provide knowledge on development of various blood cells, alterations in the morphology of red, white blood cells, platelets and abnormal cells in blood and bone marrow. This also deals with various principles pertaining to the diagnosis of abnormal hemoglobin and their clinical significances.

At the end of this course student will be able to:

1. Explain the formation and development of blood cells in normal and abnormal conditions.
2. Discuss about the various staining technique in the diagnosis of anemia, leukemia, abnormal red and white blood cells.
3. Describe the formation of abnormal hemoglobins and their screening techniques.
4. Explain the use of biomolecular techniques in identifying the presence of abnormal hemoglobins.
5. Analyze the laboratory expressions and formulate genotype of patients with hemoglobinopathy.

I. Hemopoiesis and Bone Marrow Examination

Formation of Blood – Development of Red Blood cells – Abnormal maturation of red blood cells – Alteration in red blood cells. Development of white blood cells – Alteration in white blood cells. Bone marrow aspiration, Smear making and May - Grunwald - Giemsa staining and examination of Bone Marrow.

II. Special Staining methods and techniques

Periodic Acid Schiff (PAS) Stain for leukemia – Iron storage staining for Bone Marrow – Leukocyte Peroxidase – Lupus Erythematosis: Methods using defibrinated, clotted blood and staining method. Preparation for Heinz bodies. Kala azar: making of smear for Kala azar –Aldehyde test.

III. Hemoglobinopathies

Synthesis of abnormal hemoglobin (S, C,D and E) and their diseases – Foetal hemoglobin estimation – Screening for sickle cells using reducing agents – Qualitative solubility test for HbS.

IV. HB Electrophoresis

Identification of abnormal hemoglobin by Citrate Agar Gel Electrophoresis – Spectrophptometric estimation of hemoglobins using Phosphate Cellulose Acetate Membrane Electrophoresis (Elusion technique).

V. Chemical Tests in Hematology

Determination of Plasma hemoglobin – Serum Hepatoglobin – Red Cell Pyruvate kinase - Glucose – 6 – Phosphate dehydrogenase (G-6-PD) – Red cell reduced Glutathione – Hams test – Sucrose lysis test.

Reference books:

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2	X	X	X	X	X	X	X	X	X	X
CO3	X	X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating		X	X	X	X

Mean: 4.9

VML 3404 **Metabolic Disorders and Molecular Diagnosis** 4hrs/wk 4 Cr

This course is designed to provide Clinical and Laboratory Diagnostic knowledge on metabolic disorders, Cardiovascular Diseases and various Markers used in the diagnosis of cardiac diseases and tumors .This also deals with applications of Molecular Techniques in laboratory diagnosis.

At the end of this course student will be able to:

1. Explain the signs and symptoms of various metabolic diseases and relate laboratory findings.
2. Discuss about the clinical symptoms and laboratory investigations of cardiovascular diseases.
3. Predict the use of cardiac markers in the diagnosis and assessment of treatment.
4. Describe the use of tumor markers in the diagnosis of male and female reproductive systems.

5. Explain the use of methods of various techniques in the field of molecular technology.

I. Metabolic Diseases

Endocrinology and metabolism – Wilson's disease – Porphyria – Alzheimer's diseases –Metabolic encephalopathy – Hyperlipoproteinemia –Osteoporosis – Osteomalacia – Gout.

II. Cardiovascular diseases

Congestive heart failure –Hypertension – Arrhythmias –Valvular heart disease –Congenital heart disease in adult – Infarction endocarditis –Acute Myocardial infarction – Chronic coronary artery disease – Pericardial disease – Cardiomyopathies and myocarditis – Diseases of the Aorta – Peripheral vascular disease.

III. Cardiac Markers

Serial sampling for cardiac markers – Myoglobins – Troponons – Creatine kinase MB – Homocysteine – C-Reactive protein – D-Dimer and Microalbuminuria.

IV. Tumor Markers

Alpha-fetoprotein – Beta Sub unit of Human chorionic gonadotropin – CA-15-3 ; CA-27.29 ; CA-19.9 ; CA125 - Carcino embryonic antigen – Prostate specific antigen (PSA) – Enzyme and Hormone markers.

V. Molecular Techniques

Polymerase Chain Reaction – Southern Blot – Northern Blot – Western Blot – DNA chip technology.

Reference Books:

1. Chatterjee,M.N .Shinde R.(2002)Text Book of Biochemistry,ed 5,Jaypee Brothers Medical Publishers Private Ltd, New Delhi (ISBN -81-7179-991-4)
2. Godkar, P.B and Godkar D.P (2002), A Text Book of Medical Laboratory Technology, ed 2, Balami Publishing House, Mumbai.
3. Scheppler J.A Cassin P.E and Gambier R.M (2002) Biotechnology Exploration-Applying the fundamentals, ASM Press, Washington DC.

4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO, U.S.A.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2		X	X	X	X	X	X	X	X	X
CO3	X	X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating		X			X

Mean: 4.5

VML 3116 **LAB- VI** **10 hrs/Wk 10 Cr**

This course is designed to develop skills in laboratory investigation in the diagnosis of Cardiac diseases, bone marrow diseases and diseases of the abnormal hemoglobins.

At the end of this course student will be able to:

1. Assist physician in bone marrow aspiration and prepare smears for microscopic examination.
2. Stain and scan bone marrow smears under microscope for assessing cellularity bone marrow. Identify immature, abnormal cells.
3. Examine the stained blood smear under microscope and give impression for anemias, leukaemias and other hematological disorders.
4. Perform certain biomarkers and biochemical tests in the diagnosis of heart diseases.

5. Carryout certain molecular techniques in the assessment of cancers of male and female reproductive organs.

I. Bone Marrow Examination

1. Bone Marrow Aspiration tools and method (Virtual Lab)
2. Bone Marrow Smear making (Virtual Lab).
3. May - Grunwald - Giemsa staining technique.
4. Microscopic examination of Bone Marrow smears.
5. Preparation of defibrinated blood and staining for L.E Cell.

II. Screening for abnormal hemoglobins

6. Sickling Test.
7. Estimation of Foetal Hemoglobin.
8. Demonstration of Electrophoresis units.
9. Preparation of Gel Electrophoresis Buffer.
10. Preparation of stain for electrophoresis.

III. Special chemical test

11. Determination of Glucose - 6 - Phosphate dehydrogenase

IV. Screening for Cardiac diseases

12. Troponin –I Card test.
13. Estimation of Creatine kinase MB.

V. Molecular techniques

14. PCR technique (Virtual Lab).
15. Western Blot (Virtual Lab).
16. ELISA Techniques (Virtual Lab).

Reference books:

1. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
2. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
3. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.

4. Scheppler J.A Cassin P.E and Gambier R.M (2002) Biotechnology Exploration-Applying the fundamentals, ASM Press, Washington DC.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2	X	X	X	X	X	X	X	X	X	X
CO3		X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5		X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

VML 3416 **Internship VI** **120Hrs/Sem-4Cr**

Job Training: A work-based learning experience that enables the student to apply specialized occupational theory, skills and concepts.

THE AMERICAN COLLEGE, MADURAI – 625 002

B.Voc. Degree Programme

Sem	Course No	Course Title	Hrs/wk	Cr.
V		**General Education**		
	EVS 3401	Environmental Studies	4	4
	LSV 3401	Entrepreneurship Development	4	4
	CSV 3401	Information and Communication Technology	4	4
		Skill Component		
	VFP 3401	Bakery & Confectionery	4	4
	VFP 3403	Food Service Management	4	4
	VFP 3105	Lab in Bakery, Confectionery and Food Service Management	10	10
		Job Training		
	VFP 3407	Internship V	120 /sem	4
			Total	**34**

Sem	Course No	Course Title	Hrs/wk	Cr.
VI		**General Education**		
	VEV3402	Youth in the Global Context – Value Education	4	4
	LSV3402	Soft Skills	4	4
	CSV3402	Data Base Management System	4	4
		Skill Component		
	VFP 3402	Food Adulteration	4	4
	VFP 3404	Food Quality Testing & Evaluation	4	4
	VFP 3106	Lab in Food Adulteration, Food Quality Testing & Evaluation	10	10
		Job Training		
	VFP 3408	Internship VI	120/sem	4
			Total	**34**

- **Theory / Lab Courses : 1 Credit = 15 hours / semester**
- **Internship: 1 Credit = 30 hours / semester**

B. Voc. Degree Programme

(Food Processing &Preservation)

Programme Specific Outcomes (PSO)

1. Appreciate scientific principles and techniques of food processing and preservation.
2. Acquire skills to establish food service outlet.
3. Formulate environmental friendly and nutritious food products.
4. Develop analytical skills to be employed in industries.
5. Gain employment in central and state government sectors.
6. Competent to take up careers in academics, researches, health care, processing and preservation industries.
7. Develop skill to analyze food quality.
8. Derive strategies to promote healthy living.
9. Assess adulterants in food products.
10. Design safe packaging materials.

Mapping of PSO with PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	✔									
PSO2		✔								
PSO3									✔	
PSO4		✔								
PSO5					✔					
PSO6				✔		✔				
PSO7		✔								
PSO8										✔
PSO9									✔	
PSO10									✔	

Mapping of Course Outcomes (COs) with Programme Specific Outcomes (PSOs)

Course Title	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
DFP 1409	X		X		X		X	X		
DFP 1411	X		X	X						
DFP 1113	X	X	X	X				X		
DFP 1410	X		X	X				X		
DFP 1412	X			X			X	X		X
DFP 1114						X	X			
AFP 2401	X			X				X		X
AFP 2403		X	X	X	X		X			
AFP 2105	X		X	X	X		X			
AFP 2402	X	X				X	X	X		
AFP 2404	X	X		X	X	X				
AFP2106	X	X		X		X				X
VFP3401	X	X		X			X			
VFP3403	X	X	X	X		X		X		
VFP3105	X	X		X	X		X	X		
VFP3402	X				X		X	X	X	
VFP3404		X		X	X	X			X	
VFP3106		X	X	X	X			X		

EVS 3401 **Environmental Studies** **(4h/wk) (4Cr)**

This course is designed to develop environmental awareness to the students. It deals with the natural resources, ecosystems and the impact of human activity on them. This course also imparts the biodiversity and its conservation. It also sensitizes the students on the environmental issues and abatement of pollution and gives suggestion for sustenance.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Discuss the terminology commonly used in environmental science and to identify renewable and non renewable resources and its proper usage and conservation
ii. Explain the concept , structure, function of ecosystem and to analyze the interaction of organism at different ecosystem
iii. Evaluate the adverse human impact on abiotic and biotic community and sustainable strategies to mitigate the impact
iv. Create knowledge on biodiversity and its conservation and utilize advances in environmental science to resolve issues and anticipate implications.
v. Assess the consequences of environmental disasters and its remedy

1. **Introduction to environmental studies:** Concept and Scope – importance of sustainability and sustainable development. The Atmosphere, the Hydrosphere, the Lithosphere and the Biosphere. Concept of Renewable and Non-renewable resources:

2. **Ecology and Ecosystems:** Concept of ecology and ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology; ecological succession. Characteristic features of the following- Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (ponds, lakes, rivers, oceans)

3. **Environmental Pollution:** Pollution -Definition - Causes, effects and control measures of - Air pollution - Water pollution -Soil pollution - Marine pollution - .Noise pollution - Thermal pollution - Nuclear hazards . Solid waste Management: Causes, effects and control measures. Role of an individual in prevention of pollution. Natural Disasters and their Management: floods, earthquake, cyclone and landslides.

4. **Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity. Biogeographical classification of India- values Biodiversity at global, National and local levels. India as a mega-diversity nation - Hot-spots of biodiversity. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts.. Conservation of biodiversity: In-situ and Ex-situ method of conservation.

5. **Social Issues and the Environment:** Water conservation- rain water harvesting, watershed management. Wasteland reclamation. Afforestation. Management and Wildlife conservation. Climate change - Greenhouse effect - global warming - acid rain, ozone layer depletion. Environmental Laws : Environment Protection Act, 1986 ; The Water Act, 1974, The Air Act, 1981 and The Wildlife (Protection)

Act, 1972 , Forest Conservation Act .Issues involved in enforcement of environmental legislation. Public awareness.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X			X	
K2: Understanding	X	X			
K3: Applying			X		
K4: Analyzing					
K5: Evaluating					X
K6: Creating				X	

LSV 3401 **Entrepreneurship Development** **(4h/wk) (4 Cr)**

To give an overview about the real concepts of entrepreneurship and to impart knowledge about the various sources for a small business and hence motivate the students to become a job providers.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Cite the meaning of entrepreneurship and identify the role of entrepreneurs.
ii. Identify different types of entrepreneurs and the problems faced by them
iii. Identify the various sources of small business and capable of starting a business by creating own business plan.
iv. Identify the various institutes and their functions that support entrepreneurs
v. Identify and utilize the various incentives available for small scale business.

1. **Entrepreneur:** Definition - Characteristics - Functions - Competencies - Entrepreneur vs Entrepreneurship - Role of Entrepreneur in Economic Development.

2. **Types of Entrepreneurs:** Innovative - Adaptive - Fabian - Drone; Entrepreneur vs Intrpreneur, Copreneur; Women entrepreneur - Types - Problems.

3. **Strating a small Business:** Steps; **Project Report:** Contents – Importance.

4. **Institutional Support to Entrepreneurs:** SIDCO - TCOs - DIC - TIIC - SIDBI - Commercial Banks.

5. **Incentives for Small Scale Business:** Subsidy - Tax Concessions - Assistance - Export Assistance - Technical Assistance.

Text Book

E. Gordan & K. Natarajan, Entrepreneurship Development, Himalaya Publishing House, 2017.

References

1. Holt, Entrepreneurship: New Venture Creation, Prentice-Hall, 2018.
2. R. V Badi & A. V Badi, Entrepreneurship, Vrinda Publication (p) Ltd, New Delhi 2010
3. K. Ramachandran, Entrepreneurship Development, Tata McGraw Hill, New Delhi, 2017.
4. Dr. Radha, Entrepreneurial Development, Prasanna and Co, Chennai. 2019

LSV 3401 **Entrepreneurship Development**

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	X				
K3: Applying					X
K4: Analyzing		X		X	
K5: Evaluating					
K6: Creating			X		

CSV 3401 Information Communication Technology (4hr/wk) (4Cr)

This course aims at enabling the student to know the role of ICT resources in modern applications and presenting its environment. This course also makes a student familiar with Web environment and its applications in providing utilization and communication of Information.

Course outcomes:

At the end of the course the student will be able to:

i. Explain the progress of information and communication technology and their role in modern world.
ii. Identify the difference between Operating Systems and application software.
iii. Examine different kinds of software and their working.
iv. Utilize computer and similar electronic devices suitably for data processing.
v. Use Internet safely and explore different kinds of information available on the Internet.

Unit I: Accessing the web – Introduction to the browser and browsing Accessing the web II – Introduction to the web familiarity with IOT environment – Connections and Connectors – Inputting in Indian Language – Font and Keyboard

Unit II: Creating with ICT – Handling Text – Handling Data – Handling Media – Operating Systems and it Requirement – Bringing together Hardware and Software

Unit III: Internet t access Information – Exploring Web resources – ICT in class room

Unit IV: Hardware and Software – Assistive Technologies – Working with Data I – Exploring spread sheet- Working with Data II – Exploring with spread sheet.

Unit V: E-mail and Web based Forums –Transacting through the web – Exploring E-commerce applications – Execution and peer evaluations –Evaluation and portable submission.

References

1. Brilliant Ideas for using ICT in the inclusive class room, II Edition, Sally McKeown, Angela McGlashon
2. Introducing Computing: A guide for teachers Edited by Lawrence Williams.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering		X			
K2: Understanding	X				
K3: Applying				X	X
K4: Analyzing			X		
K5: Evaluating					
K6: Creating					

VFP 3401 **Bakery and Confectionery** **(4h/wk) (4Cr)**

This course is designated to gain a deeper understanding in art of Bakery and Confectionery products.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Outline the various properties of raw materials in bakery and confectionery industries
ii. Discuss methods involved in manufacture of bakery products
iii. Compile technical knowledge in bakery
iv. Explain the physical factors of dough
v. Rate the characteristics of finished bakery and confectionery finished products

1. **Bakery and Confectionery industry:** raw materials - quality parameters - dough development, dough chemistry, raw materials for cake making – flour, egg, yeast, butter, margarine, oil, leavening agents

2. **Preparation of bakery products I:** Bakery products description – chooseberry, donut, puddings, waffle, caramel and custard.

3. **Preparation of bakery products II:** Bakery products description – cakes, eggless cake, pizza base bread, biscuits, and effect of variations in formulation.

4. **Physical Parameters:** Rheological testing- Farinograph, Mixograph, Extensograph, Amylograph / Rapid Visco Analyzer, Falling number, Hosney's dough stickiness tester.

5. **Confectionery products**: Characteristics and processing of raw material, Technology of manufacturing of toffee, chocolate, hard boiled candies, bars, chewing gums, bubble gums storage and characteristics of finished products.

Text Book

Singh UK (2011). Theory of Bakery and Confectionary An operational approach, Kanishka Publishers and Distributors, New Delhi.

References:

Bakers Hand Book on Practical Baking (2000).U.S. Wheat Associates,New Delhi.
Dubey SC (2002).Basic Baking.Published by the society of Indian Bakers, New Delhi.
Nicolello I and Foote R (2000). Complete Confectionary Techniques,Hodder and Solution, London,

Bloom's Taxonomy	K1	K2	K3	K4	K5	K6
CO1			X			
CO2				X		
CO3		X				
CO4			X			
CO5			X			

Mean = 3

VFP 3402 **Food Service Management** **(4h/wk) (4Cr)**

This course gives a comprehensive understanding of the basic principles of management in food service units. It helps students to know responsibilities in catering establishment, hospitals and paves way for becoming a conscientious caterer and food service administrator. The major aim is to develop skills in setting up food service units.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Outline therole of different food service institutions.
ii. Design layout for catering establishment.
iii. Formulate and standardize different recipes.
iv. Explain usage of equipment in food service institution.
v. Discuss the importance of management in food service outlet.

1. **Food Service industry:** Definition – types of catering – Hotel, Motel, Restaurant, Cafeteria and chain hotels. Welfare – Hospitals, School , Residential establishment and Industrial catering, bakery. Transport – Air, Rail, Sea and Space Miscellaneous – Contract and Outdoor.

2. **Layout:** Floor planning and layout for catering establishment, Characteristics of typical food service facilities. Lay out of kitchens, types of kitchen, storage and service area. Lay out of bakery unit.

3. **Equipment in Food Service:** Classification, factors affecting selection of equipment – electrical and nonelectrical equipment. food storage, preparation, service, care of major, traditional, modern equipment.

4. **Equipment in bakery and confectionery industry:** Mixers, proofing chambers, dough dividers, moulder,sheeter, baking ovens, cooling chamber, sealing packaging machines, Rolling and cutting machines.

5. **Menu planning and Food Management:** Menu planning - Definition, principles of menu planning, types of menus, standardization of recipe - standard recipe format – uses. Standard portion sizes -portioning equipment, portion control, use of left over foods.Food management - Definition, principles, functions, steps and techniques in effective management. Tools of management, organization chart, work study, work simplification and work improvement. Financial Management – Costing, budgeting, accounting – factors affecting – food cost, labour cost, operating cost, overhead cost.

Text Book

Sethi M and Malhan SM (2007).Catering Management – An Integrated Approach, Wiley Eastern Limited, Mumbai.

References

Khan MA (2003).Food Service Operations, AVI Publications Co., Connecticut.

Negi, J (2000). Professional Hotel Management.S.Chand and Company Limited, New Delhi.

Palacio JP, Harger V and Shugari,G. (2001). Introduction to Food Service.MacMillan Pub Co., New York.

Thangam Philip (2005). Modern Cookery, 3rd edition, Orient Longman.

Bloom's Taxonomy	K1	K2	K3	K4	K5	K6
CO1					X	
CO2				X		
CO3		X				
CO4			X			
CO5			X			

Mean = 3.4

VFP 3105 Lab in Bakery, Confectionery and Food Service Management (10h/wk) (10Cr)

The course is designed to develop the ability to assess, formulate & the characteristics of quality of baked & confectionary products.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Outline the role of different ingredients in baking.
ii. Acquire skills in the preparation of Bakery & Confectionary products.
iii. Design preparation methods to finishing techniques.
iv. Demonstrate an understanding of human resource management, financial management, and quality control.
v. Acquire skills in the preparation of food.

Laboratory Experiments

1. Microscopic examination of wheat flour and other flours
2. Preparation of Gluten from various cereal flours.
3. Quality test for wheat flour used in the baked products- Maltose Number, Water absorption, Sedimentation value, Alcohol Acidity.
4. Preparation of wheat bread, milk bread, millet bead, buns, rolls.
5. Preparation of cakes and icing.
6. Preparation of puffs.
7. Preparation of salt biscuits, sweet biscuits, masala biscuits, chilli biscuits, chocolate biscuits, tri color biscuits, chocolate cookies, coconut cookies, nut rings.
8. Preparation of fudge, fondant, candies, toffees chocolates jujeps.
9. Planning and preparation of menu for various occasions
    a) Birth day
    b) Deepavali
    c) New year special
    d) Wedding menu
    e) Christmas
    f) Holi
10. Calculation of food cost, labor cost, operating cost and overhead cost of a home-made dish.
11. Calculation of gross profit percentage of an establishment welfare/ commercial / transport for catering

References

Dubey SC (2002).Basic Baking.Published by the society of Indian Bakers, New Delhi.
Nicolello I and Foote R (2000). Complete Confectionary Techniques. Hodder and Solution, London.

Bloom's Taxonomy	K1	K2	K3	K4	K5	K6
CO1		X				
CO2					X	
CO3						X
CO4			X			
CO5					X	

Mean = 4.2

VEV 3402 YOUTH IN THE GLOBAL CONTEXT 4hrs /4 credits

Objective: *To make the students understand the meaning and implications of globalization. To acquaint them about new challenges world is facing due to globalization. The good side and the sad size of globalization – To enlighten them about the need to learn family values and practice them to cope up with the newly arising challenges.*

Unit - I UNDERSTANDING KEY CONCEPTS OF GLOBALISATION

Free market Economy and Global Market Network - Communication and transport - Technology and Global Production System - Global Capital and investments - Culture of over consumption - Human needs - Over exploitation of resources

Unit – II EDUCATION IN GLOBALISED CONTEXT

Differential access to Education at the Primary, Secondary and Tertiary level- Problem of Quality Addressing deficiencies – need for communication and other Social skills - need for equitable and quality universal education

Unit - III GLOBALISATION AND EMPLOYMENT

New aspirations and the demands placed on youth - Changing structure of Employment and working norms related to time and remuneration - New Forms of insecurities - Cultural alienation -Youth and Consumerism - Distinguishing successful and meaningful life

Unit - IV YOUTH AND FAMILY VALUES

Mobility of Youth - Fragmentation of family structure - Issues relating to Marriage and Marital harmony; Addressing the growing rate of divorce and separation - Family related values

Unit - V GLOBALISATION AND OTHER SOCIO POLITICAL ISSUES

Poverty and Marginalization under Globalization – Terrorism - Rise of religious fundamentalis and Cultural Chauvinism – Corruption – Democracy - civil society issues – Social Values: Honesty, Hard Work, Trustworthiness

Books for refer

Study Materials will be provided.

Course outcomes: At the end of this course, the students will be able,

CO1: To explain what is globalization and their important aspects

CO2: To assess the conditions of education in their society

CO3: To predict the new challenges arise in the society due to globalization

CO4: To analyze the emerging trends in employment and cope up with them

CO5: To apply the values in their lives amidst the changing scenario

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering			X		
K2: Understanding	X				
K3: Applying					X
K4: Analyzing				X	
K5: Evaluating		X			
K6: Creating					

LSV 3402 **Soft Skills** **(4h/wk) (4Cr)**

The learner will gain the skills required for the corporate world that would enhance one's employability and to provide an exposure to the students regarding the soft skills required for the job market.

Course outcomes:
At the end of this course, the students will be able to:

i. Cite the meaning and define soft skill and also to identify the different types of soft skills.
ii. Identify different types of communication and overcome the barriers for effective communication.
iii. Develop and exhibit a good body language and enhance their personality.
iv. Exhibit a polite behaviour in society or among members of a particular profession or group and enrich their public speaking skill.
v. Enhance their writing skill and face interviews without fear.

Unit I - Soft Skill: Definition - Importance of soft skills - Types of soft skills.

Unit II - Communication: Definition - Process - Types - Verbal, non-verbal - Uses - Barriers of effective communication.

Unit III - Inter Personal Relation Skills: Body Language and personality.

Unit IV- Etiquettes or Manners: Art of Public Speaking - Chracteristics of a good speech - Planning to speak.

Unit V- Writing Skills: Importance - Types **Interview:** Types - Selection - Appraisal - Exit.

Text Book

Rajendra Pal & J. S. Korlahalli, Essentials of Business Communication, Sultan Chand & Sons, New Delhi, 2016.

References

N.S.Raghunathan & B.Santhanam, Business Communication, Margham Publications, Chennai, 3rd Edition 2018.

Reddy, Appannnaih & Raja Rao, Essentials of Business Communication, Himalaya Publishing House, Mumbai, 2017.

Rizvi, M. Ashraf - Effective Technical Communication, Tata McGraw Hill, 2011

Blundell J. A & Middle N. M. G.: Career – English for the Business and Commercial World, Oxford University Press, 2009

Bloom's Taxonomy	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K 1: Remembering					
K 2: Understanding	X				
K 3: Applying		X	X		
K 4: Analysing				X	
K 5: Evaluating					X
K 6: Creating					

CSV 3402 Database management system (4h/wk) (4Cr)

This course is intended to familiarize the students with the concept and significance of database maintenance and management. Moreover, the course would orient the students about the various aspects involved need for systematic retention of database involved in their respective vocations.

Course outcomes

At the end of the course the student will be able to:

i. Identify the database approach and the database applications
ii. Apply relational expressions for queries.
iii. Examine the database design by normalization.
iv. Build a table and manipulate the data using SQL Commands.
v. Summarize the transactions, its properties and the concurrency controls.

Unit I: Databases and database users: Introduction – Characteristics of the database approach – Advantages of using the DBMS approach – A brief history of Database Applications.

Unit II: Database System Concepts and Architechture – Data Models, Schemas and Instances.

Unit III: Database Languages and Interfaces: The Database System Environment – Centralized and Client / Server Architecture for DBMSs – Classification of Database Management System.

Unit IV: Relational Model Concepts: Relational model Constraints and Relational Database Schemas, Update Operation, Transaction and dealing with Constraints violations.

Unit V: Database Recovery Concepts - Caching(Buffering) of Disk blocks – Write-ahead Logging, Steal / No-Steal and Force / No-Force - Checkpoints in the System Log and Fuzzy Check pointing – Transaction rollback

References

1. "Database Management System" – Raghu Ramakrishnan and Johannes Gehrke – 3rd edition, McGraw-Hill, 2003.
2. "DBMS a Practical Approach", E.R. Ragiv Chopra, S Chand Publications.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering	X				
K 2: Understanding					X
K 3: Applying		X		X	
K 4: Analysing			X		
K 5: Evaluating					
K 6: Creating					

VFP 3403 **Food Adulteration** **(4h/wk) (4Cr)**

The main objective of this course is to impart knowledge and skills related to food adulteration

Course Outcomes

Upon completion of this course, the student will be able to:

i. Discuss different food adulterations
ii. Analyze adulterants in food
iii. Discuss the role of additives as adulterants
iv. Explain the laws and regulations related to food adulteration
v. Identify various certification systems.

1. **Adulteration**: Definition – reasons – types - intentional, incidental – microorganisms metallic contamination and toxic effect – packaging hazards – new adulterants.

2. **Detection of Adulterants**– Common Food Adulterants – food grains and products, oil and fats, spices and condiments, milk and milk products.

3. **Food Additives:** Definition, need for food additives,Types - Natural additives - Sugar and salt, Chemical additives -class I, class II additives, Colours, anti-caking agents, flavours, sweetners, emulsifiers, stabilizers, chelating agents, sequestestrants, antioxidants, and antimicrobial.

4. **Preservatives:** Definition, uses and importance, types-natural, artificial preservatives Sodium Benzoate, Sodium Nitrite, Sodium Sulfite, Sulfur dioxide, propyl paraben, BHA, BHT

5. **Other additives:** (i) Organic acids, propionate, benzoates, sorbates, acetates (ii) Ethlene and propylene oxide (iii) Alcohol ((iv)Wood smoke (v)Esters (vi) Mono Sodium Glutamate (MGM)

Text Book

Srilakshmi, B. (2002). Food science,New Age Publishers, New Delhi.

References

Taylor SL, Scanlan RA and Deckker M, (1985). Food Toxicology-A perspective on the relative risks, INC. publishing, New York.

Elsevier KL, (1987). Toxicological aspects of Food, Applied science publishers Ltd., London.

Gossesl AT and Bricker JD, (1986). Principles of Clinical Toxicology, Raven press, New York.

Goldblatt LA, (1989). Aflatoxin scientific background, control and implications, Academic press, New York.

Bloom's Taxonomy	K1	K2	K3	K4	K5	K6
CO1				X		
CO2			X			
CO3		X				
CO4			X			
CO5				X		

Mean = 3.2

VFP 3404 **Food Quality Testing & Evaluation** **(4h/wk) (4Cr)**

This course deals with various attributes of food in order to prevent spoilage by applying the principles of quality management. It provides opportunities to students to develop knowledge on quality management as well as quality control in food service sectors.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Discuss the different quality attributes of food
ii. Explain the importance of colour& texture in food
iii. Discuss about the microbial aspects and methods of preventing food contamination.
iv. Explain the application of quality assurance in food industry
v. Use quality assurance technique operations in food & beverage industry

1. **Introduction to Food Quality Attributes I:** Sensory Evaluation-Appearance, flavour, textural factors and additional quality factors and quality control.
2. **Introduction to Food Quality Attributes II:** Gustation - importance of gustation - taste organs, taste perception, basic tastes- sweet, salt, sour, bitter and umami, taste measurement, Electronic Tongue, taste abnormalities. Introduction to Food Quality Attributes II: Olfaction- importance of odour and flavor, odour perception, theories of odour classification, chemical specificity of odour, odour measurement, olfactory abnormalities.
3. **Colour**: Colour - importance, attributes of colour, perception of colourcolour measurement: Munsellcolour system, CIE colour system, Hunter colour system, colour abnormalities.
4. **Texture:**Texture - importance, classification, Rheology of foods. Texture measurement – consistometer, viscometer, tenderometer, penetrometer, succulometer, gelometer.
5. **Total Quality Management: L**aboratory quality procedures and assessment of laboratory performance. International Standards, Codex Alimentaries, HACCP.

Text Book

Rao E. S. (2013). Food Quality Evaluation.Variety Books Publishers and Distributers, New Delhi.

References

David A, Shapton M, Naroh F andShapton (1991). Principles and Practises for the Safe Processing of Foods, Butterworth- Heinemann Ltd, Oxford.

Manay S and Shadaksharaswamy(2008) Foods - Facts and Principles, 3rdEdition, New Age International Pvt. Ltd.

Bloom's Taxonomy	K1	K2	K3	K4	K5	K6
CO1		X				
CO2		X				
CO3				X		
CO4				X		
CO5			X			

Mean = 3

Lab in Adulteration, Food quality testing and evaluation

VFP 3106 **(10h/wk) (10Cr)**

This course consists of planning, production and serving of food and beverages to customers and clients. Students also learn about hospitality in food service business. It provides an overview of the industry and current trends in food establishment management, food preparation theories, techniques and customer client relations.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Demonstrate technical knowledge in flour analysis.
ii. Use the techniques in setting of food outlet.
iii. Formulate plans relevant to food and service management.
iv. Compile technical knowledge of hygiene and maintenance of equipment
v. Discuss about the microbial aspects and methods

Laboratory Experiments

1. Identification of adulterants in milk and milk products.
2. Identification of adulterants in oil and fats.
3. Identification of adulterants in food grains and its products.
4. Identification of adulterants in salt, spices and condiments.
5. FPO standard foods and food products and analyzing their quality.
6. Microbiological examination of food.
7. Assessment of surface sanitation by swab and rinse method.
8. Bacteriological analysis of water by MPN method.
9. Qualitative tests for hydrogenated fats.
10. Analytical and effective tests of sensory evaluation.
11. Measurement of colour by using tintometer.
12. Study on flavour defects in milk.

References

Palacio, J.P, Harger, V, Shugari, G and Thesis, M (2001). Introduction to Food Service.MacMillan Pub Co., New York.

Cessarani,V. and Kinton,R (2002). Practical Cookery.7th Edition.Hodder and Stoughton publishers.

Khan, M.A (2003). Food Service Operations.AVI Publications Co., Connecticut.

Thangam Philip (2005). Modern Cookery.3rd Edition.Orient Longman Limited.

Sethi, M. and Malhan, S.M (2007).Catering Management – An Integrated Approach.Wiley Eastern Limited, Mumbai.

Bloom's Taxonomy	K1	K2	K3	K4	K5	K6
CO1					X	
CO2			X			
CO3					X	
CO4				X		
CO5		X				

Mean = 3.8

VMT 1

THE AMERICAN COLLEGE

B VOC IN MEDIA TECHNOLOGY

SYLLABUS – GRID – 2019-2020

I SEMESTER				
S NO	**COURSE CODE**	**COURSE NAME**	**HOURS**	**CREDITS**
1	END 1401	Conversational Skills	4	4
2	CSD 1403	Fundamentals of Computers	4	4
3	LSD 1203	Fundamentals of Life Coping Skills	4	4
4	DMT 1401	Print Media Design - I	4	4
5	DMT 1403	Image Design – I	4	4
6	DMT 1115	Lab: Laboratory In Print And Image Design	120/SEM	10
7	DMT 1407	Internship – I	**4**	**4**
		TOTAL		**30+4**
II SEMESTER				
1	END 1402	Reading and Writing Skills	4	4
2	CSA 1404	Office Automation Tools	4	4
3	LSD 1404	Performance and Life Coping Skills	4	4
5	DMT 1402	Print Media Design - II	4	4
6	DMT 1404	Image Design – II	4	4
7	DMT 1116	Lab II: Designing Techniques	120/SEM	10
8	DMT 1408	Internship – II	4	4
		TOTAL		**30+4**
III SEMESTER				
1	ENA 2401	Study Skills	4	4
2	CSA 2403	Operating System	4	4
3	LSA 2203	Coping with Psychological and Physical Issues	4	4
4	AMT 2401	Computer Aided Design (2D/3D)	4	4
5	AMT 2403	Photography	4	4
6	AMT 2115	Lab III: Photography (Practical)	120/SEM	10
7	AMT 2407	Internship III	4	4
		TOTAL		**30+4**

VMT 2

IV SEMESTER				
1	ENA 2402	Career Skills	4	4
2	CSA 2404	Programming Techniques Using C	4	4
3	LSA 2404	Coping with Social and Environmental Issues	4	4
4	AMT 2402	Audio Production	4	4
5	AMT 2404	Introduction to Flash	4	4
6	AMT 2116	Lab IV: Sound Techniques – Practical	120/SEM	10
7	AMT 2408	Internship IV	4	
V SEMESTER		**TOTAL**		**30+4**
1	EVS 3401	Environmental Studies	4	4
2	VMT 3401	Information Communication Technology	4	4
3	LSV 3401	Entrepreneurship	4	4
3	VMT 3403	Introduction to Video Production	4	4
4	VMT 3405	Video Editing Techniques	4	4
5	VMT 3117	Lab V: Video Editing (Practical)	120/SEM	10
6	VMT 3409	Internship V	4	4
		TOTAL		**30+4**
VI SEMESTER				
1	VAL 3402	Value Education	4	4
2	CSV 3402	DBMS	4	4
3	LSV 3402	Soft Skills VI	4	4
1	VMT 3402	Animation Techniques (Maya)	4	4
2	VMT 3404	Media Management	4	4
3	VMT 3116	Lab VI: Animation Techniques	120/SEM	10
4	VMT 3408	Research Project	4	4
5	VMT 3410	Internship VI	4	4
		TOTAL		**34+4**

PROGRAM SPECIFIC OUTCOME FOR B.VOC IN MEDIA TECHNOLOGY

At the end of the programme, the students will be able to:

1. Recognize the concepts, meaning and principles related to Media like Print, Electronic and New Media.
2. Reproduce and gather information through communication technologies for societal betterment.
3. Develop multitasking abilities and skills to create and design innovative printing products for an agency.
4. Produce sound tracks and video for Media Industry using Recording and Editing softwares.
5. Apprehend analytical thinking to criticize the existing production and compose new production.
6. Create a working environment inculcating the media management approach and provide work opportunities to the interns.
7. Develop an aesthetic sense to create an innovative output in media industry.
8. Applying the convention way of approaches with the new media methods like media convergence.
9. Act as a Global responsible to create animation series to sensitize the social issues using 2D and 3D animation to it.
10. Adhere and work with media laws, ethics and issues of concern to recognize the human values and exhibit social inclusiveness through media technological approach.

VMT 4

Mapping of Courses with programme Specific Outcomes (PSOs)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
DMT 1401	✓	✓	✓			✓	✓	✓		✓
DMT 1403	✓		✓		✓	✓	✓	✓	✓	✓
DMT 1405	✓	✓	✓	✓	✓	✓	✓			
DMT 1407	✓	✓	✓		✓	✓	✓			
DMT 1402	✓	✓	✓			✓	✓	✓		✓
DMT 1404	✓		✓		✓	✓	✓	✓	✓	✓
DMT 1406	✓		✓		✓	✓	✓	✓	✓	✓
DMT 1408	✓	✓	✓		✓	✓	✓			
AMT 2401	✓		✓		✓	✓	✓		✓	
AMT 2403	✓	✓	✓		✓	✓	✓	✓		✓
AMT 2405	✓	✓	✓	✓	✓	✓	✓			
AMT 2407	✓	✓	✓		✓	✓	✓			
AMT 2402	✓	✓	✓	✓	✓	✓	✓			✓
AMT 2404	✓	✓	✓		✓	✓	✓		✓	✓
AMT2406	✓		✓		✓	✓	✓	✓	✓	✓
AMT 2408	✓	✓	✓		✓	✓	✓			
VMT 3401	✓	✓			✓	✓		✓		✓
VMT 3403	✓			✓	✓	✓	✓	✓		✓
VMT 3405	✓			✓	✓	✓	✓	✓	✓	✓
VMT 3407	✓	✓	✓	✓	✓	✓	✓			
VMT 3409	✓	✓	✓		✓	✓	✓			
VMT 3402	✓	✓	✓		✓	✓	✓		✓	✓
VMT 3404	✓	✓				✓		✓	✓	✓
VMT 3406	✓	✓	✓	✓	✓	✓	✓			
VMT 3408	✓		✓	✓	✓		✓	✓	✓	✓
VMT 3410	✓	✓	✓		✓	✓	✓			

Mapping of Programme Specific Outcomes (PSOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	✓		✓		✓	✓		✓	✓	
PSO2	✓	✓	✓		✓	✓			✓	
PSO3	✓	✓		✓	✓		✓		✓	
PSO4	✓	✓	✓	✓	✓		✓			
PSO5	✓	✓	✓	✓	✓		✓			
PSO6			✓	✓	✓		✓		✓	✓
PSO7	✓	✓	✓		✓	✓	✓			
PSO8	✓	✓	✓	✓	✓		✓			
PSO9		✓		✓	✓		✓		✓	✓
PSO10		✓		✓	✓		✓		✓	✓

END 1401 **Conversational Skills** **4 Hrs/4 Cr**

[ConSkills]

The Course aims at helping students converse in English on the matters that matter to them in daily life. It provides the learners with ample opportunities and social contexts through conversations so that they can freely and fluently use informal English. It also exposes them to the apt vocabulary of such informal conversations.

At the end of the course, student will be able to

i. articulate spoken utterances clearly and fluently,

ii. speak simple sentences in English with one another in unpredictable situations,

iii. participate in dyadic communication,

iv. use phatic communion, and

v. employ word-stress and intonation in spoken utterances.

Unit 1 : Conversational skills

Unit 2 : Day-to-day matters like eating, emotions, fashion, health, friendship, money, romance, housing, job, faith & hope, busy life, memory, shopping, time, Traffic, travelling, vacation, weather

Unit 3 : Social expressions

Unit 4 : English sounds

Unit 5 : English accent and intonation

Textbook

Sekar, J. J. 2014. Conversational Skills. Madurai. Department of English, the American College.

Mapping of Course Outcomes with Bloom's Taxonomy

	K1	K2	K3	K4	K5	K6
CO 1				✓		
CO 2						✓
CO 3						✓
CO 4						✓
CO 5			✓			

Mean: 4.8

CSD 1403 **Fundamentals of Computers** **4hrs/Wk – 4 credits**

Objective:

This course aims at exploring the history and applications of Computers in various fields. This course also make the student understand the components of Computer System and the representation of Data.

Specific Learning Outcome:

At the end of the course the student will be able to:

i. Classify the Generations of a Computer and its applications.
ii. Recall the components of a Computer.
iii. Analyze Primary and Secondary storage devices.
iv. Use Data representation methods.
v. Develop Data Conversion examples.

Unit I: Introduction to computers Generations of computers –components of computer – hardware – software -classification of computers – advantages and limitations – applications of computer

Unit II: Components of the Computer CPU - I/O devices – Types and Features.

Unit III: Computer Memory Primary memory – secondary memory-auxiliary storage devices– cache memory CD – DVD –Pen drive – backup.

Unit IV: Data representation Data – Meaning - Information –Representation - files - Computer words.

Unit V: Number Systems in computer Decimal, Binary, Octal and HexaDecimal - Representation–Conversions.

Textbook:

Alphonse X, ICRDCE publication, December 2011.

Reference:

Curtin, D. P. Foley, K.Kunalsen, Morin.C "Information Technology- The Breaking Wave", TataMcGraw Hill, 2002.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering		✓			
K2: Understanding	✓				
K3: Applying				✓	✓
K4: Analyzing			✓		
K5: Evaluating					
K6: Creating					

VMT 8

FUNDAMENTALS OF LIFE COPING SKILLS

LSA 1403 **4hrs/Wk – 4 Credits**

Objectives: To prepare the students through the fundamentals of life coping skills for better citizens. To make them sociable and help them develop their personality.Understanding the need for self transformation which will guide them throughout their life in handling relationships and life challenges.To enlighten them with the necessity of learning communication and negotiation skills for achieving greater heights in their personal life and their career.

Specific Learning Outcome: At the end of this course the student will be able,

- To demonstrate how to be sociable in all demanding situations
- To prepare themselves a better personality through self transformation
- To identify need and importance of an effective and efficient communicator
- To apply the assertive skill techniques in the appropriate life situations
- To formulate personal principles based on the fundamentals of life coping skills

Unit 1: Introduction to Skills

Introduction to skills – Definition of Coping - Social Skills – Four levels: Foundation, Interactive, Affective, Cognitive – Understanding Body Language

Unit II: Personality Development

Definition of Personality – Characteristics of Personality – Ways to develop personality – Personality types – Four basic temperament

Unit III: Self Transformation

Self Identity – Self Concept – Self acceptance – Self discovery – Self Esteem: High & Low Self esteem – Johari Window

Unit IV: Communication Skills

Understanding communication – Types of communication – Patterns of communication – Importance of communication – Effective & Efficient communication

Unit IV: Assertive Skills

Assertive Behaviour – Benefits of being Assertive – Types of Assertion – Assertion rights – Developing assertive skill

Books for Reference:

1. Alphonse, X. 2011, "We shall overcome" A Text book on Life coping skills", ICRDCE Publication, Chennai
2. AIACHE Publication 2014, New Delhi, "Human Values Development"

DMT 1401 **Print Media Design I** **4 Hrs/ Wk- 4Credits**

Course Objectives:

This course aims in training the students about fundamental concepts in Corel Draw and its tools and techniques for designing the brouchers and magazines.

Course Outcome

At the end of the Course, the students will able to:

i. Apply the basic tools and menus in Corel draw for designing purposes
ii. Analyze the colour sense and basic concepts of drawing like lines, shapes and curves in CorelDraw software
iii. Compose own designing of brouchers and magazines in the CorelDraw software
iv. Apply the methods of Page Layout and modification of Background by using the software
v. Plan a Design for various medium with the help of Software

UNIT I:

Introduction to Corel Draw: Toolbox – Status Bar – Drawing Figures – Lines – Ellipse – Circles – Rectangle – Square – Polygon – Types of Views: Normal – Preview – Frame – Draft – View – View Manager – Creating a view – Raster Images Vs Vector Graphics

UNIT II:

Colour modes: RGB – CMYK – Gray Scale – Designing: Drawing the lines – shapes – Curves – Inserting – Picture – Object – Using Grid lines – Working with Power Clips – Using Templates

UNIT III:

Page Layout: Changing the Page Size – Changing the Layout – Applying Style – Applying Bitmaps to the Background – Changing the Background – Adding a Page Frame – Moving between Frames

UNIT IV:

Mastering with the Text – Text tool artistic and Paragraph Text – Formatting Text – Embedding Object into text – Text to Curves

UNIT V:

Bitmaps: Working with Bitmaps – Converting Vector Graphics to Bitmaps – Designing for various medium: Publication – Digital Publication – Advertisement – Exporting for various media

REFERENCE:

1. Corel Draw X8: The Official Guide by Gary David Bouton.
2. Deke McClelland, 1993, Coreldraw! For Dummies, John Wiley & Sons Inc
3. CorelDraw, User Guide, 2018.

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1			3			
CO2				4		
CO3					5	
CO4			3			
CO5					5	

Mean: 4

DMT 1403 **Image Design I** **4 Hrs/ Wk- 4Credits**

Course Objective:

This course aims to train the students about the fundamental concepts, Tools & Workspace in Photoshop software. It also teaches about Images/Photos manipulation in Photoshop software.

Course Outcome:

At the end of the course, the Students will be able to:

i. Understand the basics and purpose of using the software for Designing purpose
ii. Compose and blending the images and applying background for the images by using the software
iii. Create an innovative cartoon character and applying 3D effects with aid of software
iv. Classify the special effects and know about advanced technical aspects in the software
v. Apply the various types of effects and creating Caricature by using the software

VMT 11

UNIT I:

Adobe Photoshop CS6: Introduction – Tool bar – Menu bar – Resolution – Resizing the image – Composition

UNIT II:

Compositing the images: Blending two and multiple images – Removing Background – changing the background – Blurring the image

UNIT III:

Digitization: Photo Retouching – Colour Correction – Image compression – Digital Painting – Creating a cartoon effect – Creating a 3D character

UNIT IV:

Special Effects: Creating special effects – Dispersion effect – Masking Technique – Image Manipulation – Caricature – Caricature Manipulation

UNIT V:

Image Manipulation: Visual Effect Photo Editing – Photo Manipulation effects – Creating a Poster – Banner – Flyer – Double Exposure Effect

REFERENCE:

1. Adobe Photoshop CC classroom in a book by Andrew Faulkner, 2017 Release First Edition.

2. Photoshop CC 2019 – Upto speed by R.M. Hyttinen.

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1		2				
CO2					5	
CO3					5	
CO4		2				
CO5			3		5	

Mean: 3.6

DMT 1405 **Lab I – Laboratory in Print and Image Design** **10 Hrs/ Wk-10Credit**

Course Objective:

This course aims to bring the practical skills and competency in handling the tools and techniques in Print and Image Design through Lab Activities.

Course Outcome:

At the end of the course, the students will be able to:

i. Create basic documentation in various sizes by using the designing software
ii. Utilize the tools in the software to design the creative fonts and text using the software
iii. Develop special effects, titling effects and creating tables with the aid of software
iv. Remember about the formatting the document.
v. Evaluate he advantages and benefits of convention and digital printing techniques

Print Media Familiarization Techniques

- Creating Documents in different sizes
- Word Processing and Short Cuts
- Borders and Text shading
- Inserting Images and Text Wrapping
- Text Design and Font sizes
- Titles and Effects
- Using Graphs and Charts
- Working with Tables
- Document Formatting
- Printing Techniques

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1					5	
CO2			3			
CO3			3		5	
CO4	1					
CO5						6

Mean: 3.8

DMT 1407 **INTERNSHIP – I** **4 CREDITS /120 Hrs/SEM**

Course Objective:

This course aims to bridge theoretical orientation of CorelDraw and photoshop application into practical exposure. It also gives high work experience in field of designing in a professional way.

Course Outcome:

At the end of the course, the students will be able to:

i. Apply the basic usage of tools and techniques in CorelDraw
ii. Compose new designs using CorelDraw independently
iii. Modify the existing images and Designs independently
iv. Design an innovative cartoon character in a creative method
v. Apply the techniques of digitization professionally in the existing image with the aid of the software

The internship training moulds the students to higher level and grabs an opportunity to work in a professional environment. This environment hones the students' skill and makes a strong foundation in the practical and acts as a platform to create a job opportunity in the particular field.

As the students focuses in the field of Designing during the 1st semester, they have to undergo the training/ Internship in Designing companies. The students should undergo minimum of 120 hours internship in a company

At the end of the Semester, the students should submit the project regarding their experience in the company and attend a Viva Voce. The project will be evaluated by Internal and External Examiner for 100 Marks (75Marks (Internal) and 25 Marks (External))

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1			3			
CO2					5	
CO3			3			
CO4					5	
CO5			3			

Mean: 3.8

END 1402 **Reading & Writing Skills** **4 Hrs./4 Cr.**

[RWS]

The Course aims at improving the learners' productive skills of English. It offers professional guidance on meaningful and aggressive reading experiences by familiarizing them with techniques and micro-skills of reading, comprehension abilities through literary and non-literary reading materials. It also strengthens their writing skills through the forms of writing that are useful to them academically and vocationally.

At the end of the course, students will be able to

i. practise the reading of simple prose texts silently and fast,

ii. produce their comprehension abilities,

iii. write letter of requests, permission and apology,

iv. write paragraphs with topic sentence and supportive sentences, and

v. write five-paragraph essays on simple, contemporary themes.

Unit 1 : Reading and comprehension skills

Unit 2 : Reading at various speeds, skimming & scanning, inferring & interpreting, predicting, reorganizing material, comprehension skills

Unit 3 : Writing leave letters and apology letters

Unit 4 : Paragraph writing, five-paragraph essay writing,

Unit 5 : Types of essay and paragraph writing: descriptive, argumentation, narrative, and expository

Textbook

Sekar, John, J. 2014. Reading and Writing Skills. Madurai. Department of English, the American College.

Mapping of Course Outcomes with Bloom's Taxonomy

	K 1	K 2	K 3	K 4	K 5	K 6
CO 1			✓			
CO 2			✓			
CO 3						✓
CO 4						✓
CO 5						✓

Mean: 4.8

CSD 1404 **Office Automation Tools** **4hrs/Wk – 4 credits**

Objective:

This course helps the student to create , format text and to merge mail using MS-Word. It also enables them to be familiar with Worksheet, Graphics and Charts. On completion of this course the student will be able to create documents , work with Worksheets and PowerPoint.

Specific Learning Outcome:
After completing this course students will be able to

- Demonstrate text data and tables to make a Document.
- Build Graphics and format text.
- Develop worksheet and format cells using formulae.
- Examine Sorting and Filtering techniques for text and numbers.
- Design a Slide show presentation and show in Multimedia form.

Unit I: Microsoft Word: Working with text - Formatting paragraph -Numbered and Bulleted lists-Working with Tables

Unit II: Mail Merging and Graphics - Spelling and Grammar Checking - Page format – Working with graphics

Unit III: Microsoft Excel : Modifying a Worksheet -Formatting cells -Formula cells

Unit IV: Functions and Charts: Formulae and Functions - Sorting and Filtering - Graphics Charts.

Unit V: Power-Point Working with slides -Color Schemes – Graphics – Slide Effects – Master Slides – Presentations-Slide Shows–Animations.

Textbook:

MS-Office 2003 Manual by Microsoft

Reference

Curtin D.P, Kim Foley K, Kunalsen, Morin. C, "Information Technology- The Breaking Wave", TataMcGraw Hill 2002.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	X				
K3: Applying		X	X		
K4: Analyzing				X	
K5: Evaluating					
K6: Creating					X

VMT 16

PERFORMANCE AND LIFE COPING SKILLS

LSA 1404 **4hrs/Wk – 4 Credits**

Objectives: To prepare the students better individuals in the society through life coping skills. To make them understand the need for learning life skills which will guide them to face the challenges.Training them to learn stress management and time management skills in order to achieve their life goals.

Specific Learning Outcome: At the end of this course the student will be able,

- To plan and set goals for their life
- To assess the need for motivation for successful completion of tasks
- To reflect the problem solving skill in day today life
- To predict stressful situations and causes of stress in order to overcome them
- To identify need for dealing with emotions for positive mental health

Unit : 1 GOAL SETTING

Definition – Importance of Goals – SMART Goal & Time management – Types of Goals - Obstacles – Successful and Meaningful life

Unit : II MOTIVATION SKILL

Introduction to Motivation & Inspiration – Internal and External motivation – Methods of Motivation – Effects of de motivation

Unit : III PROBLEM SOLVING SKILL

Definition of problem – Reasons for problems – Stages of solving problems: Evaluation, Managing, Decision making, Resolving, Results

Unit IV : STRESS MANAGEMENT

Definition of Stress: Positive (Eustress), Negative (Destress) – Stressors: Internal, External – Causes of Stress – Types of Stress – Ways to manage stress

Unit V: TIME MANAGEMENT

Need for time management – Poor Time management – Saboteur Time styles – Techniques for managing time

Books for Reference:

1. Alphonse, X. 2011, "We shall overcome" A Text book on Life coping skills", ICRDCE Publication, Chennai

DMT 1402 **Print Media Design II** **4Hrs/Wk – 4Credits**

Course Objective:

This Course aspire the students to acquire knowledge about the advanced techniques of Designing Graphics, Advertisement and Broucher with the aid of In Design Software.

Course Outcome:

At the end of the course, the Students will be able to:

i. Understand the advance level of designing methods by using the In Design Software
ii. Discuss the basic techniques and manipulating the documents using the Software
iii. Create an innovative Characters, Graphics, Images and Text using In Design Software
iv. Plan for a professional approach for Newspaper Design and Magazine Design for a company/Institution using software
v. Assess a Broucher project using the In Design Software

UNIT I:

Identifying tools and components of the In Design Interface – Creating a new document – Adding Text and Graphics to a Document

UNIT II:

Master Pages – Rulers and Guides – Adding and Deleting Pages – Working with Master Pages – Tracking Kerning and Leading – Placing Text and Graphics on the Document Pages – Developing Paragraph – Character and Object Styles – Paragraph Styles and Character Styles – Adjusting the viewing quality of the Document

UNIT III:

Workflow for placing Graphics into In Design –Placing Graphics in Table – Wrapping text around a Graphic Colour and transparency – Critique and Hierarchy – Developing paragraph, Character and Object Styles – Editing Text Placing

UNIT IV:

Working with Column – Designing for various medium: Advertisement – Publication – Magazine Design – Newspaper Design – Publication Design

UNIT V:

Broucher Project – Output and Exporting – Packaging Files – Introduction to Interactive – Setting up an Online document – Animation Panel – Bookmark panel – Buttons Panel – Page transition Panel

REFERENCE:

1. Adobe In design CC Classroom in a book, Kelly kordes Anton, Tina Dejarld.

2. Indesign CC, Creative Classroom by Bone Peter.

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1		2				
CO2		2				
CO3					5	
CO4					5	
CO5						6

Mean: 4

DMT 1404 **Image Design II** **4Hrs/Wk – 4Credits**

Course Objective:

The Course aims to describe the advance designing methods to create objects, drawings and 3D effects with the aid of Image Design Software.

Course Outcome:

At the end of the course, the Students will be able to

i. Label out the basic techniques, menus and tools of Illustrator software.
ii. Relate the techniques of drawing tools and creating creative logo for a company with the aid of Software
iii. Create a character by using various types of drawing techniques in the tool bar
iv. Generate an innovative animations, Graphics and painting effects by using the Illustrator Software
v. Summarize the Shading and Coloring methods available in the Illustrator Software

UNIT I:

Introduction: Adobe Illustrator CC – Working with Documents – Drawings and Transforming and Transforming Objects – Blending Technique – Using the effect and Blend Tool

UNIT II:

Line Art Designing – Icon Design – Design a logo using Golden Ratio – Art Brush Lettering

UNIT III:

Line Cut Effect – Alternative Drawing Technique – Masking – Inking and Colouring Comics

UNIT IV:

Drawing and Painting – Neon Effect – 3D Gradient Liquid – Technique for shape vector – Isometric

UNIT V:

Image Cropping – Shading and Colouring Vector – Logo Design – Orange 3D Logo Design – Using the Mesh Tool (Creating an apple) – Stroke Techniques

REFERENCE:

1. Adobe Illustrator CC Keyboard Shortcuts: Volume 39 by U.C – Abel books.

2. Adobe Illustrator CC Classroom in a book (2018 release) by Brian Wood.

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1	1					
CO2			3		5	
CO3				4		
CO4					5	
CO5		2				

Mean: 4

DMT 1406 **Lab II – Designing Techniques** **10Hrs/Wk – 10 Credits**

Course Objective:

The course aims to obtain practical knowledge with the application of advancement in Print and Media technique through Lab work

Course Outcome:

At the end of the course, the Students will be able to:

i. Elucidate the basic concept of drawing like lines, curves and designing shapes using software

ii. Create images using colouring tools with the support of software

iii. Demonstrate special effects using various images and text by using the software

iv. Apply the techniques to create various image sizes and formatting images using the software

v. Remember about preparing various image sizes suitable for print media using software

Image Processing Techniques

- Lines, Shapes and Charts
- Working with Vector images and Bitmap Images
- Image (Graphic) resolution – pixel sizes
- Image shading and Colour Correction
- Image Effects
- Superimposing Images
- Adding text to images
- Working with ClipArt
- Image Resizing
- Image Formatting
- Preparing Images for Print

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1						6
CO2			3			
CO3					5	
CO4			3			
CO5	1					

Mean: 3.6

DMT 1408 INTERNSHIP – II 4 CREDITS / 120 hrs/SEM

Course Objective:

This course aims to bridge theoretical orientation of advanced designing software into practical exposure. It also gives high work experience in field of designing in a professional way.

Course Outcome:

At the end of the course, the students will be able to:

i. Recall the basic tools and menus in InDesign and Illustrator software

ii. Plan and compose designing patterns for various medium like print and electronic media

iii. Design a new broucher and innovative handouts for a company/institution in a professional way

iv. Create a Special Visual Effects (3D) by using illustrator software professionally.

v. Construct an innovative images independently with existing images, creating logo for a company/ institution in a professional way

The internship training moulds the students to higher level and grabs an opportunity to work in a professional environment. This environment hones the students' skill and makes a strong foundation in the practical and acts as a platform to create a job opportunity in the particular field.

As the students focuses in the field of designing during 2nd semester, they have to undergo internship/training in Designing companies. The students should undergo minimum of 120 hours internship in a company

At the end of the Semester, the students should submit the project regarding their experience in the company and attend a Viva Voce. The project will be evaluated by Internal and External Examiner for 100 Marks (75Marks (Internal) and 25 Marks (External))

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1	1					
CO2					5	
CO3					5	
CO4					5	
CO5					5	

Mean: 4.2

ENA 2401 **Study Skills (S S)** **4 Hrs/4 Cr**

The third sequential General English Course aims at empowering second year undergraduate students with study skills necessary to continue their chosen major disciplines. The course assumes importance in the context of students lacking study skills and strategies for academic success.

At the end of the course, students will be able to

i. practise healthy study habits and homework habits,

ii. organise their academic skills,

iii. apply time management skills,

iv. explain psychological traits, and

v. use ICT skills

Unit 1 General

Definition & scope of study skills, their needs, learning styles, study habits, homework habits, and strategies to improve study skills

Unit 2 Academic Skills

Effective, active listening, effective reading strategies & essay writing, note taking & making, summarizing, paraphrasing, information transfer, library skills, and dictionary skills

Unit 3 Time Management

Motivation & success, choosing study partners, creation of study space, barrier to time management, strategies to overcome barriers, punctuality & time management, time management during exam

Unit 4 Psychological Traits

Concentration skills, memory, remembering, stress management, coping with test anxiety, critical thinking

Unit 5 ICT

ICT skills, computer literacy skills at basic, intermediate and advanced levels

Textbook: Sekar, J.J. 2015. Study Skills. Madurai: Department of English, The American College

Mapping of Course Outcomes with Bloom's Taxonomy

	K 1	K 2	K 3	K 4	K 5	K 6
CO 1			3			
CO 2				4		
CO 3			3			
CO 4				4		
CO 5						6

Mean: 4

ENA 2402 **Career Skills** **4 Hrs. / 4 Cr**

(CaSkills)

The fourth sequential General English Course aims at empowering second year undergraduate students with communication & cognitive skills and personality traits necessary to empower their career skills. The course assumes importance in the context of students lacking career skills and strategies for successful profession.

At the end of the course, students will be able to

i. speak and write in English,

ii. practise interview skills,

iii. explain cognitive skills,

iv. produce thinking skills, and

v. understand personal traits

Unit 1 : Communication Skills

Active Listening & speaking, written & oral communication

Unit 2 : Interview Skills

Interview questions, job application, CV preparation, self-introduction, presentation skills, negotiation skills, conducting a meeting, agenda setting and recording minutes

Unit 3 : Cognitive Skills

Self- motivation, setting personal goals, problem solving, decision making and delegation skills

Unit 4 : Thinking Skills

Strategic thinking, organization, innovation, leadership skills

Unit 5 : Personal Traits Skills

Personal development & empowerment, confidence & rapport building, tact & diplomacy, emotional intelligence, self-esteem, humour and persuasion skills

Textbook

Sekar, J.J. 2015.Career Skills. Madurai: Department of English, The American College.

Mapping of Course Outcomes with Bloom's Taxonomy

	K 1	K 2	K 3	K 4	K 5	K 6
CO 1						6
CO 2			3			
CO 3		2				
CO 4						6
CO 5		2				

Mean: 3.8

CSA 2403 **Operating Systems** **4hrs/Wk. – 4 Credits**

Objectives:

This course will enable the student to have an overview on the components of the Operating systems. It will also provide knowledge on the different types of Operating System, Multiprogramming and Multitasking. They can understand the features and applications of Android.

Specific Learning Outcome:

After completing this course students will able to

- Recall the role of Operating system as an interface between user and computer.
- Summarize the basic functionality of Network Operating system.
- Illustrate the features of Windows Operating System.
- Categorize the functions of Multitasking and Time Sharing.
- Assess the operation of Voice based features and Video calling using Android.

Unit I: Introduction to Operating System BIOS – DOS – Windows - types of operating system – operating system services - desktop operating system

Unit II: Network Operating System - Server operating system – mainframe operating system – embedded operating system.

Unit III: Windows - Features of Windows Operating system – Multiprogramming

Unit IV: Process / Memory Scheduling - Multitasking – Buffering – Spooling – Time sharing – Browser support.

Unit V: Introduction to Android Application of Android – Features of Android – Messaging -Voice based features- Multitasking-Screen Capture-Video Calling-Multiple Language support.

Text books:

1. Alphonse X, 2011 ICRDCE publication, December
2. Silberchatz, Galvin and Gagne, 1999. Operating system concepts, John Wiley and sons.

References:

1. Curtin D.P, Foley K, Kunalsen, Morin, C. 2002. Information Technology- The Breaking Wave, TataMcGraw Hill.
2.http://en.wikipedia.org/wiki/List_of_features_in_Android

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X				
K2: Understanding		X	X		
K3: Applying					
K4: Analyzing				X	
K5: Evaluating					X
K6: Creating					

VMT 25

COPING WITH PSYCHOLOGICAL AND PHYSICAL ISSUES

LSA 2403 **4hrs/Wk – 4 Credits**

Objectives: To enlighten the students about psychological and physical issues everyone goes through in their life and how to manage them for successful living. To acquaint them about the consequences of fear, shyness, emotions and stress in order to overcome them for maintaining better relationship with others and in their personal and professional life.

Specific Learning Outcome: At the end of this course the student will be able,

- To understand the types of fear and shyness and the ways of overcoming them
- To manage emotions and stress for better living
- To assess the types and apply the styles of communications in their daily walk of life
- To identify the ways of coping with social media and substance addictions
- To evaluate the distinction between Gender and Sexuality and their significance

Unit 1: Coping with Fear and Shyness

Understanding Fear - Types of Fear – Overcoming Fear – Shyness – Types – Managing Shyness

Unit II: Coping with Emotions & Stress

Types of Emotions – Managing Emotions – Stress – Types & Need for understanding stress – Ways to manage stress

Unit III: Communication & Failure

Communication – Types & Styles – Ways to improve communication – Failure – Managing Failures

Unit IV: Coping with Addictions

Drug addictions – Causes of addiction – Physical & Societal implications – Internet Addiction – Cyber crime - Types and causes – Managing addictions

Unit V: Coping with Sexuality

Sex and Gender – Understanding Gender discrimination – Coping with gender discrimination – Understanding Sexuality – Consequences of Premarital & Extra martial sexual issues – Managing sexuality

References:

1. "We shall overcome - A Text book on Life coping skills", Indian Centre for Research and Development of Community Education (ICRDCE) Publication, Alphonse, X. 2011, Chennai
2. "Living with Honour", Macmillan Publishers India Ltd., Shiv Khera 2003
3. "Smart Guide to Relieving Stress", Wiley, Carole Bodger, 1999
4. "Managing Stress", National Press Publications, Kristine C. Brewer 1995

AMT 2401 **Computer Aided Design (2D/3D)** **4Hrs/Wk – 4Credits**

Course Objective:

This course aims to introduce the students to designing for various purposes using the computer based application both 2D and 3D Animation.

Course Outcome

At the end of the course, the Students will be able to:

CO1: Infer AutoCAD Software basic working Patterns.

CO2: Sketch a 2D and 3D modeling with the aid of Software

CO3: Compose various models of 3D model kitchen, adding text methods using the 2D and 3D Animation Software

CO4: Instruct to draw various types of models by using the Auto CAD Software

CO5: Plan a modeling house and writing a command for the animation with the aid of AutoCAD software

UNIT I:

Getting started with Auto CAD (2D/3D) – Working with Commands – Hatch Command – Sweep Commad – Line Command – Circle Command - Making a Door Dynamic Block in Auto CAD

UNIT II:

Making a simple floor in Auto CAD – 3D House – Modeling – Mechanical Modeling – 3D Pipe Parting – 2D/3D modeling basic shapes

UNIT III:

Raster Design – Vector & Text Recognition – Concentric Circle Method – Dimension lines – Multiline text techniques – Desk Table – 3D Modeling – Kitchen sink – shock absorber

UNIT IV:

Making a 2D Gear – Reduce AutoCAD Drawing – File Size – Creating 3D Gear – Rotate Motion – Helix (Spring) design in AutoCAD

UNIT V:

AutoCAD – 3D House Modeling – Converting 2D to 3D Building drawing – AutoCAD 3D modeling – Command – Type 3D modeling

REFERENCE:

1. Autocad 2018 Training Guide by LinkanSagar
2. Autocad 2019 for beginners by cadfolks.
3. 3D Architectural ModellingwithAutoCAD: 3D Modelling Essentials By Scott Onstott.

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1						6
CO2			3			
CO3					5	
CO4			3			
CO5	1					

Mean: 3.6

AMT 2403 **Photography** **4Hrs/Wk – 4Credits**

Course Objective:

This course aims at imparting the students about the fundamental knowledge on still photography and helps them to obtain acquaintance in Creative photograph

Course Outcomes

At the end of the course, the Students will be able to:

i. Identify the basics and functions of SLR and DSLR Cameras.
ii. Analyze the basic types of shots and Angles and apply the techniques for composition by using Rule of Third
iii. Design a lighting techniques for indoor and outdoor production and usage of various lens in DSLR Camera
iv. Understand the various types of photography in contemporary era
v. Analyze the techniques of Digital photography and image manipulation by using Photoshop software.

UNIT I:

Camera – Introduction –Parts and Functions of a camera – Box Camera - TLR – Parallax Error –SLR – DSLR- Basics of camera: Aperture – Shutter speed – ISO – Depth of Field

UNIT II:

Composition: Rule of Third – Camera Shots: Extreme Long Shot (ELS) – Long Shot (LS) – Mid shot – Close up shot (CU) – Extreme Close up Shot (ECU) — Camera angles: High Angle – Mid Angle – Low Angle

UNIT III:

Lighting techniques: One point lighting – Two point lighting – Three point lighting – Types of lights in photography, Types of Lenses: Prime/Focus lens – Wide Angle lens – Normal lens – Tele lens – Special lenses and its usage – Filters – Types of Filters

UNIT IV:

Types of Photography: Portrait – Landscape – Wildlife – Fashion – Street Photography – Table Top/Product Photography - Photo Journalism.

UNIT V:

Digital photography and image Manipulation – Types of Memory Storage Devices - Memory – File Extension in Photoshop Software - Using Adobe Photoshop for editing and creating

REFERENCE:

1. Basic Techniques of photography – book 1& 2 by: Shaefer, John P 1990 ISBN: 9780821225752, Little, Brown, 1992
2. Photography by Barbara London John Upton Jim Stone Ken Kobre Betsy, Prentice Hall 2010

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1		2				
CO2				4		
CO3			3		5	
CO4	1					
CO5				4		

Mean: 3.8

AMT 2405 Lab III- Photography (Practical) 10Hrs/Wk–10 Credits

Course Objective:

The Students learn to acquire practical knowledge of photography and apply the techniques gained in theory paper.

Course Outcome

At the end of the course, the Students will be able to:

i. Describe about Camera Shots and Angles by Using DSLR Camera
ii. Develop the knowledge for composition in the frame and lighting techniques in indoor and outdoor production.
iii. Plan to take a photograph in Landscape and Portrait by using different types of Lens in DSLR Camera
iv. Categorize various types of photography and capturing the nuances of Madurai as Street Photography using DSLR Camera

v. Apply the methods of Digitization in photograph using the Photoshop Software.

Photography Techniques – Lab

- Basic Camera Shots
- Camera Angle
- High Exposure and Under Exposure
- Composition: Rule of Third, Head Room, Nose Room and Lead Room
- Three Point Lighting
- Landscape, Portrait and Wildlife Photography
- Madurai Street Photography
- Product Photography
- Photo Journalism
- Image Manipulation using Photographs

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1	1					
CO2					5	
CO3					5	
CO4				4		
CO5			3			

Mean: 3.6

AMT 2407 **INTERNSHIP – III** **4 CREDITS/ 120 HRS/ SEM**

Course Objective:

This course gives practical knowledge to the students towards the application of photography techniques incorporating theoretical approach. It gives wide knowledge about various usages of lens, filters and types of photography.

Course Outcome:

At the end of the course, the students will be able to:

i. Able to operate DSLR Camera individually.

ii. Compose images professionally with photographic grammar in DSLR cameras.

iii. Capture various types of images using lighting techniques in DSLR Camera.

iv. Capture the nuances real life of people, emotions and their culture in the DSLR Camera.

v. Apply the techniques of image manipulation in the existing photograph.

The internship training moulds the students to higher level and grabs an opportunity to work in a professional environment. This environment hones the students' skill and makes a strong foundation in practical and acts as a platform to create a job opportunity in particular field.

As the students focuses in the field of Photography during 3rd semester, they need to work as an internee in any Photo Studio. The students should undergo minimum of 120 hours internship in a Studio. They can gain experience in taking product photography, Wedding Photography etc.

At the end of the Semester, the students should submit the project regarding their experience in the company and attend a Viva Voce. The project will be evaluated by Internal and External Examiner for 100 Marks (75Marks (Internal) and 25 Marks (External))

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1		2				
CO2					5	
CO3					5	
CO4					5	
CO5			3			

Mean : 4

ENA 2402 **Career Skills** **4 Hrs. / 4 Cr**

(CaSkills)

The fourth sequential General English Course aims at empowering second year undergraduate students with communication & cognitive skills and personality traits necessary to empower their career skills. The course assumes importance in the context of students lacking career skills and strategies for successful profession.

At the end of the course, students will be able to

i. speak and write in English,

ii. practise interview skills,

iii. explain cognitive skills,

iv. produce thinking skills, and

v. understand personal traits

Unit 1 : Communication Skills

Active Listening & speaking, written & oral communication

Unit 2 : Interview Skills

Interview questions, job application, CV preparation, self-introduction, presentation skills, negotiation skills, conducting a meeting, agenda setting and recording minutes

Unit 3 : Cognitive Skills

Self- motivation, setting personal goals, problem solving, decision making and delegation skills

Unit 4 : Thinking Skills

Strategic thinking, organization, innovation, leadership skills

Unit 5 : Personal Traits Skills

Personal development & empowerment, confidence & rapport building, tact & diplomacy, emotional intelligence, self-esteem, humour and persuasion skills

Textbook

Sekar, J.J. 2015.Career Skills. Madurai: Department of English, The American College.

Mapping of Course Outcomes with Bloom's Taxonomy

	K 1	K 2	K 3	K 4	K 5	K 6
CO 1						6
CO 2			3			
CO 3		2				
CO 4						6
CO 5		2				

Mean: 3.8

CSA 2404 **Programming Techniques using C** **4hrs/Wk – 4 Credits**

Objective

This subject will enable the student to understand the concepts of C programming language and gain knowledge on algorithms, flowcharts and logical thinking. On successful completion of this course the student will have the programming ability in C Language, and develop software application using C.

Specific Learning Outcome:

At the end of the course the student will be able to:

i. Recognize the Structure and Compilation of C Program.

ii. Summarize the basic data types and Operators.

iii. Demonstrate the concept of Control Statements in C.

iv. Develop program using Array and functions to implement reusability.

v. Create application software using Structure and Union.

Unit I

Overview of C: Middle level language – compilers versus interpreter – the form of a C program – compiling a C program

Unit II

Primitive Date types Operators: Data types – type conversions – operators – formatted input/output functions.

Unit III

Control statements: If, if-else, switch, for, while, do...while, break and continue.

Unit IV

Aggregate Data Types: Arrays – strings – functions – call by values – call by reference – passing arrays as arguments – local, global static and external variables.

Unit IV

Structure and Union: User defined data types – Structures - Union

Textbook:

Balagurusamy.E, Programming in ANSI 'C', 4th edition, Tata McGrawHill, 2007.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X				
K2: Understanding		X	X		
K3: Applying				X	
K4: Analyzing					
K5: Evaluating					
K6: Creating					

COPING WITH SOCIAL AND ENVIRONMENTAL ISSUES

LSA 2404 **4 hrs/Wk –4 Credits**

Objectives: To make the students comprehend the social and environmental issues they face in the society. To teach them the necessity for understanding the issues and how to manage them for a better society. To kindle their mind about their responsibility to become a useful citizen to protect the society and the environment where they live.

Specific Learning Outcome: At the end of this course the student will be able,

- To relate the significance of relationships and need for coping with them
- To demonstrate the skills of managing their time, money and health
- To apply their knowledge in protecting their environment and preserve the resources
- To assess the impact of globalization in our society and adjust their living conditions
- To identify healthy ways to cope up with emerging technologies which affect the life

Unit : 1 Coping with Society

Family and Issues related to Marriage – Building relationships – Conflict management – Cultural alienation

Unit : II Coping with Human Resources

Time management – Money management – Skill management: Problem Solving Skills - Social skills - Health management

Unit : III Environmental Issues

Environment Vs Ecology – Pollution: Air, Water, Soil, Sound – De forestation – Exploitation of natural resources – Environmental protection

Unit IV : Coping with Globalization

Globalization – Trends in Education, Employment, Consumerism – Merits and Demerits of Globalization

Unit V : Coping with Technology

Types of Technology – Technology in day today life - Social Media – Impacts of technology in modern society – Managing life with technology

Reference:

1. Alphonse, X. 2011, "We shall overcome" A Text book on Life coping skills", ICRDCE Publication, Chennai

AMT 2402 **Audio Production** **4Hrs/Wk – 4Credits**

Course Objective:

This Course aims to acquaint the students about Professional Sound Recording, Dubbing, Working principles of Microphone and creating a Special Sound Effects by using the Audio Editing software.

Course Outcome:

At the end of the course, The Students will be able to

i. Identify the basic concepts and methods of sound
ii. Correlate music production particularly single and multi-track recording by using the sound editing software
iii. Plan for recording a sound and edit accordingly by using the software
iv. Analyze about the various types of microphone and its usage in various sound recording in the Audio Suite
v. Compute various Audio formats and apply Background score and SFX according to the Dialogues by using Audio Editing Software.

UNIT- I

Introduction to Sound Design: The Origin – Nature of Sound – Properties of Sound Waves – Amplitude – Frequency and Phase – Noise – Music Basics – Perception of Loudness, Pitch and Direction – Sound Wave Theory

UNIT II

Introduction to Sound and Music Production: Single Track and Multi Track Recording – Editing – Mixing and Mastering – Studio Design and Equipments – Acoustics

UNIT III

Introduction to DAW – Computer Configuration and Specification – Recording, Editing and Mixing – Working in various Operating Systems

UNIT IV

Introduction to Microphone – Effects and Signal Processors: Dynamic Processors: Compressors – Reverberation – Delay – Phases and Flanges – Analog to Digital convertors – Types and kinds of Microphone

UNIT V

Audio Formats – Basic Music Theory – MIDI – Virtual Instruments VST – Editing and Mastering – Dubbing – Background Score – SFX – Final Mastering and Audio Balance

REFERENCE:

1. AutoCAD: A Progressive Course for New Users (Software Guide)by John Lockley and LamineMahdjoubi
2. AutoCAD 2002: 3D Modeling - a Visual Approach by S. Wilson

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1	1					
CO2					5	
CO3					5	
CO4				4		
CO5			3			

Mean:3.6

AMT 2404 **Introduction to Flash** **4Hrs/Wk – 4Credits**

The Course aims to highlights the students to create Logo, Story board creation, Character creation and cartooning using the software Flash.

Course Outcome
AT the end of the course, the Students will be able to:

i. Determine the basic tools and menus in the Animation Software
ii. Infer the methods of basic Animation methods to create a basic Animation process with the help of Software
iii. Create an innovative animation short films, games, Advertisement and Story Board creation by using the tools and menus in the software
iv. Design text and applying various types of effects by using the software
v. Evaluate the script for creating a Webpage using the Software Flash and HTML Language

UNIT- I

Introduction to Animation – 12 Principles of Animation – Flash Tool Box – Tools for 2D Animation

UNIT II

Introduction to Adobe Animate CC – Frame by Frame Animation – Motion Tweening - Motion Tweening – Shape Tweening – Masking – Creating a Button – Motion Guide

UNIT III

2D Short Film – Creating 2D Games – 2D Product Advertisement – Story Board Creation - Smiley Creation – Logo Creation

UNIT IV

Camera Movement in Flash – Text Animation and its effects: Glowing Text – Simple Text – Text Logo Graving – Creating a rotating Earth Animation – Compose a sequence in Flash

UNIT V

Basics of HTML – Colourful Background – Creating website using HTML – HTML Editors – Web designing using Flash and HTML

REFERENCE:

1. Adobe Animate CC Classroom in a book 2018, release by pearson, Russel Chun.
2. Adobe Flash Professional CC, Classroom in a book. The official training workbook from Adobe Systems.
3. Macromedia Flash 8 Advanced for Windows and Macintosh: Visual Quick Pro, Russell Chun.
4.

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1	1					
CO2	1			4		
CO3					5	
CO4					5	
CO5						6

Mean: 4.4

AMT 2406 Lab IV: SOUND TECHNIQUES – PRACTICAL 10 Hrs/Wk – 10 Credits

Course Objective:

This Course aims to acquire skills about Sound methods and application in various branches of media like Radio, Film Dubbing and Television dubbing. It also gives the wide knowledge about the Studio Equipment and Studio acoustics

Course Outcome:

At the end of the course, the Students will be able to

i. Infer the basic concepts of Sound
ii. Remember the technical concepts of Studio Equipment in the Audio Suite
iii. Identify the nuances of Microphone basics and its application in various production
iv. Plan the Sound techniques like dubbing, Recording and Rerecording
v. Analyze various techniques of Sound and producing final output by using the Audio Editing Software

- Analog and Digital Formats in Sound
- Decibels, metering, Amplitude, Frequency

- Introduction to Digital Workstation
- Studio equipment and Studio Acoustics
- Microphone: Working Principles of Microphone
- Recording, Editing and Mixing
- Audio Recording for various media
- Working with VST – MIDI
- Mastering Standards
- Mastering and Audio balance, Final Output

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1				4		
CO2	1					
CO3	1		3			
CO4					5	
CO5	1					

Mean: 3

AMT 2408 **INTERNSHIP – IV** **4 CREDITS / 120 HRS/ SEM**

Course Objective:

The students acquire practical knowledge in sound recording, dubbing, adding background special effects with the support of audio editing software.

Course Outcome

At the end of the course, the students will be able to:

i. Comprehend a sound track

ii. Produce Sound and music using studio Design and equipment

iii. Create a new sound track using the methods of recording, editing and mixing in the DAW

iv. Apply the techniques of microphone to record sound and music instrument.

v. Produce a Master audio output professionally using audio editing software.

The internship training moulds the students to higher level and grabs an opportunity to work in a professional environment. This environment hones the students' skill and makes

a strong foundation in practical and acts as a platform to create a job opportunity in particular field.

As the students focuses in the field of Audio during 4th Semester, they have to undergo internship/training in any Sound Recording Centre. The students should undergo minimum of 120 hours internship. They can gain experience in taking Dubbing, Recording and adding Special sound effects in the Audio Editing Software.

At the end of the Semester, the students should submit the project regarding their experience in the company and attend a Viva Voce. The project will be evaluated by Internal and External Examiner for 100 Marks (75Marks (Internal) and 25 Marks (External))

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1	1					
CO2					5	
CO3					5	
CO4			3			
CO5					5	

Mean: 3.8

Environmental Studies

EVS 3401 **4hrs/Wk-4 Credits**

This course is designed to develop environmental awareness to the students. It deals with the natural resources, ecosystems and the impact of human activity on them. This course also imparts the biodiversity and its conservation. It also sensitizes the students on the environmental issues and abatement of pollution and gives suggestion for sustenance.

UNIT – I Introduction to environmental studies

Concept and Scope – importance of sustainability and sustainable development. The Atmosphere, the Hydrosphere, the Lithosphere and the Biosphere . Concept of Renewable and Non-renewable resources

Unit –II Ecology and Ecosystems

Concept of ecology and ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology; ecological succession. Characteristic features of the following- Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (ponds, lakes, rivers, oceans)

Unit 3 Environmental Pollution

Pollution -Definition -• Causes, effects and control measures of - Air pollution -.Water pollution -. -Soil pollution -. Marine pollution -. Noise pollution - Thermal pollution - Nuclear hazards . Solid waste Management : Causes, effects and control measures . Role of an individual in prevention of pollution. Natural Disasters and their Management : floods, earthquake, cyclone and landslides.

Unit 4 : Biodiversity and its conservation

Definition : genetic, species and ecosystem diversity. Biogeographical classification of India-values Biodiversity at global, National and local levels. India as a mega-diversity nation - Hot-spots of biodiversity.Endangered and endemic species of India. Threats to biodiversity : habitat loss, poaching of wildlife, manwildlife conflicts.. Conservation of biodiversity : In-situ and Ex-situ method of conservation.

Unit 5 : Social Issues and the Environment

Water conservation- rain water harvesting, watershed management.Wasteland reclamation. Afforestation.Management and Wildlife conservation.Climate change - Greenhouse effect - global warming - acid rain, ozone layer depletion. Environmental Laws : Environment Protection Act, 1986 ; The Water Act, 1974, The Air Act, 1981 and The Wildlife (Protection) Act, 1972 , Forest Conservation Act .Issues involved in enforcement of environmental legislation. Public awareness.

OBE for EVS B. Voc .Programme

Unit	**Upon completion of this course students will be able to**	**PSO**
Unit 1	Discuss the terminology commonly used in environmental science and to identify renewable and non renewable resources and its proper usage and conservation	PSO2

Unit 2	Explain the concept , structure, function of ecosystem and to analyze the interaction of organism at different ecosystem	PSO1
Unit 3	Evaluate the adverse human impact on abiotic and biotic community and sustainable strategies to mitigate the impact	PSO7&8
Unit 4	Create a knowledge on biodiversity and its conservation	PSO 4&8
Unit 5	Utilize advances in environmental science to resolve issues and anticipate implications. Assess the consequences of environmental disasters and its remedy	PSO 7&2

Blooms Taxonomy for EVS B. Voc .Programme

Bloom's Taxonomy	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering	x			x	
K2: Understanding	X	x			
K3: Applying			x		
K4: Analyzing					
K5: Evaluating					x
K6: Creating				x	

VMT 3401 Information Communication Technology 4h/wk-4credits

Course Objective:

The Students have given the input knowledge about the Information and Communication technology and its application in contemporary trends and it also aspire the ICT system with the support of Media.

Course Outcome:

At the end of the course, the students will be able to:

i. Examine the basic concepts of ICT and its Policies towards the Development of the society

ii. Apply the advance technology of media and its understand role in developing the nation
iii. Analyze the task of ICT and catalyst agent (ICT) with special reference to Rural Development
iv. Apply the meaning and concepts of Development of development and train about the methods of development communication
v. Remember about the evolution of new media and its component in ICT.

UNIT I:

Introduction to ICT – Meaning – Scope – Significance – ICT System: History of ICT – Growth of ICT in India – Program and its Policies

UNIT II:

Technology in ICT: Radio – Television – Print – Function, Usage and Development in ICT

UNIT III:

Role of ICT in Rural Development: Education – Agriculture – Telecommunication – Its Application and Barriers – A catalyst intervention for empowering Rural India

UNIT IV:

Development Communication and ICT: Definition and Meaning – Methods of Development Communication: Community Radio - Participatory Video – Documentary – Folk Media – Usage and its Barriers in Development communication

Unit V:

New Media: Types – Internet: Digital Revolution – Digital Divide - Wireless – Cell phone – History and its Development – Media Convergence

Reference:

1. Brilliant Ideas for Using ICT in the Inclusive Classroom 2nd Edition By Sally McKeown, Angela McGlashon
2. Introducing Computing: A guide for teachers Edited by Lawrence Williams

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1				4		
CO2	1		3			
CO3				4		
CO4			3			
CO5	1					

Mean: 2.6

LSV 3401 **Entrepreneurship Development** **(4h/wk) (4 Cr)**

To give an overview about the real concepts of entrepreneurship and to impart knowledge about the various sources for a small business and hence motivate the students to become a job providers.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Cite the meaning of entrepreneurship and identify the role of entrepreneurs.
ii. Identify different types of entrepreneurs and the problems faced by them
iii. Identify the various sources of small business and capable of starting a business by creating own business plan.
iv. Identify the various institutes and their functions that support entrepreneurs
v. Identify and utilize the various incentives available for small scale business.

1. **Entrepreneur:** Definition - Characteristics - Functions - Competencies - Entrepreneur vs Entrepreneurship - Role of Entrepreneur in Economic Development.

2. **Types of Entrepreneurs:** Innovative - Adaptive - Fabian - Drone; Entrepreneur vsIntrpreneur, Copreneur; Women entrepreneur - Types - Problems.

3. **Strating a small Business:** Steps; **Project Report:** Contents – Importance.

4. **Institutional Support to Entrepreneurs:** SIDCO - TCOs - DIC - TIIC - SIDBI - Commercial Banks.

5. **Incentives for Small Scale Business:** Subsidy - Tax Concessions - Assistance - Export Assistance - Technical Assistance.

Text Book

E. Gordan& K. Natarajan, Entrepreneurship Development, Himalaya Publishing House, 2017.

References

1. Holt, Entrepreneurship: New Venture Creation, Prentice-Hall, 2018.
2. R. V Badi& A. V Badi, Entrepreneurship, Vrinda Publication (p) Ltd, New Delhi 2010
3. K. Ramachandran, Entrepreneurship Development, Tata McGraw Hill, New Delhi, 2017.
4. Dr. Radha, Entrepreneurial Development, Prasanna and Co, Chennai. 2019

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	X				

K3: Applying					X
K4: Analyzing		X		X	
K5: Evaluating					
K6: Creating			X		

VMT 3403 **Introduction to Video Production** **4h/wk-4credits**

Course Objective:

This course aims at training students for capturing and editing moving images with digital videos camera for various purposes. It also proposes to serve as a preparatory course for cinematography.

Course Outcome:

At the end of the course, the Students will be able to:

i. Infer the basic Parts and functions of a Video Camera
ii. Apply the formula of Five C's in Cinematography and identify about Camera Shots and Movements
iii. Summarize the lighting techniques in Indoor, Outdoor Production and lighting techniques for various programs in television
iv. Identify the skills of Filmic Time, Space and different types of Montages
v. Create a Video by applying the procedure of Video Editing in the Software.

UNIT I:

Introduction to Video Camera: Parts of Video Camera – Functions of Video Camera –Basics of Video Camera: Lens - Aperture – Shutter speed – ISO – IRIS – Types of Video Camera.

UNIT II:

Five C's of Cinematography: Camera Angle – Continuity – Cutting – Close – ups - Composition: Rule of Third – 180 Degree Rule – 360 Degree – Eye Match–Types of Shots – Camera Movements

UNIT III:

Introduction to Lighting: Natural Lighting – Artificial Lighting – Equipments used to control light - Lighting Equipments for indoor and Outdoor Production – Lighting for various production: Interview – Talk Show – Game Show

UNIT IV:

Shot – Scene – Sequence –Filmic Time and Space in Film –Rhythm – Tempo – Contrast – Montages – Types of montage

UNIT V:

Editing Basics – Cut - Dissolve – Fade – Wipe – Editing Process: Capturing – Transferring – Rough Cut – Applying Basic Transition and arranging the Sequence – Types of editing: Jump Cut – Match Cut – Parallel Editing

Reference:

1. Malkiewicz.k, Film Lighing, 1992, Simong& Schuster, New York
2. Mascelli. J.V, The Five C's of Cinemotography, 1965. Silman-James press, Bevely Hills.

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1		2				
CO2			3			
CO3					5	
CO4				4		
CO5			3		5	

Mean: 3.6

VMT 3405 Video Editing Techniques 4hrs/wk-4credits

Course Objective:

This course aims at enabling the students to understand the basics of Video editing components and makes the students familiar with video editing tools.

Course Outcome:

At the end of the course, the Students will be able to:

i. Relate the basic knowledge of editing methods
ii. Create an innovative video with the application of transition, Video and sound effects with the support of raw footage
iii. Apply the knowledge of Audio and adding tracks in the Video Editing Software
iv. Summarize the skills and sense of Colour theory in the software
v. Plan a final output with the source video files by sweetening Video and Audio

UNIT I:

Setting Up a Project- **Importing** Media - Organizing Media-understanding various codec-Important tools in editing application.

UNIT II:

Essentials of Video Editing –Timeline settings-Insert, Over write, extract, lift- Working with Clips and –Markers -Adding Transitions –Video effects - Trimming – Key frame animation - Multi camera Editing

UNIT III:

Audio tracks Mono, stereo-Managing audio tracks- Sweetening Sound - Adding sound Effects and Mixing Audio.

UNIT IV

Color Correction- Color balancing and Grading - Exploring Compositing Techniques –Croma keying and matte removal techniques, Creating Titles.

UNIT V:

Managing Your Projects - Exporting Frames, Clips, and Sequences - An overview of color-oriented effects Project Menu overview - Photoshop tips for DV productions - Export Options

REFERENCE:

1. Mollison.M, Producing videos a complete guide, 2007, Allen &Unwin, Austialia
2. Malkiewicz. K & Mullen M.D., Cinemotography, 2005. Simon & Schuster, New York

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1					5	
CO2					5	
CO3			3			
CO4					5	
CO5					5	

Mean: 4.6

VMT 3407 **Lab V: Video Editing (Practical)** **10 Credit/ 12 HRS/SEM**

Course Objective:

The Course aims to obtain practical skills on Video Editing by using the Video Editing Software. The course also highlights basic perceptions to final output by using various Video Effects in the Video Editing Software.

Course Outcome

At the end of the course.the Students will be able to:

i. Infer the knowledge of importing and organizing the footage in the Video Editing software

ii. Apply the basic transitions and various Cuts in the Editing

iii. Compare the production shots with Post production process like NG Removal and ordering the scene in the timeline

iv. Analyze the techniques of colour sense and its application in the Video Editing Software

v. Organize the raw footage with special effects and giving the output by using the Video Editing Software

- Importing and Organizing the Footage
- Understanding the three main Windows in Editing Application: Project Window – Source Monitor – Timeline and Display Monitor
- Insert, Overwrite, Extract and Lift
- Various Cuts: Jump Cut – Parallel Cut – Match Cut – Advance Cut
- NG Removal and Ordering in Timeline
- Adding Transitions
- Video Effects and KeyFrame Animation
- Colour Correction and Colour Balancing
- Audio Settings – Audio Tracks – Mixing
- Output Settings – Various types of Output

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1		2				
CO2			3			
CO3				4		
CO4			3	4		
CO5					5	

Mean: 3.5

DMT 3409 **INTERNSHIP – V** **4 CREDITS**

Course Objective:

The course aims to obtain hands on practical knowledge in capturing, editing and applying visual effects with the aid of Video Editing Software

Course Outcome:

At the end of the course, the students will be able to:

i. Able to operate Video Camera individually.
ii. Compose images professionally with Visual Grammar in Video Cameras.
iii. Capture various types of Videos using lighting techniques in Video Camera.
iv. Analyse the techniques filmic time, space and various types of shots in the films.
v. Create a video by using Video Editing Software professionally .

The internship training moulds the students to higher level and grabs an opportunity to work in a professional environment. This environment hones the students' skill and makes a strong foundation in practical and acts as a platform to create a job opportunity in particular field.

As the students focuses during Video Editing in the 5th Semester, they need to work as Video Editor in any Project. The students should undergo minimum of 120 hours internship.

At the end of the Semester, the students should submit the project regarding their experience in the company and attend a Viva Voce. The project will be evaluated by Internal and External Examiner for 100 Marks (75Marks (Internal) and 25 Marks (External))

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1			3			
CO2					5	
CO3					5	
CO4				4		
CO5					5	

Mean: 4.4

YOUTH IN THE GLOBAL CONTEXT

VAL 3402 **4hrs /4 credits**

Objective: To make the students understand the meaning and implications of globalization. To acquaint them about new challenges world is facing due to globalization. The good side and the sad size of globalization – To enlighten them about the need to learn family values and practice them to cope up with the newly arising challenges.

Course outcomes: At the end of this course, the students will be able,

1. To explain what is globalization and their important aspects
2. To assess the conditions of education in their society
3. To predict the new challenges arise in the society due to globalization
4. To analyze the emerging trends in employment and cope up with them
5. To apply the values in their lives amidst the changing scenario

I - UNDERSTANDING KEY CONCEPTS OF GLOBALISATION

Free market Economy and Global Market Network - Communication and transport - Technology and Global Production System - Global Capital and investments - Culture of over consumption - Human needs - Over exploitation of resources

II - EDUCATION IN GLOBALISED CONTEXT

Differential access to Education at the Primary, Secondary and Tertiary level- Problem of Quality Addressing deficiencies – need for communication and other Social skills - need for equitable and quality universal education

III - GLOBALISATION AND EMPLOYMENT

New aspirations and the demands placed on youth - Changing structure of Employment and working norms related to time and remuneration - New Forms of insecurities - Cultural alienation -Youth and Consumerism - Distinguishing successful and meaningful life

IV - YOUTH AND FAMILY VALUES

Mobility of Youth - Fragmentation of family structure - Issues relating to Marriage and Marital harmony; Addressing the growing rate of divorce and separation - Family related values

V - GLOBALISATION AND OTHER SOCIO POLITICAL ISSUES

Poverty and Marginalization under Globalization – Terrorism - Rise of religious fundamentalism and Cultural Chauvinism – Corruption – Democracy - civil society issues

VI GLOBALISATION AND VALUES

Relevance of Personal Honesty, Hard work, Trustworthiness; Social values - Social justice, Non discrimination, Economic austerity - Non violence and Peace in the Global Context

Books for reference:

Study Materials will be provided.

Database management system (4h/wk) (4Cr)

This course is intended to familiarize the students with the concept and significance ofdatabase maintenance and management. Moreover, the course would orient the studentsabout the various aspects involved need for systematic retention of database involved intheir respective vocations.

Course outcomes

At the end of the course the student will be able to:

i. Identify the database approach and the database applications
ii. Apply relational expressions for queries.
iii. Examine the database design by normalization.
iv. Build a table and manipulate the data using SQL Commands.
v. Summarize the transactions, its properties and the concurrency controls.

Unit I: Databases and database users: Introduction – Characteristics of the database approach – Advantages of using the DBMS approach – A brief history of Database Applications.

Unit II: Database System Concepts and Architechture – Data Models, Schemas and Instances.

Unit III: Database Languages and Interfaces: The Database System Environment – Centralized and Client / Server Architecture for DBMSs – Classification of Database Management System.

Unit IV: Relational Model Concepts: Relational model Constraints and Relational Database Schemas, Update Operation, Transaction and dealing with Constraints violations.

Unit V: Database Recovery Concepts - Caching(Buffering) of Disk blocks – Write-ahead Logging, Steal / No-Steal and Force / No-Force - Checkpoints in the System Log and Fuzzy Check pointing – Transaction rollback

References

1. "Database Management System" – Raghu Ramakrishnan and Johannes Gehrke – 3rd edition, McGraw-Hill, 2003.
2. "DBMS a Practical Approach", E.R. Ragiv Chopra, S Chand Publications.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering	X				
K 2: Understanding					X
K 3: Applying		X		X	
K 4: Analysing			X		
K 5: Evaluating					
K 6: Creating					

LSV 3402 **Soft Skills** **(4h/wk) (4Cr)**

The learner will gain the skills required for the corporate world that would enhance one's employability and to provide an exposure to the students regarding the soft skills required for the job market.

Course outcomes:

At the end of this course, the students will be able to:

i. Cite the meaning and define soft skill and also to identify the different types of soft skills.
ii. Identify different types of communication and overcome the barriers for effective communication.
iii. Develop and exhibit a good body language and enhance their personality.
iv. Exhibit a polite behaviour in society or among members of a particular profession or group and enrich their public speaking skill.
v. Enhance their writing skill and face interviews without fear.

Unit I - Soft Skill: Definition - Importance of soft skills - Types of soft skills.

Unit II - Communication: Definition - Process - Types - Verbal, non-verbal - Uses - Barriers of effective communication.

Unit III - Inter Personal Relation Skills: Body Language and personality.

Unit IV- Etiquettes or Manners: Art of Public Speaking - Chracteristics of a good speech - Planning to speak.

Unit V- Writing Skills: Importance - Types **Interview:** Types - Selection - Appraisal - Exit.

Text Book

Rajendra Pal & J. S. Korlahalli, Essentials of Business Communication, Sultan Chand & Sons, New Delhi, 2016.

References

N.S.Raghunathan&B.Santhanam, Business Communication, Margham Publications, Chennai, 3rd Edition 2018.

Reddy, Appannnaih& Raja Rao, Essentials of Business Communication, Himalaya Publishing House, Mumbai, 2017.

Rizvi, M. Ashraf - Effective Technical Communication, Tata McGraw Hill, 2011

Blundell J. A & Middle N. M. G.: Career – English for the Business and Commercial World, Oxford University Press, 2009

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering					
K 2: Understanding	X				
K 3: Applying		X	X		
K 4: Analysing				X	
K 5: Evaluating					X
K 6: Creating					

VMT 3402 Animation Techniques (Maya) 4 Hrs/ Wk- 4Credit

Course Objective:

The objective of this course is to train the students the necessary tools for 3D animation and makes them to design and edit animated applications

Course Outcome

At the end of the course, the students will be able to:

i. Reproduce the techniques of introduction and basic models of Animation with the support of software
ii. Apply the tools and techniques in the software and creating various types of modeling
iii. Analyze the methods of various modeling with the support of 3D animation software
iv. Design various types of 3D models by using the Animation software
v. Plan for the advanced techniques of menus and tools and create visual effects in the software

UNIT I:

Introduction to 3D Animation – Types of Modelling: Basic Models – Pillow Modelling – Ice-cream Modelling – 3D Shark Modelling – Creation of Odd Object in the software

UNIT II:

Soda can Modelling – Alternative modelling Techniques – Creating a Marble Floor in 3D – Creating a Milk Simulation – Hammer Modelling – Hard Surface Modelling – Science Fiction Panels

UNIT III:

Mash and Mesh: Introduction – Cartoon House Modelling – Modelling Complex – Objects – Stylized Fried Chicken Leg model – Lights and Shadows

UNIT IV:

Creating a Thread Model – How to use mash Dynamics – Circularize Components – Creating Ambient Occlusion – 3D Air filter Model – Twisted Candle 3D Model

UNIT V:

Creating n particles – Fluids – Dynamics – Visual Effects – Introduction to Rigging

Reference:

1. Autodesk Maya 2018: A comprehensive Guide, Sham Tickoo

2. Autodesk Maya 2018 Basics Guide, Murdock Kelly.

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1	1					
CO2			3		5	
CO3				4		
CO4					5	
CO5					5	

Mean: 3.8

VMT 3404 **Media Management** **4 Hrs/ Wk- 4Credits**

Course Objective:

This Course aims to facilitate the understanding about the functioning and operations of media enterprises. Alongside, the students will be oriented towards the different legislations and legal frame work implemented to monitor the functioning of the media.

Course Outcome:

At the end of the course, the students will be able to:

i. Recall the definition and scope of various media
ii. Infer the operation and structure of various Departments in media like Print, Electronic and New media
iii. Apply the techniques of conventional media to the New Media
iv. Summarize the Laws and Ethics of Cyber laws in various types of media
v. Review the concepts of PR and its application in various sectors in the society

UNIT I:

Definition & Scope (a) Print Media, (b) Electronic Media-development of radio and T.V. in India- Satellite TV and emerging media landscape.

UNIT II:

Organizational structure - Newspapers/Magazines Management : circulations, advertising, editorial, library, production, storekeeping.- Business Media Ethics – Press Laws, State Control Vs Freedom of Media – Broadcasting Bill PrasarBharati, Press Council of India – debates in responsibility and accountability of journalists and publishers and consequences of misreporting, Press Legislature of India.

UNIT III:

Net convergence and journalism: Concepts, components and functions - Cyber Journalism - Web Magazine and Web Newspaper - Challenges and opportunities for a journalist - Readers as publishers

UNIT IV:

Cyber laws: Introduction and its functions - Ethics and Laws related to Cyber Laws in India - Cyber Journalism: Introduction and its Significance – Future of Cyber journalism

UNIT V:

Theory and practice of PR, definition, role and functions - PR in changing social and political environment - Types of Public and Tools of PR - Art of persuasion, feedback, campaign planning and strategies - Financial PR - Media Tracking – Cross Country issue propaganda.

Reference:

1. Public Relations : Cases and Problems – B.Canfield and Moore Homewood III, Irwin Publications
2. Corporate Communication : Principles, Techniques and Strategies - Kogan Page 1997
3. Planning and Managing a Public Relations Campaign – a step by step guide –Anne Gregory

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1	1					
CO2		2				
CO3			3			
CO4					5	
CO5		2				

Mean: 2.6

VMT 3406 **Lab VI: Animation Techniques** **10 Hrs/ Wk- 10 Credit**

Course Objective:

This course aims to acquire knowledge practically to create layers, Design character and creating motion to the character by using the animation software.

Course Outcome:

At the end of the course, the students will be able to:

i. Apply the methods of creating methods, colour and text by using the animation software
ii. Create an animation to the cartoon character by using the tools and menus in the software
iii. List the various types of tweening animation with the aid of Animation software
iv. Produce a script for the animation character by using the animation software
v. Enumerate the various tools and giving an output by using the Animation software

- Creating Objects, colors and text
- Frame-by Frame animation
- Usage of layers
- Symbols

- Tweened animation
- Motion tween
- Shape tween
- Animation using Guide layer
- Masking
- Buttons
- Sounds
- Action script

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1			3		5	
CO2					5	
CO3	1					
CO4			3			
CO5	1					

Mean: 3.6

DMT 3408 **RESEARCH PROJECT** **4 CREDITS**

Course Objective:

This course aims in applying the professional skills and knowledge related to Videography, Photography, Sound and Designing. The course develops the students' ability to work independently consolidating their production in field of Photography, Videography, sound and Designing.

Course Outcome:

At the end of the course, the students will be able to:

i. Identify the area of specialization to produce an independent work
ii. Mobilize the resources that are needed for his/her independent work
iii. Utilize the available resource to produce the project work
iv. Design the final output creatively by using specific software
v. Gains hands on experience in a professional way.

The Project enhances the knowledge and experience by choosing their branch as their specialization in the last semester. They can make their interest as profession by opting any branches in media. The following courses can be the students' choice during the VI Semester. The courses are as follows:

- Photography
- Video Editing
- Sound Design
- Designing Techniques

The students can choose any one of the courses and can specialize the same. They should submit their project at the End of Semester. Both Internal and External will be evaluated for 100 Marks.

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1		2				
CO2		2				
CO3	1					
CO4					5	
CO5					5	

Mean: 3

DMT 3410 **INTERNSHIP – VI** **4 CREDITS**

Course Objective:

This course aims to bridge theoretical orientation of CorelDraw and photoshop application into practical exposure. It also gives high work experience in field of designing in a professional way.

Course Outcome:

At the end of the course, the students will be able to:

i. Able to apply the basic usage of tools in 3D Animation software.

ii. Compose various modelling techniques in 3D using Maya software

iii. Creating a character and animation with the aid of Animation Software

iv. Able to design various types of 3D models professionally

v. Apply the techniques of visual effects in the existing images independently

The internship training moulds the students to higher level and grabs an opportunity to work in a professional environment. This environment hones the students' skill and makes strong foundation in practical and acts as a platform to create a job opportunity in particular field.

As the students focuses in the field of Designing during VIth Semester, they have to undergo training/ internship in Designing companies with specialization of 3D. The students should undergo minimum of 120 hours internship in a Studio.

At the end of the Semester, the students should submit the project regarding their experience in the company and attend a Viva Voce. The project will be evaluated by Internal and External Examiner for 100 Marks (75Marks (Internal) and 25 Marks (External))

BLOOM'S TAXONOMY	K1	K2	K3	K4	K5	K6
CO1			3			
CO2					5	
CO3					5	
CO4					5	
CO5			3			

Mean: 4.2