NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

PUTHANAMPATTI

M.Phil ECONOMICS

SYLLABUS & COURSE STRUCTURE

PROGRAMME SPECIFIC OBJECTIVES:

To make the learners

1. to excel in research in Economics
2. to understand important economic issues
3. to enrich research knowledge
4. to develop teaching and learning skills in Economics
5. to acquire research attitude
6. to obtain the application of statistical tools in Economics

PROGRAMME STRUCTURE

Semester	Course	Title of the Paper	Exam Hours	Credits	Marks		
					IA	UE	Total
I	Course I	Research Methodology and Statistical Applications	3	4	25	75	100
	Course II	Emerging Issues in Indian Economy	3	4	25	75	100
	Course III	Teaching and Learning Skills (Common Paper)	3	4	25	75	100
	Course IV	Paper on Topic of Research (The syllabus will be prepared by the Guide and the examination will be conducted by the COE)	3	4	25	75	100
II	Dissertation & Viva-Voce	Dissertation 150 Marks Viva 50 Marks	---	8	---	---	200
	Total			**24**	**---**	**---**	**600**

Marks

Maximum -100 Marks (Passing minimum 50 Marks)

External -75 Marks (Passing minimum 30 Marks)

Internal -25 Marks (Internal Assessment as per M.Phil Regulations)

Question Paper Pattern for M.Phil. Programme

Section A : 10 Questions x 2 Marks = 20 Marks (Two Questions from each unit)

Section B : 5 Questions x 5 Marks = 25 Marks (Internal Choice and on set of questions from each unit)

Section C : 3 Questions x 10 Marks = 30 Marks (Answer any three out of 5 questions and one question from each unit)

PROGRAMME OUTCOMES:

On completion of the course, the learners

1. would be researcher in Economics
2. could pursue higher studies
3. could understand the important economic issues
4. would obtain research knowledge
5. could gain teaching and learning skills in Economics
6. would obtain the knowledge of statistical tools

COURSE I
RESEARCH METHODOLOGY AND STATISTICAL APPLICATIONS

Course Objectives:

1. To infuse basic knowledge on research methodology.
2. To inculcate research attitude among the learners.
3. To provide basic concepts of research.
4. To understand the research problems.
5. To identify the research design.
6. To instill inference drawing skill.
7. To develop the skill of writing research report.

Unit – I : Nature and Scope of Research

Social Research – Nature, Scope, Uses and major steps – Pure, Applied and Action Research – Research Ethics - Scientific Method : Theory and Facts - Formulation of a Research Problem-Objectives - Hypothesis: Types, Sources and Characteristics of Hypothesis.

Unit – II : Research Design and Data Collection

Research Design : Need and Types – Exploratory, Descriptive and Experimental Design - Data Collection: Primary and Secondary Methods – Preparation of Schedule and Questionnaire- Sampling Techniques.

Unit – III: Application of Statistical Techniques

Averages: Mean, Median, Mode – Dispersion - Correlation: Simple, Multiple and Rank Correlation - Regression Analysis: Linear, Non-Linear, Bivariate and Multivariate Analysis, Auto Correlation and Multicolinearity- Time Series Analysis- Scaling techniques- Factor Analysis.

Unit – IV: Statistical Inference

Testing of Hypothesis: Type I error and Type II error - T-Test: Assumptions, Properties, Applications and Simple problems - F-Test: Assumptions, Properties, Applications and Simple problems - Z-Test: Uses and Simple problems - Chi-square [χ^2] Test : Assumptions, Properties, Applications and non-parametric tests.

Unit – V: **Report Writing**

Report writing- Stages in Report writing- Layout of Report- Mechanics of Report writing – Footnotes, Endnotes- Reference and Bibliography.

Basic Reading List :

1. Elhance, D.N. [2000], Fundamentals of Statistics, Kitab Mahal, Allahabad.
2. S.P.Gupta [2014], Statistical Methods, S.Chand and Co., New Delhi.
3. Kothari, C.R.[2013], Research Methodology, Wiley Eastern Ltd., New Delhi
4. Wilkinson and Bhandarkar [2010], Methodology and techniques of social Research,Himalaya Publishing House, Mumbai.
5. Ghosh,B.N (2012),Scientific Method and Social Research,Sterling Publishers,New Delhi.

Additional Reading List :

1. Earl Babbie [1975]. Practice of Social Research. Wadsworth Publishers, New York.
2. Ferber and Verdoon [1962], Research Methods in Economics and Business. Macmillan, New York.
3. Goode and Hatt [1987], Methods in Social Research. McGraw Hill, London.
4. Kurein, C.T. [1973]. Research Methodology in Economics. Madras Sangam Publishers.
5. Moser, C.A. and Kolton, C. (1980). Survey Educational Methods in Social Investigation. Heinemann Educational Books, London.
6. Sonachalam, K.S. (1978). Research Methodology in Social Science, Kadayam, Tamilnadu.
7. Shanmugasundaram, V. (1974). Papers on the Methodology of Research in Social Sciences, University of Madras, Chennai.
8. Sitaram Pillai (1989). Basic Statistics. Progressive Publishers, Chennai.

Course Outcomes :

On completion of the course, the learners will -

1. acquire basic knowledge on research methodology.
2. develop research attitude.
3. understand the basic concepts of research.
4. attain the ability to identify the research problems.
5. understand how to construct the research design.
6. gain inference drawing skill.
7. become a good research report writer .

COURSE II
EMERGING ISSUES IN INDIAN ECONOMY

Course Objectives:

1. To cater a comprehensive knowledge on the emerging issues in Indian Economy.
2. To understand India's global linkage.
3. To bring out the relevance of gender issues in India's development.
4. To focus on social and environmental issues.
5. To trace the recent economic changes.
6. To learn about Human Development in India.

Unit – I India and the World Economy

India and Foreign Trade, WTO – Globalisation and its impact on India – India's interaction with international trade blocks- Recent trends in Macro Economic Policy, Foreign Capital- FDI and FPI- Fiscal Reforms.

Unit – II Gender Issues

Gender Equity – Gender Discrimination – Women and Employment – Women and Law – Women Empowerment – SHGs – Women's Health Issues.

Unit – III Social and Environmental Issues

Class structure, Caste and Religion – Rural and Urban inequality – Rural Poverty, Measurement of Poverty and Poverty Alleviation Programmes - Global Warming and Sustainable Development.

Unit – IV Recent Economic Issues

Issues in Agriculture : Production, Productivity, Water Management - Industry: Industrial sickness and Industrial Relations - Global Economic Crises - impact on Indian Economy – NITI Aayog - Make in India- Demonetization- GST.

Unit – V Human Development

Human Development Index – Education and HRD – Training – Types – Motivation – Methods – Health Issues – "Health for All" – Rural Health Promotion in India – Challenges.

References :

1) J.Dreze and A.K.Sen (2003), India : Development and Participation OUP, Delhi.
2) J.Dreee and A.K.Sen (Edited), (1996) Indian Development : Selected Regional Perspectives OUP, Delhi.
3) P.Patnaik (1996), Whatever happened to Imperialism? Tulika, Delhi
4) Bina Agarwal (1994), A Field of One's Own, Cambridge University Press, UK.
5) P.Patnaik, (1995), Macroeconomics OUP, Delhi.
6) G.S.Batra and Narinder Kaur, Globalisation Strategies and Economic Liberalisation.
7) rigidajaruia, Women, Poverty and Demographic Change.
8) Margrit Pernau, Imtiaz Ahmad and Herlmut Reifeld, Family and Gender, Changing Values in Germany and India.
9) SAARC (Nov, 1992) Report of the Independent South Asian Commission on Poverty Alleviation.
10) V.B. Athreya and S.R. Chunkath (1996), Literacy and Empowerment,

11) Madhav Gadgil and Ramachandran Guha (1994), A Fissure Land : An ecological History of India, Penguin, Delhi.

Course Outcomes :

On completion of the course, the learners will -

1. acquire comprehensive knowledge on the emerging issues in Indian Economy.
2. understand India's global linkage.
3. bring out the relevance of gender issues in India's development.
4. focus on social and environmental issues.
5. trace the recent economic changes .
6. understand Human Development in India .

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COURSE III
TEACHING AND LEARNING SKILLS

Objectives:

- Acquaint different parts of computer system and their functions
- Understand the operations and use of computers and common Accessories
- Develop skills of ICT and apply them in teaching learning context and Research
- Appreciate the role of ICT in teaching, learning and Research
- Acquire the knowledge of communication skill with special reference to its elements, types, development and styles
- Understand the terms communication Technology and Computer mediated teaching and develop multimedia /e- content in their respective subject
- Understand the communication process through the web
- Acquire the knowledge of Instructional Technology and its Applications
- Develop different teaching skills for putting the content across to targeted audience

Unit – I : Computer Application Skills

Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations-- **ICT for Professional Development**: Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology for action research, etc.

Unit – II : Communications Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

Unit – III : Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion

Unit – IV : E- Learning, Technology Integration and Academic Resources in India

Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning; awareness of e-learning standards- Concept of technology integration in teaching- learning processes; frameworks guiding technology integration (like TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, National academic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

Unit – V : Skills of Teaching and Technology based assessment

Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills- **Technology for Assessment:** Concept of assessment and paradigm shift in assessment; role of technology in assessment 'for' learning; tools for self & peer assessment (recording devices; e-rubrics, etc.); online assessment (open source software's; e-portfolio; quiz makers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics

References

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Brandon Hall , E-learning, A research note by Namahn, found in: www.namahn.com/resources/ .../note-e-learning.pdf, Retrieved on 05/08/2011
3. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
4. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.
5. Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in e-learning. Innovations in Education & Teaching International, 43(1), 15-27.
6. Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.
7. Learning Management system : https://en.wikipedia.org/wiki/Learning_management_system , Retrieved on 05/01/2016

8. Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.
9. Michael,D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New york.
10. Pandey,S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.
11. Ram Babu,A abd Dandapani,S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.
12. Singh,V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.
13. Sharma,R.A., (2006) Fundamentals of Educational Technology, Surya Publications,Meerut
14. Vanaja,M and Rajasekar,S (2006), Computer Education, Neelkamal Publications, Hyderabad.

Course Outcomes

After completing the course, the students will:

- Develop skills of ICT and apply them in Teaching Learning context and Research.
- Be able to use ICT for their professional development
- Leverage OERs for their teaching and research
- Appreciate the role of ICT in teaching, learning and Research.
- Develop communication skills with special reference to Listening, Speaking, Reading and Writing
- Learn how to use instructional technology effectively in a classroom
- Master the preparation and implementation of teaching techniques
- Develop adequate skills and competencies to organize seminar/conference/workshop/symposium/panel discussion
- Develop skills in e-learning and technology integration
- Have the ability to utilize Academic resources in India for their teaching
- Have the mastery over communication process through the web.
- Develop different teaching skills for putting the content across to targeted audience.
- Have the ability to use technology for assessment in a classroom

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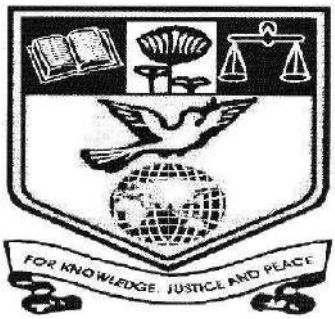
NEHRU MEMORIAL COLLEGE (AUTONOMOUS),
PUTHANAMPATTI,
POST GRADUATE AND RESEARCH DEPARTMENT OF ENGLISH,
CBCS SYLLABUS FOR M.PHIL.ENGLISH LITERATURE- 2018-19 ONWARDS



Vision

Language for Life

Mission

To make our learners proficient in English

To enable them to develop critical and creative thinking

To inculcate social values through language and literature

NEHRU MEMORIAL COLLEGE (AUTONOMOUS),
PUTHANAMPATTI,
POST GRADUATE AND RESEARCH DEPARTMENT OF ENGLISH,
CBCS SYLLABUS FOR M.PHIL.ENGLISH LITERATURE- 2018-19 ONWARDS

Sem.	Course Code	Title of the course	Exam Hrs	Credits	CIA	EXT.	Total
I	I	Research Methodology	3	4	40	60	100
	II	Literary Theories	3	4	40	60	100
	III	Paper on Topic of Research (To be framed by the guide)	3	4	40	60	100
	IV	Teaching and Learning Skills	3	4	40	60	100
II	Dissertation	Viva Dissertation 50 Marks 150 Marks		8			200
Total Hours and Credits (Semester-I& II)				**24**	**210**	**390**	**600**

NEHRU MEMORIAL COLLEGE (AUTONOMOUS),
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PAPER CODE: **SEMESTER-I CORE COURSE- I** **CREDITS:**
HRS. PER WEEK:

RESEARCH METHODOLOGY

COURSE OBJECTIVES

To identify appropriate research topics

To design a research into four components, research, theory, data and the use of the data.

To choose an accepted hypothesis and to investigate it further to precede a systematic study to the area.

To format the thesis as clear, effective and mistake-free.

UNIT I

1. Definition meaning and Philosophy of Research
2. Types of Research and Research Ethics
3. Literary Research – Thrust Areas
4. Choosing the topic/ problem

UNIT II

1. Working Bibliography and working Outline
2. Note Making – Collection and Organization of material
3. Method and Tools of analysis – Primary and Secondary source4. Library and

UNIT III THE FORMAT OF THE RESEARCH PAPER

1. Margins
2. Text Formating
3. Heading and Title
4. Page Numbers
5. Tables and Illustrations
6. Paper and Printing

7. Corrections and Insertions

8. Binding

9. Electronic Submission

UNIT IV RHETORIC MODES OF WRITING DISCOURSE

1. Narration

2. Description

3. Exposition

4. Argumentation

UNIT V

1. Writing Project Proposal

2. Statement of Aim and Objectives

3. Scope of the thesis

4. Methodology adopted

5.Documentation

6.Works cited

REFERENCES:

Campbell, W.G. *Form and Style in Thesis Writing*. Boston: Houghton Mifflin Company, 1954.Print.

Gibaldi, Joseph.*The MLA Handbookfor Writers of Research Papers, Eighth Edition*. United States: The Modern Language Association of America, 2016. Print.

Watson, George. *The Literary Thesis: A Guide to Research*. London: Longman, 1970. Print.

Lodge, *David. The Modes of Modern Writing: Metaphor, Metonymy andThe Typology of Modern Literature*. London: Bloomsbury Publishing,2015. Print

Brooks Cleanth and Warren, Robert Penn. *Modern Rhetoric*. United States: Harcourt Brace and World, 1977.Print.

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PAPER CODE: **SEMESTER-I** **CREDITS:**
CORE COURSE- II
HRS. PER WEEK:

LITERARY THEORIES

COURSE OBJECTIVES:

Getting ability to identify, analyze, describe and interpret the critical ideas with regard to its values and themes.

Stimulates Critical awareness through discussion of literary theories and offers new concepts and perspectives.

To explore how the debates about new theories have emerged from basic philosophical and cultural ideas, and to develop comparative connections and ideas from one area to another.

To analyze a wide range of literary examples from a variety of genres and periods using different critical approaches.

UNIT I: POST STRUCTURALISM AND DECONSTRUCTION

1. Elaine Showalter : Towards a Feminist Poetics
2. Harold B loom : The Breaking of Form
3. Jacques Derrida : Structure, Sign and Play in the discourse of the Humanistic Sciences

UNIT II: MODERNISM, POST MODERNISM AND PSYCHOANALYTIC THEORIES

1. L.C. Knights : How many Children had Lady Macbeth
2. Jean Lyotard Francois : Answering the question: What is Post Modernism?
3. Ernest Jones : Tragedy and the mind of the Infant
   (from Hamlet and Oedipus Chapter IV)

UNIT III : POST COLONIAL AND DIASPORA

1. Homi K Bhabha : Signs taken for Wonders
2. Helen Tiffin : Post Colonial Literature and Counter Discourse
3. Salman Rushdie : Imaginary Homelands

UNIT IV: RECENT TRENDS IN LITERARY CRITICISM

1. New Historicism

2. Semiotics and Post Semiotics

3. Logocentrism

4. Phone Centrism

5. Cyber Culture

UNIT V APPLICATION OF THEORIES IN NOVELS

1.Buchi Emecheta : The Joys of Motherhood

2. Thomas Pynchon : The Crying of Lot 49

3. Alice Walker : The Color Purple

REFERENCES:

Das, Bijay Kumar. *Twentieth Century Literary Criticism.* New Delhi: Atlantic Publishers& Distributors, 2002. Print.

Seturaman, V.S. *Contemporary Criticism; An Anthology*; Madras: Macmillan India Limited, 1989. Print.

Edt. By Ascroft, Bill. Griffiths, Gareth and Tiffin, Helen. *The Post-Colonial Studies*; Reader.London: Routledge Publishers, 1995.Print.

Wadikar, Shailaja B. *New Trends in Literary Criticism*.New Delhi:Atlantic Publishers,2010.Print

Edt By Walder, Dennis. *Literature in the Modern World; Critical Essays and Documents*.NewYork: Oxford University Press,1990.Print.

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CBCS SYLLABUS FOR M.PHIL.ENGLISH LITERATURE- 2018-19 ONWARDS

PAPER CODE: **SEMESTER-I** **CREDITS:**
CORE COURSE- IV
HRS. PER WEEK:

TEACHING AND LEARNING SKILLS

Course Objectives:

¬Acquaint different parts of computer system and their functions

¬Understand the operations and use of computers and common Accessories

¬Develop skills of ICT and apply them in teaching learning context and Research

¬Appreciate the role of ICT in teaching, learning and Research

¬Acquire the knowledge of communication skill with special reference to its elements, types, development and styles

¬Understand the terms communication Technology and Computer mediated teaching and develop multimedia /e- content in their respective subject

¬Understand the communication process through the web

¬Acquire the knowledge of Instructional Technology and its Applications

¬Develop different teaching skills for putting the content across to targeted audience

UNIT I : Computer Application Skills

Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations-- ICT for Professional Development:Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology for action research, etc.

UNIT II : Communications Skills

Communication: Definitions – Elements of Communication: Sender, Message,

Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

UNIT III : Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference

between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion.

UNIT IV : E- Learning, Technology Integration and Academic Resources in India

Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning; awareness of e-learning standards- Concept of technology integration in teaching- learning processes; frameworks guiding technology integration (like TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, National academic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

UNIT V : Skills of Teaching and Technology based assessment

Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills- Technology for Assessment: Concept of assessment and paradigm shift in assessment; role of technology in assessment 'for' learning; tools for self & peer assessment (recording devices; e-rubrics, etc.); online assessment (open source software's; e-portfolio; quiz makers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics

References

1.Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi

2. Brandon Hall , E-learning, A research note by Namahn, found in: www.namahn.com/resources/ .../note-e-learning.pdf,Retrieved on 05/08/2011

3.Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh

4.Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.

5.Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in e- learning. Innovations in Education & Teaching International, 43(1), 15-27.

6.Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.

7.Learning Management system

: https://en.wikipedia.org/wiki/Learning_management_system , Retrieved on 05/01/2016

8.Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.

9.Michael,D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New york.

10.Pandey,S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.

11.Ram Babu,A abd Dandapani,S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.

12.Singh,V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.

13.Sharma,R.A., (2006) Fundamentals of Educational Technology, Surya Publications,Meerut

14.Vanaja,M and Rajasekar,S (2006), Computer Education, Neelkamal Publications, Hyderabad.

Question Paper Pattern for M.Phil Programme:

Exam: 75 Marks

Internal: 25 Marks

Total : 100 Marks

Question Pattern — Total =75 Marks

SECTION A:	10 QuestionsX2 Marks (Two Questions from each unit)	= 20 Marks
SECTION B:	5 QuestionsX5 Marks (Internal Choice and on set of questions from each unit)	= 25 Marks
SECTION C	**:** 3 QuestionsX10 Marks (Answer any three out of 5 questions and one question from each unit	= 30 Marks

Internal Process — Total =25 Marks

CIA TEST I **CIA TEST II**	2 1/2 Units for Each Test	= 10 Marks
ATTENDANCE		= 5 Marks
ASSIGNMENT	Any topic from five Units	= 5 Marks
SEMINAR		= 5 Marks

NEHRU MEMORIAL COLLEGE

(Autonomous, Accredited with `A` Grade by NAAC & Affiliated to Bharathidasan University, Tiruchirappalli)

Puthanampatti-621007, Tiruchirappalli- District

M.Phil., Tamil

Course Structure and Syllabus under CBCS

(For the candidate admitted from the academic year 2019-2020 onwards)

M.Phil. TAMIL (FT/PT) PROGRAMME
(for the candidates to be admitted from the academic year 2019-20 onwards)

ஆய்வியல் நிறைஞர் பட்டப்படிப்பின் நோக்கம் (PROGRAMME OBJECTIVES)

1. தமிழியல் ஆய்வுகளுக்கு வித்திடல்.
2. ஆய்வுத் திறனை உண்டாக்குதல்.
3. ஆய்வியல் நெறிகளை அறியச்செய்தல்.
4. ஆய்வு நுட்பங்களை உணரச் செய்தல்.
5. ஆய்வு அணுகுமுறைகளை அறியச்செய்தல்.
6. செம்மையான ஆய்வினை நிகழ்த்த வழிகாட்டல்.
7. ஆய்வின் கல்வி, சமூகவியல் பயன்களை உணர்த்துதல்.
8. கற்றல், கற்பித்தல் திறன்களை மேம்படுத்துதல்.

PROGRAMME STRUCTURE

Semester	Course	Title of the Paper	Exam Hours	Credits	Marks		
					LA	Ext.E	Total
I	Course I	ஆராய்ச்சி நெறிமுறைகள்	3	4	25	75	100
	Course II	தமிழாய்வுக் களங்கள்	3	4	25	75	100
	Course II	கற்பித்தல், கற்றல் திறன்கள்	3	4	25	75	100
	Course IV	Paper on Topic of Research (The syllabus will be prepared by the Research advisor)	3	4	25	75	100
II	Dissertation & Viva-Voce	Dissertation 150 Marks Viva 50 Marks	- - -	8	- - -	- - -	200
	Total			**24**	**- - -**	**- - -**	**600**

ஆய்வியல் நிறைஞர் பட்டப்படிப்பின் கல்விசார் விளைவுகள் (PEO)

1. ஆய்வியலின் அடிப்படைகளை அறிந்துகொள்வர்.
2. ஆய்வு மொழி நடை, ஆய்வு நெறிமுறைகளை அறிவர்.
3. தமிழ் ஆய்வுக் களங்கள், தமிழ் ஆய்வுப் போக்குகள் குறித்துத் தெளிவு பெறுவர்.
4. முறையான ஆய்வேடுகள் உருவாகும்.
5. புதியவற்றைக் கண்டு வெளிப்படுத்தும் வேட்கை கொள்வர்.
6. விருப்பு, வெறுப்பற்ற மதிப்பீட்டுப் பண்பினைப் (விமர்சனப் பண்பினை) பெறுவர்.
7. தன் கருத்தை உரிய சான்றுகளுடன் நிறுவும் ஆற்றலைப் பெறுவர்.
8. பிறர் கருத்தை நகரிகமான முறையில் மறுக்கும் பண்பினைப் பெறுவர்.
9. பாரட்டும் திறனையும் சுவையுணர் திறனையும் வளர்த்துக் கொள்வர்.
10. தேடல் பண்பிலும், தேர்வு செய்யும் பண்பிலும் சிறந்து விளங்குவர்.
11. தன்னம்பிக்கை, விடாமுயற்சி, கடின உழைப்பின் அருமையினை உணர்வர்.

ஆய்வியல் நிறைஞர் பட்டப்படிப்பின் குறிப்பிடத்தக்க விளைவுகள் (PSO)

1. முனைவர் பட்ட ஆய்வைச் சிறப்பாக மேற்கொள்வதற்கான ஆய்வுப் பட்டறிவைப் பெறுவர்.
2. கல்லூரி ஆசிரியர் பணிக்கான கூடுதல் தகுதி பெறுவர்.
3. உலகத் தமிழ் ஆராய்ச்சி நிறுவனம், இந்திய மொழிகளின் மைய நிறுவனம் முதலான நிறுவனங்களில் ஆராய்ச்சித் திட்டப் பணிகளில் பணி வாய்ப்பு பெறுவர்.

தாள் 1

ஆராய்ச்சி நெறிமுறைகள்

பாடத்தாளின் நோக்கங்கள் (Course Objectives)

1. ஆய்வியல் அடிப்படைகளை அறியச் செய்தல்.
2. ஆய்வு நெறிகளை உணர்த்துதல்.
3. களஆய்வு முறைகள் குறித்து விரிவாக அறியச் செய்தல்.
4. அறிவியல் அணுகுமுறைகளை அறிந்துகொள்ளச் செய்தல்.
5. ஆய்வேட்டின் கட்டமைப்பு முறையினை அறியச் செய்தல்.

அலகு 1

ஆய்வு - சொல் மூலம் - சொற்பொருள் - ஆய்வு விளக்கம் - இலக்கியங்களில் காணலாகும் ஆய்வு பற்றிய குறிப்புகள், விளக்கங்கள், உரையாசிரியர்களின் ஆய்வு நெறிகள் - ஆய்வு நோக்கம் - ஆய்வுப்பயன் - ஆய்வுப்பொருண்மையைத் தேர்ந்தெடுத்தல் - ஆய்வுத் தலைப்பை இனங்காணுதல் - ஆய்வாளர் தகுதிகள் - ஆய்வு மொழிநடை.

அலகு 2

ஆய்வுச் சிக்கலும் கருதுகோளும், ஆய்வுப்பொருள் சிக்கல் – சிக்கல் வகைகள் - ஆய்வுச் சிக்கலை இனங்காணுதலும் பகுத்துணர்தலும் - ஆய்வுச் சிக்கலின் தகவல் அறிதலும் உறுதிப்பாடும் - சிக்கலை மையமிட்ட தலைப்புத் தெரிவு - கருதுகோள் - கருதுகோளின் தேவை - கருதுகோளின் வகைகள் - எளிய கருதுகோள் - மாற்றுக் கருதுகோள் - பயனில் கருதுகோள் - எதிர்மறைக் கருதுகோள்.

அலகு 3

கள ஆய்வுகள், கருதுகோள், கள ஆய்வியல் களப்பணி - விளக்கம் - களப்பணியின் தேவை - திட்டமிடல் - கள ஆய்வுக்குத் தேவையான கருவிகள் - காலம் - சேகரிக்கும் இடம், சூழல் - தகவலாளி அணுகுமுறை -

நேர்காணல், வினா நிரல், வாய்மொழி மரபுச் செய்திகள், தகவல்கள் திரட்டுதல் - வகைப்பாடு - தரவு திரட்டல் - நூலகப் பயன்பாடு - குறிப்பு அட்டைகள் - நூல்கள் -ஆய்வேடுகள் - தரவுகளைச் சேகரிப்பதில் கணினியின் பங்கு - தமிழ் ஆய்வில் இணையத்தின் பயன்பாடு – இணைய நூலகங்கள் - தமிழ் ஆய்வு மின்னிதழ்கள் - தமிழ் ஆய்வு வலைதளங்கள்- வலைப்பூக்களிபயன்பாடு - கணினிச் செயலிகள்.

அலகு 4

ஆய்வு முறைகள் , அணுகுமுறைகள்

ஆய்வு முறைகள் - தனிநிலை ஆய்வு முறை (Case Study Method), பயன்பாட்டு ஆய்வு முறை (Applied Research), ஒரு துறைசார் ஆய்வு (Mono disciplinary Research), பலதுறைசார் ஆய்வு (Interdisciplinary Research), விதியுணர் முறை (Normative Method), உய்த்துணர் முறை (Deductive Method), பகுப்பு முறை ஆய்வு (Analytical Research), தொகுப்பு முறை ஆய்வு (Synthetic Research), தருக்க முறை ஆய்வு (Logical Method), அளவீட்டு முறை ஆய்வு (Survey Method), புள்ளியியல் முறை ஆய்வு (Statistical Method), வரலாற்று ஆய்வு முறை (Historical Method), ஒப்பியல் ஆய்வு (Comparative Method), விளக்க முறை ஆய்வு (Descriptive Method), கள ஆய்வு முறை (Field Method),

ஆய்வு அணுகுமுறைகள் - சமூகவியல் அணுகுமுறை (Sociological Approach), உளவியல் அணுகுமுறை (Psychological Approach), தத்துவவியல் அணுகுமுறை (philosophical Approach) - அமைப்பியல் அணுகுமுறை (Systems Approach), வடிவவியல் அணுகுமுறை (Formalistic Approach), நவீனத்துவ அணுகுமுறைகள் (Modernism, Post-Modernism).

அலகு 5

ஆய்வேட்டின் கட்டமைப்பு - ஆய்வுப்பொருள் அமைப்பும் இயல் பாகுபாடும் - இயல் அமைப்பு - இயல்களின் வைப்பு முறை, ஆய்வு

அறிமுகம், முடிவுகளை வழங்குதல், மொழி நடைச்செம்மை, முந்தைய ஆய்வுகளைக் கூறல், உடன்படல் - மறுத்தல் - மேற்கோள் காட்டும் முறைமை - ஆய்வு நாகரிகம், அடிக்குறிப்புகள், சுருக்கக் குறியீட்டு விளக்கம், சில வரையறைகள் - எழுத்துப் புள்ளி அளவு, வரிகளின் இடைவெளி, பக்க வரையறை, கட்டமைப்பு முறை(Binding Method), ஆய்வேட்டின் அட்டை, ஆய்வாளர் உறுதிமொழி, நெறியாளர் சான்றிதழ், பின்னிணைப்புகள் - முதன்மை நூற்பட்டியல், துணை நூற்பட்டியல், பார்வை நூல் பட்டியல், படங்கள், தகவலாளர் பட்டியல், தேவையான பிற பின்னிணைப்புகள், பிழைதிருத்தம், ஆய்வேட்டு வடிவமைப்பில் கணினியின் பயன்பாடு.

கற்றல் விளைவுகள் (Course Outcome)

1. ஆய்வு என்பது குறித்து முழுமையாக அறிந்து கொள்வர்..
2. ஆய்வு அணுகுமுறைகளை அறிந்து கொள்வர்.
3. ஆய்வுப் பொருண்மையைத் தேர்ந்தெடுக்கும் அறிவு பெறுவர்.
4. ஆய்வுச் சிக்கல்களை இனம் காணும் திறன் பெறுவர்..
5. கருதுகோள் குறித்து முழுமையாக அறிவர்.
6. தரவு சேகரித்தலின் நுட்பத்தை உணர்வர்.
7. களப்பணிக்குத் தகுதி பெறுவர்.
8. ஆய்வில் நவீனத் தொழில்நுட்பத்தின் பயன்பாட்டை அறிவர்.
9. ஆய்வேட்டைக் கட்டமைக்கும் திறன் பெறுவர்.

பார்வை நூல்கள்

1. ஆய்வியல் அறிமுகம் தமிழண்ணல், இலக்குமணன், எம்.எஸ், மீனாட்சி புத்தக நிலையம், மதுரை – 1977.
2. ஆய்வியல் நெறிமுறைகள் கு.வெ. பாலசுப்ரமணியன், உமா நூல் வெளியீட்டகம், தஞ்சாவூர், 2001.

3. ஆய்வியல் கோட்பாடுகளும் செயல்முறைகளும் – எஸ்.என். கணேசன், டயோனிசியஸ் புக் சர்வீசஸ், சென்னை.
4. ஆய்வுக்கட்டுரை எழுதும் முறை, முத்துச்சண்முகம், வேங்கடராமன், சு., சர்வோதயா இலக்கியப்பண்ணை, மதுரை.
5. இலக்கிய ஆராய்ச்சி நெறிமுறைகள், முத்துச்சண்முகம், சு. வேங்கடராமன் முத்துப்பதிப்பகம், மதுரை – 1979.
6. நாட்டார் வழக்காற்றியல், கள அய்வு, தே. லூர்து, பாரிவேள் பதிப்பகம், பாளையங்கோட்டை.
7. தமழில் கணிப்பொறியில் – ச. பாஸ்கரன், உமா பதிப்பகம், தஞ்சாவூர்.
8. கணிப்பொறி ஓர் அறிமுகம் – இராம்குமார், சைவசித்தாந்த நூற்பதிப்புக் கழகம், சென்னை.
9. இணையமும் இனிய தமிழும் – க. துரையரசன், இசைப்பதிப்பகம், கும்பகோணம்.
10. தமிழும் கணிப்பொறியும், ஆண்டோ பீட்டர், கற்பகம் புத்தகாலயம் சென்னை.
11. இணையமும் தமிழும், துரை.மணிகண்டன், இணையமும் தமிழும், நல்நிலம் பதிப்பகம், சென்னை.

தாள் 2

தமிழாய்வுக் களங்கள்

பாடத்தாளின் நோக்கங்கள் (Course Objectives)

1. பல்வேறு நிலைகளில் தமிழில் நிகழ்ந்துள்ள ஆய்வுகளை அறியச் செய்தல்.
2. தமிழில் ஆய்வு நிகழ்த்தக் கூடிய ஆய்வுக் களங்களை அறிமுகப்படுத்துதல்.
3. புதிய நோக்கிலான ஆய்வுக்களங்களை இனம் காட்டுதல்.
4. தமிழாய்வுப் போக்குகளை அறியச் செய்தல்.

அலகு 1

இலக்கண ஆய்வுகள்- எழுத்து, சொல், பொருள், யாப்பு, அணி குறித்து தொல்காப்பிய காலம் முதல் இன்றுவரை வந்துள்ள இலக்கண நூல்கள், இலக்கண நூல்களின் அமைப்பு, நுவல் பொருள், தமிழ் இலக்கணங்களின் தனித்தன்மைகள், உரைநடை இலக்கண நூல்கள் - இலக்கண நூல்களில் நிகழ்ந்த மாற்றங்கள், இலக்கண வரையறைகளில் இன்றைக்குப் பொருந்தும், பொருந்தாக் கூறுகள் - இதுவரை வெளிவந்துள்ள ஆய்வுகள், புதிய களங்கள்.

அலகு 2

இலக்கிய ஆய்வுகள் - சங்க இலக்கியங்கள், பதினெண் கீழ்க்கணக்கு நூல்கள், காப்பியங்கள், சமய இலக்கியங்கள், சிற்றிலக்கியங்கள், மறுமலர்ச்சிக் கால இலக்கியங்கள், சித்தர் பாடல்கள், இக்கால இலக்கியங்கள்- சிறுகதை, புதினம், நாடகம், உரைநடை முதலான இலக்கியங்கள், படைப்புத் திறனாய்வுகள், மானிடவியல், சமூகவியல், உளவியல், அறிவியல், பெண்ணியம், பெரியாரியம், மார்க்சியம் முதலான பல்வேறு நோக்குகள் - இதுவரை வெளிவந்துள்ள ஆய்வுகள், புதிய களங்கள்.

அலகு 3

தமிழோடு தொடர்புடைய துறைகள் - வரலாறு, மானிடவியல், தொல்லியல், சுவடியியல், அகராதியியல், கல்வெட்டியல், கோயிற்கலை, நுண்கலைகள், மொழிபெயர்ப்பியல், பதிப்பியல், ஊடகவியல் – அச்சு ஊடகங்கள், மின் ஊடகங்கள் கணினியியல், இவை போன்ற பிற துறைகள் - இதுவரை வெளிவந்துள்ள ஆய்வுகள், புதிய களங்கள்.

அலகு 4

ஒப்பாய்வியல் - ஒரு மொழிக்கு உள்ளே உள்ள ஒப்பாய்வுக் களங்கள் இரு இலக்கணங்களுக்கு இடையேயான ஒப்பாய்வுகள் (தொல்காப்பியமும் நன்னூலும், தொல்காப்பியரின் புறத்திணைக் கோட்பாடுகளும் புறப்பொருள் வெண்பா மாலையும் போல்வன) இரு இலக்கியங்களுக்கு இடையேயான ஒப்பாய்வுகள் (கம்பரும் திருவள்ளுவரும், கம்பராமாயணமும் இராவண காவியமும் போல்வன) இலக்கண, இலக்கியங்களுக்கு இடையேயான ஒப்பாய்வுகள் (தொல்காப்பிய புறத்திணைக் கோட்பாடுகளும் புறநானூறும், தொல்காப்பியரின் அகத்திணைக் கோட்பாடுகளும் - அகம்சார்ந்த இக்காலப் புதுக்கவிதைகளும் போல்வன)- இதுவரை வெளிவந்துள்ள ஆய்வுகள், புதிய களங்கள்.

இரு மொழிகளுக்கு இடையேயான ஒப்பாய்வுகள் இலக்கிய ஆய்வுகள் (கம்பனும் மில்டனும், கம்பரும் வான்மீகியும், ஹோமரின் இலியட் – வியாசரின் மகாபாரதம், தமிழ், மலையாள இலக்கண ஒப்பாய்வுகள்), இதுவரை வெளிவந்துள்ள ஆய்வுகள், புதிய களங்கள்.

அலகு 5

நாட்டுப்புறவியல் - நாட்டுப்புற பாடல்கள், பழமொழிகள், நாட்டுப்புற கதைகள். கதைப் பாடல்கள், நாட்டுப்புற வழிபாடுகள், சடங்குகள், நாட்டுப்புறத் தொழில்கள், நாட்டுப்புறப் புழங்கு பொருட்கள், நாட்டுப்புற விளையாட்டுகள், நாட்டுப்புற மருத்துவம், நாட்டுப்புற உணவு முறைகள்,

நாட்டுப்புறக் கலைகள், நாட்டுப்புற கைவினைப் பொருள்கள், நிர்வாக மேலாண்மை, பிற நாட்டுப்புறக் கூறுகள் - இதுவரை வெளிவந்துள்ள ஆய்வுகள், புதிய களங்கள்.

கற்றல் விளைவுகள் (Course Outcome)

1. ஆய்வுப் பொருண்மையைத் தெரிவு செய்யும் தெளிவு பெறுவர்.
2. தமிழில் இதுவரை நிகழ்ந்துள்ள ஆய்வுகள் பற்றிய தெளிவினைப் பெறுவர்.
3. பன்முக நோக்கில் தமிழில் நிகழ்ந்துள்ள ஆய்வுகளை அறிவர்.
4. நாட்டுப்புற ஆய்வுகள் குறித்த களங்களையும், தேவையினையும் உணர்வர்.
5. தமிழோடு தொடர்புடைய பிற துறைகளில் ஆய்வு நிகழ்த்தவேண்டிய தேவையினை உணர்வர்.

பார்வை நூல்கள்

1. இலக்கண ஆய்வடங்கல், முனைவர் பட்டாபிராமன், பதிப்புத்துறை, அண்ணாமலைப் பல்கலைக்கழகம், அண்ணாமலை நகர்.
2. ஆய்வுக் களங்கள், நா.கடிகாசலம், பதிப்புத்துறை, சென்னைப் பல்கலைக்கழகம்.
3. சங்க இலக்கிய ஆய்வுகள்- செய்தனவும் செய்ய வேண்டியனவும், கேரளப் பல்கலைக்கழகம், திருவனந்தபுரம்.
4. சங்க இலக்கிய ஆய்வுகள்- டாக்டர் அமிர்தலிங்கம், மெய்யப்பன் தமிழாய்வகம், சிதம்பரம்.
5. திராவிட மொழிகளின் ஒப்பாய்வு (ஓர் அறிமுகம்) டாக்டர் ஜி.ஜான் சாமுவேல் முல்லை நிலையம், சென்னை,
6. தமிழாய்வுக் களங்கள், மாநிலக் கல்லூரி, சென்னை.

7. சங்க இலக்கிய ஒப்பீடு – இலக்கியக் கொள்கைகள், தமிழண்ணல், மீனாட்சி புத்தக நிலையம், மதுரை, 1979.
8. Tradition & Talent in Sangam Poetry, Thamizhannal, Madurai Publishing House, Madurai, 1976.
9. ஒப்பிலக்கிய நோக்கில் சங்க காலம், கதிர் மகாதேவன், லட்சுமி வெளியீடு, மதுரை, 1977.
10. வரலாற்று நோக்கில் சங்க இலக்கிய பழமரபுக் கதைகளும் தொன்மங்களும், முனைவர் பெ.மாதையன், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்.
11. ஐங்குறுநூறு உருபனியல் பகுப்பாய்வு முனைவர் அ.காமாட்சி முனைவர் செ.கல்பனா நியூ செஞ்சுரி புக் ஹவுஸ் பிரைவேட் லிமிடெட், சென்னை.
12. பண்பாட்டு அசைவுகள், தொ.பரமசிவன், காலச்சுவடு பதிப்பகம், நாகர்கோவில்.
13. புறத்திணையியல், கு.வெ. பாலசுப்பிரமணியம், தமிழ்ப்பல்கலைக்கழக வெளியீடு.
14. தமிழில் காப்பியக் கொள்கைகள், து. சீனிச்சாமி, தமிழ்ப்பல்கலைக்கழக வெளியீடு.
15. தொகையியல், அ. பாண்டுரங்கன், திருவரங்கப் பதிப்பகம், புதுச்சேரி.
16. நாட்டுப்புறவியல் ஆய்வு, சு. சக்திவேல், மணிவாசகர் பதிப்பகம், 1983.
17. நாட்டுப்புறவியல், சு. சண்முகசுந்தரம், மணிவாசகர் பதிப்பகம், 1982.
18. நாட்டார் வழக்காறுகள், லூர்து, மணிவாசகர் நூலகம், 1988..
19. தமிழாய்வுத் திறனாய்வு வரலாறு, முனைவர். ம. மதியழகன், மித்ரா வெளியீடு, சென்னை, 2009.

தாள் 3
கற்பித்தல், கற்றல் திறன்கள்

கற்றல் நோக்கங்கள் (Course Objectives)

1. கணினியின் பாகங்களையும் பணிகளையும் உணர்தல்.
2. கணினியின் பயன்பாட்டினையும் பயன்படுத்துதலையும் உய்த்துணர்தல்.
3. கணினியுடன் கூடிய துணைக்கருவிகளை உபயோகப்படுத்த அறிந்து கொள்ளல்.
4. கற்றலிலும் கற்பித்தலிலும் தகவல் தொழில்நுட்பத்தைப் பயன்படுத்தும் திறனை வளர்த்துக்கொள்ளல்.
5. பேச்சாற்றல் திறனை வளர்த்தல்.
6. தகவல் தொழில்நுட்ப அறிவினைப் பெற்று அதன்வழி பாடங்கள் நடத்துதல்.
7. இணையத்தைக் கற்பித்தலுக்குப் பயன்படுத்துதல்.
8. பல்வகைப்பட்ட மாணவர்களுக்கேற்ப கற்பிக்கும் திறனை உணர்ந்து புரிய வைத்தல்.

அலகு 1: கணினி பயன்பாட்டுத்திறன்

தகவல் மற்றும் தொடர்புடைய (கம்யூனிகேசன்) தொழில்நுட்பத்தின் (ICT) முக்கிய அம்சங்கள் – வரையறை, பொருள் – விளக்கம், போக்குகள் – கற்பித்தல் மற்றும் கற்றலுடன் ICT ஒருங்கிணைத்தல் (ICT – Information and Communication Technology) – ICT பயன்பாடுகள் – சொல் செயலிகள் ஸ்ப்ரெட் தாள்கள் (Sheets) – வகுப்பறையில் பவர் பாய்ண்ட் ஸ்லைடுகள் – ஆய்விற்கு ICT – ஆன்லைன் பத்திரிக்கைகள் – இ-புத்தகங்கள் (Electronic Books) – பாடநெறி – பயிற்சிகள் – தொழில்நுட்ப அறிக்கைகள் – கருத்துக்கள்

மற்றும் விவாதங்கள் – ஆசிரியத்தொழிலில் வளர்ச்சியடைய ICTயைப் பயன்படுத்துதல் – ஆசிரியத்தொழிலில் வளர்ச்சி – கருத்து – கற்பித்தலில் போதிய ஆற்றலை வளர்த்தல் – சமூக வலைதளங்களைப் (Networks) பயன்படுத்தி தனித்திறமை வளர்த்தல் – ஆய்விற்குத் தொழில் நுட்பத்தைப் பயன்படுத்துதல் – திறந்த கல்வி வளங்களைப் பயன்படுத்துதல் (OER – Open Education Resource).

அலகு 2: தொடர்புத்திறன்கள் (Communication Skills)

தொடர்பாடல் (கம்யூனிகேஷன்) – வரையறைகள் – தொடர்பாடல் கூறுகள் – அனுப்புநர் – செய்தி – சேனல் (பாதை), பெறுநர் – கருத்து மற்றும் சத்தம் (சப்தம் – தேவையற்ற ஒலிகள்) – தொடர்பாடல் வகைகள் – பேச்சு மற்றும் எழுத்துச் சொற்கள் அல்லாத தொடர்பாடல் – உள்முக, தனிநபர், குழு மற்றும் தகவல் தொடர்பில் (Mass Communication) ஏற்படும் தடைகள் – சாதனங்கள் வழி, பௌதிக, மொழியியல் மற்றும் கலாச்சாரம் ஆகியனவற்றால் ஏற்படும் தடைகள் – தொடர்புத்திறன் – கவனித்தல், பேசுதல், எழுதுதல், சரளமாக எழுத மற்றும் பேசும் திறனை வளர்த்துக்கொள்ளும் முறைகள் – தனிநபர் பாணி, உச்சரிப்பு, சொல்வளம், சொற்களஞ்சியம் – வகுப்பறையில் உரை நிகழ்த்துதல் – உரையில் ஏற்ற இறக்கம்.

அலகு 3: ஆசிரியரியல் (Pedagogy)

கற்பித்தல் தொழில்நுட்பம்: வரையறை, குறிக்கோள், வகைகள் – கற்பித்தலுக்கும் விரிவுரை (போதனை) (Lecture) ஆற்றுதலுக்கும் இடையேயான வேறுபாடுகள் – விரிவுரை நுட்பம்: படிப்படியான நிலைகள் – விரிவுரை ஆற்றல் – பவர்பாய்ண்டு துணை கொண்டு விரிவுரை நிகழ்த்துதல் – பன்முக விரிவுரை நுட்பம்: செயல்விளக்கம் – சிறப்பியல்புகள்,

கோட்பாடுகள், திட்டமிடல், நடைமுறைப்படுத்துதல் மற்றும் மதிப்பீடு – கற்கும் மற்றும் கற்பித்தலின் நுட்பங்கள்: குழுவாகக்கற்பித்தல் – குழுவிவாதம், கருத்தரங்கு (Seminar), பட்டறை (Workshop), கருத்துக்கோவை மற்றும் குழு கலந்துரையாடல்.

அலகு 4: மின்னணு வழி கற்றல்

தொழில்நுட்ப ஒருங்கிணைப்பு மற்றும் இந்தியாவில் அமைந்துள்ள கல்வி வளங்கள் – மின்னணு கற்றல்: கருத்துக்கள், வகைகள் (ஒத்திசைவு, ஒத்திசைவற்ற கருத்துரையாற்றல் மற்றும் வழிகள்) –கைப்பேசி (செல்போன்) துணையோடு கற்றல் – கைபேசி செயலிகள் – கலப்பின கற்றல் – சுத்திகரிக்கப்பட்ட கற்றல் – மின்னணுக்கற்றலுக்கான கருவிகள் – (LMS கற்றல் முகாமைத்துவ முறைமை, சொல் செயலாக்க மென்பொருள், விளக்கக்காட்சிகள் தயாரித்தல், இணையத்தில் திருத்தம் செய்தல் ...) துறைசார்ந்த மின்னணு கற்றல் கருவிகள் – மின்னணு கற்றலின் தரம் அறிதல் – கற்பித்தலில் தொழில்நுட்பத்தை ஒருங்கிணைத்தல் – நுண்ணறிவு – கற்றல் செயல்முறை – தொழில்நுட்ப ஒருங்கிணைப்பை நெறிப்படுத்தும் கட்டமைப்பு (T PACK; SAMR) – TIM தொழில்நுட்பத்தைத் திறம்பட ஒருங்கிணைக்க பாடங்கள் (TIM – Technology Integration Management).

இந்தியாவில் காணப்பெறும் கல்விவளம்

MOOC, NMEICT, NPTEL, e-pathshala, SWAYAM, SWAYAM Prabha, தேசியக்கல்வி வைப்பு நிதி (NAD), தேசிய இணையக்கல்விக் கழகம் (NDL), e-Sodh Sindhu, உயர்கல்வி மின்னணு வளம் – Virtual Labs – வர்ச்சுவல் லாப்ஸ் – மெய்நிகர் ஆய்வகம் – e-yantra – Talk to a Teacher – Moodle – mobile apps etc. – கைப்பேசி செயலி – இன்னும்பல.

அலகு 5 :கற்பித்தல் திறன் மற்றும் தொழில் சார்ந்த மதிப்பீடு

கற்பித்தல் திறன்: வரையறை – பொருள் தன்மை – கற்பித்தல் திறன்: (வகைகள்: உரை தொடங்குதல், கற்கத்தூண்டுதல், ஊக்கம் ஊட்டுதல் – விளக்குதல் – கேள்வி கேட்கத் தூண்டுதல் – கரும்பலகையில் எழுதி விளக்குதல் – உரையை முடித்தல்) கற்பிக்கும் திறன்களை ஒருங்கிணைத்தல் – கற்பிக்கும் திறனை மதிப்பிடுதல் – மதிப்பிடுதலின் நுட்பம்: மதிப்பிடுதலின் வழிமுறைகள் – தேவைக்கேற்ப மதிப்பிடுதலில் மாற்றம் – கற்கும் திறனை மதிப்பிடுதலில் தொழில்நுட்பத்தின் பங்கு – தன்னையும் தனக்கு இணையானவர்களையும் மதிப்பிடப் பயன்படுத்தும் கருவிகள் – (பதிவு செய்யும் கருவிகள், e-rubrics (மின்-ரூபிக்) – ஆன்லைனில் மதிப்பிடுதல், மென்பொருள் பயன்பாடு, ஆன்லைன் தேர்வு (நேர்முகத்தேர்வு, Report folio, அமைத்தல் பொது மதிப்பாய்வு செய்ய கருவிகள்) வலைப்பதிவுகள் மற்றும் கருத்தரங்கு விவாதம் மூலம் கற்பதை மதிப்பீடு செய்ய தொழில்நுட்பத்தைப் பயன்படுத்துதல், கற்றலைப் பகுப்பாராய்தல்.

கற்றல் விளைவுகள் (Course Outcome)

1. இணைய அறிவைப் பெறுவர்.
2. புதிய தகவல் தொழில்நுட்ப அறிவைத் தேர்ந்து தெளிவர்.
3. கற்பித்தலில் நவீன உத்திகளைப் பயன்படுத்துவர்.
4. பரந்துபட்ட அறிவைப் பெறுவர்.
5. இணையம், மின்நூலகம் வழி புதிது புதிதாகக் கற்பர்.
6. மாணவர்கள் மனம் புரிந்து கொள்ளும்படிக் கற்பிப்பர்.
7. கணினிப் பயன்பாட்டினை அறிவர்.
8. பேச்சாற்றலை வளர்த்துக் கொள்வர்.

பரிந்துரை நூல்கள்

1. கல்வியியல் புதுமைகள், கி. நாகராஜன் – கல்வியியல் புதுமைகள் – ராம் பதிப்பகம், காந்தி நகர், சாலிக்கிராமம், சென்னை 93, 2003.
2. கல்வியியல் புதுமைகள் மேலாண்மை மற்றும் மதிப்பீடு எஸ்.ஆரோக்கியசாமி –முத்துலட்சுமி பதிப்பகம், பாளையங்கோட்டை.
3. கல்வியும், சமூகமும், எஸ். சந்தானம் ,சாந்தா பதிப்பகம், சென்னை 14,
4. கணிப்பொறி தகவல் தொழில்நுட்பம், ச. பாஸ்கரன், தமிழ்ப் பல்கலைக்கழகம், தஞ்சை, 1998.
5. கணினியும் தமிழ் கற்பித்தலும், சு.ப. திண்ணப்பன் ஐந்திணைப் பதிப்பகம், சென்னை, 1995.
6. தமிழில் கணிப்பொறியியல், உமா பதிப்பகம், தஞ்சாவூர், 2003.
7. கணிப்பொறியில் தமிழ், உமா பதிப்பகம், தஞ்சாவூர், 2003.
8. மக்கள் ஊடகத் தொடர்பியல் (அடிப்படைகள், புதிய பரிமாணங்கள்) – அ. சாந்தா, வீ. மோகன் மீடிய பப்ளிகேஷன்ஸ், மதுரை 7, 2001.
9. தகவல் தொடர்பியல், வெ. கிருட்டிணசாமி, மணிவாசகர் பதிப்பகம், சென்னை, 2000.
10. தகவல் தொடர்புகளும், முனைவர் ச. ஈஸ்வரன், நெறிமுறைகளும், சாரதா பதிப்பகம், சென்னை-14.
11. தமிழ்க்கணினி இணையப் பயன்பாடுகள், முனைவர் துரை. மணிகண்டன், த. வானதி, கமலினி பதிப்பகம், தஞ்சாவூர்.
12. இணையமும் இனிய தமிழும், முனைவர் க. துரையரசன், இசைப்பதிப்பகம், கும்பகோணம்.
13. முனைவர் மு. பழனியப்பன், கணினியும் இணையமும், மீனாட்சி பதிப்பக வெளியீடு, புதுக்கோட்டை.

PG & RESEARCH DEPARTMENT OF BOTANY

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

PUTHANAMPATTI-621 007

TIRUCHIRAPPALLI DISTRICT

SYLLABUS FOR

MASTER OF PHILOSOPHY IN BOTANY

(For the candidates to be admitted from the academic year 2018-19 onwards)

NEHRU MEMORIAL COLLEGE (Autonomous), Tiruchirappalli-620 007

M.Phil., Botany– Part Time /Full Time -Course Structure

(For the candidates admitted from the academic year 2018-2019 onwards)

Eligibility : **M.Sc. Botany/Plant Sciences/Plant Biology and Plant Biotechnology**

course	Title of the course	Hrs/ week	Credits	Exam Hrs.	Marks		Total
					Int	Ext	
	Semester - I						
CC-I	Research methodology	4	4	3	25	75	100
CC-II	Recent Advances in Botany	4	4	3	25	75	100
CC-III	Paper on Topic of Research (The syllabus will be prepared by the Guide and the examination will be conducted by the COE)	4	4	3	25	75	100
CC-IV	Teaching and Learning Skills (Common Paper)	4	4	3	25	75	100
	Semester -II						
	Dissertation and Viva-Voce Viva Voce 50 marks Dissertation 150 marks	-	8	-	-	-	200
	GRAND TOTAL		**24**				**600**

For each Course other than the Dissertation

Continuous Internal Assessment (CIA) - 25 Marks

Semester Examination (SE) - 75 Marks

Total - 100 Marks

NEHRU MEMORIAL COLLEGE (AUTONOMOUS
DEPARTMENT OF BOTANY
(For those who join in 2018 onwards)

Course : M.Phil Botany
Class : M.Phil
Semester : I
Title of the Paper: **CC-I.Research Methodology**

Int Marks : 25
Ext Marks : 75
Max Marks : 100
Hours /week: 4
Credits : 4

CC-I . RESEARCH METHODOLOGY

Unit 1 : Centrifugation and Microscopy:

Centrifugation: Principle and types of centrifuges - Ultracentrifugation, density gradient centrifugation and continuous centrifugation.

Microscopy: Differential interference contrast (DIC), polarization, fluorescent microscopy, dark field and phase contrast microscopy - Electron microscope- SEM and TEM. Atomic force microscopy, Confocal and Scanning and tunnelling microscope.

Unit 2: Spectrophotometry, Electrophoresis and Separation techniques

Spectrophotometry: Principle – Beer Lambert's Law. UV-IR, FT-oIR, Atomic Absorption Spectroscopy, CD, Stop Flow, Mass, MALDI-TOF and NMR.

Electrophoresis: Principle of Gel electrophoresis, Agarose gel electrophoresis, Polyacrylamide gel electrophoresis (PAGE & SDS PAGE), capillary electrophoresis, two-dimensional electrophoresis, isoelectrofocussing and comet assay.

Chromatography: Principle, procedures and applications of TLC, PC, Gel Filtration and Ion exchange, Affinity Chromatography, GC, GLC, HPLC/FPLC and HPTLC.

Unit 3: Molecular Biological Techniques

Molecular biological techniques: Isolation and amplification of nucleic acid – Genomic DNA (*Escherichia coli*), Plasmid DNA, total RNA, Polymerase Chain Reaction – Types and its applications

Gene cloning techniques: Phosphatase treatment of cloning vectors, use of adapters and linkers in cloning – screening of recombinants – labelling of nucleic acids by radioactive methods – plaque and colony hybridization – Southern blot – Western blot – Northern blot – DNA finger printing and Microarray.

Unit 4: Biostatistics

Biostatistics: Collection and presentation of experimental data - Design of experiments – Randomized Block Design (RBD) and Completely Randomized Block Design (CBD) – Measures of Central Tendency - Arithmetic Mean, Median, Mode, Position of averages, Geometric Mean, Harmonic mean and percentile – Measures of Dispersion - Range, Inter quartile range, variance, standard deviation and standard error.

Correlation and Regression: Correlation coefficient – Types of correlation – Regression – Simple and linear regression – Biological significance of correlation and regression – Tests of significance: Basis of statistical inference – Student's 't' test for mean, difference of means and test for correlation and regression coefficients – Chi-square test – Analysis of variance (ANOVA) and Duncan's Multiple Range Test (DMRT).

Unit 5: Data Collection, Analysis and Research Publications

Data collection and analysis – Web browsing and searching – Electronic biological databases – NCBI, PubMed, Sequence and Structure databases. Ethics in publication – Checking for Plagiarism - Research Publications, Preparation of manuscripts – full paper, short communications and LCD preparations. Review paper, Thesis writing, Bibliography, Index card and Proof reading.

REFERENCES:

1. Batschelet, E. 1991. Introduction to Mathematics for Life Scientists. Springer International Student Edn., Narosa Publishing House, New Delhi.

2. Becker, J.M., Caldwell, G.A. and Zachgo, E.A. 1996. Biotechnology: A Laboratory Course, 2nd Edn. Academic Press, Inc., San Diego, California.

3. Cannel, J.P. 1998. Natural Products Isolation. Humana Press, New Jersey, USA.

4. Chirikjian, J.G.1995. Biotechnology: Theory and Techniques Vol. I. Plant Biotechnology, Animal Cell Culture, Immunobiotechnology. Jones and Bartlett Publishers, London, England.

5. Gibas, C. and Jambek, P. 2001. Developing Bioinformatics Computer Skills. Shroff Publishers, Mumbai.

6. Forthofer, L. 1995. Introduction to Biostatistics, Academic Press, New York.

7. Green, M.R. and Sambrook, J. 2012. Molecular Cloning A Laboratory Manual Vol. 1. (4th Edn.). Cold Spring Harbor Laboratory Press, New York.

8. Gupta, S.C. and Kapoor, V.K. 2002. Fundamentals of Mathematical Statistics (11th Edn.). Sultan Chand & Sons, New Delhi.

9. Gurumani, N. 2006. Research Methodology for Biological Sciences. MJP Publishers. A Unit Tamil Nadu Book House, Chennai.

10. Harborne, J.B. 1998. Phytochemical Methods. Chapman & Hall, London.

11. Jordan, D.W. and Smith, P. 2002. Mathematical Techniques. Oxford University Press, New Delhi.

12. Kothari, CR, Garg G. 2018. Research methodology – methods and techniques. New Age International Publishers, Kochi.

13.Kumar, R. 2014. Research Methodology: A step by step guide for Beginners. SAGE Publications India Pvt. Ltd., New Delhi.

14. Le, C.T. and Eberly, E.N. 2016. Introductory Biostatistics. John Wiley & Sons, Inc., Hoboken, New Jersey, USA.

15. Primrose, S.B. and Twyman, R. B. 2006. Principles of gene manipulation and genomics (7th edn.). Blackwell Publishing, Oxford, UK.

16. Sharma, B.K 1996. Instrumental Methods of Chemical Analysis. Goel Publishing House, Meerut.

17. Snedecor, GW and Cochran, WG. 1967. Statistical methods. Oxford & IBH Pub. New Delhi.

18. Sokal, R. R. and Rohlf, F.J. 1987. Introduction to Biostatistics (Biology- Statistics Series). W.H. Freeman & Company, New York.

19. Wilson, K. and Walker, J. 1997. Practical Biochemistry: Principles and Techniques. Cambridge University Press, Cambridge.

20. Zar, J. H. 2006. Biostatistical Analysis: Prentice-Hall.

NEHRU MEMORIAL COLLEGE (AUTONOMOUS
DEPARTMENT OF BOTANY
(For those who join in 2018 onwards)

Course : M.Phil Botany — Int Marks : 25
Class : M.Phil — Ext Marks : 75
Semester : I — Max Marks : 100
Title of the Paper: **CC-II. Recent Advances in Botany** — Hours /week: 4
Credits : 4

CC-II . RECENT ADVANCES IN BOTANY

Unit I : Molecular Taxonomy

Molecular markers – Random Amplified Polymorphic DNA (RAPD), Restriction Fragment Length Polymorphism (RFLP), Amplified Fragment Length Polymorphism (AFLP), Internal transcribed spacer (ITS), Inter Simple Sequence Repeats (ISSR), Simple Sequence Repeats (SSR), Chloroplast markers – matK, ndh*F*, rbcL, trnH-psbA – SCAR (Sequence Characterized Amplified Region), SSCP (Single-Strand Conformation Polymorphism) - DNA Barcoding - Applications in molecular systematics

Unit II : Plant Genome Organization and Expression

Organization of chloroplast and mitochondrial genome. Nucleus-encoded and chloroplast-encoded genes for chloroplast proteins. Targeting of proteins to mitochondria – Regulation of prokaryotic and eukaryotic gene expression and gene silencing – Genetic Code, Protein Synthesis – Initiation and their regulation – Elongation and Elongation Factors – Aminoacyl-tRNA synthetase, translation, inhibitors, post–translation modification of proteins.

Unit III - Applications of Tissue Culture

Secondary Metabolites – Types – Mevalonate pathway, Malonate pathway and Shikimic acid pathway. Secondary metabolite production through *in vitro* culture – biotransformation of high value metabolites - Biofermentors – Types and design – Industrial scaling – Upstream and downstream processing. Food vaccines, bioplastics, plantibodies, plantigens - Application of tissue culture techniques in agriculture, horticulture and forestry.

Unit IV : Genetic Engineering in Plants

Selectable markers, reporter genes and promoters used in plant vectors – Plant transformation technology – Ti and Ri Plasmids, Mechanism of gene transfer in plants

– Direct gene transfer methods – Electroporation, microprojectile bombardment methods, microinjection. Transgenic plants – virus resistance, pest resistance, herbicide resistance, resistance to fungi and bacteria.

Unit V : Nanobiotechnology

Nanoparticles – definition and historical background. Principles and properties of nanoparticles and nanomaterials. Biological synthesis – biomimetics – Microbial nanoparticle production – Magnetosomes – Bacteriorhodopsins- Nanoproteomics – Role of biomolecules – reducing and/or capping agents: proteins, viruses and carbohydrates. Nanomaterials and their applications.

REFERENCES :

1.Anis, M. and Ahmad, N. 2016. Plant Tissue Culture: Propagation, Conservation and Crop Improvement. Springer, Singapore.

2. Belluci, S. (Ed.). 2009. Nanoparticles and Nanodevices in Biological Applications. The INFN Lectures – Vol. 1. Springer-Verlag, Berlin.

3. Chawla H.S. 2002. Introduction to Plant Biotechnology. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

4. Chrispeels, M.J. and Sadava, D.E. 2002. Plants, Genes and Crop Biotechnology.Jones and Bartlett Publisher, Boston.

5. Govil, CM, Aggsrwal A and Sharma J. 2017. Plant Biotechnology and Genetic Engineering. PHI Learning Pvt. Lted., New Delhi.

6. Hillis, D.M., Moritz, C. & Mable, B.K. (Eds.). 1996, Molecular Systematics. Sinaver Associates, Inc., Publishers, Massachusetts, Sunderland, USA.

7. Lea, P.J. and Leegood, R.C. (Eds.). 1999. Plant Biochemistry and Molecular Biology. Wiley, New York.

8. Mirkin, C.A. and Niemeyer, C.M. (Eds.) (2007). Nanobiotechnology II: More Concepts and Applications. John Wiley & Sons, New York.

9. Murata M. (Ed.). 2016. Chromosome and Genomic Engineering in Plants. Humana Press. New York.

10. Murty, B.S., Shankar, P., Raj, B., Rath, B.B. and Murday, J. 2013. Textbook of Nanoscience and Nanotechnology. Springer-Verlag, Berlin

12.Plummer, D.T. 2004. An Introduction to Practical Biochemistry, 3rd edition. Tata McGraw-Hill Education Pvt. Ltd., New Delhi.

13. Primrose, S.B. 1991. Molecular Biotechnology, 2nd edition. Blackwell Scientific Publications, London, UK.

14. Primrose, S.B. and Twyman, R. B. 2006. Principles of gene manipulation and genomics (7th edn.). Blackwell Publishing, Oxford, UK.

15. Simpson. M.G. 2018. Plant Systematics, 3rd edition. Academic Press Inc., San Diego, USA.

16. Slater, A., Scott, N. and Fowler, M. 2003. Plant Biotechnology: The Genetic Manipulation of Plants. Oxford University Press, Oxford, UK.

17. Westhoff, P., Jeske, H., Jurgens, G., Kloppstech, K. and Link, G. 1998. Molecular Plant Development: From Gene to Plant. Oxford University Press, Oxford, UK.

NEHRU MEMORIAL COLLEGE (AUTONOMOUS
DEPARTMENT OF BOTANY
(For those who join in 2018 onwards)

Course : M.Phil Botany
Class : M.Phil
Semester : I
Title of the Paper: **CC-III (a) . SOIL MICROBIOLOGY**

Int Marks : 25
Ext Marks : 75
Max Marks : 100
Hours /week: 4
Credits : 4

CC-III . SOIL MICROBIOLOGY

UNIT – I:

Soil: Introduction – Physiochemical properties of Soil, Soil water, Structure. Soil Micro organisms: Bacteria, Actinomycetes, Fungi, Algae, Protozoa. Methods used for screening of Soil Microbiological Studies – Streak plate, Pour plate, Spread plate. Molecular methods in Soil microbiology.

UNIT – II:

Organic Matter Decomposition – Humus, Mineralization, Composting, Green manure, Vermicomposting. Organisms involved in organic matter formation – Rhizosphere, Root exudates, Plant growth promoting Rhizobacteria.

UNIT – III:

Biofertilizers: Bacteria, Algae, Fungi (VAM), Phosphate solubilizing micro organisms. Nitrogen fixation by free living bacteria, Mechanism of nitrogen fixation, Symbiotic bacteria, Actinorhizal plants, Isolation, Identification, Mass multiplication of Biofertilizers.

UNIT – IV:

Biopesticides – *Bacillus thuringiensis*, Genetic Engineering of Bt toxin, Baculovirus – Mode of Action, Resistance, Mass production. Interaction among Microbial population: Interaction within a single microbial population – positive and negative interaction, Interaction within a diverse microbial population – Commonsalism, Synergism, Mutualism, Competition, Amensalism, Parasitism and Predation.

UNIT – V:

Biogeochemical Cycles – Carbon, Nitrogen, Oxygen, Phosphorous and Sulphur.Microbial degradation of Polysaccharides, Lignin, Biodetoriation. Microbial Interactions with Xenobiotic Compounds, Mineral nutrition to the plants, Macro and micro nutrients.

REFERENCES:

1. Microbiology by Prescott *et al.,* McGraw Hill International Edition.
2. Microbial Ecology by Atlas and Bartha, Pearson Education International Edition.
3. Molecular Biotechnology – Glick and Pasternak, ASM Press, London
4. Soil Microbiology by N.S.Subba rao, Oxford and TBH Publications, Delhi.
5. Biofertilizers for Sustainable Agriculture by A.K.Sharma, Agrobios Publication, Jodhpur.

NEHRU MEMORIAL COLLEGE (AUTONOMOUS
DEPARTMENT OF BOTANY
(For those who join in 2018 onwards)

Course : M.Phil Botany
Class : M.Phil
Semester : I
Title of the Paper: **CC-III (b) . MOLECULAR GENETICS**

Int Marks : 25
Ext Marks : 75
Max Marks : 100
Hours /week: 4
Credits : 4

CC-III(b). MOLECULAR GENETICS

UNIT- I

Genetics – Historical introduction – Mendelian principles – DNA as a genetic material – Diplex DNA. Chemical composition, Physicall structures of DNA, Circiluar and Superhelical DNA.

UNIT - II

DNA replication – Enzymes of replication – Rolling circle model – DNA damage and Repair. Mutation- Spontaneous – Origin of bacterial mutations – Mutagenesis – Spontaneous and Induced mutations – Physical and chemical agents. Mutant selection – Carcinogenicity testing.

UNIT - III

Genetic transfers in bacteria – Transformation – Transduction and Conjugation. Linkage and genetic maps. Phage genetics, Phage T mutants, Genetic recombination, Genetic mapping of T-4 Phage.

UNIT- IV

Genetic code – Relation between genes and proteins – DNA transcription – RNA translation – Polypeptide synthesis – Rate of Synthesis of Polypeptide Chain – Inhibitors of Protein Synthesis – Central Dogma.

UNIT- V

Regulation of gene activity – Operan model (Lac, Tryp), Autoregulation – translational regulation – RNA Processing – Nucleocytoplasmic mRNA Transport – mRNA Stability and Translation

.

REFERENCES

1. Freifelder. D. 1995, Molecular Biology
2. Maloy, S.R. Cronan. J.E. Jr and David Freidfelder, Microbial genetics, 2 ed.
3. Benjamin Lewin. Genes VII. 1996.
4. Tamarin. R.H. 1996. Principles of Genetics. 5 ed.
5. Klug, W.S. and Cummings. M.R. 1996. Essentials of Genetics.

NEHRU MEMORIAL COLLEGE (AUTONOMOUS
DEPARTMENT OF BOTANY
(For those who join in 2018 onwards)

Course : M.Phil Botany
Class : M.Phil
Semester : I
Title of the Paper: **CC-IV . Teaching and Learning skills**

Int Marks : 25
Ext Marks : 75
Max Marks : 100
Hours /week: 4
Credits : 4

CC-IV . TEACHING AND LEARNING SKILLS

Unit I. Computer Application Skills

Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations-- ICT for Professional Development: Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology for action research, etc.

Unit II : Communications Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

Unit III : Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power

point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion.

Unit IV : E- Learning, Technology Integration and Academic Resources in India

Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning; awareness of e-learning standards- Concept of technology integration in teaching- learning processes; frameworks guiding technology integration (like TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, National academic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

Unit V : Skills of Teaching and Technology based assessment

Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills- Technology for Assessment**:** Concept of assessment and paradigm shift in assessment; role of technology in assessment 'for' learning; tools for self & peer assessment (recording devices; erubrics, etc.); online assessment (open source software's; e-portfolio; quiz makers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics

References:

1.Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi

2. Brandon Hall , E-learning, A research note by Namahn, found in: www.namahn.com/resources/ .../note-e-learning.pdf, Retrieved on 05/08/2011

3. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh

4. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.

5. Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in elearning. Innovations in Education & Teaching International, 43(1), 15-27.

6. Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.

7. Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.

8. Michael, D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New york.

9.Pandey, S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.

10. Ram Babu, A abd Dandapani, S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.

11. Singh, V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.

12. Sharma, R.A., (2006) Fundamentals of Educational Technology, Surya Publications, Meerut

13. Vanaja, M and Rajasekar, S (2006), Computer Education, Neelkamal Publications, Hyderabad.

NEHRU MEMORIAL COLLEGE (AUTONOMOUS
DEPARTMENT OF BOTANY
(For those who join in 2018 onwards)

Course : M.Phil Botany
Class : M.Phil
Semester : II
Title of the Paper: **Projects work & Dissertation**

Int Marks : 00
Ext Marks : 200
Max Marks : 200
Hours /week: 0
Credits : 8

PG & RESEARCH DEPARTMENT OF BIOTECHNOLOGY

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

PUTHANAMPATTI - 621 007

TIRUCHIRAPPALLI

SYLLABUS FOR

MASTER OF PHILOSOPHY IN BIOTECHNOLOGY

(For the candidates admitted from the Academic year 2019 – 2020 onwards)

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

PUTHANAMPATTI – 621 007.

P.G. AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY

M.Phil., BIOTECHNOLOGY PROGRAMME – FT/PT

(For the candidates admitted from the academic year 2019 – 2020 onwards)

Semester I	Title of the course	Marks			Credits
		Int	Ext	Total	
Course-I	Research Methodology	25	75	100	4
Course-II	Advances in Biotechnology	25	75	100	4
Course-III*	i) Agricultural Biotechnology	25	75	100	4
	ii) Pharmaceutical Biotechnology	25	75	100	4
Course-IV	Teaching and Learning Skills	25	75	100	4
Semester II	Dissertation and Viva-Voce	50	150	200	8

Topic of Research –** ***Guide Paper

M.Phil., BIOTECHNOLOGY

Programme Outcomes (POs):

1. Scholars are to be adopted with a new paradigm of self-learning in the form of review of earlier knowledge acquired.

2. Scholars are brought to light from the previous investigation completed to the newer thrusts of knowledge and implementation in research.

3. Scholars are trained to design, implement and evaluate secured information systems with assured quality and efficiency.

4. Scholars are to be oriented towards becoming globally competent.

Programme Specific Outcomes (PSOs):

1.Scholars will produce as Biotechnology professionals with leadership quality in technology, creativity, innovation and entrepreneurship.

2. Scholars are provided with state of the art outcome-based teaching/ learning practices.

3. Scholars will be developed as a research-based education model in Biotechnology.

4. Scholars will have an ability to demonstrate an advanced technical knowledge of Biotechnology.

5. Scholars will have awareness of modern bio-analytical techniques and their limitations.

6. Scholars will be equipped to undertake a research project which requires an understanding of techniques and published literature, originality in the application of knowledge, and some degree of self-direction.

SEMESTER-I

COURSE I: RESEARCH METHODOLOGY

Course Code:	Max Marks: 100
Hours per Week:	Internal Marks: 25
Credits: 4	External Marks: 75

Course Objectives:
To enable the students to

- Give information about basic concept of research and how to write/publish a thesis and its basic steps.
- Critically analyze the separation and characterization techniques.
- Know the statistical problems in biological science, this is useful for the students for their research works.
- Train the scholars to collect, organize and analyze data.
- Learn to apply different statistical/ bioinformatics tools in presenting biological data.

Unit - I

Literature review – sources of information – technical papers – peer reviewed journals-e-journals – citation index – impact factor – reference collection from internet – index card and arrangement of reference collected, Thesis writing – components of a thesis, preparation of research documents (abstracts, papers etc). Planning of research: Research ethics, Research proposals, time scheduling of research, available sources and generation of funds and facilities.

Unit - II

Principles and applications of atomic force microscope, atomic tunneling microscope, cytophotometry and flow cytometry, X-ray diffraction, NMR, and ESR spectroscopy, Mass Spectrometry, GC Mass Spectra, ion exchange and affinity chromatography, thin layer and reverse phase chromatography, High Performance Liquid Chromatography, Gas Chromatography.

Unit - III

Principles and applications of SDS – PAGE, AGE, 2D- gel electrophoresis, gel documentation, Immunoelectrophoresis, Immunodiffusion, Immunoprecipitation – agglutination techniques, Radio Immuno Assay. Southern, Northern and Western blotting techniques and hybridization, PCR, RFLP, RAPD, AFLP, DNA finger printing and DNA sequencing, Micro array technique, gel filtration.

Unit - IV

Databases : DNA and Protein databases, Sequence Analysis, Global and local alignments – Similarity searching – principles and algorithms – Pair wise and Multiple alignments; Data base searching methods; Protein structure prediction: secondary and tertiary structure predictions; protein motifs;– RNA structure analysis – Genome comparisons, phylogeny analysis, pharmacogenomics.

Unit - V

Principles and practice of statistical methods in biotechnological research; collection and tabulation of data; graphical and diagrammatic representation of data; basic statistics; Simple Correlation and regression analyses; significance tests: Chi-squre test, student's t-test, ANOVA, Duncan's Multiple Range Test. Multivariate Analysis: Basic principles and applications of Multiple regression analysis, Cluster Analysis.

Course Outcomes:

- Relate to the learning process of how to write thesis and how to publish papers in various journals.
- Produce transformants by employing the various transfer techniques in the applied research.
- Explain the scope and applications of Biostatistics
- Analyze the recent molecular techniques pertaining to the Biological research.
- Analyze and apply various statistical tools.

TEXT BOOKS:

1. Gurumani, N. 2006. Research methodology for biological science, MJP Publishers, Chennai.
2. Sathyanarayana, U. 2006. Biotechnology. Books and Allied (P) Ltd. India.
3. Dubey, R.C. 2001. A text book of Biotechnology, Rajendra Printers, New Delhi.
4. Das, H.K. 2005. Text book of Biotechnology (2^{nd} edition). Wiley Dream Tech India Pvt Ltd.,New Delhi.

BOOKS FOR REFERENCE:

1. Anderson,J; Durston, D; Poole, M. 1991. Thesis and assignment writing. New Age International Pvt.Ltd, New Delhi.
2. Conference of Biological Editors.2000. Style manual for Biological Journals, American Institute of Biological Science, Washington,D.C.
3. Gurdeep R Chatwal, Sham K Anand. 2007. Instrumental methods of chemical analysis (2^{nd} edition), Himalaya Publishing House.
4. David Freifelder. 1982. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (2^{nd} edition), W.H.Freeman & Co Ltd..
5. Jerrold H. Zar, 2005. Biostatistical Analysis (4^{th} edition) Prentice Hall publishers,

SEMESTER-I

COURSE II: ADVANCES IN BIOTECHNOLOGY

Course Code:	Max Marks: 100
Hours per Week:	Internal Marks: 25
Credits: 4	External Marks: 75

Course Objectives
To enable the students to

- Provide education that leads to comprehensive understanding of the principles and practices of biotechnology.
- Empower students with the ability to think and solve problems in the field of biotechnology.
- Ensure students are able to effectively communicate with biotech and other interdisciplinary professionals.
- Produce responsible biotechnologists that can work within the interdisciplinary framework of biotechnology and related fields.
- Ensure students to gain an insight into the concepts and techniques of Plant, Animal & Microbial biotechnology and its wide industrial & medicinal applications.

Unit – I: Plant Biotechnology: Introduction to plant tissue culture and culture media. Plant transformation technology, Vectors for gene transfer in Plants. Agrobacterium mediated gene transfer, Biolistic transformation. Antisense technology. Transgenic crops for herbicide, pest and abiotic stress resistance. Plantibodies. Terminator gene technology. Biosafety issues, IPR- Copyrights, Trade secrets, Trade Mark, GATT and TRIPS, biopiracy and Bioethics.

Unit – II: Animal Biotechnology: Different cell culture techniques ; Development of cell lines; Characterization and maintenance of cell lines; cryopreservation, Cell cloning and selection; transfection and transformation of cells; Application of animal cell culture for in vitro testing of drugs; Transgenic animal models: gene knock-outs.

Unit – III: Medical Biotechnology: Human health care, genetic disorder, gene therapy, Infectious diseases, DNA- based disease diagnosis, Stem cell therapy, stem cell types- haematopoietic and embryonic – cord blood cells – regenerative medicines. Production of Bioactive Compounds, Drug delivery, Development of recombinant vaccines.

Unit – IV: Industrial Biotechnology: Production of enzymes & organic acids, Downstream processing, Solid state fermentation, Bioprocess monitoring and control, Biocatalysis & Biotransformation, Bioconversion of biomass, Biosensors, Biofuel – bioethanol and biohydrogen, biopolymers. Treatment of industrial effluents – solid waste management – Management of nuclear waste.

Unit – V: Ethical Issues in Biotechnology: Biosafety – Biosafety for human health and environment. Social and ethical issues of biosafety. Use of genetically modified organisms (BT cotton and BT brinjal) and their release into the environment. Special procedures for rDNA based products. Intellectual property rights, patenting (Process and Product). Bioethics - Ethical issues of Synthetic biology and Nanobiotechnology.

Course Outcomes:

- Explain in detail the importance of IPR, antisense technology and plant tissue culture techniques.
- Analyze the animal cell culture methods and gene knock out methods.
- Ability to produce fermented useful products using bacteria.
- Emphasise the importance of bioremediation bacteria and its importance to clean the environment which hamper the society in various ways.
- Understand the knowledge about gene therapy, DNA fingerprinting and human genome project.

TEXT BOOKS:

1. Das, H.K. 2005. Text Book of Biotechnology. Wiley Dream Tech India Pvt. Ltd., New Delhi.
2. Crueger, W. and Crueger, A., 2003. A Text Book of Industrial Microbiology. 2nd edition, Panima Publishing Corporation, New Delhi.
3. Glick, B.R and J.J. Pasternak. 2005. Molecular Biotechnology – Principles and application of recombinant DNA, 3rd edition. ASM press. Washington, USA.

BOOKS FOR REFERENCE:

1. Slater, A. Scot, N. and Fowler, M. 2007. Plant Biotechnology – The genetic manipulation of plants. Oxford press.
2. Watson, J.D; Gilman, M; Witkowshi, J and M.Zollar, 1992. Recombinant DNA, (2nd edition), Scientific American Books, W.H. Freeman and Co; New York, USA.
3. Jogdand, S.N. 2004. Advances in Biotechnology. Himalaya publishing House, Mumbai.
4. Benjamin Lewin. 1999. Genes VII. Oxford University Press, New York.
5. Mathuriya, A.S. 2009. Industrial Biotechnology, 1st edition, Ane Books India Ltd., New Delhi, 2009.

COURSE IV: TEACHING AND LEARNING SKILLS

Course Code:	Max Marks: 100
Hours per Week:	Internal Marks: 25
Credits: 4	External Marks: 75

Course Objectives:

To enable the students to

- Apply and integrate knowledge of teaching and learning skills among scholars.
- Get a fundamental knowledge about basic and advanced teaching methods.
- Understand the role of advanced teaching skills in various institutions.
- Enlighten the scholars with the new information related to teaching technology.
- Teach the scholars understanding development of advanced teaching skills.
- Prepare the scholars e-contents for future use by using various technology.

Unit - I: Computer Applications Skills: Computer system: Characteristics, parts and their functions – Different generations of computer – Operation of computer: switching on/off/restart. Mouse control, Use key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends. Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom.

Unit - II: Communication Skills: Definitions – Elements of communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication – Spoken and Written; Non-verbal Communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

Unit - III: Communication Technology: Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-Content – Satellite-based communication: EDUSAT and ETV Channels. Communication through web: Audio and Video applications on the internet, Interpersonal communication through the web.

Unit - IV: Pedagogy: Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration I tune with the nature of different disciplines – Lecture with power point presentation – Versatility of Lecture technique –Demonstration: Characteristics, Principles, Planning, Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Modes of teaching: CAI, CMI and WBI.

Unit - V: Teaching Skills: Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing, Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills.

Course Outcome:

- Analyze the components of computers and its.
- Enumerate the applications of ICT enabled teaching.
- Explain the scope of teaching skills.
- Emphasise the importance of EDUSAT and ETV Channels and its importance to improve the teaching skills.
- Understand the knowledge on valuation of teaching skills.

TEXT BOOKS:

1. Bela Rani Sharma. 2007. Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi.
2. Don Skinner. 2005. Teacher Training, Edinburgh University Press Ltd., Edinburgh.
3. Kumar, K.L. 2008. Educational Technology, New Age International publishers, New Delhi.

BOOKS FOR REFERENCE:

1. Michael, D and William, K. 2000. Integrating Technology into Teaching and Learning: Concepts and Applications, prentice Hall, New York.
2. Pandey, S.K. 2005. Teaching Communication, Commonwealth Publishers, New Delhi.
3. Ram Babu, A and Dandapani, S. 2006. Microteaching (Vol.1&2), Neelkammal Publications, Hyderabad.
4. Singh, V.K and Sudarshan, K.N. 1996. Computer Education, Discovery Publishing Company, New York.
5. Sharme, R.A. 2006. Fundamentals of Educational Technology, Surya Publications, Meerut.
6. Vanaja, M and Rajasekar, S. 2006. Computer Education, Neelkamal Publications, Hydrabad.

COURSE III: AGRICULTURAL BIOTECHNOLOGY

(Topic of Research)

Course Code:	Max. Marks: 100
Hours per Week:	Internal Marks: 25
Credits: 4	External Marks: 75

Course Objectives:

To enable the students to

- Understand the importance of soil and molecular methods in soil Microbiology.
- Learn the technology of vermicomposting.
- Study the method s of collection of wastes.
- Acquire knowledge on decomposition of organic matter.
- Know the methods of solid waste management.
- Assess the role of microbes in biodegradation and recycling of matters.

Unit – I: Soil: Introduction- Physiochemical properties of Soil, Soil water, Structure. Soil Micro organisms: Bacteria, Actinomycetes, Fungi, Algae, Protozoa. Methods used for screening of Soil Microbiological Studies – Streak plate, Pour plate, Spread plate. Molecular methods in Soil microbiology.

Unit – II: Organic Matter Decomposition: Humus, Mineralization, Composting, Green manure, Vermicomposting: Preparatory methods of vermiculture. Economic and ecological importance of vermicompost and vermi wash. Organisms involved in organic matter formation – Rhizosphere, root exudates, plant growth promoting Rhizobacteria. Waste as a resource organic compost-process of composting. Significance of organic compost.

Unit – III: Biofertilizers: Bacteria (Rhizobium, Azospirrillum and Azotobacter) Blue green algae (Nostoc and Anabaena) Fungi (VAM), Phosphate solubilizing micro organisms. Nitrogen fixation by free living bacteria, Mechanism of nitrogen fixation, Symbiotic bacteria, Actinorhizal plants, Isolation, Identification, Mass multiplication of Biofertilizers.

Unit – IV: Biopesticides – *Bacillus thuringiensis*, Genetic Engineering of Bt toxin, Baculovirus – Mode of Action, Resistance, Mass production. Interaction among Microbial population: Interaction within a single microbial population – positive and negative interaction, Interaction within a diverse microbial population – Commonsalism, Synergism, Mutualism, Competition, Amensalism, Parasitism and Predation.

Unit – V: Biogeochemical Cycles – Carbon, Nitrogen, Oxygen, Phosphorous and Sulphur. Microbial degradation of Polysaccharides, Lignin, Biodetoriation. Microbial Interactions with Xenobiotic Compounds, Mineral nutrition to the plants, Macro and micro nutrients.

COURSE OUTCOMES:

- Demonstrate the molecular methods in soil microbiology.
- Distinguish the microbes involved in organic matter degradation.
- Experiment with the existing applications of microbes and its applications with reference to soil fertility.
- Produce industrial value added products using microbial fermentation at a commercial level.
- Analyze the role of various biogeochemical cycles in the atmosphere.

TEXT BOOKS:

1. Dubey, R.C. 2009. A Text book of Microbiology, S.Chand & Co. Ltd, New Delhi.
2. Sharma, A.K. 2004. Biofertilizers for Sustainable Agriculture. Agrobios Publication, Jodhpur, India.
3. Subba Rao, N.S. 2004. Soil Microbiology by N.S.Subba rao, Oxford and TBH Publications, Delhi.

BOOKS FOR REFERENCE:

1. NIIR Board, 2004, The Complete Technology Book on Biofertilizers and Organic Farming, National Institute of Industrial Research.
2. Bhatnagar, R.K and Palta, R.K. 1996. Earthworm – Vermiculture and Vermicomposting. Kalyani Pyblishers, Ludhiana, India.
3. Gupta, P.K.2005. Vermicomposting for Sustainable Agriculture. Agrobios, Jodhpur, India.
4. Prescott L.M., Harley J.P., Klein D.A., 2006. Microbiology, 6th edition. McGraw – Hill, New York.
5. Glazer and Nikaido, 2007. Microbial Biotechnology, 2nd edition, Cambridge University Press.

COURSE III: PHARMACEUTICAL BIOTECHNOLOGY
(Topic of Research)

Course Code: Max. Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

To enable the students to

- gain the knowledge on importance of pharmaceutical biotechnology
- be familiar with the basics of pharmacodynamics
- be acquainted with drug dosage and drug delivery
- discern pharmaceutical analytical techniques
- acquire knowledge about biotransformation.

Unit – I: Pharmaceuticals: Pharmaceuticals: Pharmaceutical products – importance of pharmaceutical biotechnology. Microbes in pharmaceutical industry: Applications of microbes - products. Secondary metabolites: Types - pharmaceutical importance. Drug discovery: Target discovery - target validation - assay development – screening - clinical trials.

Unit – II: Pharmacodynamics and Pharmacokinetics: Pharmacodynamics: Principle - mechanism of drug action. Pharmacokinetics: ADME properties - Mechanism of drug absorption - active - passive diffusion. Distribution of drugs: Plasma protein binding - factors affecting drug distribution. Biotransformation of drug metabolism: Phase I and Phase II reactions. Excretion of drug: Renal excretion – factors affecting excretion.

Unit – III: Drug delivery: Pharmaceutical dosage: Materials – formulations - manufacture of tablets. Delivery of biopharmaceuticals: Oral delivery system – pulmonary delivery system. Drug delivery system: Controlled drug delivery system - transdermal system - protein as drug delivery system. Drug delivery and development: Liposomes – liposomal drug delivery system – advantages and disadvantages.

Unit – IV: Analytical techniques: Chromatography techniques: Principle - procedure - applications of gel filtration - ion exchange - HPLC – GC-MS. Spectrophotometry: Principle – procedure - applications of flame emission - atomic absorption – fluorimetry. Pharmacogenomics: Drug interaction - applications. Personalized medicine: Definition - case studies on gene related diseases.

Unit - V: Biotransformation: Biotransformation of therapeutic agents: Production of aspirin - tissue Plasminogen activator – flucanozole. Production and purification of antibiotics: Streptomycin - chloramphenicol – safety – efficacy – US-FDA regulations. Monoclonal antibody in therapy: Antibody screening – therapeutic applications of monoclonal antibodies. Gene therapy: Basic approach to gene therapy – gene therapy of HIV.

COURSE OUTCOMES:

- Explain the importance of secondary metabolites and its applications in pharma industries.
- Understand the concepts of Pharmacodynamics and Pharmacokinetics.
- Analyze the Drug delivery systems and their development.
- Elucidate various analytical techniques in Pharmaceutical Biotechnology.
- Discuss the production and purification methods of antibiotics.

TEXT BOOKS:

1. Kumar, M., 2010. Pharmaceutical Biotechnology, 1st edition, Anmol Publication Pvt. Ltd., New Delhi, 2010.
2. Jogdand, S.N., 2005. Medical Biotechnology, 1st edition, Himalaya Publishing House, Mumbai, 2005.

BOOKS FOR REFERENCE:

1. Kulkarni, J.S., Pawar, A.P. and Shedbalkar, V.P., 2012. Biopharmaceutics and Pharmacokinetics, 1st edition, CBS Publishers and Distributers, New Delhi.
2. Nallari, P. and Rao, V.V., 2010. Medical Biotechnology, 1st edition, Oxford University Press, New York.
3. Walsh, G., 2011. Pharmaceutical Biotechnology, 1st edition, CBS Publishers and Distributers, New Delhi.
4. Wilson, K. and Walker, J., 2010. Principles and Techniques of Biochemistry and Molecular Biology, 6th edition, Cambridge University Press, London.

II Semester

Project Work
Total Marks = 200
(Thesis = 150 marks; Viva - voce = 50 marks)

BLUE PRINT OF THEORY QUESTION PAPER FOR BOTH FULL TIME AND PART TIME

Question Paper Pattern

I Semester:

External: Total 75 Marks

Theory Paper

Section A : 10 Questions x 2 Marks = 20 Marks (Two Questions from each unit will be asked) Answer all the questions. Define each question in four or six sentences.	20
Section B: 05 Questions x 5 Marks = 25 Marks (Internal choice (or) Either or type and one set of questions from each unit will be asked) Answer all the questions in 500 -700 words, draw diagram wherever necessary.	25
Section C: 03 Questions x 10 Marks = 30 Marks (5 questions will be asked and one question from each unit will be asked) (Answer any THREE questions only) Write the answer in 1500 words, draw diagram wherever necessary.	30
Total	**75**

Internal: Total 25 Marks

CIA Components	Portions to be covered	Question Paper pattern to be followed	CIA Marks allotted
CIA Test – I	First 2½ Units	Same as Autonomous Examination Question Paper	10
CIA Test – II	Remaining 2½ Units		
Attendance	---	---	05
Assignments (2)	Any topics from five Units	---	05
Seminar (1)		---	05
		Total	**25**

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)
(Accredited with 'A' Grade by NAAC)
PUTHANAMPATTI - 621 007
M.Phil. (Commerce) (FT/PT) (w.e.f.2019-2020 onwards)
Course structure &scheme of Examinations
(For the candidates Admitted from the Academic year 2019-2020 onwards)

Semester	Course	Title of the papers	Marks		
			CIA	F.E	Credit
I	CC-I	Research Methodology	40	60	4
	CC –II	Advanced Financial & Marketing Management	40	60	4
	EC- III	Entrepreneurial development	40	60	4
		Personnel Management	40	60	4
		Marketing Management	40	60	4
		Corporate Finance	40	60	4
	CC- IV	Teaching and Learning Skills	40		
II		Dissertation	50	150	8

(Thesis 150+Viva-Voce 50)

CIA—Continuous Internal Assessment

F.E—Final Examination

CC - I: RESEARCH METHODOLOGY

Objective
At the end of this course, students will be able to ❖ Understand some basic concepts of research and its methodologies ❖ Identify appropriate research topics ❖ Select and define appropriate research problem parameters ❖ Prepare a project proposal ❖ Write report thesis

UNIT -I	Foundations of Research: Meaning, Objectives, Ethics, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process, Research Methodology and Design; Approaches – selection of problem – Techniques involved in defining a problem – concept of Research Design – Basic Principles – Concepts – types.
UNIT -II	Sampling Design – Steps – Criteria in selecting a sample – Types of sampling design – Sampling error - Scaling techniques – rating scale – attitude scales –Likert, Thurstone and Guttman scales.
Unit -III	Technique of survey and data collection - Primary and secondary data - design of questionnaire and schedules – interview technique – experimental and case study - pilot study –processing of data – Tabulation – Internet sources – Data bases – Websites available for data collection.
Unit- IV	Formulation of Hypothesis – Null and Alternative Hypothesis – Analysis of data – statistical tools for analysis – Frequency distribution – Mean – Standard deviation – correlation - regression – Factor analysis – ANNOVA - F test, t test , z test - and interpretation of data through SPSS.
Unit -V	Report writing – Meaning – Techniques and precautions – Significance of report writing – Target audience – Different steps in writing report – Layout of research report – Types – Mechanism of report writing.Use of

	tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.

Reference Books:

- Kothari C.R. Research Methodology : Method and Techniques, Wiley Eastern Ltd., New Delhi
- Amarchand D. Research Methods in Commerce – Emerald Publishers, Chennai
- Rigley, Paul: Conceptual foundations of Business Research – John Wiley and Sons, NewYark
- Tandon B.C. Research Methodology in Social science.
- Anderson J.Berry H.D&Poole M. Thesis and Assignment writing M.Wiley Eastern. Limited New Delhi
- Krishnasamy O.R. Research Methodology in Business, Himalaya Publishing House.
- Emory – Business Research Models.
- Murdick _ Business Research Concept and practice.
- Goode & Had – Methods of social Researcvh Mc Graw Hill.

CC-II: ADVANCED FINANCIAL AND MARKETING MANAGEMENT

Objectives
At the end of this course, students will be able to ❖ Understand some basic concepts of financial management ❖ Identify appropriate marketing structure ❖ Select and define appropriate marketing research parameters ❖ Understand buyer behavior

UNIT- I	Fifty years of development in Finance – Relationship between Risk and value additivity – Markowitz and birth of portfolio theory – capital Asset Pricing Model – Capital budgeting - Techniques – Uncertainties.
UNIT -II	Financial decision – theories of capital structure – trading on equity – EBIT – EPS analysis- analysis of internal and external financial methods – capital structure planning in practice – determinants – financial planning - over capitalization – under capitalization. (Problem and theory).
UNIT –III	Financing Decision and Market Efficiency – Efficient Market Hypothesis – corporate Financing – Interaction between Investment and Financing Decisions.
UNIT-IV	Market structure – Kinds – channel policy and selection criteria – market measurement and forecasting – segmentation and Targeting the market – distribution policy – features of middlemen –Understanding the Buyer: Roles in consumer decision making – influences on Buyer behavior – tools to study Buyers behavior.
UNIT-V	Marketing research and contemporary Issues in marketing: Objectives and methods of marketing research – major Issues of research – methodology for research – questionnaires – interview methods – measurement of scaling techniques and data analysis. Global marketing – rational – principal driving forces - product strategy and organization for global marketing –WTO –recent development.

Reference books:

- IM.pandey,Financial management, vikas 1999.
- Brealey 7 Myers, principles of corporate Finance, McGraw Hill 1990.
- Prasanna Chandra Financial management – Tata McGraw Hill 2004.
- khan & Jain Financial management – Vikas publishing House – 2004.
- Van Horne – Financial management and policy – PHL New Delhi – 2004.
- SN Maheswari – Financial management - Sultan chan company New Delhi – 2004.
- Sharma & Kupta Financial management – kalyani publishers Ludhiana – 2004.
- Cundiff, Still &Covoni:"Fundamentals of Modern marketing" (Prentices Hall of India) – New Delhi2004.
- Philip Kotler – marketing of the New Millennium" (Prentices Hall of India) – New Delhi2004.
- W.stanton –Marketing Management - Tata McGraw Hill, New Delhi 2004.

EC-I: ENTREPRENEURIAL DEVELOPMENT

Objective
At the end of this course, students will be able to ❖ Understand some basic concepts of Entrepreneurship ❖ Identify entrepreneurial traits ❖ Select appropriate source of finance ❖ Plan various marketing channels

UNIT- I	Entrepreneurial culture – Meaning – Stages in the entrepreneurial process - Barriers to entrepreneurship – socio-economic origins of entrepreneurship – Environmental factors affecting entrepreneurship – Entrepreneurial structures – characteristics of entrepreneurship – Conceptional model – views of Schumpeter – walker and Drucker - Theories of entrepreneurial origin – Entrepreneurs.
UNIT -II	Entrepreneurial traits and motivation : Entrepreneur and enterprise – Entrepreneurs and managers – Traits of a true entrepreneurs – Types of entrepreneurs – Functions of an entrepreneur – Behavioural patterns of entrepreneurs – Motivating factors.
UNIT -III	Sources of project Finance : Sources of finance – Capitalstructure planning – Financial leverage – cost of capital – project finance – Term loans – Lease finance – working capital – Sources capitilisation – over and under capitalization – Bridge finance – Venture capital.
UNIT- IV	Marketing channels – Concept of marketing channel – significance of channel – Need and functions - Channel design – Strategy and choice of channel – Setting quality channels.
UNIT -V	Entrepreneurial Development Programmes : Concept of entrepreneurial development – Need for training and development – Phases of entrepreneurial development – Contents of training programme – Problems in institutional framework.

Reference books:

- Desai V. 2000 Entrepreneurial Development Bombay, Himalaya Publishing House
- Gupta C.B. and Srinivasan N.P. 2000 Entrepreneurial Development New Delhi, Sultan Chand & Sons
- Saravanavel, 2000, Entrepreneurial Development New Delhi Sultan Chand & co

EC-II: PERSONNEL MANAGEMENT

Objective
At the end of this course, students will be able to ❖ Understand some basic concepts of Personnel Management ❖ Identify Procurement of Man power planning ❖ Select appropriate training methods ❖ Evaluate performance appraisal ❖ Able to settle various grievances

UNIT- I	Definition of Personal Management – Evolution and Growth of personnel management – Qualities of a good personnel management- professionalization – future of personnel management in India. Planning and organizing the personal function – operative and Managerial function.
UNIT -II	Procurement of Man power planning – Procurement of personnel – Kinds or quality of personnel – job Analysis – Job Description – Recruitment Policy – Sources of Recruitment – Selection – Recruitment and selection practices in India.
UNIT -III	Development of employees: Orienting and Training employees – New employees orientation – Training needs Assessment – Training practices in India – Principles of learning- Identifying and Developing management Talent – Development Programmes.
UNIT- IV	Performance Appraisal : Purpose of Appraisal – Factors affecting performance appraisal – Essentials of a good appraisal methods – Criteria of performance appraisal – Performance criteria for operatives – for Frontline supervisors- Limitations of performance appraisal.
UNIT -V	Grievance and Discipline : Causes of Grievance redressal procedure – The Open door policy – Settlement of Grievance in Indian Industry.

Reference books:

- Dale Earnest ‘Management Theory and practice’ McGraw Hill
- Bearly & Mayers ‘Principles of Corporation McGraw Hill
- Lawrence, A Ralt, Robert & Hurdick & Fred E.Schuster ‘Human Resource Management’: A behavioural system approach Richard D.Irwin, Homewood, Illinois
- Philip Kotler ‘Marketing management, Analysis, Planning & control Prentice Hall
- Aswathappa K. Human Resources Management , Himalaya, Bombay
- Tripathi ND., Personnel Management and Industrial Relations, S.Chand

EC-III: MARKETING MANAGEMENT

Objective
At the end of this course, students will be able to ❖ Understand some basic concepts of marketing ❖ Plan for new product development ❖ Select appropriate pricing decision ❖ Plan various channel.

UNIT -I	Evolution of Marketing : Modern views on marketing – The core concepts of Marketing – Marketing environment – Marketing strategy – Consumer Behaviour – Market Segmentation – Marketing information system and Marketing Research.
UNIT- II	Product Decision: Product Mix decision, Product Positioning life cycle, Marketing strategies on for introduction Growth, maturity and declining stages – New product development process – various stages in new product development process.
UNIT -III	Pricing Decisions: Pricing Objectives, Policies – Strategies – Selecting a pricing method – New product pricing – Pricing strategies for different stages in the Life Cycle of a product, Skimming pricing strategies – Penetration pricing strategies.
UNIT -IV	Channel Decision : Role of distribution channels – Channel functions – Channel levels – Channel management Decisions – Factors Governing Choice of channel – Selection of channel for new product of new company – E marketing.
UNIT- V	Promotional Decisions: Promotion decision – Communication process – Promotional mix- Advertisement – Sales – promotion and public relations – Managing the sales force Rationale for Global Marketing Impact of ICT on Global Marketing Importance of Rural Marketing in India Concept and Strategy of Green Marketing.

Reference books:

- Philip Kotler – Marketing Management analysis planning and control(prentice Hall)
- Condiff Still and Govoni – Fundamentals of Modern Marketing(Prentice Hall)
- Mandell and Rosenbverg – Marketing (Prentice Hall)
- J.C.Gandhi – Marketing A Managerial Introductiion Tata Mc Graw Hill
- D.Amarchand B.Varadharajan – Introduction to Marketing (Vikas)

EC-IV: CORPORATION FINANCE

Objective
At the end of this course, students will be able to ❖ Understand some basic concepts corporation finance ❖ Identify various sources and forms of finance ❖ Select appropriate financial intermediaries ❖ Review Global financial market

UNIT -I	Financial Environment - Finance – Economics and Accounting – An overview of finance functions – Legal Operative and Tax Environment of the firm. Financial plan – need theories, capitalization over and under capitalization – capital structure corporate share capital, debt capital and Leverages.
UNIT- II	Sources and forms of finance – Source of long-term finance, long- term debt – characteristic of long-term financing, term loans corporate bonds, Investment Banking – Preferred and common stock –leasing – convertible warrants options. Sources of short term financing – Spontaneous sources, unsecured source and secured source.
UNIT -III	Financial Intermediaries Markets and Interest rates – Money market – capital market – Interest rates – Required returns, International Financial Market.
UNIT -IV	Multinational Finance – Global Financial Markets – Exchange Rates and International Monetary system procedure for analyzing potential foreign investment – Management of foreign Assets, International capital market.
UNIT- V	Finance and Financial Institutions – Factors responsible for Growth of Institutional Financial Institutional Agencies for supply of Finance to the Industries. Regulations on Financing by financial institutions – Commiottees on regulation finance – Regulations on Stock markets. Recent reforms in stock Market – SEBI.

References books:

- H.B.Mayo – Finance an Introduction – Dryden Press
- S.C.Dachall – Corporation Finance – Chaiutany Publication
- J.C.Vanhorne – Financial Management and policy – Eastern Economy edition – Eight edn 1985
- Scall Haley – Introduction to Financial Management – Mc Graw Hill Book Company 2nd Edn 1986
- Lareence J.Gitman – Principles of Managerial Finance – Haper International Edn 1985
- E.F.Brighem – Fundamentals of Financial management – Dryden Press 1980
- R.M. Srivastava – Essentials of Business Finance – Himalay Publishing house 1986.

CC-IV: TEACHING AND LEARNING SKILLS

Objective
At the end of this course, students will be able to ❖ Understand some basic concepts of teaching and learning skills ❖ Identify various elements of communication ❖ Select appropriate communication Technology ❖ Review various pedagogy

UNIT- I	New Trends in Learning and Teaching : Learner's characteristics – Factors affecting learning – Methods of teaching – Factors affecting teaching – Teaching aids – Evaluation systems – ICT in teaching and learning –ICT for research – on line journal & E-book review - E-content development.
UNIT -II	Communication : Definition – Elements of communication – Nature – Characteristics – types- Barriers and effective classroom communication – Skills of communication – Listening- speaking – reading and writing.
UNIT- III	Communication Technology: Bases Trends and developments – Skills of using communication technology – EDUSAT - and ETV channels, communication through web Audio and video applications on internet ,Interpersonal communication through web.
UNIT- IV	Pedagogy: Instructional Technology – Definition, objectives, and Types – Difference between teaching and Instruction -Lectures Techniques – Steps, Planning of a lecture, delivery of a lecture – narration in tune with the nature of different disciplines – lecture with power point presentation – versatility of Lecture techniques – Demonstration: Characteristics, Principles, planning, implementation and evaluation – teaching learning techniques : Team teaching , Group discussion, seminar, workshop, conference, symposium, and panel discussion – Modes of teaching CAI, CMI and WBI.
UNIT -V	Teaching skills: Definition, meaning and nature- types of teaching skills – skill of set induction, skill of stimulus variation, skill of explaining, skill of probing questions, skill of black board writing and skill of closure- Integration of teaching skills – Evaluation of teaching skills.

Reference books:

- Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, sarup and sons, New Delhi
- Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh.
- Information and Communication Technology in Education: A Curriculum for schools and Programme of Teacher development, Jonathan Anderson and Tomvan Weart, UNESCO, 2002
- Kumar, K.L.(2008) Educational Technology, New Age International Publishers, New Delhi
- Mangal, S.K. (2002) Essential of Teaching—Learning and information Technology, Tandon Publications, Ludhiana
- Michael, D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York.
- Pandey S.K (2005) Teaching Communications, Commonwealth Publishers, New Delhi
- Ram Babu, A and Dandapani, s (2006) Microteaching (vol. 1& 2), Neelkammal Publications, Hyderabad
- Singh V.K and Sudarshan K.N(1996), computer Education, Discovery Publishing Company, New York
- Sharma, R.A (2006) Fundamentals of Educational Technology, Surya Publications, Meerut
- Vanaja, M and Rajasekar, s (2006), Computer Education, Neelkamal Publications, Hyderabad

CURRICULUM FRAMEWORK AND SYLLABUS FOR

MASTER OF PHILOSOPHY (M.PHIL) IN COMPUTER SCIENCE

For the students admitted from the Academic Year 2019-2020 onwards

BASED ON CHOICE BASED CREDIT SYSTEM (CBCS) AND OUTCOME BASED EDUCATION (OBE)

2019-2020

Submitted to Academic Council

POST GRADUATE AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

NEHRU MEMORIAL COLLEGE

[Nationally Accredited with 'A' Grade by NAAC]
An Autonomous College affiliated to Bharathidasan University

Puthanampatti—621 007

[Board of Studies meeting was held on 21.09.2018 and approved by academic council on 10.04.2019]

M.Phil Computer Science

VISION

Provide quality research in Computer Science and to be recognized as an international research programme

MISSION

To excel in research and innovation that discovers new knowledge and enables to develop new methodologies and models

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The scholars of M.Phil Computer Science programme will be able to

PEO1: understand the principles and methodologies of research

PEO2: identify the critical and relevant research problems in Computer Science

PEO3: undertake the research for professional carriers to meet the needs of the society

PEO4: apply the acquired knowledge for implementation of their research

PEO5: motivate and inspire the students to pursue their doctoral programmes

PROGRAMME OUTCOME (PO)

PO1: Scientific Knowledge
Apply the knowledge, methods and techniques to solve real world research problems

PO2: Problem Analysis
Analyze the research problems and interpret the data relevant to the research

PO3: Design and Development of Solution
Design the appropriate methods or techniques to solve the research problems

PO4: Conduct investigations of complex problems
Ability to design algorithms using research based knowledge and methods

PO5: Modern tool usage
Develop a model and implement the methodology using the available research tools

PO6: Life long learning
Extend life long learning in the field of research in order to undertake and solve the various challenging research problems

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: Understand the concepts, techniques and methods of research methodology

PSO2: Apply the techniques and algorithms to develop solutions to research problems

PSO3: Design techniques or methods to solve the complex problems in the field of research

PSO4: Implement and test the solutions developed for the research problems

Programme Structure

a. Programme Duration:

Full Time: One year

Part Time: Two years

b. System followed: Semester

c. Medium of Instruction: English

d. Credit System:

Total number of credits: 24

e. Eligibility criteria for admission to the programme:

M.Sc. Computer Science

Master of Computer Application

M.Sc. Information Technology

M.Phil - Internal and External Assessment

Internal Assessment – 25 Marks

CIA Test (Mid and End Semester)	**-**	**10 Marks**
CIA Test I – for first two and half units		
CIA Test II – for remaining two and half units		
Attendance	**-**	**05 Marks**
Seminar	**-**	**05 Marks**
Assignment	**-**	**05 Marks**
Total	**-**	**25 Marks**

External Assessment – 75 Marks

Question Paper Pattern for CIA Test and External Assessment:

Section A: 10 Questions x 2 Marks = 20 Marks

(Two Questions from each unit)

Section B: 5 Questions x 5 Marks = 25 Marks

(Internal Choice and one question from each unit)

Section C: 3 Questions x 10 Marks = 30 Marks

(Answer any three out of 5 questions and one question from each unit)

POST GRADUATE AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Phil PROGRAMME IN COMPUTER SCIENCE [CBCS]

[For the candidates admitted from 2019-2020]

Sem	Course	Title	Credit	Marks		Tot
				CIA	SE	
I	Core Course I	Research Methodology	4	25	75	100
	Core Course II	Advanced Topics in Computer Science	4	25	75	100
	Core Course III	Teaching and Learning Skills	4	25	75	100
	Core Course IV	Paper on Topic of Research	4	25	75	100
II		Dissertation & Viva Voce (150 + 50)	8	-	200	200
		Total	24			600

Core Course IV - Paper on Topic of Research

a. Big Data Technology and Analytics
b. Wireless Communication and Networks
c. Cloud Computing
d. Web Mining
e. Data Mining and Warehousing
f. Cryptography and Network Security
g. Machine Learning
h. Social Network Analytics

Course Code & Title	CC-I Research Methodology	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K1 –** Recall **K2 –** Understand **K3 –** Apply **K4 –** Analyze **K5 –** Evaluate **K6 –** Create	
Learning Objectives	**This Course aims to** • classify and analyze various types of algorithms • learn the various probability distributions and statistical tests • study the mathematical logics and optimization algorithms • know thesis writing • prepare research articles for journal publications .	

Unit-I Analysis of Algorithm

Algorithm specification – Performance Analysis – Randomized Algorithm –General Methods - Divide and Conquer method – Greedy method – Dynamic Programming -Basic Traversal and Search Techniques –Backtracking –Branch and Bound –NP hard and NP Complete problems.

Unit-II Probability and Analysis of Experiments

Introduction to Probability –Probability Distribution: Binomial –Poisson –Uniform – Exponential and Normal –Analysis of Variance (ANOVA) – Nonparametric Tests: One Sample Test -Two Sample Test - Basic Multivariate Analysis: Correlation Analysis.

Unit-III Mathematical Logic

Propositions - evaluation - precedence rules -tautologies - reasoning using equivalence transformation - laws of equivalence - substitution rules - a natural deduction system. Deductive proofs - inference rules - proofs - sub proofs- The predicate calculus – statement functions, variables , quantifiers, Predicate formulae – Theory of Inference – Formulae involving more than one quantifier.

Unit-IV Evolutionary Optimization Algorithms

Genetic Algorithm-Mathematical Models of Genetic Algorithm-Genetic Programming-Evolutionary Programming-Simulated Annealing-Ant Colony Optimization-Particle Swarm Optimization- Biogeography based Optimization.

Unit-V Thesis Writing

Introduction to Research – Defining the research problem – Research Ethics - Research Design – Planning the Thesis – Writing Journal Articles – Publication of papers - Writing the Thesis – Referencing.

Books for Study:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekaran, " Computer Algorithms/C++", Second Edition, Universities Press(India) Private Ltd,2008,ISBN-10: 092930642,ISBN-13: 978-0929306421
2. R.Pannerselvam, "Research Methodology", Prentice Hall of India , second Edition, New Delhi,2013, ISBN-30:978-812034 -9469
3. David Gries, "The Science of Programming", Narosa Publishing House, New Delhi, 1993,ISBN-10: 038790641X,ISBN-13: 978-0387906416
4. Dan Simon, "Evolutionary Optimization Algorithms", Wiley, Black wheel ,2013,ISBN-B:978-0470-937419.
5. Jonathan Anderson, Millicent.Poole, "Assignment & Thesis Writing ", 4th Edition ,Wiley India Pvt Ltd.,2011, ISBN-30:978-81265-3075.

Books for Reference:

1. Nikalaus Wirth , "Algorithms and Data Structures", Mc Graw–Hill International Edition, 1985.
2. Kothari C.R , "Research Methodology – Methods and Techniques", New Age International, New Delhi, 2011.
3. R.Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011.
4. J. P Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science ", McGraw – Hill International Edition, 1987.
5. Zobel Justin, "Writing for Computer Science", Springer Publications, 2004.

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify and understand the performance of the algorithms **-K1,K2**
CO2: apply different statistical test to research problems **-K3**
CO3: analyze the research problems using mathematical tools **-K4**
CO4: develop new algorithms and compare with existing **-K5, K6**
CO5: write thesis and research articles **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	M	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S
CO5	S	S	S	M	M	S	S	S	S	S

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Dr.S.Murugan & Dr.K.Mani
Verified by	Dr.M.Muralidharan

Course Code & Title	CC-II Advanced Topics in Computer Science	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K1 –** Recall **K2 –** Understand **K3 –** Apply **K4 –** Analyze **K5 –** Evaluate	
Learning Objectives	**This Course aims to** • learn evolution of big data, need for big data and big data analytics • know the characteristics of cloud computing, technologies, platform, storage and various cloud services • gain knowledge in soft computing through Aritificial Intelligence, Fuzzy Sets and Neural Networks • study the concept of machine learning and its algorithms • attain the knowledge on IoT	

Unit-I Bigdata

Classification of Digital Data - Characteristics of Data - Evolution of Big Data - Definition of Big Data - Challenges with Big Data - What is Big Data – Need of Big Data – Consumer or producer of Big data – business Intelligence - Data Warehouse Environment- Hadoop Environment - Big Data Analytics : Big Data Analytics - Classification of Analytics - Greatest Challenges that Prevent Businesses from Capitalizing on Big Data - Challenges in Big Data – Importance of Big Data Analytics - Technologies in Big data - Data Science - Basically Available Soft State Eventual Consistency (BASE) -Big data Analytics Tools

Unit-II Cloud Computing

Characteristics of cloud computing - cloud deployment Model - Cloud Service models - Cloud concept and technologies: virtualisation - load balancing - scalability and elasticity – deployment - replication – monitoring - identity and access management - Service level agreements - billing - Cloud services and platforms: classification of cloud services – computing - storage – database - application - Analytics - network and deployment services

Unit-III Soft Computing

Introduction - Software computing constituents of conventional AI – Fuzzy set theory: Fuzzy sets – Fuzzy rules and Fuzzy relationship – Neural Networks: Introduction – Architecture - Back propagation for feed forward networks – Perceptions

Unit-IV Machine Learning

Machine Learning: Examples of Machine Learning Applications:Classification-Regression-Unsupervised Learning - Reinforcement Learning- Supervised Learning: VC Dimension - PAC Learning - Noise - Learning Multiple Classes - Regression - Model Selection and Generalization - Dimensions of Supervised Machine Learing Algorithm - Bayesian Decision Theory: Classification - Losses and Risks - Discriminant Functions -Clustering: Mixture

Densities - *k*-Means Clustering - Expectation-Maximization Algorithm - Mixtures of Latent Variable Models - Supervised Learning after Clustering - Hierarchical Clustering

Unit-V Internet of Things

Putting the Internet of Things forward to the Next Level - Internet of Things Strategic Research and Innovation Agenda : Internet of Things Vision - Internet of Things Strategic Research and Innovation Directions - IoT Smart X Applications - Network and Communications - Processes - Data Management - Security, Privacy and Trust - IoT6 Architecture - DigCovery - IoT6 Integration with the Cloud and EPICS – Enabling Hetrogeneous Integration - IoT6 Smart Office Use Case - Scalability Perceptive

Books for Study:

1. Seema Acharya, SubhashiniChellappan, "Big Data and Analytics", Wiley India Pvt. Ltd, New Delhi, First Edition, 2015, ISBN: 978-81-265-5478-2
2. ArshdeepBahga, VijayMadisetti, "Cloud Computing – A Hands on Approach", University Press, 2015, ISBN - 978-8173719233
3. J.S.R Jang, C.T Sun and E.Mizutani, "Neuro – Fuzzy and Soft Computing – A computational Approach to Learning and Machine Intelligence", PHI Learning Private Ltd., New Delhi,2012,ISBN-10: 9332549885,ISBN-13: 978-9332549883
4. Ethem Alpaydin, "Introduction to Machine Learning",3rd Edition, Prentice Hall, New Delhi ,2015.Jason Bell,"Machine Learning for Big Data",Wiley Publication,2014.
5. Vidiu Vermesan and Peter Fries, "Internet of Things - From Research Innovation to Market Deployment", River Publishers, 2014.

Books for Reference:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
2. Arshdeep bahga , Vijay madisetti ," Cloud computing A hands on approach**",** Universities Press (India) private limited ,2013.
3. Prasant kumar pattnaik, Rajib Mall, "Fundamentals of mobile computing", PHI Learning Pvt. Ltd. New delhi-2012.
4. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking: Techniques and Applications", 2011 print, Springer Science, ISBN: 978-1-4419-7735-9 (Chapters 1,2,4,5 & 6)

Web Reference:

1. https://kkpatel7.files.wordpress.com/2015/04/alppaydin_machinelearning_2010.pdf
2. http://www.internet-of-things-research.eu/pdf/IERC_Cluster_Book_2014_Ch.3_SRIA_WEB.pdf

Course Outcomes:

On completion of the course, the students will be able to

CO1: apply various KDD process in bigdata **-K1, K2**
CO2: understand the basics of cloud computing and services **-K2**
CO3: apply neuro-fuzzy soft computing techniques to solve research problems **-K3**
CO4: understand and compare various machine learning algorithms **-K4**
CO5: identify IoT architecture and cloud service **-K2**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	M	M	M	S	S	S	M	M	M
CO2	S	M	S	M	S	S	S	S	M	M
CO3	S	S	M	M	S	S	S	S	S	M
CO4	S	S	S	S	S	S	S	S	M	M
CO5	S	S	S	M	S	S	S	S	M	M

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Dr.K.Mani, Dr.D.Jayachitra, Mrs.V.Priya & Ms.P.Kalpana
Verified by	Dr.S.Murugan

Course Code & Title	CC - III Teaching and Learning Skills	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K2 –** Understand **K3 –** Apply **K4 –** Analyze **K 5 –** Evaluate	
Learning Objectives	**This Course aims to** • acquaint the integration of ICT in teaching and learning • acquire the knowledge of communication skill with special reference to its elements, types, development and styles • attain the knowledge of Instructional Technology and its applications • appreciate and use e-learning resources available • develop different teaching skills for putting the content across to target audience	

Unit I : Computer Application Skills

Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations - ICT for Professional Development : Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology for action research, etc.

Unit II : Communications Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

Unit III : Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion.

Unit IV : E- Learning, Technology Integration and Academic Resources in India

Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning; awareness of e-learning standards- Concept of technology integration in teaching- learning processes; frameworks guiding technology integration (like TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, National academic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

Unit V : Skills of Teaching and Technology based assessment

Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills- Technology for Assessment: Concept of assessment and paradigm shift in assessment; role of technology in assessment 'for' learning; tools for self & peer assessment (recording devices; e-rubrics, etc.); online assessment (open source software's; e-portfolio; quiz makers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics.

Books for Reference:

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi 2. Brandon Hall , E-learning, A research note by Namahn, found in: www.namahn.com/resources/ .../note-e-learning.pdf.
2. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
3. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.
4. Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in elearning. Innovations in Education & Teaching International, 43(1), 15-27.
5. Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.
6. Learning Management system: https://en.wikipedia.org/wiki/Learning_management_system
7. Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.
8. Michael, D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New york.
9. Pandey, S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.
10. Ram Babu, A abd Dandapani, S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.
11. Singh, V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.
12. Sharma, R.A., (2006) Fundamentals of Educational Technology, Surya Publications, Meerut

13. Vanaja, M and Rajasekar, S (2006), Computer Education, Neelkamal Publications, Hyderabad.

Course Outcomes:

On completion of the course, the students will be able to

CO1: use instructional technology effectively in a classroom **-K2**
CO2: mastering over communication process **-K3**
CO3: apply lecture techniques and evaluation **-K3**
CO4: understand and use e-learning tools **-K4**
CO5: evaluate the methods to be applied **-K5**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	M	M	W	S	S	M	M	M
CO2	S	M	S	S	S	S	S	S	S	S
CO3	S	S	M	M	S	W	S	S	M	M
CO4	S	S	M	S	S	M	S	S	M	S
CO5	S	S	S	M	M	M	S	S	M	M

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Course Code & Title	CC – IV a Big Data Technology and Analytics	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K1 –** Recall **K2 –** Understand **K3 –** Apply **K4 –** Analyze **K5 –** Evaluate **K6 –** Create	
Learning Objectives	**This Course aims to** • understand the basics of Big Data • obtain the knowledge of Big Data mining • state the importance of context in Big Data, Text categorization and Muliti-label Big Data mining • acquire skill on High Dimensional Data clustering for Big Data • study Machine Learning and Incremental Leaning with Big Data	

Unit - I

Introduction to Big Data: Introduction - Definition for Big Data - Mining Unstructured data: Challenges and Modern Techniques - Unstructured Data Mining Applications- Context Building - Building Application and Dealing with Big data - Big data and Learning - Analytics and Big Data - Text Analytics and Big Data - Understanding Text Analytics - Business Intelligence products to handle Big Data - Unstructured Data Mining and Classification Methods - Big Data and Machine Learning Trends. **Data Mining and Modelling:** Introduction - Data Models - stages of Data Mining - Data Mining and knowledge Recovery - Aspects of Data Mining - Data Mining Approaches - Crawling the web and Information Retrieval.

Unit - II

Big Data Mining - Application Perspective: Introduction - Big Data Mining - Data Mining with Big Data - **Long Live the Kind of Big Data - The Context:** Introduction to context - context and unstructured Big Data - Use of Contextually enabled data - context issue in Big Data with unstructured Big Data- Context Types - Context in User Data - Contextual Analytics - Advantages of Contextual Analytics - Using Apache-Hadoop for Context Aware Recommendation System.

Unit - III

Big Data, Text Categorization and Topic Modelling: Introduction - Corpus representation - Context based Learning - Gate JAPE Rules - Topic Modelling - Situation Modelling - Big Data and Text Classification. **Multi-label Big Data Mining:** Introduction - Phases in Multi-label Unstructured Text Mining - Graph based model- Graph representation - Text Operation using Graph Model

Unit -IV

Distributed High Dimensional Data Clustering for Big Data: Introduction - Applications of Distributed subspace clustering - High Dimensional Data Clustering - Dimensionality reduction - subspace clustering - Distributed Systems - Types of Distributed Databases - Types of Transmission of Data - Distributed Clustering - Text data Clustering - Data Representation for Clustering Text Data - Text Clustering System - Subspace clustering in Text Data - Big data Clustering

Unit - V

Machine Learning and Incremental Learning with Big Data: Introduction - Machine Learning: Concepts - Big Data and Machine Learning - Incremental Learning - Incremental Learning for Knowledge Building - Incremental Techniques to Handle Big Data - Applications.

Books for Study:

1. Parag Kulkarni, Sarang Joshi and Meta S. Brown, "BIG DATA ANALYTICS ",PHI Learning Private Limited, New Delhi, 2016

Books for Reference:

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, " Big Data for Dummies", A Wiley Brand, 2013, ISBN:978-1-118-50422-2.
2. Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, "Understanding Big Data", Tata McGraw Hill publishing Limited, ISBN:978-0-07-179053-6.

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify the need for big data analytics	**-K1, K2**
CO2: apply and evaluate techniques for mining big data	**-K3, K5**
CO3: analyze the research problems using bigdata	**-K4**
CO4: build distributed data cluster	**-K6**
CO5: understand big data with machine learning algorithms	**-K2**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	M	M	W	S	S	M	M	M
CO2	S	S	S	S	M	S	S	S	S	S
CO3	S	S	M	M	S	S	S	M	M	M
CO4	S	S	M	S	S	S	S	M	M	S
CO5	S	S	S	M	M	S	S	M	M	M

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Ms.P.Kalpana
Verified by	Dr.D.Jayachitra

Course Code & Title	CC – IV b Wireless Communication and Networks	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K1 –** Recall **K2 –** Understand **K3 –** Apply **K6 –** Create	
Learning Objectives	**This Course aims to** • understand the basics of global cellular network • study wireless communication technology and networking • obtain the knowledge of wireless networking • define and describe cordless system and wireless local loop • gain the skill on wireless LAN	

Unit-I Introduction

The Cellular Revolution – The Global Cellular Network – Broadband – The Trouble with wireless – Technical Background:- Transmission Fundamentals: Signals for Conveying Information – Analog and Digital Data Transmission – Channel Capacity – Transmission Media – Multiplexing .

Unit-II Wireless Communication Technology

Antennas and Propagation: Antennas – Propagation Modes – Line-of-Sight Transmission – Fading in the Mobile Environment – Signal Encoding Techniques: Signal Encoding Criteria – Digital Data, Analog Signals – Analog Data, Analog Signals – Analog Data , Digital Signals.

Spread Spectrum:The Concept of Spread Spectrum – Frequency Hopping Spread Spectrum – Direct Sequence Spread Spectrum – Code-Division Multiple Access – Generation of Spreading Sequences – **Coding and Error Control**: Error Detection - Block Error Correction Codes – Convolutional Codes – Automatic Repeat Request

Unit-III Wireless Networking

Satellite Communications: Satellite Parameters and Configurations – Capacity Allocation-Frequency Division – Capacity Allocation-Time Division

Cellular Wireless Networks: Principles of Cellular Networks – First Generation Analog – Second Generation TDMA – Second Generation CDMA – Third Generation Systems

Unit-IV Cordless System and Wireless Local Loop

Coreless Systems – Wireless Local loop – IEEE 802.16 fixed Broadband Wireless Access Standard **- Mobile IP and Wireless Access Protocol:** Mobile IP – Wireless Application Protocol

Unit-V Wireless LAN

Wireless LAN Technology- Infrared LANs – Spread Spectrum LANs – Narrowband Microwave LANs – IEEE 802.11 Wireless LAN Standard: IEEE 802 Protocol Architecture – IEEE 802.11 Architecture and Services - IEEE 802.11 Medium Access Control - IEEE 802.11 Physical Layer

Bluetooth:

Radio Specification – Baseband Specification – Link Manager Specification – Logical Link Control and Adaptation Protocol.

Books for Study:

1. William Stallings , Wireless Communications and Networks ,second Edition,Pearson Education,2004
2. Kaveh Pahlavan, Prashant Krishnamurthy ,Principles of Wireless Networks –Printice – Hill of India Private Ltd. New Delhi. 2004

Books for Reference:

1. Jon W.Mark,Weihna Zhuang, "Wireless Communications and Networking", Second Edition, , John Wiley &Sons Inc 2002.
2. Theodore S.Rappaport "Wireless Communications Principles & Practices" Prentice Hall, Jan 2002.

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify and understand cellular network and wireless communication **-K1,K2**
CO2: apply wireless communication technologies to research problems **-K3**
CO3: understand satellite communications and cellular wireless network **-K2**
CO4: learn cordless system **-K2**
CO5: design and modify WLAN protocols **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	W	S	S	M	M	M
CO2	S	S	S	S	W	S	S	S	S	S
CO3	S	S	M	S	W	M	S	S	M	M
CO4	S	S	M	S	M	W	S	S	M	M
CO5	S	S	S	S	M	M	S	S	S	S

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Mrs.V.Priya
Verified by	Dr.S.Murugan

Course Code & Title	CC – IV c Cloud Computing	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K1 –** Recall **K2 –** Understand **K3 –** Apply **K4 –** Analyze **K6 –** Create	
Learning Objectives	**This Course aims to** • learn the cloud computing architecture and model • acquire the knowledge on cloud hardware and software infrastructure • understand the operating system of cloud services • obtain the skill on cloud programming paradigm • attain the knowledge on security services on cloud	

Unit-I

Cloud Architecture and Model: Cloud Computing – Overview – System Models for Distributed and Cloud Computing – Cloud Models: Characteristics– Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions Cloud ecosystem – Service management – Computing on demand- Applications- Intranets and the Cloud– Cloud Computing Services– Discovering Cloud Services- Development Services and Tools.

Unit-II

Cloud Infrastructure**:** Cloud hardware and infrastructure-clients-network-services-platforms-cloud storage- Layered Cloud Architecture Development - Cloud software architecture issues- Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

Unit-III

Operating System for the Cloud - Application Patterns and Architecture – Case Studies-Cloud Computing services available under various platforms.

Unit-IV

Programming Model: Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative Map Reduce – Hadoop Library from Apache.

Unit-V

Security In The Cloud: 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.

Books for Study:

1. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, "Cloud Computing Principles and Paradigms", John Wiley and Sons, Inc, 2011.

Books for Reference:

1. George Reese, "Cloud Application Architectures", O'Reilly Media, Inc, First Edition, 2009.
2. Michael Miller, "Cloud Computing: Web based Applications That Change the Way You Work and Collaborate Online", QUE Publishing, 2009.

Course Outcomes:

On completion of the course, the students will be able to

CO1: understand cloud basics, architecture, applications and its services **-K1,K2**
CO2: understand and apply cloud services **-K3**
CO3: analyze the cloud computing service under various platform **-K4**
CO4: learn and apply hadoop map reduce **-K3**
CO5: design and develop secured cloud service **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	S	S	S	M	S	S	S	S	S
CO3	S	S	M	M	S	M	S	M	M	M
CO4	S	S	M	S	M	W	S	M	M	S
CO5	S	S	S	M	M	M	S	M	M	M

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Dr.D.Jayachitra
Verified by	Mrs.V.Priya

Course Code & Title	CC-IV d Web Mining	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K1 –** Recall **K2 –** Understand **K3 –** Apply **K6 –** Create	
Learning Objectives	**This Course aims to** • learn the basics of information retrieval • understand social network analysis • attain the skill on web crawling • state opinion mining • gain the knowledge on web usage mining	

Unit-I

Information Retrieval and Web Search: Basic Concepts of Information Retrieval - Information Retrieval Models - Text and Web Page Pre-Processing - Inverted Index and Its Compression - Latent Semantic Indexing - Web Search - Meta-Search: Combining Multiple Rankings - Web Spamming.

Unit-II

Social Network Analysis: Social Network Analysis - Co-Citation and Bibliographic Coupling – PageRank – HITS - Community Discovery.

Unit-III

Web Crawling: A Basic Crawler Algorithm - Implementation Issues - Universal Crawlers - Focused Crawlers - Topical Crawlers.

Unit-IV

Opinion Mining and Sentiment Analysis: The Problem of Opinion Mining - Document Sentiment Classification - Sentence Subjectivity and Sentiment Classification - Aspect-Based Opinion Mining - Mining Comparative Opinions - Opinion Search and Retrieval - Opinion Spam Detection.

Unit-V

Web Usage Mining: Data Collection and Pre-Processing - Data Modeling for Web Usage Mining - Discovery and Analysis of Web Usage Patterns - Recommender Systems and Collaborative Filtering - Query Log Mining.

Books for Study:

1. Bing Liu,"Web Data Mining Exploring Hyperlinks, Contents, and Usage Data", Second Edition, 2011 print, Springer ISBN 978-3-642-19459-7.

Books for Reference:

1. Soumen Chakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", 2002 print, Morgan Kaufmann Publishers, ISBN: 978-1-55860-754-5
2. Matthew A. Russell, "Mining the Social Web", 2nd Edition, O'Reilly Media Publications, October 2013 print, ISBN-13: 978-1449367619
3. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking: Techniques and Applications", 2011 print, Springer Science, ISBN: 978-1-4419-7735-9

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify the functionality of web crawling and web usage mining **-K1,K2**
CO2: understand and analyze the web data **-K2**
CO3: analyze the algorithms to mine social media content **-K3**
CO4: understand and apply opinion mining on web data **-K3**
CO5: develop new algorithms to mine the web with web usage mining **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	S	S	M	M	S	S	S	S	S
CO3	S	S	M	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Dr.K. Sridevi
Verified by	Dr.M.Muralidharan

Course Code & Title	CC-IV e Data Mining and Warehousing	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K1 –** Recall **K2 –** Understand **K3 –** Apply **K4 –** Analyze **K5 –** Evaluate **K6 –** Create	
Learning Objectives	**This Course aims to** • describe data mining and data preprocessing • understand association rule mining • obtain the knowledge on classification and prediction • acquire the skill on cluster analysis • state the model and methods of data warehouse	

Unit-I Data Mining & Data Preprocessing

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization

Unit–II Association Rule Mining

Introduction - Data Mining Functionalities - Association Rule Mining - Frequent Item set Mining Methods: Apriori Algorithm: Finding Frequent Item sets using Candidate Generation- Generating Association Rules from Frequent Itemsets- A Pattern-Growth Approach for Mining Frequent Itemsets.

Unit–III Classification & Prediction

Classification vs. Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines – Associative Classification – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit-IV Clustering:

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint- Based Cluster Analysis – Outlier Analysis

Unit-V Data Warehouse

Data Warehousing - Operational Database Systems vs. Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP Operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools.

Books for Study

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" , Second Edition, Elsevier, Reprinted 2008., ISBN 13: 978-1-55860-901-3

Books for Reference:

1. K.P. Soman, Shyam Diwakar and V. Ajay, "Insight into Data mining Theory and Practice**",** Easter Economy Edition, Prentice Hall of India, 2006., ISBN-10: 8120328973; ISBN-13: 978-8120328976
2. G. K. Gupta, "Introduction to Data Mining with Case Studies**"**, Easter Economy Edition, Prentice Hall of India, 2006., ISBN-10: 8120343263; ISBN-13: 978-8120343269

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify the KDD process and data preprocessing **-K1,K2**
CO2: apply the techniques in association rule in data mining **-K3**
CO3: apply the algorithms in classification and prediction **-K4**
CO4: develop new algorithms in clustering **-K5**
CO5: build the knowledge of data warehousing in forming data warehouses **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	M	M	S	S	S	M	M	M
CO4	S	S	M	S	S	S	S	M	M	S
CO5	S	S	S	M	S	S	S	M	M	M

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Dr.D. Jayachitra
Verified by	Dr.S.Murugan

Course Code & Title	CC- IV f Cryptography and Network Security	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K1 –** Recall **K2 –** Understand **K3 –** Apply **K4 –** Analyze **K5 –** Evaluate **K6 –** Create	
Learning Objectives	**This Course aims to** • identify types of attacks and security mechanisms • learn symmetric key algorithms • attain the skill on digital certificates • understand user authentication and Kerberos • state the protocols on network security	

Unit-I

Security Goals :Types of Attacks – Services and Mechanisms – Techniques - Cryptography Concepts and Techniques :Introduction – Plain Text and Cipher Text – Substitution Techniques – Transposition Techniques – Encryption and Decryption – Symmetric and Asymmetric Key Cryptography – Steganography – Key Range and Key size.

Unit-II

Symmetric Key Algorithms:Introduction – Algorithms types and Modes – Data Encryption Standard (DES) – International Data Encryption Algorithm (IDEA) – Blowfish-AES-Asymmetric Key Algorithms and Digital Signatures:Introduction – The RSA Algorithm – Digital Signatures

Unit- II

Digital Certificates and Public Key Infrastructure (PKI):Introduction – Digital certificates – Private Key Management – XML, PKI and Security. Internet Security Protocols :Introduction – Basic Concepts – Secure Socket Layer (SSL) – Secure Electronic Transaction (SET) –SSL Versus SET- Email Security – WAP Security.

Unit–IV

User Authentication and Kerberos: Introduction – Authentication Basics – Passwords – Authentication Tokens – Certificate based Authentication – Biometric Authentication – Kerberos – Cryptographic Solutions – Key Management.

Unit-V

Network Security : Introduction -Firewalls –IP Security- Trusted Systems .Case Studies: Cookies and Privacy

Books for Study:

1. William Stallings ,"Cryptography and Network Security", Seventh Edition, Pearson Prantice Hall,2016.

Books For Reference:

1. Bruce Schneier, "Applied Cryptography Protocols, Algorithms", Second Edition, , John Wiley &Sons Inc 2002.
2. Richard E.Smith, "Internet Cryptography" ,Addison –Wasley Professional Aug 1997.
3. Atul Kahate, "Cryptography and Network Security", Second Edition, Tata McGraw-Hill Publishing Company Limited, 2008
4. Behrouz A. Forouzan, "Cryptography and Network Security", Tata McGraw-Hill Publishing Company Limite,2007.

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify various algorithms to secure data on network **-K1,K2**
CO2: apply network security algorithms to research problems **-K3**
CO3: analyze the algorithms to enhance the security of network **-K4**
CO4: compare the authentication services and enhance **-K5**
CO5: design algorithms of their own to enhance network security **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	M	M	S	M	S	M	M	M
CO4	S	S	M	S	M	W	S	M	M	S
CO5	S	S	S	M	S	M	S	M	M	M

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Dr.S.Murugan
Verified by	Dr.K.Mani

Course Code & Title	CC – IV g Machine Learning	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K1 –** Recall **K2 –** Understand **K3 –** Apply **K4 –** Analyze **K6 –** Create	
Learning Objectives	**This Course aims to** • learn the basics of concept learning and algorithms • study decision tree learning and comparison of algorithms • understand Bayesian learning • gain the knowledge on instance based learning • attain the skill on analytical learning	

Unit- I:

Well-Posed Learning Problems – Designing a Learning System – Perspective and Issues in Machine Learning – Concept learning Task –Concept Learning as search – Version Spaces and the candidate Elimination Algorithm – Remarks on Version Spaces and Candidate – Elimination – Inductive Bias.

Unit- II:

Decision Tree Learning- Representation- Appropriate problems for decision tree learning – Basic Decision Tree Learning Algorithm - Hypothesis Space Search –Inductive Bias –Issues in Decision Tree Learning – Evaluating Hypothesis – Motivation – Estimating Hypothesis Accuracy – Basics of sampling theory – A general approach for deriving confidence intervals – Difference in Error of two hypothesis – Comparing learning algorithms

Unit- III

Bayesian learning – Bayes theorem –Bayes theorem and concept learning –Bayes Optimal Classifier – Gibbs algorithm – Naive Bayes classifier – Bayesian belief networks – EM algorithm – Computional Learning theory –Probably leraning an approximately correct hypothesis – Sample Complexity for finite hypothesis Spaces - Sample Complexity for infinite hypothesis Spaces – The mistake bound model of learning

Unit-IV

Instance Based learning – K-nearest neighbor learning – locally weighted regression – radial basis function – case based reasoning – remarks on lazy and eager learning –Learning sets of rules – Sequential covering algorithm – learning rules sets –learning first order rules – learning sets of first order rules(FOIL) – Induction as inverted Deduction –Inverting resolution

Unit-V

Combining Inductive and analytical learning –Inductive analytical approaches to learning – using prior knowledge to initialize the hypothesis – Using prior knowledge to alter the search objective- Using prior knowledge to augment search – Reinforcement Learning – Learning task - Q-learning – Nondeterministic rewards and actions – temporal difference learning-generalizing from examples –relationship to dynamic programming

Books for Study:

1. Tom M.Mitchell, "Machine Learning", McGraw-Hill, First Edition,2013, ISBN :0070428077

Books for Reference

1. Ethem Alpaydin, "Introduction to Machine Learning",3rd Edition, Prentice Hall, New Delhi ,2015.Jason Bell,"Machine Learning for Big Data",Wiley Publication,2014.

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify the basics of machine learning and algorithms **-K1,K2**
CO2: apply decision tree learning **-K3**
CO3: analyze and understand Bayesian learning **-K4**
CO4: apply instance based leaning to research problems **-K3**
CO5: design new machine learning algorithms **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	M	S	S	M	S	S	S	S	S
CO3	S	S	S	M	S	S	S	M	M	M
CO4	S	S	S	S	S	S	S	M	M	S
CO5	S	S	S	S	S	S	S	M	M	M

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Dr.M.Muralidharan
Verified by	Dr.K.Mani

Course Code & Title	CC – IV h Social Network Analytics	
M.Phil	**Semester I**	**Credit 4**
Cognitive Level	**K1 –** Recall **K2 –** Understand **K3 –** Apply **K4 –** Analyze	
Learning Objectives	**This Course aims to** • understand the components of the social network • model and visualize the social network • mine the users in the social network • understand the evolution of the social network • know the applications in real time systems	

Unit I

Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks.

Unit II

Modeling and Visualization: Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix-Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data **–** Random Walks and their Applications –Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships.

Unit III

Mining Communities: Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

Unit IV

Evolution: Evolution in Social Networks – Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation – Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction – Bayesian Probabilistic Models - Probabilistic Relational Models.

Unit V

Applications:A Learning Based Approach for Real Time Emotion Classification of Tweets, A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments, Explaining Scientific and Technical Emergence Forecasting, Social Network Analysis for Biometric Template Protection

REFERENCES:

1. Ajith Abraham, Aboul Ella Hassanien, Vaclav Snasel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2012
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1st edition, 2011
3. Charu C. Aggarwal, "Social Network Data Analytics", Springer; 2014
4. Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.
5. Guandong Xu , Yanchun Zhang and Lin Li, "Web Mining and Social Networking-Techniques and applications", Springer, 1st edition, 2012
6. Peter Mika, "Social Networks and the Semantic Web", Springer, 1st edition, 2007.
7. Przemyslaw Kazienko, Nitesh Chawla, "Applications of Social Media and Social Network Analysis", Springer,2015

Course Outcomes:

On completion of the course, the students will be able to

CO1: understand the internals components of the social network **-K1,K2**
CO2: apply social network model and visualizations **-K3**
CO3: analyze the mining communities in the social network **-K4**
CO4: understand evolutions of social networking **-K2**
CO5: learn the real time application of social networks **-K2**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
CO1	S	S	M	M	W	S	S	M	M	M
CO2	S	M	S	S	W	S	S	S	S	S
CO3	S	S	M	M	S	S	S	M	M	M
CO4	S	S	M	S	M	S	S	M	M	S
CO5	S	S	S	M	M	S	S	M	M	M

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Dr.K.Sridevi
Verified by	Dr.D.Jayachitra

M.Phil. CHEMISTRY SYLLABUS

(For the candidates admitted from the academic year 2019 – 2020 onwards)

(Under Choice Based Credit System)

PG Department of Chemistry

Nehru Memorial College (Autonomous),

(Affiliated by Bharathidasan University)

(Accredited with 'A' grade by NAAC

Puthanampatti – 621 007

Eligibility: M.Sc. Chemistry

PROGRAMME OBJECTIVES:

- To impact advance knowledge of chemistry in different subjects which are required to understanding philosophy of chemistry.
- To train post graduates capable of undertaking higher level chemical research.
- To produce skilled postgraduates who can act in the increasingly wide research area of chemistry.
- To practice innovative teaching methods to communicate clearly and effectively, orally and in writing.
- This programme can also be extended to PhD studies by the addition of one year's worth of research.

PROGRAMME STRUCTURE

NEHRU MEMORIAL COLLEGE (AUTONOMOUS). PUTHANAMPATTI – 7

M.Phil. CHEMISTRY (FT/PT) Programme

(For the candidates admitted from the academic year 2019 – 2020 onwards)

COURSE STRUCTURE

SEMESTER – I	COURSE TITLE	MARKS			CREDITS
		IA	UE	TOT	
COURSE – I	Research Methodology	25	75	100	4
COURSE – II	Physical Methods in Chemistry	25	75	100	4
COURSE – III	Teaching and Learning Skills	25	75	100	4
COURSE – IV	Elective – (Any one)	25	75	100	4
	Elective Papers 1. Chemical kinetics 2. Phytochemistry and Natural products 3. Advanced Inorganic chemistry 4. Co-ordination Chemistry and Spectroscopy 5. Advanced Organic and medicinal Chemistry				

SEMESTER – II

Dissertation and Viva – Voce	Viva Voce – 50 Marks Dissertation – 150 Marks	200(150+50)	8

Course code & Title	**PAPER – I: RESEARCH METHODOLOGY**		
M.Phil. Chemistry	**Semester -I**	**Credits: 4**	**Hrs/Wk: 6**
Cognitive Level	**K1 Acquire** **K2 Understand** **K3 Apply** **K4 Evaluate** **K5 Analyze**		
Course Objectives	The course aim • Develop skills of literature survey, Research proposal and preparation records • Appreciate the role of statistical tools for research • Acquire the knowledge of computer in chemistry and separation techniques • To get knowledge in laboratory practices and safety • To familiarize the project management		

UNIT – I - RESEARCH METHODOLOGY:

Meaning, Scope, Primary sources of literature survey, Journals, patents etc., secondary sources of literature survey, Books, Reference books, Text books, listing of letters. **Research problem**: meaning of research problems, sources of research problems, criteria / characteristics of a good research problem, errors in selecting a research problem and research ethics. **Hypothesis**: Meaning, types of hypothesis. **Developing a Research Proposal**: Format of research proposal, individual research proposal and institutional proposal. **Research Report**: Format of the research report, style of writing the report, references and bibliography **Preparation of Records** – Manuscripts – Research Paper formats in Indian J.Indian Chem. Soc., Tetrahedran, etc.,

UNIT – II – STATISTICAL TOOLS OF RESEARCH

Types of Error – Accuracy, precision, Significant figures-Tests for accuracy of results-positive and negative deviation from accuracy. Distributions- Binomial, Gaussian, etc., The normal distribution of random errors-mean value-Variance-Standard deviation-reliability interval – t-test-F-test. Regression-standard deviation-Correlation coefficient-Multiple linear regression-Observation. Inference-Hypothesis generation-Testing of Hypothesis. Evolving and modifying Rules & Theories.

UNIT – III – COMPUTER APPLICATIONS IN CHEMISTRY

Introduction to computers – history of development of computers. Main frame, mini, micro and super computer systems. Computer hard ware CPU, input, output devices, auxiliary storage devices, interpreter, compiler, machine language, assembly language, high level languages. Operating systems-MS DOS, windows, UNIX. Languages – C Language & programming – constants, variable functions– Logical & arithmetic statements. Simple programming examples from chemistry Temperature conversion, C_v of solids(C_v at $T < 30$ K and at $T > 30$K), Activity coefficient of Electrolytes, Rate constants of I & II order reactions, Calculation of Arrhenius parameters. Introductory Operatives – Package, MS word, MS Excel, MS power Point – preparing scientific manuscripts.

UNIT - IV – GOOD LABORATORY PRACTICES AND SAFETY

Introduction: History, definition, principles, Good laboratory practices (GLP) training: Resources, Rules, characterization, Documentation, quality assurance. **Facilities:**building and equipment, personal, GLP and FDA, European Union, non-member countries. Stepwise implementation of GLP and compliance monitoring.

Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation, safe storage and use of hazardous chemicals, procedures for working with substances that pose hazards, flammable or explosive hazards, procedures for working with gases at pressure above or below atmospheric – 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 sewer system, in incineration and transportation of hazardous chemicals.

UNIT- V: PROJECT MANAGEMENT

Need for project management, project management approaches, project development stages, work breakdown structures.

Time, cost quality and risk management, tools and techniques for project management, cost estimation and budgeting, monitoring controlling and closure, continual improvement.

Text Books

1. Research Methodology. Methods and Techniques : C. R. Kothari,
2. Tests, Measurements and Research Methods in Behavioural Sciences : A. K.Singh
3. March J, 1996, "Advanced Organic Chemistry Reactions, Mechanisms and Structure." 5th ed, New York, Wiley.
4. D.B.Hibbert and J. J. Googling, Data Analysis for Chemistry, Oxford University Press, 2006.
5. J. Topping, Errors of Observation and Their Treatment, Fourth Edn., Chapman Hall. London, 1984.
6. S.C. Gupta, Fundamentals of Statistics, Sixth Edn.,Himmalaya Publ. House, Delhi, 2006.
7. H. E. Solbers, Inaccuracies in Computer Calculation of Standard Deviation, Anal. Chem.. 55, 1611 (1983).
8. P.M. Wanek et al., Inaccracies in the Calculation of Standard Deviation with Electronic Calculators, Anal. Chem. 54, 1877 (1982).
9. A. M. Cogill and L.R. Gardson, The ACS Style Guide – Effective Communication of Scientific information, 3rdEdn., Oxford University Press, 2006.
10. H. Bell and J. Trimbur, A short Guide to Writing about Chemistry, 2ndEdn, Longman, 2001.
11. Handbook Good Laboratory Practice (GLP) Quality Practices for Regulated Non-Clinical, Research and Development.
12. . Good Laboratory Practice Standards: Applications for Field and Laboratory Studies (ACS Professonal Reference Book) by Willa Y. Gamer, Maureen S. Barge, and James,.P
13. Chemical safety matters – IUPAC – IPCS, Cambridge Univ. Press, 1992.
14. James P. Lewis, Fundamentals of Project Management. 3rd Edition, AMACOM, 2006.

References

1. http://www. Virtualref.com/govdocs/s189.htm
2. http://www.inflibnet.ac.in
3. http://www.springerlink.com
4. http://rsc.org
5. http://www.pubs.acs.org
6. http://dspaace.org
7. http://dspace.bdu.ac.in
8. B.S. Furniss. A.J. Hannaford, P. W. G. Smith, A.R. Tatchell, Vogel's Text Book of Practical Organic chemistry, 5th Edition, Pearson, New Delhi9, 1989.
9. V. K. Srinivasan and K. K. Sreinivastave, Intoduction to Chromatography, S.Chand& Co., New Delhi, 2nd edition, 1981.
10. C. H. Hamann, A. Hammett and W. Vilelstich, Electrochemistry, Wiley – VCH, 1998.
11. A.J. Bard and L.F. Faulkner, Electrochemmical methods – Fundamentals and Applications, 2ndEdn., Wiley-VCH, 1998.
12. A. C. Fisher, Electrode Dynamics, Oxford University Press, 1996.
13. J. Koryta and K. Stulik, Ion-Selective Electrodes, Cambridge University Press 1983.
14. Christopher.M.A and Ana Maria Oliveira Brett,:Electroanlysis" Oxford Univeristy Press, Oxford, 1998.
15. Daniel C. Harris, "Quantitative Chemical Analysis", Third Edn., W.H. Freeman and Company New York, 1996.
16. A. J. Bard L.F. Faulkner, Electro Chemical methods – Fundamentals and Applications, Second Edn., Wiley-VCH, 1998.
17. Joseph Wang,"analytical electrochemistry", Second Edn., Wiley-VCH, 2001.

Course outcomes:

- The scholars will know the different routes to design a research problem
- General terminology including various methods for the research shall be the outcome of the course.
- To improve the numerical aptitude and computational knowledge in the basic of collection and presentation of data.
- The scholars will acquire knowledge of safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents.

Course code & Title	PAPER – II: Advanced Physical Methods in Chemistry		
M.Phil. Chemistry	Semester -I	Credits: 4	Hrs/Wk: 6
Cognitive Level	**K1 Acquire** **K2 Understand** **K3 Apply** **K4 Evaluate** **K5 Analyze**		
Course Objectives	The course aim • Develop skills of instruments and apply them in research • Appreciate the role of spectroscopy in research • To familiarize in EPR spectroscopy in research • To get knowledge in XRD studies • Acquire the knowledge of spectroscopy and Nano chemistry		

UNIT – I

UV Visible spectroscopy – Instrumentation. Microstates- Term symbols and energy levelsfor d^1 - d^9 ions in cubic and square fields. Intensity of bands - group theoretical approach toselection rules - effect of distortion and spin orbit coupling on spectra - Evaluation of 10 Dqand βvalues for octahedral complexes of cobalt and nickel. Application to simple coordination compounds. Applications to organic compounds and calculation of λ_{max} - charge transfer spectra.

IR and Raman spectroscopy – Instrumentation. Combined uses of IR and Raman spectroscopyin structural elucidation of simple molecules like N_2O, ClF_3, NO_3^-, ClO_4^-. Predicting IR bandsfor simple organic molecules - effect of coordination on ligand vibrations - uses of group vibrations in the structural elucidation of metal complexes of urea, thiourea, cyanide, thiocyanate, nitrate, sulphate and dimethyl sulfoxide. Effect of isotopic substitution on the vibrational spectra of metal carbonyls with reference to the nature of bonding, geometry and number of C-O stretching vibrations (group theoretical treatment). Applications of Raman Spectroscopy. Photo electron spectroscopy - Principle - Auger electron spectroscopy-electron spectra in chemical analysis.

UNIT – II – ADVANCED RESONANCE SPECTROSCOPY

NMR of paramagnetic molecules- isotropic shifts contact and pseudo contact interactions - lanthanide shift reagent. Characteristics of quadrupolar nucleus - effect of field gradient and magnetic field upon quadrupolar energy levels - NMR transitions applications – Basic principles and applications of NQR.

^{1}H NMR: Long-range coupling – Homotopic, enentiotopic and diastereotopic systems – Conformationally mobile, open chain systems. Virtual coupling – Coupling of proton to fluorine, phosphorous. Nuclear Overhauser effect.

^{13}C NMR: Off resonance decoupling – Coupling of carbon to deuterium, fluorine, phosphorus – DEPT – Application of proton and carbon data in identifying small organic compounds. 2D NMR: Principles of 2D NMR spectroscopy: ^{1}H – ^{1}H COSY, ^{1}H – ^{13}C COSY, HMBC and HSQC.

UNIT – III

EPR spectroscopy - Factors affecting the magnitudes of g and A tensors in metal species. Zero field spitting and Kramer's degeneracy- spectra of V(II) , Mn(II), Fe(II), Co(II), Ni(II) andCu (II) complexes- applications of EPR to few biological molecules containing Cu(II), Fe(II)and Fe(III) ions - spin densities and McConnel relationship. Applications of EPR to somesimple systems such as CH_3, p-benzosemiquinone. Xe^{2+}.

Moss Bauer spectroscopy - Isomer shifts - magnetic interactions - Mossbauer emissionspectroscopy - application to iron and tin compounds.

Mass spectrometry - Instrumentation - resolution, EI and CI methods - base peak, isotopicpeaks, metastable peak, parent peak, determination and use of molecular formula,recognition of molecular ion peak - FAB Fragmentation - general rules - pattern offragmentation for various classes of compounds, McLafferty rearrangement, Importance ofmetastable peaks.

UNIT IV

Diffraction Methods - Crystal symmetry - combination of symmetry elements – crystalclasses - screw axis and glide planes - space group - crystal axes - crystal systems, unit cell,Bravais lattices, asymmetric unit - space group - Equivalent positions- relationship betweenmolecular symmetry and crystallographic symmetry - basic concepts and examples.

X - Ray diffraction - The concept of reciprocal lattice and its applications - X-ray diffraction bysingle crystals - structure factor - determination of space group by symmetric phase problemin structure analysis - heavy atom method - Fourier synthesis - refinement of structure.Neutron diffraction - Magnetic scattering - applications and comparison with X-ray diffraction.Electron diffraction - Basic principles and application to simple molecules such as XeF6, $Be(BH_4)_2$, Ferrocene, Cr(II)acetate.

UNIT –V –NANO CHEMISTRY

Importance and necessity for nanomaterials – Different types of nanomaterials – nanotubes, nanowires, nanorods, nanofibres and nanoflowers of polymers, semiconductors, metals and alloys – nanocystalline materials – nanoporous materials – nanothinfilms.Synthesis of Nanomaterials: Wet processes – colloidal chemical method, hydrothermal method, sol-gel method.

Techniques in Nanochemistry

Techniques for Characterisation of nanoscale materials (Basic aspects): Atomic force microscopy (AFM)-Transmission electron microscopy (TEM)-Resolution and scanning transition electron microscopy (STEM) Scanning Tunneling Microscopy (STM) Scanning nearfield optical microscopy (SNOM) and surface plasmon spectroscopy.

Text Books

1. Huheey JE, Keiter EA and Keiter RA, 2000, Inorganic Chemistry, Principles of Structure and Reactivity, 4th edition, New Delhi, Pearson Education (Asia).
2. Silverstein RM and Webster FX, 2003, Spectrometric Identification of Organic Compounds, 6th edition, New York, John-Wiley and Sons Inc.
3. Kalsi PS, 1990, Stereochemistry Conformation and Mechanism, 4th edition, New Delhi, New Age International Publishers.
4. Straughan BP and Walker S, 1976, Spectroscopy vol: 1-3, London, Chapmann and Hall.
5. Drago RS, 1980, Physical Methods in Chemistry, New Delhi, W. B. Saunders.

REFERENCES:

1. Acc. Chem. Res. July 2005.
2. BengtNolfing, ‘Methods in Modern Physics’, Springer, 2004.
3. T.Pradeep, Nano: The Essentials, McGraw-Hill Edn. New Delhi, 2007.
4. P.M. Silverstein, F.X. Wester, Spectroscopic Identification of Organic Compounds. 6^{th} Ed., Wiley 1998.
5. W. Kemp, Organic Spectroscopy, 3^{rd} Ed., MacMillon, 1994.

6. H. Gunther, NMR spectroscopy, Basic principles, concepts and application in chemistry, John Wiley & Sons, 2nd Ed., 1995.
7. R. S. Drago, Physical Methods in Chemistry, Saunders, 1977.
8. J. A. Weil, ZJ. R. Boldton and J. E. Wertz, Electro Paramagnetic Resonance: Elementary Theory and Practical Applications, John Wiely and Sons, 1994.
9. Nanotechnology – Basic Science and Emerging Technologies, MichWilson, KamaliKannagari, Geoff Smith, 2005, overseas press India private Ltd.,
10. K.L.Choy, Process principles and applications of novel and costeffective ESAVD based methods, Scientific Publishing, Singapore, 2002.
11. A. Jones and M.Mitchell, Nanotecnology-Commercial Opportunity, Evolution Capital Ltd., London, 2001.
12. C.N.R. Rao, A. Muller and A.K. Cheetham(Eds), The Chemistry of NanometrialsVol.I& Vol. II., Wiley-VCH, 2004.

Course outcomes:

- Different analytical tools for the characterization of materials can be very well understood by the scholars.
- The scholars able to predict the concepts and applications of NMR, ESR and mass spectroscopy.
- The scholars will understand the importance of potentiometry and electro analytical techniques.
- The scholars will be able to articulate the importance of fluorescence spectroscopy.

Course code & Title	**COURSE - III - Teaching and Learning Skills**		
M.Phil. Chemistry	**Semester -I**	**Credits: 4**	**Hrs/Wk: 6**
Cognitive Level	**K1 Acquire** **K2 Understand** **K3 Apply** **K4 Evaluate** **K5 Analyze**		
Course Objectives	The course aim • Acquaint different parts of computer system and their functions. • Understand the operations and use of computers and common Accessories. • Develop skills of ICT and apply them in teaching learning context and Research. • Acquire the knowledge of communication skill with special reference to its elements, types, development and styles. • Understand the terms communication Technology and Computer mediated		

Course Objectives :

teaching and develop multimedia /e- content in their respective subject.

- Understand the communication process through the web.
- Acquire the knowledge of Instructional Technology and its Applications.
- Develop different teaching skills for putting the content across to targeted audience.

Unit I: Computer Application Skills

Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICTapplications: Using word processors, Spread sheets, Power point slides in theclassroom – ICT for Research: On-line journals, e-books, Courseware,Tutorials, Technical reports, Theses and Dissertations-- **ICT for Professional**

Development: Concept of professional development; institutional efforts forcompetency building; individual learning for professional development usingprofessional networks, OERs, technology for action research, etc.

Unit II : Communications Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken, and Written; Non-verbal communication – Intrapersonal, interpersonal, Groupand Mass communication – Barriers to communication: Mechanical, Physical,Linguistic & Cultural – Skills of communication: Listening, Speaking, Readingand Writing – Methods of developing fluency in oral and writtencommunication – Style, Diction and Vocabulary – Classroom communication and dynamics.

Unit III : Pedagogy

Instructional Technology: Definition, Objectives and Types – Differencebetween Teaching and Instruction – Lecture Technique: Steps, Planning of aLecture, Delivery of a Lecture – Narration in tune with the nature of differentdisciplines – Lecture with power point presentation - Versatility of Lecturetechnique – Demonstration: Characteristics, Principles, planningImplementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion.

Unit IV: E- Learning, Technology Integration and Academic Resources in India

Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flippedlearning; E-learning tools (like LMS; software's for word processing, makingpresentations, online editing, etc.); subject specific tools for e-learning;awareness of e-learning standards- Concept of technology integration inteaching- learning processes; frameworks guiding technology integration (likeTPACK; SAMR); Technology Integration Matrix- Academic Resources in India:MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, Nationalacademic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

Unit V : Skills of Teaching and Technology based assessment

Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skillof Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of ProbingQuestions, Skill of Black Board Writing and Skill of Closure – Integration ofTeaching Skills – Evaluation of Teaching Skills- **Technology for Assessment:**Concept of assessment and paradigm shift in assessment; role of technology inassessment 'for' learning; tools for self & peer assessment (recording devices; erubrics,etc.); online assessment (open source software's; e-portfolio; quizmakers; e- rubrics; survey tools); technology for assessment of collaborativelearning like blogs, discussion forums; learning analytics.

References

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Brandon Hall , E-learning, A research note by Namahn, found in: www.namahn.com/resources/ .../note-e-learning.pdf, Retrieved on 05/08/2011
3. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
4. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.
5. Jereb, E., &Šmitek, B. (2006). Applying multimedia instruction in e-learning. Innovations in Education & Teaching International, 43(1), 15-27.
6. Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.
7. Learning Management system: https://en.wikipedia.org/wiki/Learning_management_system , Retrieved on 05/01/2016
8. Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.
9. Michael,D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New york.

10. Pandey,S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.

11. Ram Babu,AabdDandapani,S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.

12. Singh,V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.

13. Sharma,R.A., (2006) Fundamentals of Educational Technology, Surya Publications,Meerut

14. Vanaja,M and Rajasekar,S (2006), Computer Education, Neelkamal Publications, Hyderabad.

Course Outcomes

- After completing the course, the students will:
- Develop skills of ICT and apply them in Teaching Learning context and Research.
- Be able to use ICT for their professional development.
- Leverage OERs for their teaching and research.
- Appreciate the role of ICT in teaching, learning and Research.
- Develop communication skills with special reference to Listening, Speaking, Reading and Writing.
- Learn how to use instructional technology effectively in a classroom.
- Master the preparation and implementation of teaching techniques.
- Develop adequate skills and competencies to organize seminar / conference / workshop / symposium / panel discussion.
- Develop skills in e-learning and technology integration.
- Have the ability to utilize Academic resources in India for their teaching.
- Have the mastery over communication process through the web.
- Develop different teaching skills for putting the content across to targeted audience.
- Have the ability to use technology for assessment in a classroom

PROGRAMME OUTCOMES:

- The scholars will develop knowledge and understand the current issues, research and developments.
- M.Phil Scholar shall get new ideas about the current scenario by studying literature.
- The scholars will acquire knowledge in soft skill and it can be introduced for class room teaching.

Research supervisor Papers

Course – IV CHEMICAL KINETICS

Research supervisor: Dr. A. Sekar

Unit – I

Empirical treatment of reaction rates: effect of concentration – rate expression – product study – stoichiometry. Experimental methods of measuring reaction rates: Instrumental method of analysis – chemical methods – determination of order. Relation between rate and mechanism.

Unit – II

Activated complex theory – current status – extension – applications. Entropy of activations – enthalpy of activation. Reactions in solutions: Factors determining reaction rates in solution. Reaction between ions, dipoles – effect of ionic strength – primary and secondary salt effect-kinetic isotope effect – primary and secondary isotope effect.

Unit – III

Complex reactions: steady state treatment – microscopic reversibility – detection and estimation of radicals in reaction system. Homogeneous catalyst in solution: Mechanism of acid – base catalysis – catalytic constant – general and specific and base catalysis. Bronsted catalysis law - acidity function.

Unit – IV

Hammett and Taft equation: Influence of substituent on reaction rates – electronic theory of organic reactivity – influence of substituent on the energy activation – LFER substituent constant reaction constant for aromatic and aliphatic systems. Applications of Hammett and Taft equations in reaction mechanism. Linear free energy relations and Bronsted catalysis law. Isokinetic relationship: Effect of temperature on reaction rates – reaction series – enthalpy and entropy relationship. Exner plot – isokinetic temperature.

Unit – V

Some reaction mechanism in solution: Hydrolysis of esters and acetals, oxidation of alcohols and aldehydes by N-halogeno compounds like NBS, NCS, CBT etc.

Text books

1. Laidler K.J, 1984, Chemical kinetics, 3rd edition, New Delhi, Tata McGraw-Hill Publishing Company.
2. Frost. A and Pearson R.G, 1970, Kinetics and Mechanism, John-Wiley Eastern.

References

1. Indian J. Chem., 1986. 25,pp 478.
2. Can. J. Chem., 1969. 47, pp 694.
3. Indian J. Chem. 1976. 14B, pp898.

Course –IV - Phytochemistry and Natural Products

Research supervisor :Dr. D. VijiSaralElezabeth

Unit I:Plants and Plant Products:

Classification of Plants – Nomenclature – Cells – Tissues – Structures and Functions of Cells and tissues – Primary Metabolites – Secondary Metabolites – Microorganism- Types – Microbes and Man – Biological Activities – Microbial Studies – Techniques – Interpretation of results

Unit II: Methods of Plant Analysis I:

Methods of Extraction – Cold Percolation Method – Soxhlet Method – Methods of Isolation – Methods of Separation Chromatography – Column Chromatography – Thin layer Chromatography – Gas Chromatography – High performance Liquid Chromatography– Distillations – Steam Distillation – Fractional Distillation – Vacuum Distillation – Crystallization Techniques

Unit III: Methods of Plant Analysis II:

UV-VIS spectroscopy – IR Spectroscopy – Proton and Carbon-13 NMR Spectroscopy – Mass Spectroscopy- GCMS Analysis– X-ray and Neutron Diffraction studies– Qualitative and Quantitative Analyses – Interpretation of Results

Unit IV: Phenolic Compounds and Terpenoids:

Methods of separation, isolation and identification – Phenolics – Phenyl propanoids – Anthocyanins – Flavonoids – Xanthones – Stilbenes – Chemical conversions of these compounds – Structure Elucidation of Quercetin, Methods of separation, isolation and identification – Monoterpenes – Sesquiterpenes –Steroids – Carotenoids – Chemical conversions of these compounds – Structure Elucidation of Menthol. Alkaloids – Cyanogenic glycosides – Purines – Pyrimidines -Chemical conversions of these compounds

Unit V:Brief introduction to Pharmacological screening methods with following categories:

Hepatoprotective's, anti diabetes, antiepileptic, hypo lipidaemics, antioxidants, anti-inflammatory, analgesics & anticancer.

Text Books:

1. Peach K and Tracey MV (eds.), 1956-1964, Modernederpfranzenanalyse, Berlin, Spingerverlag.

2. Krishnasamy N.R, 1999, Chemistry or Natural Products, Hyderabad, University Press.

3. Boyer RF, 1993, Modern Experimental Biochemistry, II Ed., California, The Benjamin /Cummings publishing company Inc.

4. Furniss BS, Hannaford AJ, Smith PWG and Tatchell AR, 1989, Vogel's Text book of Practical Organic Chemistry, V Ed., Essex, England, ELBS with Longman.

5. Harborne JB, 1988, Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis, II Ed., London and New York, Chapman and Hall.

References:

1. Finar I.L. Organic Chemistry, Vol. 2. ELBS London.

2. Raphael Ikan, 1969, Natural Products: A Laboratory Guide, Jerusalem, Israel University
Press. 3. Jeffrey C, 1982, an Introduction Plant Taxonomy, II Ed., Cambridge, Cambridge University Press.

4. William J and Sham M, 1976, Microorganisms, London, Mills and Boon Limited.

5. Ari Koskinen, 1993, Asymmetric Synthesis of Natural Products, Chichester, New York,
Brisbane, Toronto, Singapore, John Wiley and Sons.

Course – IV- ADVANCED INORGANIC CHEMISTRY

Research supervisor:Dr.M. Umadevi

UNIT I – HEAVY METAL TOXICOLOGY

Concept, heavy metals in environment (i.e. Arsenic, Selenium, Cadmium, Mercury, Thallium, Lead), sources, toxicity, transformations, biochemical effects, and remedial measures

Organic pollutant toxicology: introduction, application potential, limitation of pesticides uses, toxicology of major pesticides, environmental impacts of pesticides, pesticide persistence, bioaccumulation and biomagnifications pesticide resistance

Radiation hazards: introduction, atomic radiations, natural radiations, effects of radiations, radioactivity and effects on man, impacts of radioactive radiations, radioactive waste, ionizing radiation and effects, radiation protection

UNIT – II COORDINATION COMPLEXES IN BIOLOGY AND MEDICINE

Metal-nucleic acid interactions:

The basics- nucleic acid structures- fundamental interactions with nucleic acids- fundamental reactions- binding of metal complexes with DNA- Techniques to monitor binding- applications of different metal complexes that bind nucleic acids (Spectroscopic probes).

Metal complexes in medicine:

Metal deficiency and diseases- toxic effects of metals- metals used for diagnosis and chemotherapy- platinum anticancer drugs- A case study of bioinorganic chemistry of platinum anticancer drugs- Design of new Inorganic anticancer drugs.

UNIT III -ELECTRON SPIN RESONANCE OF TRANSITION METAL IONS

EPR of transition metal ions containing one un paired electron- EPR of transition metal ions containing more than one un-paired electrons- Inter and Intra Kramer's transition- Solution, Powder and single crystal EPR Spectra – Study of distortion in geometry with the aid of EPR- EPR of Vanadyl, Mn(II), Fe(III), Cu(II) and Co(III) Complexes – Application of EPR in Biology and study of surface reactions over diamagnetic metal oxides.

UNIT IV - COMPUTATIONAL CHEMISTRY

Computational quantum chemistry - introduction – Ab initio calculations – Gaussian type orbital – Slate type orbital – basis set – Electron correlation – Hartree-Frock-Roothan SCF method for polyatomic molecules - Pariser-Parr-Pople approximation-configuration interaction-semi-emprical – Extended Huckel theory – Mulliken population analysis – Semi empirical SCF thory – computer programs - DFT the Kohn-Sham method – energy expression- orbitals – The DFT calculation procedure.

UNIT V - GREEN CHEMISTRY& NANOCHEMISTRY

Basic principles of green chemistry, Application of non-conventional techniques in organic synthesis (ultrasonic, microwave and grinding). Solid state synthesis and synthesis under solvent free conditions. Use of ionic liquids. **Drug discovery and development**A rational approach to drug design and drug development of following drugs: cimetidine oxamniquine. Nanoparticles and nanostructural materials – introduction – methods of preparation – application of nanoparticles: water purification – catalysis – sensors – information storage – solar cells – environmental cleanup – photodegradation of pesticides andphotodisinfection of E.coli.

REFERENCES

Unit I

1. Perry, G. 1980. Introduction of Environmental Toxicology, Elsevier, Netherland.
2. Santra, S.C. 1994, Ecology; Basic and Applied , M.D. Publication, New Delhi (India).
3. Santra, S.C. 2001, Enviromental Science, New Central Book Agency (P) Ltd. Calcutta (India).
4. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, Bioinorganic Chemistry, University of Science, Mill Valley, California (1994)
5. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Blackwell Science (2000)
6. E.A.V. Ebsworth, D.W.H.Rankin and S. Cradock, Structural Methods in Inorganic Chemistry, ELBS, Great Brittan (1987)
7. D.F. Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry, 3rd Edition, Oxford University Press (1999).

Unit II

1. R.S. Drago, Physical Methods in Chemistry, W.B. Saunders Co., London (1977).
2. B.J. Hathaway, D.E. Billing, *Coordin. Chem. Rev*., **5,** 143 (1970).

3. G.H. Reed and G.D. Markham, in "*Biological Magnetic Resonance*" Vol. **6**, Berliner/Reuben, Plenum Press, New York, (1984) p. 73.
4. R .W. Hagen, *J. Chem. Soc. Dalton Trans*., (2006) 4415
5. Instrumental Surface Analysis of Geological Material, VCH Publication , New York (1990)

Units III, IV & V.

1. M.T. Pope, and A. Muller, *Angew. Chem. Int. Ed. Engl*., **30** (1991) 34.
2. L.C.W. Baker and D.C. Glick, *Chem. Rev*.,**98** (1998) 3.
3. M.T. Pope, in *Comprehensive Coordination Chemistry*., G. Wilkinson, R.D. Gillard and J.A. Mccleverty, (Eds,) Pergamon Press, New York, 3 (1987).
4. I.V. Kozhevnikov, *Chem. Rev*., **98** (1998) 171.
5. R.A. Marcus and N. Sutin, *Inorg. Chem.*,**67** (1963) 853.
6. Y. Tajima, *Mini-Reviews in Medicinal Chem.*,**5** (2005) 255.
7. Computational Chemistry - Introduction to the theory and applications of Molecular and quantum mechanics, Errol Lewars, Springer Publisher, New Delhi.
8. Green Chemistry by M. Kidwai and V. K. Ahluwalia.
9. Wilson and Gisvold's Text Book of organic medicinal and pharmaceutical chemistry Ed. R. F. Dorge.

Course - IV: COORDINATION CHEMISTRY AND SPECTROSOCOPY

Research supervisor:Dr M. RAMESH

Unit I

Methods of preparation of coordination compounds - Analysis and determination of molecular formula - Volumetric, gravimetric and colorimetric methods - Conductance and magnetic measurements of complexes

Unit II

Theories of coordination - CF, MO, LF Theories - Merits and demerits - □donor and □ acceptor ligands - Carbonyls - Nitrosyls - Cyanides - Triphenyl phosphine complexes - Organo metallic compounds - Allene, alkyne and allyl complexes

Unit III

Special application to the study of coordination compounds - Electronic spectra - IR spectra - NMR spectra - ESR spectra - Moss Bauer spectra - PES

Unit IV

Kinetics and reaction mechanism in coordination compounds - SN_1, SN_2, SNCB mechanisms - Trans effect - Electron transfer and electron exchange reactions - Catalysis by organometallic compounds

Unit V

Bioinorganic chemistry-structure and functions of chlorophyll, hemoglobin, myoglobin, cytochromes and iron enzymes

Text Books

1. Kettle SFA, Physical Inorganic Chemistry: A Coordination chemistry Approach, 1996, Oxford, Spectrum.
2. Drago R.S., 1977, Physical methods in inorganic chemistry, London, Saunders Golden Sunburst Series, W.B.Saunders Company.
3. Lewis J and Wilkinson RG (Editors), 1960, Modern coordination chemistry, Principles and Methods, New York, Interscience Publishers, Inc.

References

1. Lee JD, 1988, *Concise inorganic chemistry*, (sixth edition) London, ELBS.
2. Huheey JE., 1972, *Inorganic chemistry Principle structure and reactivity*, (second edition), New York, Harper & Row publishers.
3. Cotton F.A. and Wilkinson G., 1988, *Advanced inorganic chemistry,* (Third Edition) London, John Wiley & sons.

Course –IV Advanced Organic and medicinal Chemistry

Research supervisor: Dr. A. Idhayadhulla

Unit 1: Asymmetric synthesis:

Chiral auxiliaries, methods of asymmetric induction – substrate, reagent and catalyst controlled reactions; Analytical methods used for the determination of enantiomeric and diastereomeric excess; enantio-discrimination- HPLC, NMR, Optical rotation. Resolution - optical and kinetic resolution. Racemic modification and resolution of racemic mixture.

Unit 2: Ternary Mixture Separation:

Separation of at least ten mixtures containing three components. The mixtures should also involve separation of nitro phenols, amino acids, low boiling substances, water soluble substances. Amines, Phenols and acids used should also contain other elements and functional groups. The mixture separation should be carried out on micro-scale using ether. The purity of the separated compounds should be checked by TLC.

Unit 3: Two Dimensional NMR Correlation Spectroscopy:

Two dimensional NMR spectroscopy, 2D-HETCOR, ^{1}H- ^{1}H COSY, types of COSY experiments, 2D TOCSY, NOSEY, ROSEY, J resolved 2D NMR spectroscopy, HSQC, HMQC and HMBC.

Unit 4: Synthetic Methods in Organic Chemistry:

Transition metal complexes in organic synthesis: only Pd, Ni, Co, Pt, Fe, Rh, Ru; Grubb's catalyst, Ziegler Natta catalyst. Nitrogen, Phosphorous and SulphurYlides in Organic synthesis. **Designing in Organic Synthesis:**Retrosynthesis, disconnection, synthons, linear and convergent synthesis. **Coupling Reactions and Process:** Stills Coupling, Sonogashira reaction, Buchwald reaction, Pusond-Kahn Reaction, Suzuki Coupling, Mitsunobu reaction, Baylis-Hillman reaction, Mukiayama's esterification, Metathesis reaction. Green Chemistry – Basic Principles, Methods & Reactions.

Unit 5: Synthesis and application of Drugs from each of following class:

Antibiotics: Synthesis of Streptomycin, penicillins, cephalosporin-C, chloroamphenicol, tetramycin. **Antidiabetics:** Synthesis of Sequence of A- and B- chains of insulin, glibenclamide, metformin, ciglitazone. **Antivirals:** Synthesis of Acyclovir, amantidine, rimantidine and Zidovudine. **Cardiovascular drugs:** Synthesis of amyl nitrite, sorbitrate,

diltiazem, quinidine, verapamil, methyldopa, atenolol and oxrprenol. **Local Anti-infective agents:** Synthesis of sulphonamides, furazolidone, nalidixic acid, ciprofloxacin, dapsone, aminosalicylic acid, isoniazide, ethionamide, ethambutal, fluconazole, econozole, griseofulvin. **Antihypertension Drugs:**Antimalarial Drugs, Anti HIV Drugs, Anticancer Drugs

Text Books:

1. Organic Chemistry, by I. L. Finar, Vol8. 5th

2. Spectrometric identification of organic compounds, T. C. Morril, R. S. Silverstein, G. C. Bessler 4th edition.

3. Comprehensive Organometallic Chemistry—G. Wilkinson, F.G.A. Stone and E. Abel Pergamon—1980.

4. Principles of Medicinal Chemistry (4th Edition) W. D. Foye, T. L. Lemke, D. A. Williams.

References

1. Principles and applications of asymmetric synthesis-Gou-Qiang Lin, YueMing Li and S. C. Chan-Wiley-Interscience, John Wiley and Sons, Inc. Publication 2001.

2. Vogel's, Practical Organic Chemistry.

3. Practical Organic Chemistry, R. K. Bansal

4. Some Modern methods of organic Synthesis, W. Carruthers.

5. Synthetic drugs—G. R. Chatwal—Himalaya, New Delhi 1995
6. Medicinal Chemistry—By A. Kar, Wiley, 2000.

Course –IV Organic and Bio-organic heterocyclic Chemistry

Research supervisor: R. Surendra Kumar

Unit – I Bioorganic Chemistry

Chemistry in bio systems – non covalent interaction and molecular recognition - proximity – enzymes chemistry – mechanism od enzyme action – chymotrypsin – transition state analogues – anti bodies as enzymes – enzymes – enzymes in synthetic organic chemistry – coenzymes chemistry - biologic energy – ATP, NADH, NADPH and FADH(2) as electron carriers – coenzymes A as acyl carrier – suicide enzyme inactivators and affinity labels. Bioenergetics and metabolism – carbohydrate metabolism – lipid metabolism – citric acid cycle – urea cycle –link between glycolysis and citric acid cycle – biological oxidation.

Unit – II – Drug Design

Introduction, Analogues and Prodrug – Concept of Lead (Examples), Factors governing Drug Design, Relational approach to Drug-Design (Quantum mechanical approach, Molecular orbital approach, Molecular connectivity approach, Linear free energy approach). Drug Design: The method of variation (Drug design through disjunction, Drug Design through conjunction), Drug design and development: An overview (problem, Revolution in drug discovery, Research and development strategies, Molecular hybridization, Rigidity and flexibility vs Drug design (Increased rigidity and increased flexibility), Tailoring of drugs.

Unit – III Nature of bonding in Organic Molecules

Localized and delocalized covalent bond – Concept of aromaticity annulenes and hetero annulenes. Inductive and mesomeric effects, Huckel's rule for aromaticity in benzenoid and non-benzenoid compounds and ant-aromaticity and homo aromaticity. Introduction to types of organic reactions reactive intermediates.

Unit – IV - New synthetic Methodologies of Organic synthesis and applications of reagents.

Microwave and Ultrasonic methods of synthesis, biocatalysts and bio-transformations, phase-transfer catalyst, electro organic synthesis, Ionic liquids, Enantio and diastereoselective synthesis use of oxone. Designing of Organic synthesis (Retro synthesis) – Synthesis of heterocycles, agrochemicals, natural products and perfumery compounds–Synthesis and applications of the following drug: Cardiovascular, antidiabetics, antineoplastic and antiviral drugs – Computer aided drugs designing and molecular Modeling,.

Unit- V – Spectroscopy and Purification techniques

Basic principles of UV, IR, NMR and Mass spectroscopy –Instrumentation and applications of spectrometric methods in elucidating the structure of organic compounds.Chromatography: Principles and applications of Paper, Thin layer, 2D-thin layer chromatography, Gas chromatography – detectors, temperature programming, GC-MS, HPLC electro analytical methods – Principles and applications of electrogravimetry – Coulometry.

References:

Unit I :

A.L.Lehninger, Principles of Biochemistry, 5th edition, Freeman, W.H. & Company, New York, 2008.

Unit-II:

1. Medicinal chemistry; AshutoshKar, New age International Publisher.

2. Natural Products, Chemistry and Biological Significance, J. Mann, R.S. Davidson, J. B. Hobbs, D.V. Banthrope and J.B. Harborne, Longman, Essex.

3. New Trends in Natural Product Chemistry, Atta-ur-Rahman and M.I. Chaudhary Harwood Academic Publishers.

4. Organic Chemistry, Vol 2, I.L. Finar, ELBS

Unit:III

Organic Chemistry (fifth Edn.,) by Morrison and Boyd, PHI, India

Unit-IV:

1] Modern Synthetic ReactionH.O.House:.

2] Principles of Organic SynthesisM.B.Smith:

3] (Organic ChemistryMcGraaw Hill) Hendrikson, Cram and Hammond:

4] Designing of Organic Synthesis S.Warren:

5] Organic Synthesis: Strategy and Control Warren ant Wyatt:

6] The Total Synthesis of Natural Products Apsimon:

7] Organic Chemistry Vol. II and II. Finar 5^{th} edition ELBS.

Unit-V:

1.Silverstien R.M., and W.P. Weber. Spectrometric identification of organic compounds. 2005.

2.Christian G.D. Analytical chemistry. 5 thed, John – Wiley and Sons Inc., 1994.

Course –IV ENVIRONMENTAL POLLUTION AND ADSORPTION

Research supervisor:: Dr. A. Kasthuri

Unit-1 Types of pollution

Types and causes of pollution – air pollution, water pollution, soil pollution, noise pollution, radioactive pollution, light pollution, thermal pollution. Effects of pollution. Environmental pollution in India.

Unit-2 Treatment methods

Physical processes: Sedimentation, flotation, filtration, centrifugal separation, screening.

Chemical processes: Precipitation, coagulation, oxidation and reduction, disinfection.

Sorption process: Adsorption, ion-exchange

Biological processes: Aerobic – fixed film and suspended growth processes, anaerobic process.

Membrane process: Electro dialysis, ultra-filtration, microfiltration, nano filtration, reverse osmosis.

Unit-3 Surface phenomena

Types of adsorption. Differentiation between physisorption and chemisorption. Factors affecting adsorption from solution. Applications of adsorbents and adsorption. Adsorption isotherm – Freundlich, Langmuir, B.E.T, Gibbs, Tempkin. Adsorption isobar.

Unit-4 Thermodynamics

Thermodynamic scale of temperature. Types of systems. Adiabatic and isothermal processes. Thermodynamic requirements of reactions - ΔG, ΔH, ΔS and their significance. Gibbs function and Helmholtz function as thermodynamic quantities. Equilibrium constant and free energy change. Thermodynamic interpretation of Le Chatelier principle. Addition on inert gases, reaction isotherms, Van't Hoff equation.

Unit-5 Kinetics

Introduction to rate equation, reaction order, molecularity and their characteristics. Derivation of rate constants for first order, second order and third order reactions; Dependence of temperature on reaction rate. Theories of reaction rate – Lindemann's theory of unimolecular reactions, collision theory of bimolecular gaseous reactions and absolute reaction rate theory

Text books:

1. S.S. Dara, A textbook of environmental chemistry and pollution control – S Chand & company, 2004.
2. Asim K. Das, Environmental chemistry with green chemistry, 2nd edition – New age int. publisher.
3. Tom Stephenson & Richard Stuetz, Principles of water and wastewater treatment process – 1st edition, IWA publishing, London, 2009.
4. Nicholas P Cheremisinoff, Handbook of water and wastewater treatment technologies – Butterworth-Heinemann, Woburn, 2002.
5. Gurdeep Raj, Advanced physical chemistry – Goel publishing house, 35th edition, 2009.
6. Keith J. Laidler, Chemical kinetics, 3rd edition, Pearson Education, 1987.
7. J. Rajaram J.C. Kuriacose, Thermodynamics – Dorling Kindersley (India) pvt. Ltd. 2013.

References:

1. P.S. Sindhu, Environmental chemistry –New age int. pvt. Ltd., 2010.
2. V.K. Ahluwalia, Green chemistry- Environmentally Benign Reaction – Ane books pvt. Ltd.,
3. Alfred Clark, Theories of adsorption and catalysis – Academic press, 1970.
4. B.R. Puri, L.R. Sharma & S. Pathania, Principles of physical chemistry – Vishal publishing company, 2008.

M.Phil., Programme in Mathematics
(CBCS)

Courses, Syllabi & Scheme of Examinations

(For the candidates admitted from the Academic year 2019-2020 onwards)

DEPARTMENT OF MATHEMATICS
NEHRU MEMORIAL COLLEGE (AUTONOMOUS)
PUTHANAMPATTI
TIRUCHIRAPPALLI-621 007

COURSES (CC)

S.No	Code	Title of the Course	Credits
Sem I			
1.	**19MM11**	**Research Methodology**	**4**
2.	**19MM12**	**Advanced Real and Complex Analysis**	**4**
3.	**19MM13**	**Paper on the Topic of Research (Guide Paper)**	**4**
4.	**19MM14**	**Teaching and Learning Skills**	**4**
Sem II		**Dissertation**	**8**

Scheme of Examinations
Semester I

Courses I, II, III (Elective) & IV: CIA : 25 Marks
FE : 75 Marks
Total : 100 Marks

Duration: 3 hours

CIA Components : Two Tests : 20 Marks (2×10 = 20)
Seminar : 5 Marks
Total : 25 Marks

Semester II

Dissertation: 200 Marks
(Thesis 150 + Viva-Voce 50)
(Credits: 8)

Final Examination (F.E)

	Semester I	Semester II (Submission of Dissertation)
Full time (1 year) :	**Jan/Feb**	**July to August**
Part time(2 years) :	**April/May**	**March to May**

Question paper pattern

2 Marks : 10x2=20
5 Marks : 5 x 5=25
10 Marks : 3x10=30

Total Marks: 75marks

COURSE I – RESEARCH METHODOLOGY

Semester: I **Code:19MM11**
Credit:4

Unit –I: Writing your thesis

The preliminary pages and the introduction – The literature review – Ethics of research - The conclusion –Publishing findings during preparation of the thesis.

Unit –II: Linear system of differential equations

Uncoupled linear systems – Diagonalization – Exponentials of operators- The fundamental theorem for linear systems- Linear systems in R^2- Complex Eigen values- Multiple Eigen values –Jordan forms- Stability theory- Non –homogeneous linear systems.

Unit –III: MATLAB

Starting with MATLAB- Creating arrays- Mathematical operations with arrays- Using script files and managing data- Two –dimensional plots.

Unit- IV: MATLAB (Contd…)

Programming in MATLAB- User –defined functions and Function files – Polynomials, Curve fitting and Interpolation – Application in numerical Analysis – Three - Dimensionals plots – Symbolic math.

Unit – V: LaTeX

The Basics – The document – Bibliography – Bibliographic databases – Table of content, Index and Glossary – Displayed Text rows and columns – Typesetting mathematics – Typesetting Theorems – Several kinds of Boxes – Floats – Cross References in LATEX – Footnotes, Margin pars, and Endnotes.

Text books:

1 . Paul Oliver, Writing Your Thesis, Sage Publications, 2nd edition (2008).
2. Lawrence Perko, Differential Equations and Dynamical systems, Springer – Verlag, Third Edition 2001.
3. Amos Gilat ,An Introduction with applications ,Wiley student edition – 2014.
4. Leslie Lampert, Latex – Users guide and References manual, Pearson Education (2003).

COURSE II – ADVANCED REAL AND COMPLEX ANALYSIS

Semester: I **Code :19MM12**
Credit: 4

Unit I

Sequences: Problems and solutions – Limits of Functions: Problems and solutions – Continuity : Problems and solutions.

Unit II

Differentiability: Problems and solutions- Integration: Problems and solutions.

Unit III

Series – Problems and solutions – Sequence and series of Functions: Problems and solutions.

Unit IV

Complex and Integral calculus: Singularities-Calculus of residues.

Unit V

Complex and integral calculus: Computation of integrals- Harmonic function.

Text Books:

1. A Problem Book in Real Analysis ,Asuman G. Aksoy, Mohamed A. Khamsi, Springer, 2010

2.V.Karunakaran,ComplexAnalysis,CRCPress,Secondedition2005.

References:

1. Robert G. Bartley, Donald R.Sherbert, Introduction to Real Analysis, 3rd Edition, Wiley student edition, 2007.
2. W. Rudin, Real and Complex Analysis, 3rd edition, McGraw Hill International,1987

Course III- Elective II - Advanced Stochastic Processes

Semester: I **Code:19MM13a**
Credit: 4

Unit-I :Poisson processes

Poisson processes and its Extensions (Markov processes with discrete Poisson process – properties of Poisson process – Generalizations of Poisson process: Poisson process in higher dimensions – Poisson cluster process – pure birth process: Yule-Furry process –Birth Immigration process – Time- dependent Poisson process.

Unit- II : **Markov process with continuous state space**

Introduction – Brownian Motion – Wiener process – Differential Equations for a wiener process – Kolmogorov Equations – First passage Time distribution for Wiener process – Ornstein – Uhlenbeck process.

Unit III : Renewal processes

Renewal processes – Renewal process in continuous Time – Renewal equation – stopping time: Wald's Equation – Renewal Theorems – Delayed and Equilibrium Renewal processes – Residual and Excess lifetimes – Renewal Reward (cumulative Renewal) process.

Unit IV: Reliability

The study of reliability and maintainability – concepts, Terms and definitions – Application – A brief history – The reliability function – Mean time to failure – Hazard rate function – Bathtub curve – conditional Reliability.

Unit V:Analysis of failure data

Data collection and Empirical methods: Data collection – Empirical methods – Static life estimation – Reliability Testing: product testing – Reliability life Reliability Testing – Reliability life Testing – Test time calculations – Burn – In – Testing – Acceptance Testing – Accelerated life testing – Experimental Design – Competing Failure Modes – Reliability Growth Testing: Reliability Growth process – Idealized Growth curve – Duane Growth Model – AMSAA Model – Other Growth Models.

Text Books:

1. J. Medhi , Stochastic processes, New Age Science, Second edition – 2002.
2. Charles E. Ebeling , Reliability and Maintainability Engineering, TATA McGraw Hill Edition , 2007.

Reference Books:

1. Sheldon M. Ross, Stochastic processes, John Wiley, Second Edition 2012.
2. S.Karlin and M.Taylor ,A first course in Stochastic Processes, Academic Press, Second edition, 1975

Course III- Elective II - Graphs and Networks

Semester: I **Code:19MM13e**

Credit*:* 4

Unit I : Matching , Algorithms and Appilications

Matchings and covers: Maximum matchings-Hall's Matching condition-Min-Max Theorems-Independent Sets and Covers-Dominating Sets. Algorithms and Applications-Maximum Bipartite Matching – Weighted Bipartite Matching.

Unit II: Connectivity

Cuts and Connectivity : Connectivity, Edge – connectivity, Blocks. K – connected Graphs : 2- Connected Graphs , Connectivity of Digraphs , K – connected and K – edge – connected Graphs, Application of Menger's theorem.

Unit III: Coloring, Structure of k-chromatic Graphs

Definition and Examples-Upper Bounds – Brook's Theorem – Graphs with Large Chromatic number – External problems and Turan's Theorem – color – Critical Graphs – Forced subdivisions

Unit IV: Edges and Cycles

Edge-colorings-Characterization of Line Graphs.Hamiltonian Cycles :Necessary Conditions –Sufficient Conditions-Tait's Theorem-Grinberg's Theorem

Unit V: Perfect Graphs

The Perfect Graph Theorem-chordal Graphs Revisited-Imperfect Graphs-The Strong Perfect Graph Conjecture

Text Book

B.W.Douglas , Introduction to Graph Theory , Second edition ,
Prentice-Hall of India, New Delhi , 2006

References

1.Frank Harary, Graph Theory ,Narosa Publishing House, New Delhi,1997.

2.J.A.Bondy and U.S.R.Murthy, Graph Theory and Applications, Mamillan, London,1976.

Course III- Elective II - THEORY OF DOMINATON IN GRAPHS

Semester: I **Code:19MM13g**
Credit :4

UNIT I

Domination number-Independent, Total & Connected Domination numbers.

UNIT II

Edge, Total edge and Connected edge domination numbers-Domatic, Edge domatic numbers and related parameters.

UNIT III

Matrix representation of a graph-Incident matrix,Adjacency matrix and Cycle matrix-Rank of a matrix –Cut set matrix.

UNIT IV

Digraphs –Types of Digraphs-directed paths and connected digraphs Incidence matrix of a digraph.

UNIT V

Digraphs with special properties-Seating arrangement problem-street-sweeping (or)snow-Removing problem-Tele printer's problem-Project scheduling-Huls scheduling Algorithm-Users of graphs in Markov processes.

TEXT BOOKS

1) V.R.Kulli, College graph theory ,Vishwa International Publications,2012.
2) V.R.Kulli,Theory of Domination in Graph, Vishwa International Publications,2012.
3) V.R.Kulli, Advances in Domination Theory (Vol.I,II), ,Vishwa International Publications,2012.
4) M.Murugan, Applications of Graph Theory,Muthali Publishing House, Chennai 2003.
5) T.W.Haynes, S.T.Hedetniemi,P.J.Slaler, Fundamentals of Dominations in Graphs, Marcel Dekker,Inc.,New York,1998.
6) K.R.Parthasarathy,Basic Graphs Theory, Tata Mc.Graw- Hill Publishing co.Ltd,New Delhi,1994.

Course IV – TEACHING AND LEARNING SKILLS

Semester : I

Code:19MM14
Credit:4

UNIT- I : COMPUTER APPLICATION SKILLS

Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations - ICT for Professional Development : Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology for action research, etc.

3

UNIT- II : COMMUNICATIONS SKILLS

Definition – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

UNIT- III : PEDAGOGY

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion.

UNIT-IV : E- LEARNING, TECHNOLOGY INTEGRATION AND ACADEMIC RESOURCES IN INDIA

Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning; awareness of e-learning standards-Concept of technology integration in teaching- learning processes; frameworks guiding technology integration (like

TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, National academic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

UNIT –V : SKILLS OF TEACHING AND TECHNOLOGY BASED ASSESSMENT

Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills- Technology for Assessment: Concept of assessment and paradigm shift in assessment; role of technology in assessment 'for' learning; tools for self & peer assessment (recording devices; e-rubrics, etc.); online assessment (open source software's; e-portfolio; quiz makers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics.

REFERENCES :

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Brandon Hall , E-learning, A research note by Namahn, found in: www.namahn.com/resources/ .../note-e-learning.pdf, Retrieved on 05/08/2011
3. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
4. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.
5. Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in e-learning. Innovations in Education & Teaching International, 43(1), 15-27.
6. Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.
7. Learning Management System:https://en.wikipedia.org/wiki/Learning_management_system, Retrieved on 05/01/2016
8. Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.
9. Michael, D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York.
10. Pandey, S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.
11. Ram Babu, A abdDandapani, S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.
12. Singh, V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.
13. Sharma, R.A., (2006) Fundamentals of Educational Technology, Surya Publications, Meerut
14. Vanaja, M and Rajasekar, S (2006), Computer Education, Neelkamal Publications, Hyderabad.

NEHRU MEMORIAL COLLEGE (AUTONOMOUS) PUTHANAMPATTI

M.Phil. PHYSICS (FT/PT) PROGRAMME

(For the candidates to be admitted from the academic year 2018-19 onwards)

Eligibility: M.Sc. Physics

PROGRAMME OBJECTIVES :

- To equip students with essential knowledge and skills required for taking up multidimensional responsibilities in research.
- To prepare students through systematic study and research towards contributing to the development of educational literature and leading to the growth of education as a discipline.
- To develop a set of core skills in students to work with efficiency in the areas of teaching and learning.
- To train students to conduct field based research studies including selection of research problems, sampling and preparation of research tools and adoption of statistical methodologies.
- To prepare professional administrators and supervisors for the position of responsibilities in the context of emerging perspectives in educational planning and research.

PROGRAMME STRUCTURE

Sem-ester	Course	Title of the Course	Exam. Hours	Credits	Marks		
					IA	UE	Total
I	Course - I	Research Methodology	3	4	25	75	100
	Course - II	Advanced Physics	3	4	25	75	100
	Course – III	Teaching and Learning skills (Common Paper)	3	4	25	75	100
	Course - IV	Paper on Topic of Research (The syllabus will be prepared by the Guide and the examination will be conducted by the COE)	3	4	25	75	100
II	---	Dissertation and Viva-Voce Viva Voce 50 marks Dissertation 150 marks	--	8	--	--	200
Total				**24**	**--**	**--**	**600**

PROGRAMME OUTCOMES :

- Transformation of Post Graduate students into research scholars.
- Understanding of research process, its design and ethical issues involved in research.
- Sharpened abilities to analyse information.
- Ability to critically examine research documentation and publication in SCI/SCI expanded journals.
- Submission of a thesis at the end of the programme.

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COURSE I

RESEARCH METHODLOGY

Course Objectives :

1. To understand the techniques, and a thorough knowledge of the literature
2. To develop skills about data analysis and application of software's
3. To impart knowledge about highly sophisticated analytical equipments.

Unit I : Working on a Research Problem

Scientific research – Aim and motivation – Principles and ethics – Identification of research problem: Determining the mode of attack – Current status – Literature survey – Abstraction of a research paper – Access using Internet web tools – Impact and usefulness of the research problem – Role of research guide – Guidance and rapport - Preparation and presentation of Scientific reports; need and methods – Power point and poster – Writing of synopsis and dissertation and thesis.

Unit II : Mathematical Methods

Hypergeometric function – Confluent Hypergeometric function – Series solution of Gauss Hypergeometric equations – Elementary properties - Symmetry property – Differential and Integral representations – Linear transformation of Hypergeometric function.
Elliptic functions and elliptic integrals – The Binomial, Poisson and Gaussian distributions – General properties and fitting experimental data.

Unit III : Data Analysis

Introduction – Statistical description of data - Mean , variance, skewness, median, mode – Distributions : Binomial, Poisson and Gaussian distributions – Student's t-test, F-test, Chi-square test – Linear and rank correlations – Modelling data: Least-squares, Fitting data.

Unit IV : High Performance Computing

High performance computing basics – Elements of Fortran 90/95– Constants and variables – Arithmetic expressions – I/O statements – Logical expressions – Conditional and control statements - Arrays – Functions and subroutines – Format statements – Advanced features: Procedures, modules, recursive functions and generic procedures – Applications Software and Libraries: MATLAB, MATHEMATICA, GNUPLOT, LATEX, LAPACK, BLAS, and FFTW (basics only).

Unit V : Analytical techniques and Instrumentation

Analytical Techniques – principles of single crystal and powder X-ray diffraction , FT-IR, Raman and UV-visible spectrometers- SEM, TEM, EDAX, AFM, EPMA – Instrumentation – Sample preparation – Analysis of materials – Study of dislocation – ion implantation uses.

Books for Study and References

Unit I

1. J. Anderson, B.H. Durston and M. Poole, *Thesis and Assignment writing* (Wiley Eastern, New Delhi, 1977).
2. Rajammal Devadas, *Hand Book of Methodology of Research* (R.M.M. Vidyalaya Press, 1976).
3. *Internet: An Introduction*, CI Systems School of Computing, Jaipur (Tata McGraw Hill, New Delhi, 1999).
4. C.R. Kothari, *Research methodology: Methods and Techniques*, (New age International, New Delhi, 2006).

Unit II

1. P. K. Chattopadhyay, *Mathematical Physics*, (Tata McGraw Hill, New Delhi,2007).

Unit III & IV

1. Troy Baer, *An Introduction to FORTRAN 90,* Ohio Supercomputer Centre, Columbus, OH, USA Internet Tutorial URL: http://oscinfo.osc.edu/training/f90/html/bsld.002.html
2. V. Rajaraman and C. Siva Ram Murthy, *Parallel computers – Architecture and Programming*, Prentice Hall of India, New Delhi.
3. H. K. Dass, *Mathematical Physics,* S. Chand & Company, New Delhi (2003).
4. C.R. Kothari, *Research methodology: Methods and Techniques*, (New age International, New Delhi, 2006).

Unit V

1. M. William and D. Steve, Instrumental Methods of Analysis (CBS Publishers, New Delhi, 1986).

COURSE- II

ADVANCED PHYSICS

Course Objectives :

1. To familiarize the learners with concepts and techniques of certain Quantum mechanical models and sub atomic particles.
2. Students are expected to understand the concepts of theoretical and experimental research.
3. To impart knowledge about nonlinear dynamics.

UNIT-I: BASICS OF CRYSTAL GROWTH AND THINFILMS

Nucleation – Different kinds of nucleation – Formation of crystal nucleus – Energy formation of nucleus – Spherical and cylindrical nucleus- Thermodynamics of nucleation – growth kinetics of thin films-crystal growth process of thin films – Epitaxial growth of thin films (Basic concept only).

UNIT-II: SOLUTION GROWTH TECHNIQUES Low temperature solution growth: Solution – Solubility and supersolubility – Expression of supersaturation –Moier's T-C diagram-constant temperature bath and crystallizer –Seed preparation and mounting- Slow Cooling, solvent evaporation method-Gel growth-structure of gel-Importance of gel technique-Chemical reaction method- Single and double diffusion methods-Chemical reduction method-Advantages of gel method.

Phase diagram and phase rules(basic concept) - Melt techniques: Bridgman technique – Basic process –thermal consideration–vertical Bridgman technique- experimental arrangement-Czochralski technique – experimental arrangement- growth process-growth rate – Vapour growth – Physical vapour deposition (PVD) – Chemical vapour deposition (CVD).

UNIT – III : THIN FILM PREPARATION TECHNIQUES Thin Films – Introduction to Vacuum Technology –Deposition Techniques –Physical methods – Resistive Heating, Electron Beam method – sputtering - Reactive sputtering -RF sputtering –pulsed laser deposition-chemical Methods –electrodeposition-spray pyrolysis deposition.

UNIT IV : QUANTUM FIELD THEORY

Lagrangian field theory – Canonical quantization – Classical field equations – Hamiltonian formulation quantization of field – Non-relativistic field – System of Bosons – System of Fermions – Relativistic fields – Klein Gordon fields – Dirac fields.

UNIT V : NEMATIC LIQUID CRYSTALS

Introduction-Isotropy and Anisotropy phases-Order parameter-Phase diagram of cholesteryl –myristate and PAA-Nematic phase-deformatio in Nematic liquid crystals-liquid crystal display(Introductory concepts).

BOOKS FOR STUDY AND REFERANCE:

1. J.C. Brice, Crystal Growth Processes, John Wiley and Sons, New York (1986).

2. P. Santhana Raghavan and P.Ramasamy, 'Crystal Growth Processes and Methods', KRU Publications Kumbakonam (2000).

3. A. Goswami, Thin film Fundamental, New Age International (P) Ltd, New Delhi (2006).

4. M.Ohring, Material science of Thin films, second EDITION, Academic press, Elsevier,New Delhi(2002).

5. V.K. Thankappan, *Quantum Physics,* (New Age International (P) Limited Publishers, 2nd Edition New Delhi, 2006)

6. H.H.Williard,L.L Merrit, J.Dean and F.A settle, Instrumental methods of Analysis-Sixth Edition,CBS publishers& Distributors, Delhi(1986)

7. Pefer J.collings, liquid crystals,New international(P)Limited publishers(2007).

COURSE III

Teaching and Learning Skills

Course Objectives :

- Acquaint different parts of computer system and their functions.
- Understand the operations and use of computers and common Accessories.
- Develop skills of ICT and apply them in teaching learning context and Research.
- Appreciate the role of ICT in teaching, learning and Research.
- Acquire the knowledge of communication skill with special reference to its elements, types, development and styles.
- Understand the terms communication Technology and Computer mediated teaching and develop multimedia /e- content in their respective subject.
- Understand the communication process through the web.
- Acquire the knowledge of Instructional Technology and its Applications.
- Develop different teaching skills for putting the content across to targeted audience.

Unit I : Computer Application Skills

Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations-- **ICT for Professional Development**:Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology for action research, etc.

Unit II : Communications Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

Unit III : Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion.

Unit IV : E- Learning, Technology Integration and Academic Resources in India

Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning; awareness of e-learning standards- Concept of technology integration in teaching- learning processes; frameworks guiding technology integration (like TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, National academic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

Unit V : Skills of Teaching and Technology based assessment

Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills- **Technology for Assessment:** Concept of assessment and paradigm shift in assessment; role of technology in assessment 'for' learning; tools for self & peer assessment (recording devices; e-rubrics, etc.); online assessment (open source software's; e-portfolio; quiz makers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics.

References

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Brandon Hall , E-learning, A research note by Namahn, found in: www.namahn.com/resources/ .../note-e-learning.pdf, Retrieved on 05/08/2011
3. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
4. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.
5. Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in e-learning. Innovations in Education & Teaching International, 43(1), 15-27.
6. Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.
7. Learning Management system : https://en.wikipedia.org/wiki/Learning_management_system , Retrieved on 05/01/2016
8. Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.
9. Michael,D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New york.

10. Pandey,S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.
11. Ram Babu,A abd Dandapani,S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.
12. Singh,V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.
13. Sharma,R.A., (2006) Fundamentals of Educational Technology, Surya Publications,Meerut
14. Vanaja,M and Rajasekar,S (2006), Computer Education, Neelkamal Publications, Hyderabad.

Course Outcomes

After completing the course, the students will:

- Develop skills of ICT and apply them in Teaching Learning context and Research.
- Be able to use ICT for their professional development.
- Leverage OERs for their teaching and research.
- Appreciate the role of ICT in teaching, learning and Research.
- Develop communication skills with special reference to Listening, Speaking, Reading and Writing.
- Learn how to use instructional technology effectively in a classroom.
- Master the preparation and implementation of teaching techniques.
- Develop adequate skills and competencies to organize seminar / conference / workshop / symposium / panel discussion.
- Develop skills in e-learning and technology integration.
- Have the ability to utilize Academic resources in India for their teaching.
- Have the mastery over communication process through theweb.
- Develop different teaching skills for putting the content across to targeted audience.
- Have the ability to use technology for assessment in a classroom.

CC-III(f) CRYSTAL GROWTH TECHNOLOGY

UNIT-I CRYSTAL PHYSICS AND PHYSICAL PROPERTIES OF CRYSTALS:

Representation of physical quantities by scalars, vectors and tensors Effect of crystal symmetry on crystal properties Neumann's principle-Magnitude of a property in a given direction-Geometrical properties of the representation quadric-Equilibrium properties represented by second- rank tensor: Electric polarization: relation between D,E,and P in a parallel plate condenser-Stress tensor homogeneous and inhomogeneous stresses-stain tensor homogeneous three-dimensional strain.

UNIT-II CRYSTAL OPTICS AND NON-LINEAR AND ELECTRO-OPTICAL EFFECTS IN CRYSTALS:

Double refraction: optical indices-Effects of crystal symmetry on optical indices-Wave surface: Uniaxial and Biaxial crystals-Non-linear optics: Harmonic generation-:Second harmonic generation-phase matching-Third harmonic generation-optical mixing: Sum and difference frequencies-parametric generation of light-Focusing of intense light beams-Electro-optic Effect.

UNIT-III NANOMATERIALS AND THEIR APPLICATIONS:

Properties of metallic and semiconducting Nanoparticles-Various physical and chemical methods of preparation-Synthesis of carbon nanostructure and their applications-Nanostructured ferromagnetism-size and dimensinality effects in nanostructures-Biological application of nanomaterials.

UNIT-IV:SURFACE ANALYSIS TECHNIQUES:

Atomic collision and Backscattering spectrometry: Energy loss of light ions and Backscattering Depth profiles-Sputter depth profile and secondary ion mass spectroscopy-Chennaling: Basis and its application in thin Film analysis-X-ray photoelectron spectroscopy-Electron Micro analysis of surface-Nonradioactive Transitions and Auger Electron spectroscopy.

UNIT-V SPECTROSCOPIC METHODS:

Spectrometer-UV-VIS-Near IR,-Basic concepts of FTIR and Raman and its applications to various materials-NMR and ESR and its applications-Thermal analysis(TG/DTA,DSC)of different materials-ray method Diffraction Directions-Diffraction methods-Powder method-Particle size calculation-X ray scattering by electrons ,atomic and unit cells.

BOOKS FOR STUDY AND REFERENCE:

1.'Physical properties of crystals: Their Representation by tensor and Matrices' by J.F.Nye,1985,Oxford University press, New York.

2.'Lasers and Non-linear Optics' by B.B.Laud,Chapter-13,Wiley Eastern Ltd.,1985.

3. Introduction to Nanotechnology by C.P.Pool Jr.and F.J Owens, John wiley&sons.

4.Fundamental of surface and thin film analysis Leonard C.Feldman and James W.Mayer.

CC-III(c) LIQUID CRYSTALS

UNIT-I INTRODUCTION:

States of matter- The liquid crystal phase- Order parameter Broad classification of crystals-Lyotropic, polymeric and Thermo tropic types.

UNIT-II EVOLUTION OF LIQUID CRYSTALS PHASES:

Discovery of liquid crystals-Brief history-Developments after the discovery.

UNIT-III THERMOTROPIC-TYPE LIQUID CRYSTALS:

Thermotropic types of liquid crystals- Nematic,cholesteric and smectic phases.

UNIT-IV EFFECTS OF EXTERNAL FIELDS:

Isotropy and Anisotropy nature ,Liquid crystals in electric,magnetic,and optic fields.Effects on liquid crystal-nematic.

UNIT-V LIQUID CRYSTALS DISPLAYS:

Display Technique: Types of modes-Dynamicscattering mode chiral nematic mode-Twisted nematic mode.

BOOKS FOR STUDY AND REFERENCES:

1. Peter J.Collings. Liquid crystals princoton university press, UAS(2007)

2. S.Chandrasekhar, Liquid crystals,The Cambridge university press(1977,1992)

3. P.G De Gennes and J.Prost, the physics of liquid crystals, Oxford university press(1999).

CC III(a) NONLINEAR DYNAMICS

UNIT-I INTRODUCTION TO NONLINEAR DYNAMICS:

What is nonlinearity? Linear and nonlinear force-Mathematical explanation. of nonlinearity- Linear super position and its validity-Linear and nonlinear oscillators-Autonomous and nonautonomous systems.

Phase space –equilibrium points-classification of points –limit cycle motion,Poincare bendixon therom.

UNIT-II BIFURCATION AND CHAOS IN DISCRETE CONTINUOUS SYSTEM;

Period doubling phenomenon and onset of chaos in a logistic map-Bifurcation diagram-Some simple bifurcation scenario in a Duffing oscillator-poincare section and Lyapunov Exponents(qualitative features only).

UNIT –III NONLINEAR ELETRONIC SYSTEMS:

\ Necessity of nonlinear electronics simulation studies-Nonlinear circuit elements analog simulation of a duffing oscillator.

Chuas's Diode its characteristics and experimental realization-MLC oscillator-Bifurcation sequence in a MLC oscillator.

UNIT –IV SOLITIONS:

Scotl Russell phenomenon and solitary waves-kdv equation-Fermi-pastal Ulam numerical experimental.

Numerical experiments of kruskal and zabusky-Hirota's bilinearisation method for solion solutions of Kdv equation.

UNIT V APPLICATION OF NONKINEAR DYNAMICS:

Synchronization of chaotic systems method of one way coupling –illustrative, Example: synchronization of two MLC oscillators-secure communication chaotic signal masking and transmission of analog signals-using MLC Circuits.

Ubiquitous solution equation NLS equation in optic fibers, equation in long Josephson junction.

BOOKS FOR STUDY REFERENCES:

1, **Nonlinear Dynamics: Integrability, Chaos and patterns (M.Lakshmanan and S.Rajasekar) Springer verlag- Indian Reprint, 2003.**

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

(Nationally Accredited with 'A' Grade by NAAC)

PUTHANAMPATTI – 621 007

TIRUCHIRAPPALLI DISTRICT

TAMIL NADU - INDIA

Revised

M.Phil., ZOOLOGY SYLLABUS

(WITH EFFECT FROM THE ACADEMIC YEAR 2019 -2020 ONWARDS)

PG AND RESEARCH DEPARTMENT OF ZOOLOGY

APRIL– 2019

POST GRADUATE AND RESEARCH DEPARTMENT OF ZOOLOGY

(M.Phil Zoology Program)

VISSION AND MISSION

Vision:

- Scholars get individual attention and focus on the prevailing challenges by way of giving strong foundation.
- Create a conductive environment for Scholars to develop innate skill to discover themselves and explore scientific pursuits with various opportunities.
- The Scholars grow in a fully equipped environment rich in its infrastructure which creates physically sound, mentally serene, spiritually humane and scientifically excelling.
- Creativity is a spark that lasts long. We provide ample opportunity for our students to think and make outside the box. We treasure their pride of being a creator.

Mission:

- Our mission is to mould the Scholars into a world class community who would feel legitimately proud to think critically and innovatively.
- We focus more on the approach of making the Scholars observe, analyze, interpret, evaluate and solve problems.
- Providing very good opportunity to the Scholars who willing to do novel approach on research in various fields.
- The Post Graduate and Research Department of Zoology providing very good learning information with an excellent academic and research facilities to the Scholars of all category and enhance their natural and artificial intelligence.

PROGRAM SPECIFIC OBJECTIVES

1. To enable the Scholars to learn the application of various experiments to the animal and human biology.

2. Understand the impact of Zoology on basic human needs such as, health care, agriculture, industrial, chemical, energy etc.,

3. To know the current development in Zoological Sciences.

4. Evaluate the future priorities in Zoological Research.

5. Know the practical areas for application of Advanced Zoological Research.

6. To develop skill in the various modern bio-techniques.

PROGRAM OUTCOMES

Scholars of Zoology will be able to

1. To become knowledgeable person in the subject of Zoology and apply the principles of the gained knowledge in different fields and to the needs of Society and Nation.

2. Acquisition of technical competence in specialized areas, to develop confidence and gain analytical skills in various fields viz., research methodology, recent trends in zoology, environmental biology, toxicology, immunology, biotechnology, rodent pests, vermibiotechnology, herbal drug technology and phytochemistry, ornithology, medical nanotechnology, medical microbiology etc.,

3. To understand and appreciate professional ethics, community living and Nation Building initiatives.

4. Ability to conduct investigation and research on problems in a chosen field of study.

5. Ability to work effectively as an individual and as a member leader in a team and to be a multi-skilled person in the field of Zoology with good technical knowledge, management, leadership and entrepreneurial skills.

6. Awareness of the social, cultural, global and environmental responsibilities as a Zoologist in various fields.

7. Capability and enthusiasm for self-improvement through continuous professional development and life-long learning.

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

(Nationally Accredited with 'A' Grade by NAAC)

PUTHANAMPATTI – 621 007, TRICHY DISTRICT

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY

M.Phil., ZOOLOGY PROGRAMME – (CBCS Pattern)

(For candidates admitted from the Academic year 2019 – 2020)

Semester	Course	Course Title	Course Code(s)	Credits	Marks		Total
					Internal	External	
I	Course –I	Research Methodology		4	25	75	100
	Course – II	Recent Trends in Zoology		4	25	75	100
	Course – III*	1 Management of Rodent Pests		4	25	75	100
		2 Vermibiotechnology					
		3 Toxicology					
		4 Herbal Drug Technology and Phytochemistry					
		5 Ornithology					
		6 Entomology					
		7 Medical Nanotechnology					
		8 Agricultural Ornithology					
		9 Medical Microbiology					
	Course –IV	Teaching and Learning Skills.		4	25	75	100
II		**Dissertation**		8	**Thesis =150**	**Viva =50**	**200**
		Total		**24**			**600**

******Topic of Research – Guide Paper***

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

(Nationally Accredited with 'A' Grade by NAAC)

PUTHANAMPATTI – 621 007, TRICHY – DT.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY

M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)

(For candidates admitted from the Academic year 2019 – 2020)

SEMESTER-I

COURSE I: RESEARCH METHODOLOGY

Course Code: Max. Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

- To give information about basic concept of research and how to write/publish a thesis and its basic steps.
- Critically analyze Microtechniques, cryotechniques and tissue culture techniques.
- To know the statistical problems in biological science, this is useful for the students for their research works.
- To train the scholars to collect, organize and analyze data.
- Learn to apply different statistical/bioinformatic tools in presenting biological data.

UNIT – I: Scope of Research: Objectives – types of research– research ethics – importance of research – selection of research problem – experimental design – Literature survey - use of internet in literature survey - preparation of index card. Printed and online journals – Refereed journals, Impact Factor, Citation Index. **Preparation of Thesis**: Components of thesis; Preparing of scientific paper for publication in a journal; **Model organisms**: C.elegans, drosophila, hydra, rat, mouse - CPCSEA regulations – IPR - Patent.

UNIT – II: Analytical Instruments: Spectrophotometer (Principles, types, description of instruments and applications). Centrifuge (Principles, types, description of instruments and applications). Chromatography: Paper – TLC - Ion–exchange chromatography, GLC and HPLC (Principles, description of instruments and applications). Electrophoresis – Types of Electrophoresis –PAGE, SDS-PAGE, 2D Electrophoresis – Immunoelectrophoresis – ELISA – Blotting techniques – Southern, Western and Northern.

UNIT – III: Microtechnique: Permanent mounting – narcotization and killing – fixing – washing – tissue processing – staining – mounting – Labeling. Histochemistry – Carbohydrate, Protein, Lipid and Nucleic acids. Microscopy: Types of microscopes–principle and applications of Light microscopes and Electron microscopes (SEM and TEM) – Histological preparation of tissues for SEM and TEM. Photomicrography: principles and applications.

UNIT-IV: Bioinformatics: Scope of Bioinformatics – Genomes and Proteomes – The genome of *Homo sapiens* (the human genome). Single Nucleotide Polymorphisms. Biological Databases – Primary, Secondary, Specialized and Structural database. Databases searches for homologous sequences – FASTA, BLAST and molecular docking. Local and global alignment concepts – Clustal-W –Phylogenetic trees – clustering methods.

UNIT V: Statistical methods: Hypothesis testing. Tests of Significances: Student's "t" test, F – Test – One way ANOVA and Two way ANOVA with interpretation of data – Multiple comparison tests – LSD, SNK, DMRT. Correlation and regression: Correlation (Pearson's and Spearman's Rank), partial and multiple correlation – simple linear regression and multiple regressions. Non-Parametric Tests: Chi square, Mann Whitney "U" test, Wilcoxon's test and Kruskal Wallis tests. Use of SPSS for statistical analysis.

Course Outcomes:

- Relate to the learning process of how to write thesis and how to publish papers in various journals.
- Produce transformants by employing the various transfer techniques in the applied research.
- Experiments with the concept of permanent mounting and its application.
- Critically evaluate cell culture techniques in various experiments.
- Explain the scope of Biostatistics. Test the hypotheses using chi-squre test, compare the data using 't' test, Analyze the data using ANOVA, Explain types of Correlation and regression, analyze and apply various statistical tools.

TEXT BOOKS:

1. Gurumani, N. 2006. Research methodology for biological science, MJP Publishers, Chennai, P 753.
2. Sathyanarayana, U. 2006. Biotechnology. Books and Allied (P) Lit. India.
3. Dubey, R.C. 2001. A text book of biotechnology, Rajendra Printers, New Delhi.
4. Das, H.K. 2005. Text book of biotechnology (second edition). Wiley Dreamtech India Pvt Ltd.,New Delhi. P 149.
5. Arumugam, N., Gopi, A., Sundaralingam, R., Meena, A. and Kumaresan, V. 2009. Biostatistics, Computer Application, Bioinformatics and Instrumentation. Saras Publication, Nagercoil.
6. Ramakrishnan, P. 1995. Biostatistics. Saras Publications, KanyaKumari.
7. Gurumani, N. 2005. An Introduction to Biostatistics 2nd Edition, MJP Publishers, Chennai.
8. Sharma, A.K 2005. Text book of Biostatistics, Discovery publishers House, New Delhi.

REFERENCES BOOKS:

1. John, R.W and Masters, D. 2000. Animal cell culture. A practical approach. IRC Press.
2. Ignacimuthu, S. 1996. Basic Biotechnology. Tata McGraw – Hill publishing company Limited, New Delhi.
3. Anderson, Dunston and Pole. 1970. Thesis and Assignment writing. Wiley Eastern Ltd., New Delhi.
4. Gupta S.C.& Kapoor V.K, (2000): Fundamentals of & Mathematical Statistics, Sultan Chand Sons 10th edition.
5. Croxton F.E., Cowden D.J. & Kelin S, (1967): Applied General Statistics, Prentice Hall.
6. Hogg and Craig, Introduction to Mathematical Statistics, (2013): Prentice Hall, 7th edition.
7. Daniel, W.W. 2000. Biostatistics - A foundation for analysis in the Health science. John Wiley and sons, New york.
8. Sokal, R.R. and Rohlf, F.J. 2000. Biometry. Freeman, San Francisco.
9. Zar, J.H. 2003. Biosatistical Analysis. Person Edition Asia, New Delhi.

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

(Nationally Accredited with 'A' Grade by NAAC)

PUTHANAMPATTI – 621 007, TRICHY – DT.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY

M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)

(For candidates admitted from the Academic year 2019 – 2020)

SEMESTER-I

COURSE – II: RECENT TRENDS IN ZOOLOGY

Course Code: Max. Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

- Apply and integrate knowledge of species' biology, interactions among species, and environmental variation to predict EIA & Biodiversity.
- To get a fundamental knowledge about microbes & microbial diversity.
- To understand the role of microbes in different spheres of life and to enlighten the students with the new information related to microbes.
- To teach the students understanding development of antibodies responses to a vaccine.
- To give the idea about environmental microbes which hamper the life in society in various ways and to give knowledge about various cell culture techniques.

UNIT – I: Pollution Abatement Measures: Bioremediation – Solid Waste Management – Biofertilizers and Biopesticides – Environmental Impact Assessment (EIA) – Environmental Laws in India. Genetic, species and ecosystem diversity – Values of biodiversity – Biodiversity indices: Alpha, beta and gamma – Treats to Biodiversity – IUCN Categories – Red Data Book – Conservation of biodiversity – *ex situ* and *in situ.* GPS, GIS, Remote sensing and radio telemetry techniques used in ecological research – Molecular Markers in Genome analysis – RFLP, RADP, AFLP and their applications in Biodiversity.

UNIT – II: Microbial diversity – Prokarya – Eukarya and Viruses – Microbial diseases of Bacterial, Fungal, Viral diseases – Chemotherapy and antibiotics – Vaccines (types) – rDNA Vaccines – applications. Molecular mapping of genome – Genome organization. Cloning technology and its application in biology – Ethical issues.

UNIT – III: Antigen – Antibody interactions – Isolation of pure antibodies – monoclonal and polycolonal antibodies - Assays of complement – Assays for circulating immune complexes – Isolation of lymphocyte populations Effector cell assays, Gene targeting Immunological techniques in medical diagnosis – HIV, Hepatitis A & B, Cancer and Pregnancy.

UNIT – IV: Methods in microbiological studies: Isolation and culture of microorganisms – mixed cultures; physical methods – chemical methods – biological methods. Methods of isolation and maintenance of pure culture. Microbial growth – growth curve of bacteria – measurement of growth. Culture media – characteristics – types and preparation.

UNIT – V: Basic techniques of Mammalian cell cultures – Cell lines – Manipulation of cultured cells and tissues – Application of Animal cell cultures – Stem cell cultures – Apoptosis – Protein Engineering – Transgenic animals – Advantages. Gene Therapy. Human Genome Project – DNA fingerprinting and its applications – Biosensors and Biochips and their Applications.

Course outcome:

- To know about environment and its role in various aspects with respect to GPS, GIS.
- Explain in detail the importance of conservation of Biodiversity and the students will able to recognize the scope of microbiology.
- Narrate the nutrition for bacterial growth and the factors affecting the growth. Ability to produce fermented products using bacteria.
- To emphasise the importance of bioremediation bacteria and its importance to clean the environment which hamper the society in various ways.
- To gain knowledge about gene therapy, DNA fingerprinting and human genome project.

TEXT BOOKS:

1. Krishnamurthy, K.V. 2004. An advance Text book on Biodiversity. Principles and Practice. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Das, H.K. (Editor) 2005. Text Book of Biotechnology. Wiley Deramtech India Pvt. Ltd., New Delhi.
3. Jogdand, S.N. 2004. Advances in Biotechnology. Himalaya publishing House, Mumbai.
4. Benjamin Lewin. 1999. Genes VII. Oxford University Press, New York.
5. Kumar, H.D. Modern concepts of Biotechnology. Vikas Publishing House Pvt. Ltd., New Delhi.
6. Kumar, D and Kumar, S. 1998. Modern concepts in Microbiology, Vikas Publishing house Pvt. Ltd., New Delhi.
7. Ivan Roitt, David Male and Jonatham Brostoff. 2002. Immunology. Mosby Edinburgh, London.
8. Anathanarayanan, R, and C.K., Jayaramam Paniker. 1990. Text book of Microbiology. Orient London.

REFERENCES BOOKS:

1. Pelczar, M.J. and R.D. Reid. 1996. Microbiology. Tata McGraw Hill.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 1995. Cell and Molecular Biology. 8th Edition, B.I. Waverly Pvt. Lid., New Delhi.
3. Attwood, T.K. and PLarry – Smith, D.J. 2002. Introduction to Bioinformatics, Pearson Education (Singapore).
4. Lesk, A.M., 2007. Introduction to Bioinformatics (S.E.), Oxford University, Oxford.
5. Mani, K. and Vijayaraj, N., 2004. Bioinformatics. A Practical Approach, Aparnaa publications, Coimbatore.
6. Murthy, C.S.V., 2003. Bioinformatics, Himalaya Publishing House, New Delhi.
7. Sundararajan, S. and Balaji, R. 2002. Introduction to Bioinformatics, Himalaya Publishing House, New Delhi.
8. Westhead, D.R., Parish, T.H. and Twyman, R.M., 2003. Instant Notes: Bioinformatics BIOS Scientific Publisher Ltd, Oxford, UK.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER – I
Elective Course I

COURSE III: MANAGEMENT OF RODENT PESTS

(Topic of Research)

Course Code: Max. Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

- Apply and integrate knowledge of rodent pest control measures among scholars.
- To get a fundamental knowledge about Rodent Pest control.
- To understand the role of rodent pest on agricultural fields.
- To enlighten the scholars with the new information related to rodent control.
- To teach the scholars understanding development of various methods regarding rodent control among agricultural habitats and to give knowledge about role of various institutions in rodent pest control measures.

UNIT-I: Rodent diversity : Diversity of rodents in the world – Rodent diversity in India – Rodents as Pest Species – Ecological Distribution of Indian Rodents – Rodents as beneficial species – History of Rodent Research in India - AINP on Vertebrate Pest Management: A Profile - Rodent pests of India; **Rodent pests of Tamil Nadu:** The Indian Crested Porcupine, *Hystrix indica* – The Indian Gebril, *Tatera indica* – The house Rat, *Rattus rattus*– The soft-furred Field Rat, *Millardia meltada* – The mice, *Mus* spp. – The Lesser Bandicoot Rat, *Bandicota bengalensis* – The Large Bandicoot Rat, *Bandicota indica;* **Methods of estimation of rodent pest population**: Tracking tiles – Census cards – Burrow counts – Visual surveys – Calibrating relative estimates of abundance –Equipments for marking techniques - calculating population size from capture- mark- release data.

UNIT-II: Rodent depredation: Magnitude of rodent depredation to agricultural crops (Pre-harvest losses) in Rice, Sugarcane, Groundnut, Soybean, Bengal Gram, Plantation Crops, Coconut – Quantity of production losses due to Rodents in Poultry Farms – The relationship between rodent abundance and rodent damage in crop fields – Extent of production losses due to Rodents in stored food grains (post-harvest losses), Afforestation, Grasses, fodder crops and soil conservation – **Crop specific methods of rodent depredation assessment**.

UNIT-III: Rodent Ecology: Burrow patterns of different rodent pests – Food habits – Breeding ecology – Litter size of predominant rodent pest species – Activity patterns – Home ranges; **Ethology and Eco-Physiology**: Bait preferences – Shyness Behaviour – Scent marking Behaviour – Adaptations in Some Indian Rodent Species; **Design of field studies:** General principles of experimental design – Identification of hypotheses and key factors – Size of experimental units – Duration of an experiment – Inclusion of controls – Replication – Randomisation and interspersion.

UNIT-IV: Rodents of Medical importance – Rodents and Human Diseases: A Global Appreciation of Zoonotic diseases – Plague – Rat typhus – Leptospirosis – Rat bite fever – causative organisms, symptoms, treatment and prophylactic measures of each disease - Managing rodent pests in households and food stores through intensive trapping - Urban Rodent Control Programs for the 21st Century.

UNIT-V: Management of rodent pests: Cultural, Physical, mechanical, biological and chemical methods: Environmental management – Rodent proofing and sanitation – Tribal rodent catchers – Rodent Fumigation Equipments - Rodent management operational schedule for crop fields and threshing floors, Residential premises and godowns - Social Engineering Activity in Rodent Control – Peoples' Participation in Rodent Control - The Sidhpur Experience - Trap barrier system - Biological agents of managing rodent pests - Registered Acute and chronic rodenticides in India and their efficacies against different rodent pests – Factors influencing the bait preferences – Qualities of a rodent bait – Chemical fumigants – Anti-fertility agents for Rodent Control - The Potential of Pheromonal involvement in Rodent Control Programs – Natural / Synthetic Chemical Repellents - Education and Training of the Stakeholders – Current Integrated Rodent Pests Management (IRPM) packages adopted in India.

Course Outcome:

- To know about equipments and kits with respect to rodent control.
- Explain in detail the importance of and preventive measures of diseases caused by rodents.
- The scholars will able to recognize the scope of rodent pest control measures.
- To emphasise the importance of equipments and repellents and its importance to clean the rodent pest from agricultural fields in various ways.
- To gain knowledge about rodent pest management.

TEXT BOOKS:

1. Barnett, S. A. and Prakash, I. 1975. Rodents of Economic importance in India. Arnold – Henemann, New Delhi & London. 175p.
2. Prakash, I. and Mathur, R.P. 1987. Management of Rodent Pests. Indian Council of Agricultural Research, New Delhi. 133p.
3. Prakash, I. 1988. Rodent Pest Management. CRC Press, Inc. Boca Raton, Florida. 480p.
4. Fitzwater, W.D. and Prakash, I. 1989. Handbook of vertebrate pest control (Third Edition). Indian Council of Agricultural Research, New Delhi. 103p.
5. Prakash, I. and Ghosh, P.K. 1992. Rodents in Indian Agriculture. Scientific Publishers, Jodhpur. 707p.
6. Singleton, G.R., Hinds, L.A., Leirs, H. and Zhang, Z. (Eds.). 1999. Ecologically-based management of rodent pests. ACIAR Monograph No. 59, 494p.

REFERENCES BOOKS:

1. Singleton, G.R., Hinds, L.A., Krebs, C.J., and Spratt, D.M. 2002. Rats, mice and People: rodent biology and management. ACIAR Monograph No. 96, 564p.
2. Rana, B.D., Tripathi, R.S., Mohd. Idris and Vipin Chaudhary. 2002. Glimpses of Rodent Research in India. Project Co-ordinator's Cell, Jodhpur, 57p.
3. Aplin, K.P., Brown, P.R. Jacob, J., Krebs, C.J., and Singleton, G.R. 2003. Field methods for rodent studies in Asia and the Indo-Pacific. ACIAR Monograph No.100. 223p.
4. Singleton, G.R., Belmain, S.R., Brown, P.R., and Bill Hardy. (Eds.). 2010. Rodents outbreaks : ecology and impacts. Los Banos (Philippines): International Rice Reseach Institute (IRRI). 289p.
5. Corrigan, R.M. and Don Moreland. 2001. Rodent control: A Practical Guide for Pest Managemant Professionals. GIE media. 300p.

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M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER I
Elective Course – II

COURSE III: VERMIBIOTECHNOLOGY

(Topic of Research)

Course Code: Max Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

- To impart the knowledge of vermiculture to the scholars both on site and off site on the technique of Vermiculture and to kindle the scholars to become self employers/entrepreneurs of vermiculture practices of their choice in their native places after getting degree. The part time scholars can able to teach the techniques to their students at 10^{th} and +2 level.
- To impact the scholars to understand the culture practices of various species of earthworms in their backyard for the decomposition of their house hold waste biological materials.
- To prepare the scholars to know about opening of commercially viable business opportunities in the field of vermiculture.
- To aware the scholars about creation of employment, especially in field of vermiculture in rural as well as urban areas.
- To aware the scholars about Governmental organizations for supporting vermiculture.

UNIT – I: Diversity of Earthworms and their Geographical distribution: Systematic position – Classification of Earthworms at family, genera and species level in the Indian subcontinent – Brief account on the classification of Earthworms at the global level – Ecological classification of Earthworms – Epigeic, Endogeic and Anecic - Earthworms used in vermicomposting in India and at the global level – *Eudrilus eugeniae*, *Eisenia foetida*, *Perionyx excavatus* and *Lampito mauitii*.

UNIT – II: Morphology and Biology of Earthworms: External segmentation – External apertures – Clitellum and associated structures – Digestive and Reproductive systems – Life cycles – Reproduction – Spermatogenesis and Oogenesis – Copulation and Fertilization – Growth.

UNIT – III: Ecology of Earthworms: Estimation of populations – size of populations – Numbers and Biomass- Population structure – Age distribution and Spatial Distributions – Horizontal and Vertical distributions – Structure of Earthworm Communities – Major ecological groups – Predators, Parasites and Pathogens of Earthworms. **Earthworms and Microorganisms**

- Importance of Microorganisms as food for Earthworms – Dispersal of Microorganisms by Earthworms – Earthworm burrows and casts in soil – Effects of Earthworms on soil structure.

UNIT – IV: Organic wastes and their management utilizing Earthworms: Sources of organic wastes – Conversion of Sewage Sludges, Animals, Vegetable and Industrial organic wastes into Vermicompost – Species of Earthworms suitable for Vermibiotechnology – Criteria used for species selection – Various methods of vermicomposting and vermiwash – Vermicast – Vermicompost - Macro and Micronutrients composition of vermicompost – Methods of application of vermicompost to various crops – Advantages of using vermicompost to crops. **Other beneficial roles of Earthworms** – Interaction with organisms that promote plant growth – production of plant growth promoting substances – Production of biologically active materials by Earthworms.

UNIT – V: Earthworms as a source of Animal Protein: Food Value of Earthworms – Production of Earthworm Feed Protein – Assessment of the value of worm protein as Animal Feed – Fish, Chicken, Pig and Shrimp Feeding trails – Economics of production of Earthworm protein – Earthworms as human food – Medicinal values of Earthworms for humans.

Course Outcome:

- Explain the morphology, structure and reproduction about earthworms.
- Write the different species of earthworms and suitable species for vermiculture.
- Describe the vermiculture techniques and related equipments.
- Justify – earthworms as farmer's friend.
- Write the values and importance of earthworm and to explain the values and production vermicompost.

TEXT BOOKS:

1. Edwards, C.A. and Bohlen, P.J.1996. Biology and Ecology of Earthworms. Chapman and Hall, London. 380p.
2. Lee, K.E.1985. Earthworms: Their Ecology and Relationship with soils and Land use, Academic press, Sydney.

REFERENCES BOOKS:

1. Ismail, S.A. 1997. Vermicology. The Biology of Earthworms. Orient Longman Limited. Hyderabad.
2. Bhatnagar, R.K and Palta, R.K. 1996. Earthworm – Vermiculture and Vermicomposting. Kalyani Pyblishers, Ludhiana, India, 106 P.
3. Gupta, P.K. 2005. Vermicomposting for Sustainable Agriculture (Second Edition). Agrobios (India), Jodhpur, India. 210P.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER-I
Elective Course - III

COURSE III: TOXICOLOGY

(Topic of Research)

Course Code: Max Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

- To make the scholars to understand about the toxicological effects of heavy metals, pesticides, and their biotransformation and also to know about toxicity testing techniques.
- The scholars should learn about the strategies of toxicity and their impact on the environment, exposure of toxicants, management strategies, biomagnifications and toxicity testing.
- To know about food additives and hazards of food additives.
- To find out the mechanism of various toxicants storage and excreation.

UNIT-I: Introduction to Toxicology: Scope of Toxicology – Factors influencing Toxicology – Species and strain, Age, Nutritional status, Time of Dosing Environmental factors, Exposure (dosing) characteristics, Formulation and presentation – Exposure to mixtures of chemicals – Drugs toxicity – Types of Toxins.

UNIT- II: Toxicological methods: Acute, sub-acute, chronic and special tests. Statistical concepts of toxicity – Concentrations. Dose Response relationship – Margin of safety, Toxicity curve, Cumulative toxicity, and toxicity of chemical mixture.

UNIT-III: Pesticide toxicity: Pesticides and their types – Insecticides – Herbicides – fungicides – rodenticides – nematicides – fumigants. Properties and effects of pesticides – Mechanism of action – Acute and Chronic effects, treatment, biological monitoring and regulation. Primary and secondary toxicity – Residue analysis.

UNIT-IV: Xenobiotics: Xenobiotic – Transfer across membrane, barriers absorption, distribution. Biotransformation. Phase I: Oxidation, reduction, and hydrolysis. Phase II: Glucoronidation, sulfation, Glutathymine, conjugation, Acetylation, Amino acid conjugation and methylation reactions – Excretion of Xenobiotics.

UNIT-V: Toxicology of food additives and metals (Arsenic, Cadmium, lead, mercury, zinc and nickel). Types and functions of food additives – hazards of food additives, Pharmokinetics of

metals (Absorption, distribution inhalation, oral ingestion, dermal exposure) metabolism. Storage and Excretion.

Course outcome:

- To know various toxicants which affect the environment and its remedial process make the students to create employment opportunities.
- To emphasise the importance of bioremediation techniques and its importance to clean the environment which hamper the society in various ways.
- To emphasise the storage and excretion of various toxicants.

TEXT BOOKS:

1. Srivastav, R.P. and Saxena, R.C. 1989. Text book of Insect Toxicitya.Himansha puplications, Rajasthan.
2. Brown, A.W.A.1951. Insect control by chemical.John Wiley and Sons. New York.
3. R.T. Williams. 1959. Detoxification mechanisms. Wiley. New York.
4. Sharma, P.D. 1995. Toxicology. Rastogi and Company, Meerut.

REFERENCES BOOKS:

1. O' Brien, R.D. and Yamamoto, I. 1970. Biochemical Toxicity of Insecticides. Academic Press. New York.
2. Corbett, J.R. 1974. The Biochemical mode of Action of pesticides. Academic Press. New York.
3. Gruzdyer, G.S. 1983. The chemical protection of plants. Ed. MIR publisher, Moscow.
4. Sood, A. 1999. Toxicology. Sarup & Sons. Darya Ganj. New Delhi.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER-I
Elective Course - IV

COURSE III: HERBAL DRUG TECHNOLOGY AND PHYTOCHEMISTRY

(Topic of Research)

Course Code:	Max Marks: 100
Hours per Week:	Internal Marks: 25
Credits: 4	External Marks: 75

Course Objectives:

- Apply and integrate knowledge of herbal drug technology and phytochemistry.
- To get a fundamental knowledge about drug design.
- To understand the role of medicinal plants as drug character to cure various diseases.
- To enlighten the scholars with the new information related to drug discovery.
- To teach the scholars understanding development of herbal drugs.

HERBAL DRUG TECHNOLOGY

UNIT-I: Brief history and scope of herbal science. Definition of herb, herbal medicine and herbal medicinal product. Source of herbs, selection, identification and authentication of herbal materials. Role of natural products in herbal medicine. General status and importance of herbal medicine. Safety of herbals / herbal pharmacovigilance. W.H.O. policy on herbal medicine.

UNIT-II: Preparation of herbal drug - Herbal material drying; processing of herbal raw material - grinding and extraction (choice of solvents; methods of extraction- maceration, percolation, Soxhlet extraction; stream distillation). Herbal Drug Formulations - study of different dosage forms such as solid, semi-solid, liquid and gaseous containing herbs/herbal extracts/herbal products intended for treatment of GIT (Diabetes, Liver, Constipation, Diarrhoea and Dysentery). Physical, chemical, spectral and toxicological standardization, qualitative and quantitative estimations exemplified by the method of preparation of at least two standardized extracts. Stability studies for extracts.

UNIT-III: Analysis of drugs/metabolites in biological studies like urine, blood, and tissue, enzymatic analysis – Biochemical analysis of drugs, estimation of enzymes and other endogenous materials. Microbiological assay of antibiotics and vitamins. Concepts of reverse Pharmacognosy. Herbal drugs with special reference to Cardiovascular, anti-cancer, anti-viral, anti-microbial anti-parasitic, anticoagulant and anti-inflammatory agents.

PHYTOCHEMISTRY

UNIT IV: Preliminary Phytochemical Screening: a) Successive solvent extraction. b) Qualitative chemical examination-(i) Detection of different classes of phyto constituents by test tube and TLC methods. (ii) Detection of volatile oil by hydrodistillation method.

UNIT V: Methods of isolation, purification and characterization of natural products. Phyto constituents – Introduction, definition, classification, source, importance of alkaloids (quinine, morphine and atropine), *Terpenoids* (Citral, Menthol, Isoprene and Zingiberene), *Steroids* (cholesterol and auxins), flavanoids (Resveratrol, Naringin and Quercetin) and *Purines* (Caffeine).

Course outcome

- Explain in detail the importance of conservation of herbal plants.
- The scholars will able to recognize the scope of phytochemical screening techniques.
- To emphasise the importance of herbal drug to cure dangerous diseases which hamper the society in various ways.
- To gain knowledge about agents which cause diseases.
- To know the knowledge of isolation, purification and characterization of natural drug products.

TEXT BOOKS:

1. Nadkarni, K.M. 1990. Indian Matera Media. Popular Prakasam Publication, New Delhi.
2. Bhattacharjee, S.K. 1998. Handbook of Medicinal plants, Pointer Publications, Jaipur.
3. Bone, K. 1996. Clinical application of Ayurvedic and Chinese herbs, Phytotherapy press, Australia.
4. Garratt, D.C. 1995. The Quantitative analysis of drugs. 2nd edition.
5. Brain and Turner, 1996. The practical evaluation phytopharmaceuticals.

REFERENCES BOOKS:

1. Sharma, O.D. Natural products inorganic chemistry. K. Nath & Co.
2. Gurdeep and R. Chatwall. Organic chemistry of Natural Products. Himalaya publishers.
3. Mant Timothy, G.K.M. Ritter, M.James and D. Lewis Lionel. A Text book of Clinical Pharmacology.
4. Mithal. 1984. Text Book of Pharmaceutical formulation, Vallabh Prakasham, Delhi.

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M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER I
Elective Course – V

COURSE III: ORNITHOLOGY

(Topic of Research)

Course Code: Max Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

- The main aim of this paper is to know the scholars about the importance of avian community in seed dispersal, pollinators etc.,
- To create an awareness to the scholars about avian species and this paper is used for conservation and management issues of birds.
- To teach the scholars about the scientific methods and its application in avian conservation.
- To know the importance of avian community to safeguard the wildlife and to prevent the man and animal conflict among public.
- To emphasize to the scholars about the contribution of NGOs in avian conservation in national and international level.

UNIT I: Classification of Birds: Classification up to order level with examples – IUCN classification - Rare, Vulnerable, Threatened, Endangered, Extinct. Economic importance of birds - Food and other products from birds – birds of agricultural importance – bird hazards in airports – recreation – aesthetics- hunting – bird watching. Social behavior such as aggregation, sexual behaviour. Evolution of biodiversity indices: Shannon and Weninner index, dominance index, similarity and dissimilarity index and association index.

UNIT II: Breeding Biology: breeding seasons- Factors influencing breeding seasons – Seasonal reproductive cycle – Photo periodism – Courtship and display – Sexual selection – Pair bond – Sexual dimorphism – mating systems – Polyandry, Polygyny – Promiscuity – Co-operative breeding – Brood parasites. Nests: Functions of nests- Choice of nest sites – Colonial nesting – Forms of nest – Multiple nests – Nest materials – Nest building - Nesting habitats- copulation-nest building – Nest sanitation – Egg Laying: Timing of egg laying and clutch size – Incubation patterns – incubation and hatching - growth and development – sex ratio. Parental Care: Feeding – Brooding the young – Defense of young.

UNIT III: Bird Migration: Mechanics of migration – timing of migration – physiology of migration – orientation and navigation. Migration and territorial behavior in birds - means of

dispersal and barriers of dispersal, group size and spacing carrying capacity. GPS, GIS and Remote sensing to monitor avian habitats. Radio telemetry and satellite telemetry studies.

UNIT IV: Population estimation: Direct count (Total count, drive counts, transect methods) - Indirect count: (Call count, track count, pellet count) - mark recapture method (Peterson or Lincon index method). Population Regulation: Population densities – Predation – Competition – Climate and weather – Accidents – parasites and diseases – Population fluctuations. Habitat ecology of Indian birds: coastal birds- inland water birds – birds of high altitudes and deserts. Feeding ecology of birds: Insectivores – frugivores – nectarivores – graminivores – carnivores and scavengers- Optimum foraging theory. Adaptive radiation of Aves.

UNIT V: Conservation issues and Management of Aves: Basic concepts and scope of avian conservation and management – Climate change- pesticides – shooting – drought- persecution-intervention at nest sites and agricultural factors – habitat selection - manipulation. Threats to avian habitats – habitat destruction – fragmentation and degradation – exotic species (weeds) intrusion in avian habitat. Role of NGOS in avian conservation: RSPB, BNHS, SACON, Bird life International, IBWL,WPA,WII,WWF, IUCN,US fish and Wildlife services. Wildlife Act.

Course Outcome:

- To know about various avian status and their importance by reading this course.
- To find out the conservation issues to safeguard the various avian community.
- The role NGOs and their importance by carrying out various projects to safe guard the avian community.
- Scholars get through the employment opportunities in various research institutions.
- Students able to understand the various avian population techniques to construct management strategy to safe guard the avian community.

TEXT BOOKS:

1. Ali, S and Ripley, S.D. 1969. The Handbook of the Birds of Indian and Pakistan. Oxford University Press, New Delhi.
2. Farner, D.S and King, J.K. 1971-75. Avian Biology, 5 Vols. Academic Press, New Delhi.
3. Welty J. 1983. The Life of Birds. Saunders College publishing, New York.
4. Welty J. 1983. The Life o Birds. Saunders College Publishing, New York.

REFERENCES BOOKS:

1. Giles, R.H. Jr (Ed). 2002. Wild Life management techniques3rd edition. The Wildlife society, Washington. D.C Nataraj pulishers, Dehra Dun.india P 547.
2. Robinson. W.L and Eric, G. Bolen. 1984. Wild life ecology and management. Mac Milan Publishing co. P 478.
3. Artikeya, K. 2005. Biodiversity: Extinction and Conservation, (202pp).

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
(For candidates admitted from the Academic year 2019 – 2020)
SEMESTER – I
Elective Course – VI

COURSE III: ENTOMOLOGY

(Topic of Research)

Course Code: Max Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

- To teach the basics of insect structure and function.
- To provide the concepts of beneficial insects; predators and parasitoids, pollinators, scavengers, weed feeders, insects of medicinal and aesthetic value.
- To enable the students know about principles and practices of biological control.
- Describe molecular basis of insect behavior.
- List the types of pesticides, modes of actions, and efficacy.

UNIT – I: Insect nutrition – role of vitamins, proteins, amino acids, carbohydrates, lipids, minerals and other food constituents; extra and intra-cellular microorganisms and their role in physiology – artificial diets.

UNIT – II: Internal anatomy, physiology, biochemistry and modifications of digestive, circulatory, respiratory, excretory, nervous, sensory, reproductive and musculature systems. Embryonic development in insects – formation of different organs – post embryonic developments - physiology of integument, moulting, growth, and metamorphosis - transmission of nerve impulses – neurotransmitters – and modulators – different types of sensilla – toxins and defense mechanisms.

UNIT –III: Digestive enzymes – digestive physiology in phytophagous and wool feeding insects – efficiency of digestion and absorption – role of endosymbionts in insects nutrition – osmoregulation and water conservation mechanisms in insects –polyphenism and diapauses. Endocrine system and insect hormones – physiology of insect growth and development – metamorphosis – exocrine secretion in insects and their application in pest management – bioluminescence in insects.

UNIT-IV: Traditional pest control - Traps - promising botanicals - Biorational approaches - Environment Modelling in pest management. Advanced techniques in chemical control – IRM - Impact of pesticides in Agro ecosystem - Hormones - Insect growth regulators Moulting inhibitor - Juvenile Hormone mimics -Biotechnology – Molecular tools in pest in Management.

UNIT–V: Problems associated with pesticide use in agriculture: Pesticide resistance - Physiology of insecticide resistance - genetic mechanism - Resistance management. Pest resurgence and outbreaks; persistence and pollution; health hazards and other side effects. Insecticide residues, their significance and environmental implications. Estimation of insecticidal residues- sampling, extraction, clean-up and estimation by various methods; maximum residue limits (MRLs) and their fixation; safe use of insecticides; diagnosis and treatment of insecticide poisoning.

Course Outcome:

- Explain the morphology of insects and analyze the appendages and their function.
- Relates the structure and function of organ systems.
- Describe classification, biology and control of insect vector and control. Explain insect metamorphosis and analyze role hormones in metamorphosis.
- Identify the insect pests of crops, vegetables, fruits, stored grains and household pests and to enhance the productivity of agricultural crops through insect pest management.
- Analyze and apply the biological control of insect pests. Explain the IPM

TEXT BOOKS:

1. Ambrose, Dunston P. 2004. The Insects: Structure, function and Biodiversity. Kalyani publishers, Ludhiana – New Delhi.
2. Bhaskaran, G., S. Friedman and J.C .Rodriguez (Eds.) 1981. Current topics in insect endocrinology and nutrition. Plenum Press, New York, pp. 326.
3. Blum,M.S. 1985. Fundamental of insect physiology. Wiley, New York. 598p.
4. Capman, R.F. 2002. The Insect structure and function. English Languages Book Society, Hooder Strongton.
5. Hassal, K. 1990. The biochemistry and uses of pesticides. VCH Publishers, Weinheim, New York, Basel, Cambridge. 536 p.

REFERENCES BOOKS:

1. Matsumara, F. 1985. Toxicology of insecticides. Second edition, Plenum Publns. New York . 598p.
2. O'Brien, R.D. and I. Yamamoto. 1970. Biochemical toxicology of insecticides. Academic Press, New York .218p.
3. Selvanaryanan. V. Arivudainambi. S. 2013. Introductory Entomology, Unicorn printers and publishers, Koyambedu, Chennai.
4. Temphare, D.B. 2009. Modern Entomology, Himalaya publishing Mumbai.
5. Vasantharaj David. B. and V.V. Ramamurthy 2011. Elements of Economic Entomology, Namrutha publications, Chennai-600 116.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
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SEMESTER I
Elective Course - VII

COURSE III:MEDICAL NANOTECHNOLOGY

(Topic of Research)

Course Code: Max Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

- To give information about the techniques of medical nanbiootechnology among scholars.
- To encourage the scholars to take medical nanobiotechnology as their career as it provides ample scope for bright feature.
- Independently execute a laboratory experiment using the standard methods and techniques in nanbiotechnology, with the appropriate analysis and interpretation of results obtained.
- The contents are more informative and essential for scholars lab and research work such as synthesis of nonmaterial in different ways.

UNIT I: Synthesis of Nanomaterials: Synthesis of nanomaterials by Physico-chemical approaches. Bionanocomposites : Nano particles and Microorganisms, Microbial Synthesis of Nano materials, Biological Methods for Synthesis of nano-emulsions using bacteria, Fungi and Actinomycetes, Plant based nanoparticle synthesis.

UNIT II: Characterization Methods: Determination of nanoparticles using microscopes - Optical Microscopy – Scanning Electron Microscopy – Transmission Electron Microscopy - Atomic Force Microscopy – Scanning Tunneling Microscopy – Optical Absorption and Emission Spectroscopy – Thermogravimetric Analysis – Differential Scanning Calorimetry – Thermomechanical Analysis- X-Ray Diffraction.

UNIT III: Nanotechnology in Pharmaceutical Applications: Trends in nanobiotechnology - Protein and peptide based compounds for cancer, diabetes, infectious diseases and organ transplant- therapeutic classes- focused pharmaceutical delivery systems.

UNIT IV: Nanotechnology in Drug Delivery: Nanoparticle in Drug delivery- Nanopowder and Nanocrystals, Targeting Ligands. Applications of Nanoparticle in Drug Delivery, Cancer & Diabetes mellitus Treatment. Nanosystems in Inflammation, Targeting Macrophages to Control Inflammation, Tissue Regeneration, Growth and Repair, Tissue Bioengineering.

UNIT V: Methods for Diagnosis: Animation of the PCR - DNA Profiling - Cantilever Sensors - Targeted Drug Delivery - Magnetic Nanoparticles - Cancer cell targeting - Stem Cell Scaffolds - Electrochemical Impedance Spectroscopy (EIS) - Tethered Lipid Membranes.

Course Outcome:

- Discuss the most significant discoveries and their impacts on the development of medical nanobiotechnology .
- Explain the fundamental structure, properties and processes in which the nanoparticles play a part in different fields.
- This field would help the scholars for drug discovery along with several plant extracts.
- Process the results obtained in the conducted experiments using computer processing, and display the results in the form of a written report.
- Accept the need and importance of ongoing development through the available lifelong learning programmes.

TEXT BOOKS:

1. Inorganic Nanoparticles: Synthesis, Application and Perspectives. Edited by Claudia Altavilla and Enrico Ciliberto. CRC Press, 2011.
2. G.Cao, "Nanostructures and Nanomaterials: Synthesis, Properties and Applications", Imperial College Press, 2004.
3. T.Pradeep, "Nano: The essentials, understanding Nanoscience and Nanotechnology", Tata Mc Graw Hill, 2007.

REFERENCES BOOKS:

1. Willard, "Instrumental Methods of Analysis", Van Nostrand, 2000.
2. R.S. Greco, F.B.Prinz and R.L.Smith, "Nanoscale Technology in Biological Systems", CRC press, 2005.
3. David.S.Goodsell, "Bionanotechnology: concepts, Lessons from Nature", Wiley-Liss, 2004.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
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SEMESTER I
Elective Course - VIII

COURSE III: AGRICULTURAL ORNITHOLOGY

(Topic of Research)

Course Code: Max Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

- The main aim of this paper is to know the scholars about the importance and role of birds in various agricultural fields as pollinators, predators etc.
- To create an awareness to the scholars about avian species.
- This paper is used for conservation and management issues of birds present in various agricultural fields.
- To teach the scholars about the scientific methods and its application in avian conservation.
- To know the importance of avian community to safeguard the avian community and to prevent the man and animal conflict among public.

UNIT – I: Diversity and distribution of Avifauna at Global and India level - An overview of Agricultural Ornithology in India – Groups of Birds Associated with Agro-ecosystems - Association of birds with different cultivation practices and crop stages -Their seasonality and succession –Adaptations of Diurnal and Nocturnal Birds.

UNIT – II: Bird pest Surveillance – Estimation of Bird Pest population in crop fields - Bird Census Techniques: Point counts – Line Transects – Netting of Birds – Knowledge of Calls of Birds – Call Playback method for Nocturnal Birds – Economic Threshold Levels - Home Range – Home Range overlap - Resource Partitioning -Radio-telemetry technique and its applications – Use of GIS and GPS for studying Birds - Camera traps – Night vision equipment in bird study – Plotting of GPS locations on Google Maps.

UNIT - III: Food and feeding habits of birds in crop fields: Carnivorous – Frugivorous – Granivorous – Insectivorous- Nectivorous – Omnivorous with suitable examples - Other food habits of Birds - Avivorous — Piscivorous with examples – Roles of these birds in Cropping systems - Bird Pests of Paddy, Sunflower, Maize, Vegetable crops - Types of damage caused by birds in different crops with examples – Methods of assessment of Bird depredation in various crops in India –Paddy – Sunflower – Maize – Vegetable crops – Magnitude of depredation to these crops at pre-harvest level.

UNIT – IV: Roosting and Nesting sites of Birds – Nesting territories –Solitary and Communal nesting - Type of nests - Nest building - Nest defense - Ecology and Biology of Barn owl - Spotted owl - Indian Eagle owl – Mottled Wood owl – Indian Scops owl – Utilization of these birds in managing the pests in crop fields – Use of Artificial Nest Boxes for conservation and propagation of owls – Utilization of Perching poles in managing pests in crop fields.

UNIT–V: Methods and principles of Bird Pest Management – Natural and Artificial Management - Management of bird pests in agriculture: physical, cultural, mechanical, ecological and chemical methods - Role of Insectivorous birds in agriculture as Bio-control agents -Attracting them to crop fields - Use of bird excreta in agriculture -Trends in Managing Bird Pests – Reflective Ribbons – Leaf wrapping in Maize – Paper plate – Spraying of 2% Egg Solution and 2% Neem seed extract solution – Bio-Acoustics – Border crops – Botanical Repellents - Integrated Bird Pest Management (IBPM) adopted currently in India.

Course Outcome:

- To know about various avian status and their importance by reading this course.
- The role NGOs and their importance by carrying out various projects to safe guard the avian community.
- Scholars get through the employment opportunities in various research institutions.
- Students able to understand the various avian population techniques to construct management strategy to safe guard the avian community.
- To emphasize to the scholars about the contribution of NGOs in avian conservation in national and international level.

TEXT BOOKS:

1. Ali, S. 2002. *The Book of Indian Birds*. Oxford University Press, New Delhi, India. 326p.
2. Ali, S. and Ripley, D. *Handbook of the Birds of India and Pakistan*. Vol 1-10. Oxford University Press, India. 3121p.
3. Bibby, C. J., Burgess, N. D. and Hill, A. 1992. *Bird Census Techniques*. Academic Press, UK. 257p.
4. Grimmett, R., Inskipp, C. and Inskipp, T. *Pocket Guide to the Birds of the Indian Subcontinent.*Oxford University Press, New Delhi, India. 384 p.

REFERENCES BOOKS:

1. Manakadan, R., Ranjit Daniels, J. C. and Bhopale, N. 2011. *Birds of Indian Subcontinent*: A Field Guide. Bombay Natural History Society and Oxford University Press, New Delhi.
2. Naoroji, R. 2006. *Birds of Prey of the Indian Subcontinent.*Om Books, 692p.
3. Sridhara, S. 2006. *Invertebrate Pests in Agriculture, The Indian Scenario*. ScientificPublishers, Jodhpur.

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
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SEMESTER I
Elective Course - IX

COURSE III: MEDICAL MICROBIOLOGY

(Topic of Research)

Course Code: Max Marks: 100
Hours/Week: Internal Marks: 25
Credit: 4 External Marks: 75

Course Objectives:

- The aim of this course is to train the students in the field of Medical Diagnostic Microbiology.
- Knowledge and practical skills shall be acquired by the candidates in the sub-specialities of Bacteriology including Mycobacteriology, Virology, Parasitology, Immunology, Serology & Mycology.
- This paper will help the scholars to deal with diagnosis and prevention of infectious diseases in the community.
- Organize the prevention and control of communicable diseases in the community.
- Understand and practice the principle of prevention and control of health care associated infections and rational antibiotic policy.

UNIT-I: General Microbiology: History and pioneers in Microbiology: Microscopy - Morphology of bacteria and other micro-organisms. Growth and nutrition of bacteria - Bacterial metabolism. Sterilization and disinfection - Biomedical waste disposal - Bacterial toxins. Antibacterial substances used in treatment of infections and drug resistance in bacteria. Host parasite relationship. Quality control and Quality Assurance in Microbiology. Laboratory Biosafety - Health care associated infections- prevention and control.

UNIT-II: Immunology and applied aspects: The normal immune system - Innate immunity – Antigens – Immunoglobulins - Complement. Antigen and antibody reactions - Hypersensitivity. Cell medidated immunity – Immunodeficiency – Autoimmunity - Immune tolerance. Transplantation immunity. Tumour immunity. Prophylaxis and immunotherapy Measurement of immunity. Immunity and immunopathogenesis of specific infectious diseases. Molecular Biology Techniques. For e.g. PCR, DNA probes.

UNIT-III: Systematic bacteriology and Virology: Isolation, description and identification of bacteria -The epidemiology, pathogenesis, antigenic characteristics and laboratory diagnosis of disease. Staphylococcus and Micrococcus - Anaerobic Gram positive cocci. - Streptococcus and Lactobacillus. Neisseria, Branhamnella and Moraxella. Corynebacterium and other coryneform organisms. Bacillus and Enterobacteriaceae. **VIROLOGY**: Morphology :virus structure. Virus

replication. The genetics of viruses. The pathogenicity of viruses. Epidemiology of viral infections. Vaccines and antiviral drugs Emerging viral infections – SARS, Avian influenza, H1N1.

UNIT-IV: Mycology: The morphology and reproduction of fungi and antimycotic agents. Classification of fungi. Contaminant and opportunistic fungi. Fungi causing superficial mycoses and. subcutaneous mycoses. Fungi causing systemic infections

UNIT-V: Applied Clinical Microbiology: Epidemiology of infectious diseases. Hospital acquired infections. Infections of various organs and systems of the human body. Molecular genetics as applicable to Microbiology. Automation in Microbiology. Rapid diagnostic techniques for microbial diseases. Vaccinology : principle, methods of preparation, administration of vaccines. Outbreak investigations & disaster management. Biological warfare

Course Outcome:

At the end of the course the scholars shall be able to:

- State and explain the etiology, pathogenesis and methods of laboratory diagnosis of infectious diseases and apply that knowledge in the treatment, prevention and control of communicable diseases caused by micro-organisms.
- State and explain the principles of immunity and immunological phenomenon which help to understand the pathogenesis, laboratory diagnosis of infectious and non-infectious diseases.
- Establish and practice “laboratory medicine” for diagnosis of infectious diseases in hospitals and community in the field of bacteriology, virology, mycology and immunology in the light of clinical findings.
- State the recent advances in the field of Medical Microbiology and apply this knowledge in understanding aetiopathogenesis and diagnosis of diseases caused by micro-organisms.
- Carry out fundamental or applied research involving microbiological work.

TEXT BOOKS:

1. Pelczar, M.J., E.C.S. Chan and N.R. Kreig. 2009. Microbiology, fifth edition. McGraw-Hill. Book Co. Singapore.
2. Tortora, G.J., Funke, B.R. and Case, C.L. 2009. Microbiology: An Introduction. 9th Edition, Pearson Education, Singapore.
3. Madigan, M.T., Martinkl, J.M. and Parker, J. 2009. Brock Biology of Microorganisms, 12th Edition, MacMillan Press, England.
4. Prescott, L.M., Harley, J.P. and Klein, D.A. 2008. Microbiology (7th edition) McGraw Hill, Newyork.
5. Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. 1991. General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.
6. Cappuccino and Sherman, 2012. Microbiology – A Laboratory Manual. 7th Edition, Dorling Kindersley (India) Pvt. Ltd., New Delhi
7. Gunasekaran, P. 2008. Laboratory Manual in Microbiology, New Age International (P) Ltd. Publishers, New Delhi.

REFERENCE BOOKS:

1. Alcamo, I.E. 2001. Fundamentals of Microbiology, sixth edition, Addison wesley Longman, Inc. California.
2. Alexopoulos, C.J., C.W. Mims and M.Blackwell. 2000. Introductory Mycology. fifth edition John Wiley & Sons. Chichester.
3. Atlas, R.A. and Bartha, R. 2000. Microbial Ecology. Fundamentals and Application, Benjamin Cummings, New York.
4. Black, J.G.2005. Microbiology-principles and explorations, 6th edition. John Wiley & Sons, Inc. New York
5. Dubey, R.C. and Maheswari, D.K. 2010. A Text Book of Microbiology. S Chand, New Delhi.
6. Johri, R.M., Snehlatha, Sandhya Shrama, 2010. A Textbook of Algae. Wisdom Press, New Delhi.
7. Kanika Sharma, 2011. Textbook of Microbiology – Tools and Techniques. 1st Edition, Ane Books Pvt. Ltd., New Delhi.
8. Kanika Sharma, 2009. Manual of Microbiology – Tools and Techniques. 2nd Edition, Ane Books Pvt. Ltd., New Delhi.
9. Kulanthaivel,S and S. Janarthanan 2012. Practical Manual on Fermentation Technology. I.K. International Publishing house. New Delhi.

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

(Nationally Accredited with 'A' Grade by NAAC)
PUTHANAMPATTI – 621 007, TRICHY – DT.
P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY
M.Phil, ZOOLOGY PROGRAMME – (CBCS Pattern)
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SEMESTER - I

COURSE IV: TEACHING AND LEARNING SKILLS

Course Code: Max Marks: 100
Hours per Week: Internal Marks: 25
Credits: 4 External Marks: 75

Course Objectives:

- Apply and integrate knowledge of teaching and learning skills among scholars.
- To get a fundamental knowledge about basic and advanced teaching methods.
- To understand the role of advanced teaching skills in various institutions.
- To enlighten the scholars with the new information related to teaching technology.
- To teach the scholars understanding development of advanced teaching skills and to prepare the scholars e-contents for future use by using various technology.

UNIT-I: Computer Applications Skills: Computer system: Characteristics, parts and their functions – Different generations of computer – Operation of computer: switching on/off/restart. Mouse control, Use key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends. Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom.

UNIT-II: Communication Skills: Definitions – Elements of communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication – Spoken and Written; Non-verbal Communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

UNIT-III: Communication Technology: Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-Content – Satellite-based communication: EDUSAT and ETV Channels. Communication through web: Audio and Video applications on the internet, Interpersonal communication through the web.

UNIT-IV: Pedagogy: Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a

Lecture – Narration I tune with the nature of different disciplines – Lecture with power point presentation – Versatility of Lecture technique –Demonstration: Characteristics, Principles, Planning, Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Modes of teaching: CAI, CMI and WBI.

UNIT-V: Teaching Skills: Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing, Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills.

Course Outcome:

- To know about computers and its parts.
- The ICT technology will be improved in various ways.
- The scholars will able to recognize the scope of teaching skills.
- To emphasise the importance of EDUSAT and ETV Channels and its importance to improve the teaching skills.
- To gain knowledge about Evaluation of Teaching Skills.

TEXT BOOKS:

1. Bela Rani Sharma (2007). Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi.
2. Don Skinner (2005). Teacher Training, Edinburgh University Press Ltd., Edinburgh.
3. Information and Communication Technology in Education: A Curriculum for schools and programme of Teacher development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.
4. Kumar, K.L (2008). Educational Technology, New Age International publishers, New Delhi.
5. Mangal, S.K (2002), Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.

REFERENCES BOOKS:

1. Michael, D and William (2000). Integrating Technology into Teaching and Learning: Concepts and Applications, prentice Hall, New York.
2. Pandey, S.K (2005). Teaching Communication, Commonwealth Publishers, New Delhi.
3. Ram Babu, A and Dandapani, S (2006). Microteaching (Vol.1 &2), Neelkammal Publications, Hyderabad.
4. Singh, V.K and Sudarshan, K.N (1996). Computer Education, Discovery Publishing Company, New York.
5. Sharme, R.A (2006). Fundamentals of Educational Technology, Surya Publications, Meerut.
6. Vanaja, M and Rajasekar, S (2006). Computer Education, Neelkamal Publications, Hydrabad.

BLUE PRINT OF THEORY QUESTION PAPER
FOR BOTH FULL TIME AND PART TIME
Question Paper Pattern

I Semester:

External: Total 75 Marks
Theory Paper

Section A : 10 Questions x 2 Marks = 20 Marks (Two Questions from each unit will be asked) Answer all the questions. Define each question in four or six sentences.	20
Section B: 05 Questions x 5 Marks = 25 Marks (Internal choice (or) Either or type and one set of questions from each unit will be asked) Answer all the questions in 500 -700 words, draw diagram wherever necessary.	25
Section C: 03 Questions x 10 Marks = 30 Marks (5 questions will be asked and one question from each unit will be asked) (Answer any THREE questions only) Write the answer in 1500 words, draw diagram wherever necessary.	30
Total	**75**

Internal: Total 25 Marks

CIA Components	Portions to be covered	Question Paper pattern to be followed	CIA Marks allotted
CIA Test - I	First 2½ Units	Same as Autonomous Examination Question Paper	10
CIA Test - II	Remaining 2½ Units		
Attendance	---	---	05
Assignments (2)	Any topics from five Units	---	05
Seminar (1)		---	05
		Total	**25**

II Semester:
Project Work
Total Marks = 200
(Internal: Thesis = 150 marks, External: viva = 50 marks)

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