SRI MEENAKSHI GOVERNMENT ARTS COLLEGE FOR WOMEN

(Autonomous)

Madurai - 625 002.

DEPARTMENT OF BOTANY

Syllabus for M.Sc. Botany

June 2022 Onwards

Department of Botany

Study of plants has always been a fascination of the human kind for all life will have to essentially depend on floral elements for both nutritional and survival needs. From such a fundamental understanding of life and life's processes, to reach to an aesthetic appreciation of nature and its constituent biotic elements interacting with the abiotic material world, one needs a systemic approach and a critical study of the plant world. The idea of development and conservation will have to be pragmatically addressed for a comprehensive understanding and an active engagement at different levels. The Department of Botany dedicating its efforts, grit and the single-minded focus on this exciting mission, functions as a humble but active constituent of the noble institution Sri Meenakshi Government Arts College for Women that has envisioned and committed itself to the cause of emancipation of the womanhood in this part of our nation. The crew in Botany dedicates dearly for the noble endeavor by finding viable and practical solutions, infusing interest and imparting relevant skills in every possible way that a holistic education is made available in its portal.

The credibility and trust that the college and the department have earned over the years make the women folk of this region to come into its fold for pursuing professional training for career prospects. The need for updated knowledge in Botany to deal with the issues of this predominantly agrarian backdrop and the modest household from where the students hail, but the immense energy and potential that they hone could suffice to find relevance in these students to go after their personal and professional dreams and aspirations. The programs, courses and the training offered in the department by its committed faculty help learners to equip with vocational skills and leadership traits that the two academic programs, offered at the bachelors' and masters' level to promptly meet the task cut out (Specific Vission, Mission statements) with appropriate outcomes (listed course-wise), embed effective exposure and ensure training on plant based knowledge and resources for self actualization and upholding common good.

Programs offered by the Department:

1. B.Sc. Botany since 2008-09
2. M.Sc. Botany since 2013-14

Object of the Department:

To explore nature and the plant world and translate the experience in organic terms for empowering self and womanhood

Vision

- To help learners gain insights on the intricacies of variations in plant forms from common ancestral stocks to appreciate the grand unification of life
- To appreciate the robustness of Indian floristic wealth to cherish and own with pride the rich heritage of the motherland
- To provide understanding on effective management and use of plant resources with ecological fairness
- To enable a thorough study of the constituent structure and functions of plant paving way for sustained utilization
- To make students life-long learners with skilled expertise to find botanical solutions and face challenges in real-life situations

Mission

- To inculcate confidence and entrain women folk to hone life and career skills for self reliance and inclusive development
- To provide updated knowledge to handle professional and vocational tasks in this agrarian district in consonance with the subject-based training
- To provide ample chances for students to inculcate leadership traits and provide the grit to deal with the challenges that one would face in life
- To entrain students to identify plants at different locations and impart the idea of sustainable use and conservation for ideal plant resource management
- To offer entrepreneurial insights in plant-based vocations and make learners to secure placement in private and public sector or kick start their own business

PROGRAMME: M.Sc. BOTANY

SEMESTER –I

Course Type	Course Code	Title of the Course	Hrs / Week	Credits	Exam Hrs	Marks		
						Int	Ext	T
CCI	P22CF1	Plant Diversity –I Algae, Fungi, Lichens and Bryophytes	5	4	3	25	75	
CC II	P22CF2	Plant Diversity – II Pteridophytes, Gymnosperms and Paleobotany	5	4	3	25	75	
CC III	P22CF3	Genetics and Evolution	5	4	3	25	75	
CCIV	P22CF4P	Practical Paper– I	8	4	3	40	60	
DSEC- I	P22DSF1A	Ecology and Biodiversity	5	5	3	25	75	
	P22DSF1B	Seed Technology						
SEC –I	P22SEF1	Phytochemistry	2	2	3	25	75	
Total			**30**	**23**				

SEMESTER –II

Course Type	Course Code	Title of the Course	Hrs / Week	Credits	Exam Hrs	Marks		
						Int	Ext	Total
CCV	P22CF5	Plant Anatomy and Embryology of Angiosperms	5	4	3	25	75	100
CCVI	P22CF6	Cell and Molecular Biology	5	4	3	25	75	100
CCVII	P22CF7	Microbiology and Plant Pathology	5	4	3	25	75	100
CCVIII	P22CF8P	Practical Paper –II	8	4	3	40	60	100
DSEC-II	P22DSF2A	Horticulture and Plant Breeding	5	5	3	25	75	100
	P22DSF2B	Environmental Bioresource Management						
SEC- II	P22SEF2	Techniques in Mushroom Cultivation	2	2	3	25	75	100
Total			**30**	**23**				**600**

SEMESTER –III

Course Type	Course Code	Title of the Course	Hrs / Week	Credits	Exam Hrs	Marks		
						Int	Ext	Tota
CC-IX		Taxonomy of Angiosperms	5	4	3	25	75	100
CC– X	P22CF10	Plant Physiology	5	4	3	25	75	100
CC – XI	P22CF11	Bioinstrumentation and Biostatistics	5	4	3	25	75	100
CC–XII	P22CF12P	Practical Paper - III	8	4	3	40	60	100
DSEC–III		Plant Tissue Culture	5	4	3	25	75	100
		Research Methodology						
NMEC –I	P22NMF1	Gardening	2	2	3	25	75	100
	Total		**30**	**22**				**600**

SEMESTER –IV

Course Type	Course Code	Title of the Course	Hrs / Week	Credits	Exam Hrs	Marks		
						Int	Ext	Total
CC-XIII	P22CF13	Plant Biotechnology and Bioinformatics	6	5	3	25	75	100
CC–XIV	P22CF14	Biochemistry and Biophysics	6	4	3	25	75	100
CC-XV	P22CF15P	Practical Paper- IV	5	4	3	40	60	100
CC– XVI	P22CFPW	Project	8	5	-	80	20	100
DSEC–IV	P22DSF4A	Applied Botany	5	4	3	25	75	100
	P22DSF4B	Ethnobotany and Pharmacognosy						
	Total		**30**	**22**				**500**

COURSE SRUCTURE

ABSTRACT FOR M.Sc. BOTANY Programme

PART	COURSES	TOTAL NO OF COURSES	HOURS	CREDIT	MARK
III	Core Course	15	86	61	1500
III	Core Project	1	8	5	100
III	Discipline Specific Elective Course	4	20	18	400
III	Non-Major Elective Course	1	2	2	100
III	Skill Enhancement Course	2	4	4	200
Total		**23**	**120**	**90**	**2300**

SEM	COURSE TYPE	COURSE CODE	COURSE TITLE	HRS/ WEEK	CREDITS	EXAM HRS	MARKS	
							INT	EXT
I	CC1	P22CF1	Plant Diversity I -Algae, Fungi, Lichens and Bryophytes	5	4	3	25	75
	CCII	P22CF2	Plant Diversity II -Pteridophytes, Gymnosperms and Paleobotany	5	4	3	25	75
	CCIII	P22CF3	Genetics and Evolution	5	4	3	25	75
	CC IV	P22CF4P	Practical Paper - I	8	4	3	40	60
	DSEC-I	P22DSF1A	Ecology and Biodiversity	5	5	3	25	75
		P22DSF1B	Seed Technology					
	SEC I	P22SEF1	Phytochemistry	2	2	3	25	75

II	CCV	P22CF5	Plant Anatomy and Embryology of Angiosperms	5	4	3	25	75	
	CCV1	P22CF6	Cell and Molecular Biology	5	4	3	25	75	
	CCVII	P22CF7	Microbiology and Plant Pathology	5	4	3	25	75	
	CCVIII	P22CF8P	Practical Paper - II	8	4	3	40	60	
	DSEC II	P22DSF2A	Horticulture and Plant Breeding	5	5	3	25	75	
		P22DSF2B	Environmental Bioresource Management						
	SEC II	P22SEF2	Techniques in Mushroom Cultivation	2	2	3	25	75	
III	CC IX	P22CF9	Taxonomy of Angiosperms	5	4	3	25	75	
	CCX	P22CF10	Plant Physiology	5	4	3	25	75	
	CCXI	P22CF11	Bioinstrumentation and Biostatistics	5	4	3	25	75	
	CCXII	P22CF12P	Practical Paper -III	8	4	3	40	60	
	DSEC III	P22DSF3A	Plant Tissue Culture	5	4	3	25	75	
		P22DSF3B	Research Methodology						
	NMEC I	P22NMF1	Gardening	2	2	3	25	75	
IV	CCXIII	P22CF13	Plant Biotechnology and Bioinformatics	6	5	3	25	75	
	CCXIV	P22CF14	Biochemistry and Biophysics	6	4	3	25	75	
	CCXV	P22CF15P	Practical Paper - IV	5	4	3	40	60	
	CCXVI	P22CFPW	Project	8	5	-	80	20	
	DSEC IV	P22DSF4A	Applied Botany	5	4	3	25	75	
		P22DSF4B	Ethnobotany and Pharmacognosy						

PROGRAMME OBJECTIVES FOR ALL POSTGRADUATE PROGRAMMES

PO1: Getting enriched by the existing knowledge in their respective disciplines and apply appropriate methodology for research and implementation

PO2: Develop technology compatible to new perceptions and evolve innovative pedagogy In their discipline

PO3: Design creative projects and translate it to the present day scenario

PO4: Evaluate the issues and challenges pertaining to their disciplines and synergize them

with the growing needs in their arena

PO5: Explore the diverse value systems of our nation and contribute towards building an egalitarian society

PROGRAMME SPECIFIC OUTCOMES (PSO) for M.Sc. BOTANY

PSO 1: Developing competence to document, monitor and manage plant diversity resources to foster scientific temperament and research attitude.

PSO 2: Pursuing analytical, technological and teaching skills for innovative and industrial support services.

PSO 3: Exploring the feasibility of developing ingenious approaches in the field of bioresource management and biotechnology to cater and strengthen the societal needs.

PSO 4: To identify the plant ecosystem indicators, provide valid conclusions and to pursue career in various domains of plant sciences relating to farming, forestry and floral aesthetics.

PSO 5: To learn from the study of plants to be diverse in meeting the pluralistic needs of the system and draw personal and collective meaning for peaceful co-existence with changing times.

Programme: M.Sc. **Core Course I**
Semester : I **Hours : 5 /wk 75 hrs /sem**
Sub. Code : P22CF1 **Credits: 4**

TITLE OF THE PAPER: PLANT DIVERSITY I - ALGAE, FUNGI, LICHENS AND BRYOPHYTES

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	4	-	-	2

PREAMBLE:

- To provide practical training as well as theoretical knowledge about different plant groups.
- To improve skills for identifying the various plant groups.
- To create awareness about the different plant groups.
- Students are introduced the applications of algae and fungi to human welfare.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: understand the different systems of algal classification and recognizes the habitat of algae.	1	15
UNIT 2 CO2: realize the application of algae in human welfare.	2	15
UNIT 3 CO3: understand the general features of fungi, its classification and identifies its economic importance.	3	15
UNIT 4 CO4: develop an understanding of the role of lichens in the environment.	4	15
UNIT 5 CO5: analyse the phylogenetic relationship of bryophytes with other higher groups of plant kingdom.	5	15

SYLLABUS

Unit I:

Classification of Algae (F.E.Fritsch 1945, Bold & Wynne 1978). Criteria used for algal classification. Range of thallus structure, Life cycle patterns of algae. General account on the structure and reproduction of algae belonging to Cyanophyceae, Chlorophyceae, Bacillariophyceae, Phaeophyceae & Rhodophyceae.

Unit II:

Algae as pollution indicators, algal blooms. Algicides. Economic importance of algae: Food & feed. Agar-agar, Carragenin and Diatomaceous earth Iodine, Vitamins, Medicine Single cell protein. Phylogenetic trends in algae.

Unit III:

Fungi: General features, occurrence and distribution, classification of fungi (Alexopoulos & Mims, 1979), recent trends in the classification of fungi. General characters of major classes: Myxomycetes, Oomycetes, Zygomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes. (Thallus organization, cell structure and fruiting bodies). Economic importance of fungi.

Unit IV:

Homothallism and Heterothallism in fungi. Homokaryon and Heterokaryon. Sex hormones and pheromones in fungi. Reproduction - Life cycle types, parasexual cycles, reduction in sexuality in fungi. Lichens: General features, classification of lichens, distribution, thallus

organization, vegetative and sexual reproduction. Role of lichens in soil formation. Economic importance of lichens.

Unit V:

Bryophytes: General features, distribution and classification of Bryophytes (Rothmaler.1955). Structure, reproduction and life cycle of major groups- Marchantiales, Jungermaniales, Anthocerotales and Polytrichales. Range of vegetative structure, Evolution of gametophytes and sporophytes. Economic importance of Bryophytes.

REFERENCE BOOKS:

ALGAE

TEXT BOOKS:

1. Sharma, O.P. (2011). Diversity of microbes & Cryptogams – Algae, Tata Mc Graw Hill Education Private Limited, New Delhi
2. Kumar, H.D. (1985). Introductory Phycology- East West Press, New Delhi.
3. Kumar, H.D and Singh, H.N. (1982) .A text book of Algae. Affiliated East West Press, New Delhi.

REFERENCE BOOKS:

1. Bold, H.C and Wyne M.J. (1978). Introduction to algae – Structure & reproduction –Prentice hall, New Jersey
2. Fritsch, F.E. (1935).The Structure & Reproduction of The Algae (Vol1&2) Cambridge University press, England
3. Venkataraman G.S *et al.,* (1974). Algae form and Function – Today and Tomorrow publishers, New Delhi.

FUNGI:

TEXT BOOKS:

1. Sharma, O.P. (2011). Fungi and allied microbes The McGraw –Hill companies, New Delhi
2. Alexopoulus, C.J. Mims, CW. (1979). Introductory Mycology, Wiley Eastern Ltd., New Delhi
3. Dube, H.C. (1990). An Introduction of Fungi. Vikas Publication House Ltd, New Delhi
4. Sharma, P.D (2003). The Fungi. Rastogi Publications, Meerut

REFERENCE BOOKS:

1. Burnett, J.H. (1971). The fundamentals of Mycology. ELBS Publication, London
2. Sundararajan, S. (2004). Practical manual of fungi, Anmol publications Pvt.Ltd., New Delhi

LICHENS:

REFERENCE BOOKS:

1.Muthukumar, S. and Tarar, J.L. (2006).Lichen Flora of Central India, Eastern book Corporation, New Delhi.
2. Dharani Dhar Awasthi. (2000). A Hand book of Lichens Vedams e -Books (P) Ltd. New Delhi.
3. Hale, M.E. (1983). The Biology of Lichens. Edward Arnold, London

BRYOPHYTES:

TEXT BOOKS:

1. Rashid, A. (1998). An introduction to bryophyte. Vikas Publishing Co. New Delhi.
2. Vashishta, Sinha A.K, Adarsh Kumar. (2011). Bryophytes, S.Chand &Company Ltd., New Delhi.

REFERENCE BOOKS:

1 Chopra, R.N and Kumar P.K. (1988). Biology of Bryophytes, John Wiley, New York.
2. Prem Puri, P. (1990). Bryophytes: Morphology, Growth and Differentiation.Atmaram and Sons.
3. Smith, A.J.E. (1982). Bryophyte Ecology. Chapman and Hall. London.

4. Watson, E.V. (1970). Structure and life of Bryophytes. Hutchinson and Co, London.			
UNITS	**TOPIC**	**LECTURE HOURS**	**MODE OF TEACHING**
UNIT I (15 hours)			
	Classification of algae,range of thallus structure, lifecycle patterns of algae.	6	ICT
	Phylogenetic trends in algae	3	Chalk and talk
	Structure and reproduction of Cyanophyceae, Chlorophyceae	3	Chalk and talk
	Structure and reproduction of Bacillariophyceae, Pheophyceae and Rhodophyceae	6	Chalk and talk
UNIT II(15 hours)			
		3	ICT
	Algae as pollution indicators- algalblooms, algicides.	3	Chalk and talk
	cultivation of freshwater and marine algae,sea weed cultivation,processing and its application.	6	Chalk and talk
	Economic importance of algae- food,feed,agar-agar,carragenin,diatomaceous earth,vitamins,medicine,single cell protein.	6	Chalk and talk
UNIT III (15 hours)			
	Fungi- general features, occurrence, distribution and culture	3	Chalk and talk
	Fungi- classification, economic importance	3	Chalk and talk
	General characters of myxomycetes,oomycetes and zygomycetes	6	ICT
	General characters of ascomycetes,basidiomycetes and deuteromycetes	6	ICT
UNIT IV (15 hours)			
	Homothallism,heterothallism, homokaryon, heterokaryon, sexhormones and pheromones	3	Chalk and talk
	Reproduction ,lifecycle types, parasexual cycles, reductionin sexuality.	6	ICT
	Lichens –classification,thallus organization,reproduction	6	
	Roleof lichen in soil formation, economic importance of lichens	3	
UNIT V (15 hours)			
	Classification of bryophytes,general features	3	Chalk and talk

	Structure,lifecycle and reproduction of marchantiales and jungermaniales	6	ICT
	Structure,lifecycle and reproduction of anthocerotales and polytrichales	3	ICT
	Evolution of gametophytes and sporophytes	3	Chalk and talk
	Economic importance of bryophytes	3	Chalk and talk

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	3	4	3	3	3	3	3.1
CO2	3	3	4	4	3	3	4	4	4	2	3.4
CO3	4	3	4	3	3	3	3	3	3	3	3.2
CO4	3	3	4	3	3	3	3	3	4	3	3.2
CO5	3	3	4	3	3	4	3	3	3	3	3.2
Mean Overall Score											3.22

Result: The Score for this Course is 3.22 (High relationship)

Programme: M.Sc. **Core Course II**
Semester : I **Hours : 5 hrs /wk 75 hrs /sem**
Sub. Code : P22CF2 **Credits: 4**

TITLE OF THE PAPER: PLANT DIVERSITY II - PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	ICT
	6	3	1	1	1

PREAMBLE:

Pteridophytes and Gymnosperms as early effective colonizers of land have in their fold the secrets and strategies that they have adopted to place and sustain themselves in the newer and harsher geo-climatic situations of the primitive and changing earth. Paleobotany deals with fossils and the fossilization processes that account for species that have gone extinct, for want of adequate adaptations to survive.

In the light of the rapid and rash global climate challenges and the avaricious anthropocentric influences thrown open today, it becomes important that this study on early vascular plants is a must and necessity.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: relate to the forms they study in theory and lab and hence shall be comfortable in describing and adopting strategies in conserving and managing plant resources.	1	15
UNIT 2 CO2: aesthetically connect with the plant group to identify and develop skills in dealing with economically important taxa among this studied plant group subscribing to floristic and horticultural significance.	2	15

UNIT 3 CO3: visualize and gain holistic knowledge of gymnosperms, especially on anatomical aspects of wood and seed development, and appreciate rationalization of using the resource for their own use and commercial purposes	3	15
UNIT 4 CO4: conceive the idea of seeing gymnosperms as dominant elements of biota of the past and capture the inside stories of their survival for analysing factors that had led to their depletion and extinction that they may effectively apply the knowledge in current situation to stem the loss of similar and related elements.	4	15
UNIT 5 CO5: comprehensively use the knowledge of handling and studying fossils, entrain with cross disciplinary approaches that shall enable them to go for career opportunities in contemporary avenues in connected fields of geology, earth sciences, geography, sociology and anthropology.	5	15

SYLLABUS

Unit I:

A General account of Pteridophytes. Classification of Pteridophytes (Smith, 1955), Morphology, Anatomy, Reproduction and Evolution of gametophytes and sporophytes of following families: Selaginellaceae, Equisetaceae, Marsileaceae, Gleicheniaceae and Azollaceae.

Unit II:

Phylogenetic trends in Pteridophytes, Evolution of stele, Sporangial Organization, Heterospory and seed habit, Alternation of generation. Economic importance of Pteridophytes.

Unit III:

Classification of Gymnosperms (Sporne K.R, 1956) Comparative study of vegetative, anatomical and reproductive characteristics of major Orders: Cycadales, Coniferales and Gnetales. Economic importance of Gymnosperms.

Unit IV:

General Structure and Interrelationship of Pteridospermales and Pentoxylales. Living fossils: Affinities with Angiosperms & Pteridophytes.

Unit V:

Paleobotany: Geological time scale, Fossilization and types of fossils, Carbon dating. Fossil Pteridophytes: *Rhynia, Sphenophyllum, Lepidocarpon.* Fossil Gymnosperms: *Lyginopteris and Lagenostoma.*

PTERIDOPHYTES:

TEXT BOOKS:

1. Vashishta , P.C , Sinha and Anilkumar (2010). Pteridophytes, S.Chand & company Ltd, New Delhi.
2. Smith,G.M (1955). Cryptogamic Botany Vol. II, Tata Mcgraw Hill Publishing Co., Ltd., New Delhi.
3. Rasheed, A. (1999). An Introduction to Pteridophyta, Vikas Publishing Co., NewDelhi.

REFERENCE BOOKS:

1. Eames, A.J. (1936). Morphology of Vascular Plants - Lower groups, Tata Mcgraw Hill Publishing Company Ltd., New Delhi.
2. Sporne,K.R. (1972). The Morphology of Pteridophytes, B.I. Publications, Madras.

GYMNOSPERMS:

TEXT BOOKS:

1. Sharma, O.P. (1997). Gymnosperms, Pragati Prakashan, Meerut, India.
2. Biswas, C. and Johri, B.M. (2004). The Gymnosperms. Narosa Publishing House, New Delhi.
3. Vashista P.C. (1990). Gymnosperms, S. Chand & Co. Ltd., New Delhi

REFERENCE BOOKS

1. Bierhost, D.W. (1971). Morphology of Vascular plants. Mc Millan Company, NewYork.
2. Chamberlain, C.J. (1934).Gymnosperms: Structure and Evolution. Chicago (Reprinted 1950) NewYork.

PALEOBOTANY

REFERENCE BOOKS:

1. Atchlay W.R & Woodnuff D.S. (1981). Evolution and speciation, Cambridge University Press, Cambridge.
2. Arnold C.I.A – An Introduction to Paleobotany.
3. Kirkaldy, J.E. (1963). The study of Fossils. Hutchinson Educational, London.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1 : 15 hours			
	A General account of Pteridophytes. Classification ofpteridophytes (Smith,1955) Anatomy, Reproduction and Evolution of gametophytes of Selaginellaceae	3 hours	Chalk–talk techniques to familiarize and internalize terms, definition and key words Use of OHP to present schemes of classification
	Anatomy, Reproduction and Evolution of gametophytes of Equisetaceae	3 hours	Use of AV aids, animations and short films
	Anatomy, Reproduction and Evolution of gametophytes of Marsileaceae	3 hours	Use of AV aids, animations and short films

	Anatomy, Reproduction and Evolution of gametophytes of Gleicheniaceae	3 hours	Use of AV aids and if there be any need animations and short films
	Anatomy, Reproduction and Evolution of gametophytes of Azollaceae.	3 hours	Use of AV aids, peer teaching techniques, and if there be any need animations
UNIT 11: 15 hours			
	Phylogenetic trends in Pteridophytes, Evolution of stele	5 hours	Blackboard use to familiarize and internalize terms, definitions and key words, Use of OHP to present schemes of classification
	Sporangial Organisation, Heterospory and seed habit	4 hours	Use of POP models to provide a three dimensional perspective
	Alternation of generation	4 hours	Power Point Presentation with animations and video clips, Peer teaching.
	Economic importance of Pteridophytes.	2 hours	By way of sensitising students to do surveys and collect appropriate material, products and produce for making display through charts and museum mounts
UNIT III: 15 hours			
	Classification of Gymnosperms (Sporne K.R, 1956)	3 hours	Use of OHP to present schemes of classification and peer participation through GD
	Comparative study of vegetative, anatomical and reproductive characteristics of Cycadales	3 hours	Appraisal through field trips and site study, use of museum mounts and AV aids, Peer teaching
	Comparative study of vegetative, anatomical and reproductive characteristics of Coniferales	3 hours	Appraisal through field trips and site study, use of museum mounts and AV aids, Peer teaching
	Comparative study of vegetative, anatomical and reproductive characteristics of Gnetales	3 hours	Appraisal through field trips and site study, use of museum mounts and AV aids, Peer teaching
	Economic importance of Gymnosperms	3 hours	Market Survey Techniques and collecting inputs and raw materials for display through charts and museum mounts
UNIT IV: 15 hours			
	General Structure and Interrelationship of Pteridospermales and Pentoxylales	5 hours	Use of videos and suitable short films

	Living fossils : Affinities with Angiosperms	5 hours	ICT techniques for peer interactions
	Living fossils: Affinities with Pteridophytes.	5 hours	Comparative studies with charts and slides
UNIT V: 15 hours			
	Paleobotany: Geological time scale.	3 hours	Use of e-resources, charts, animations and short films
	Fossilization and types of fossils	2 hours	Inspection of fossils Collection and visits to fossil sites
	Carbon Dating	2 hours	Use of OHP and Peer participation through GD
	Fossil Pteridophytes : *Rhynia* *Sphenophyllum* *Lepidocarpon*	3 hours	Use of POP models to provide a three dimensional perspective AV aids, charts and slides
	Fossil Gymnosperms: *Lyginopteris*	3 hours	AV aids, charts and slides
	Fossil Gymnosperms: *Lagenostoma*	2 hours	AV aids, charts and slides

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	3	4	3	4	4	3	3.3
CO2	3	3	3	3	3	3	3	3	3	4	3.1
CO3	4	3	3	4	3	4	4	4	4	3	3.6
CO4	4	3	3	3	3	3	3	3	3	4	3.2
CO5	4	3	3	4	3	4	4	4	3	2	3.4
Mean Overall Score											3.32

Result: The Score for this Course is 3.32 (High relationship)

Programme : M.Sc. **Core Course III**
Semester : I **Hours : 5 /wk 75 hrs /sem**
Sub. Code : P22CF3 **Credits : 4**

TITLE OF THE PAPER: GENETICS AND EVOLUTION

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	ICT
	5	2	1	1	1

PREAMBLE:

- To know about the rationale behind the study of Genetics
- To understand the heredity of life, to have a clear cut knowledge about the functioning of gene ie how it expresses
- To understand the mechanism of sex determination and to study the efficacy of sex linked genes
- To analyse the difference between chromosomal and extra chromosomal inheritance
- To understand and analyse the cause and effect of mutation and to appreciate the evolution of life on earth

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Point out the rationale behind the study of genetics and understands the heredity of life	1	15

UNIT 2 CO2: differentiate between independent assortment and linkage.	2	15
UNIT 3 CO3: Explain the sex determination in plants	3	15
UNIT 4 CO4: Analyse the cause and effect of mutation	4	15
UNIT 5 CO5: Appreciate the gradual change that took place on earth	5	15

SYLLABUS

UNIT I:

Introduction. Mendelism: Law of dominance, Law of segregation, Law of independent assortment. Back cross, Test cross. Genetic Interaction: complementary genes, supplementary genes, epistasis, duplicate genes, (lethal genes, complete dominance, incomplete dominance, co dominance). Multiple alleles with reference to skin colour in mice coat colour in Rabbit, wings of Drosophila

UNIT II:

Linkage: Linkage in maize: types, theories related to linkage, linkage groups, factors affecting linkage. Crossing over: significance & mechanism of crossing over theories related to crossing over, factors affecting crossing over, chromosomal map.

UNIT III:

Sex determination in plants: Introduction, sex determination in Melandrium, Sex limited and sex linked inheritance - Colour blindness, Haemophilia. Pedigree analysis Cytoplasmic Inheritance - plastid inheritance in *Mirablis jalapa*, Kappa particles in Paramoecium, Male sterility in Maize and applications.

UNIT IV:

Mutation -Types- Spontaneous, Induced. Mechanism of mutations - Chromosomal and gene mutations - Duplication, Deletion, Inversion, Translocation. Polyploidy: types, induction and role in plant breeding. Population genetics.

UNIT V:

Theories of organic evolution: Lamarckism, Neo Lamarckism, Darwinism, Neo Darwinism. Modern synthetic theories-Natural selection and speciation. Adaptive variation and mimicry. Genetic Drift, Hardy-Weinberg law. Role of RNA in Organic evolution.

TEXT BOOKS:

1. Dayanasargar, V. R. (1990). Cytology and Genetics. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

2. Sharma, A. K. and Sharma, A. (1985). Advances in Chromosome and Cell Genetics. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

REFERENCE BOOKS :

1. Gardner et al. (2004). Principles of Genetics. John Wiley and Sons Inc., Singapore.

2. Primrose, S. B. and Twyman, R. M. (2006). Principles of Gene Manipulation and Genomics. 7th ed. Blackwell Science, London.

3. Rothwell, N. V. (1983). Genetics. Oxford University Press, London.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1(15 hours)			
	Introduction Mendelism: Law of dominance,Law of segregation ,Law of independent assortment. Back cross, Test cross.	5hrs	Group discussion
	Genetic Interaction: complementary gene supplementary genes, epistasis, duplicate genes, (lethal genes, complete dominance, incomplete dominance, co dominances.	5hrs	Lecture method
	Multiple alleles with reference to skin colour in mice coat colour in Rabbit,wings of Drosophila	5hrs	Videos
UNIT II(15 hours)			
	Linkage : Linkage in maize : types, theories related to linkage, linkage groups ,factors affecting linkage	5hrs	Lecture method
	Crossing over : significance & mechanism of crossing over theories related to crossing over, factors affecting crossing over,	5hrs	ICT
	Chromosomal map.	5hrs	ICT
UNIT III(15 hours)			
	Sex determination in plants : Introduction, sex determination in Melandrium	5hrs	Tutorial
	Sex limited and sex linked inheritance - Colour blindness, Haemophilia. Pedigree analysis	5hrs	ICT
	Cytoplasmic inheritance plastid inheritance in Mirablis jalapa,Kappa particlesin Paramoecium, Male sterility in Maize and applications	5hrs	Group discussion
UNIT IV(15 hours)			
	Mutation Types, spontaneous, induced. Mechanism of mutations -Chromosomal and gene mutations	5hrs	Lecture
	Polyploidy: types, induction and role in plant breeding.	5 hrs	Videos
	Population Genetics – Hardy- Weinberg law.	5hrs	
UNIT V(15 hours)			
	Theories of organic evolution : Lamarckism , Neo Lamarckism , Darwinism , Neo Darwinism	5hrs	ICT
	Modern synthetic theories – Natural selection and speciation	5hrs	ICT
	Role of RNA in organic evolution.	5hrs	ICT

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	2	3	3	2	2	2	2.6
CO2	3	3	3	4	2	3	3	3	3	2	2.9
CO3	4	4	4	4	3	4	3	4	4	4	3.8
CO4	4	4	4	3	2	4	4	4	4	4	3.8
CO5	3	3	3	3	2	3	3	2	2	2	2.6
Mean Overall Score											3.14

Result: The Score for this Course is 3.14 (High relationship)

Programme: M.Sc. **Core Course IV**
Semester : I **Hours : 8 /wk 120 hrs /sem**
Sub. Code : P22CF4P **Credits: 4**

TITLE OF THE PAPER: PRACTICAL PAPER I

Pedagogy	Hours	Lab experimentation	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	8	8	-	-	-
COURSE OUTCOME At the end of the Semester, the Students will be able to					

□ analyse ,characterize and identify the different types of Algae.
□ understand to differentiate the types of Fungi
□ identify the Lichens.
□ identify Bryophytes, Pteridophytes, Gymnosperms & gain knowledge of the fossil forms.
□ have problem solving ability in genetics and acquire deep understanding of Mendelian genetics and its application

SYLLABUS

Study of the Morphology & Anatomy of the vegetative and reproductive parts of the following:

I Algae:

a) Cyanophyceae - *Nostoc, Oscillatoria*
b) Chlorophyceae - *Spirogyra,Caulerpa,Volvox, Chara.*
c) Bacillariophyceae - *Diatoms*
d) Phaeophyceae - *Sargassum, Ectocarpus, Laminaria.*
e) Rhodophyceae - *Gracilaria, Polysiphonia*

II Fungi:

a) Myxomycetes - *Plasmodiophora*
b) Oomycetes - *Saprolegnia, Albugo*
c) Zygomycetes - *Rhizopus, Mucor*
d) Ascomycetes - *Aspergillus, Penicillium.*
e) Basidiomycetes - *Agaricus, Polyporus, Puccinia.*
f) Deuteromycetes - *Cercospora , Fusarium*

III Lichens: *Usnea*

IV Bryophytes:

a) Marchantiales - *Marchantia, Riccia.*
b) Jungermaniales - *Porella*
c) Anthocerotales - *Anthoceros*
d) Polytrichales - *Polytrichum*

V Pteridophytes:

a) Selaginellaceae - *Selaginella*
b) Equisetaceae - *Equisetum*
c) Marsileaceae - *Marsilea*
d) Gleicheniaceae - *Gleichenia*
e) Azollaceae - *Azolla*

VI Gymnosperms:

a) Cycadaceae - Cycas
b) *Araucariaceae* - *Araucaria*
c) Podocarpaceae - *Podocarpus*
d) Cupressaceae - *Cupressus*
e) Gnetaceae - *Gnetum*

VII Fossil slides observation:

a) Rhynia
b) Lepidocarpon

c) Sphenophyllum
d) Lyginopteris
e) Lagenostoma.

Genetics:

VIII: Genetics: Solving problems in genetics. Mendelian hypothesis. Epistasis, Complementary, Supplementary, Duplicate factor, Interaction of genes, multiple alleles, Linkage and Crossing over and Hardy-Weinberg law. Three point test cross –chromosome mapping.

Evolution:

IX: Only Spotters related to evolution.

X: Spotters related to theory.

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	3	4	3	4	4	4	4	4	4	3.8
CO2	4	3	4	3	4	4	4	4	4	4	3.8
CO3	4	3	4	3	4	4	4	4	4	4	3.8
CO4	4	3	3	2	4	3	3	3	3	4	3.2
CO5	4	3	4	3	3	4	4	4	4	3	3.6
Mean Overall Score											3.64

Result: The Score for this Course is 3.64 (High relationship)

Programme: M.Sc. **Discipline Specific Elective Course I (a)**
Semester : I **Hours : 5 /wk 75 hrs /sem**
Sub. Code : P22DSF1A **Credits: 5**

TITLE OF THE PAPER: ECOLOGY AND BIODIVERSITY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	2	1	1	1

PREAMBLE:

- Understand and appreciate interdependence of life on earth and evaluate and predict changes in environment in future.
- Understanding importance of ecological interactions among community.
- To create awareness about causes, consequences, prevention and remediation of pollution and sustainable use of earth resources, there by making healthy environment.
- Ability to analyze information from GIS and GPS and evaluate the effects of human on climate management and conservation and sustainable use of biodiversity.
- To trace and examine the evolutionary trends and ecological relationship between various forms.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Understand the ecology and dynamics of ecosystem elucidate critical connection between living and non living things. Apply knowledge to measure productivity in ecological studies.	1	15
UNIT 2 CO2: Understand the ecological principles and their relationship among population and communities.	2	15
UNIT 3 CO3:Understand geology, differentiate renewable and non renewable resources, assess the importance of forest ,changing climate and loss of biodiversity.	3	15
UNIT 4 CO4:Develop knowledge to use GIS and GPS to study biodiversity in relation to measurements, understanding the value of biodiversity.	4	15
UNIT 5 CO5:Understand the importance of phytogeographical relationship origin and development of species and different types of vegetation in India.	5	15

SYLLABUS

Unit I:

Ecology: Introduction, Concepts and dynamics of ecosystem. Types of ecosystem, Components of Ecosystem. Food Chain, Food web & energy flow – Tropic levels, ecological pyramids. Biogeochemical cycles (Nitrogen, Phosphorus and Carbon). Productivity Primary and secondary productivity. (GPP & NPP) Methods of measurement of primary productivity.

Unit II:

Basic concepts of Population ecology: Describing a Population size, density, dispersion, age, structure, natality, mortality, Life tables. Population dynamics. Population regulation. Community-Characteristics of a community, composition, structure, origin & development of Community. Community dynamics.

Unit III:

Types of forests and forest conservation. Utilization of energy resources- non renewable and renewable, Soil formation, types & profile, erosion & conservation. Water resources-Conservation and management. Ecological indicators. Cumulative effect of pollution on global environment.Ozone depletion, Green House effect and their consequences.

Unit IV:

Biodiversity Definition, Types of biodiversity, values of biodiversity-measurements of diversity-remote sensing. Applications of GIS and GPS in environmental studies. Hot spots of biodiversity, Threats to biodiversity -Habitat loss- man & wildlife conflicts. endangered

and endemic plant species of India. Conservation of biodiversity-*in situ and ex situ* methods.

Unit V:

Phytogeography: Principles, Phytogeographical zones of India-Distribution. Continuous,discontinuous-theories of discontinuous distribution, continental drift. Age and area hypothesis. Ecological genetics, Ecotypes, Ecads and Ecolines.

REFERENCES:

ECOLOGY:

TEXT BOOKS:

1. Agrawal, K. C. (1987). Environmental Biology. Agro-botanical Publications, India.
2. Ambasht, R. S. (1974). A Textbook of Plant Ecology. 3rd ed. Students' Friends Co., Varanasi, India.
3. Vashista, P. C. (1974). A Textbook of Plant Ecology. Vishal Publications, Jullunder.

REFERENCE BOOKS:

1. Billings, W. B. (1965). Plants and the Ecosystem. Wards worth Publishing Co. Inc., Belmont.
2. Jogdand, S. N. (2003). Environmental Biotechnology (Industrial Pollution Management). Himalaya Publishing House, Delhi.
3. Krishnan Kannan (1997). Fundamentals of Environmental Pollution. S. Chand and Co.Ltd., New Delhi.
4. Odum, E. P. (1971). Fundamentals of Ecology. W. B. Saunders & Co., Philadelphia,USA.
5. Odum, E. P. (1975). Ecology. 2nd ed. Oxford & IBH Publications, New Delhi.
6. Smith, J. M. (1974). Models in Ecology. Cambridge University Press, London.

BIODIVERSITY:

TEXT BOOKS:

1. Krishnamurthy, K. V. (2004). An Advanced Textbook on Biodiversity: Principles and Practice. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Mani, M. S. (1974). Ecology and Biogeography of India. Dr. W. Junk Publishers, The Haque.

REFERENCE BOOKS:

1. Margalef, R. (1968). Perspectives in Ecological Theory. University of Chicago Press, Chicago.
2. Frankel, O. H., Brown, A. H. D. and Burdon, J. J. (1995). The Conservation of Plant Diversity, Cambridge University Press, London.
3. Heywood, V. H. (1995). Global Biodiversity Assessment. UNEP, Cambridge University Press, London.
4. Good, R. (1953). The Geography of Flowering Plants. 2nd ed. Longmans Green & Co.Inc., London.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1 (15 hours)			

	Ecology: Introduction, Conceptsand dynamics of ecosystem. Types of ecosystem, Components of Ecosystem. Food Chain, Food web & energy flow	7	Lecture Video PPT
	Tropic levels, ecological pyramids. Biogeochemical cycles (Nitrogen, Phosphorus and Carbon). Productivity Primary and secondary productivity.(GPP & NPP) Methods of measurement of primary productivity.	8	Lecture Video PPT
UNIT 11(15 hours)			
	Basic concepts of Population ecology: Describing a Population size, density, dispersion, age, structure, natality, mortality. .	7	Lecture
	Life tables. Population dynamics. Population regulation. Community-Characteristics of a community, composition, structure, origin & development of community. community dynamics	8	Lecture
UNIT III(15 hours)			
	Types of forests and forest conservation. Utilization of energy resources- non renewal and renewable, Soil formation, types & profile, erosion & conservation. Water resources- Conservation and management.	7	Peer Teaching, PPT
	Environmental Pollution – Air, water, soil, thermal and radiation, Ecological indicators. Cumulative effect of pollution on global environment. Ozone depletion, Green House effect and their consequences.	8	Video, PPT
UNIT IV(15 hours)			
	Biodiversity Definition, Types of biodiversity, values of biodiversity-measurements of diversity-remote sensing. Applications of GIS and GPS in environmental studies.	7	Lecture PPT **ICT** Video, Peer Teaching
	Hot spots of biodiversity, Threats to biodiversity -Habitat loss- man & wildlife conflicts. Endangered and endemic plant species of India.	8	Lecture PPT **ICT** Video, Peer Teaching

	Conservation of biodiversity-*in situ and ex situ* methods.		
UNIT V(15 hours)			
	PhytogeographyPrinciples.Phytogeographical zones of India- Distribution. Continuous, discontinuous-theories of discontinuous distribution.	8	PPT Video Lecture
	Continental drift. Age and area hypothesis. Ecological genetics, Ecotypes, Ecads and Ecolines.	7	PPT Video Lecture

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	4	4	4	2	3	2	4	2	3.3
CO2	4	4	4	4	4	2	3	3	3	2	3.3
CO3	4	4	4	4	4	4	3	4	4	4	3.9
CO4	4	4	4	4	5	4	3	4	4	4	4.0
CO5	4	4	4	4	5	4	3	4	3	4	3.9
Mean Overall Score											3.68

Result: The Score for this Course is 3.68 (High relationship)

Programme: M.Sc. **Discipline Specific Elective Course I (b)**

Semester : I **Hours : 5 /wk 75 hrs /sem**
Sub. Code : P22DSF1B **Credits: 5**

TITLE OF THE PAPER: SEED TECHNOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	2	1	1	1

PREAMBLE:

- To enable the students about seed science and crop improvement
- To acquaint the students with seed certification and marketing
- To enrich students in inculcating career opportunities in seed technology and bio based industries.

COURSE OUTCOME	Unit	Hrs P/S
UNIT 1 CO1: To understand the morphology, characters and structure of seeds.	1	15
UNIT 2 CO2: To learn the concepts related to seed germination studies.	2	15
UNIT 3 CO3: To be aware of the process involved in seed processing and seed quality techniques.	3	15
UNIT 4 CO4: To acquire the knowledge on seed certification practices.	4	15
UNIT 5 CO5: To develop the entrepreneurial skills in seed storage and marketing.	5	15

SYLLABUS

UNIT I:

Seed technology-Importance-Characters of good quality seed- dormancy: Types of seed dormancy. Morphological and structural details of seeds-Cereals (paddy), Pulses (Glycine), Oil seeds (Ground nut) Vegetables (Tomato) and Gourds (bitter Gourd).

UNIT II:

Chemical composition of seeds-Principles of seed production-GM crops and Organic seed production-Phases of seed germination-factors affecting seed germination-changes that takes place during germination (Physical and Chemical).

UNIT III:

Post harvest handling of seeds-trashing methods-Methods of seed drying-Seed processing-Seed cleaning and grading. Seed quality enhancement techniques-Seed fortification. Seed polluting.

UNIT IV:

Seed certification-NBPGR, Phases-Procedure for Seed certification, Seed viability test (Tetrazolium test). Post harvest inspection-processing, bagging and tagging. Seed law enforcement-Detection of genetically modified crops.

UNIT V:

Seed storage-factors affecting seed longevity during storage-seed treatments and packaging materials-measures of pest control during seed storage. Seed marketing-factors affecting seed marketing and demand-Role of international organizations in seed trade.

TEXT BOOKS:

1. Sambamoorthy. A.V.V.S, Subramanian. N.S. (1989), Text book.

2. Verma.V. 2010. Anne Books pvt. Ltd, New Delhi.

REFERENCES:

1. Agarwal, R.L, 1996, Seed Technology, Oxford and IBH Publishing Co., New Delhi.
2. Bryant, J., Edward Arnold. A. 1985. Seed Physiology, Chapman and Hall London.
3. Pandey.B.P., 1995, Economic Botany, S. Chand & Company Ltd., New Delhi.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1 (15 hours)			
	Seed technology-Importance-Characters of good quality seed- dormancy: Types of seed dormancy.	7	Lecture Video, PPT
	Morphological and structural details of seeds-Cereals (paddy), Pulses (Glycine), Oil seeds (Ground nut) Vegetables (Tomato) and Gourds (bitter Gourd).	8	Lecture Video PPT
UNIT 11(15 hours)			
	Chemical composition of seeds-Principles of seed production-GM crops and Organic seed production-Phases of seed germination	7	Lecture
	Factors affecting seed germination-changes that takes place during germination (Physical and Chemical).	8	Lecture
UNIT III(15 hours)			
	Post harvest handling of seeds-trashing methods-Methods of seed drying-Seed processing-Seed cleaning and grading.	7	Peer Teaching, PPT
	Seed quality enhancement techniques-Seed fortification. Seed polluting.		Video, PPT
UNIT IV(15 hours)			
	Seed certification-NBPGR, Phases-Procedure for Seed certification, Seed viability test (Tetrazolium test).	7	Lecture PPT, **ICT** Video, Peer Teaching
	Post harvest inspection-processing, bagging and tagging. Seed law enforcement-Detection of genetically modified crops.	8	Lecture, PPT, **ICT**, Video, Peer Teaching
UNIT V(15 hours)			
	Seed storage-factors affecting seed longevity during storage-seed treatments and packaging materials-measures of pest control during seed storage.	8	PPT Video Lecture

	Seed marketing-factors affecting seed marketing and demand-Role of international organizations in seed trade.	7	PPT, Video Lecture

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	3	3	3	2	3	3	2	3	2.7
CO2	3	4	4	3	3	3	4	4	2	4	3.4
CO3	4	4	4	4	4	3	3	4	2	4	3.5
CO4	4	4	4	4	4	3	4	4	2	4	3.7
CO5	4	4	4	4	4	3	4	4	2	4	3.7
Mean Overall Score											3.4

Result: The Score for this Course is 3.4 (High relationship)

Programme: M.Sc. **Skill Enhancement Course I**
Semester : I **Hours: 2 hrs / wk 30 hrs/ Sem**
Sub. Code : P22SEF1 **Credits: 2**

TITLE OF THE PAPER: PHYTOCHEMISTRY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	ICT
	6	3	1	1	1

PREAMBLE:

- To understand the basic information about phytochemistry
- To learn the structure and properties of phytoconstituents
- To know the working principle of instruments
- To enable the students to know the phytoconstituents and their therapeutic uses

COURSE OUTCOME Successful completion of the course, the students will be able to	Unit	Hrs P/S
UNIT 1 CO1: understand the importance, structure and types of common phytochemicals	1	6
UNIT 2 CO2: Comprehend the properties and functions of phytoconstituents	2	6
UNIT 3 CO3: Indentify the useful plant parts and their therapeutic uses	3	6
UNIT 4 CO4: Analysis the types of solvents and method used in the preparation crude drugs	4	6
UNIT 5 CO5: Evaluate the active components of plant constituents through qualitative and qualitative analysis	5	6

SYLLABUS

UNIT I:

Scope, importance and future prospects. Classification and therapeutic uses of phytochemicals - phenolics, terpenes, terpenoids, nitrogen containing compounds and sulphur containing compounds.

UNIT II:

Sources of phytochemicals-vegetables, fruits and seeds. Properties and functions of phytochemicals -antioxidants, antimicrobial agents, immunomodulators and anticancer agents. Phytochemicals as neutraceuticals.

UNIT III:

Role of phytochemicals in therapeutics-morphology of plant parts used, phytoconstituents and therapeutic uses of: Rhizome (*Curcuma longa*), Leaves (*Eucalyptus globulus*), Flower (*Cassia auriculata*), Fruits (*Emblica officinalis*), Seeds (*Foeniculum vulgare*).

UNIT IV:

Process in the preparation of crude drugs-drying-decoction-maceration-infusion. Methods of choice of solvents used for extraction of plant compounds-solvent extraction.

UNIT V:

Structural elucidation of Phytoconstituents-UV, IR, NMR, HPLC and GCMS using UV-visible spectrophotometric analysis, IR spectroscopy, NMR spectroscopy, HPLC and GCMS analysis.

TEXT BOOKS:

1. Campbell, M.K. 1999. Biochemistry, Saunders College Publishing. New York. Harbone, J.B. 1999. Plant Biochemistry. Chapman & Hall, New Delhi.
2. Jain, J.L. 2005. Fundamentals of Biochemistry. S. Chand & Co. New Delhi.
3. Satyanarayana, U. 2005. Biochemistry. Books and Allied (p) Ltd. Calcutta.
4. Conn E.E. and P.K. Stumpf. 1987. Outlines of Biochemistry, Wiley Eastern Ltd, Chennai.
5. Lehninger, A.I. 1987. Biochemistry. Kalyani Publishers, New Delhi.
6. Lubertstryer, 1986. Biochemistry, C.B. S. Publishers, New Delhi.
7. Veerakumari, I. 2004. Biochemistry M. J. P. Publishers, Chennai.
8. Blonstein, A.B. and King, P.J. (1987). A Genetic approach to plant Biochemistry. Narosa, New Delhi.

REFERENCE BOOKS:

1. Plummer, D. T. 1996. An introduction to practical Biochemistry. Mc Graw Hill.
2. Brett, C. T. and Hillman, J.R. (ed.) (1985). Biochemistry and plant cell walls. Cambridge University Press, UK.
3. Cohn, E. E. and Stumpf, P.K. (1994). Outlines of Biochemistry. Wiley Eastern Ltd., New Delhi.
4. Goodwill, F.W. and Mercer, F. I. (1983). Introduction to plant Biochemistry. 2nd ed. Pergamon Press, New York.
5. Keshav Trehan (1987). Biochemistry. Wiley Eastern Ltd., New Delhi.
6. Lehinger, A. L. *et al*. (1993). Principles of Biochemistry. CBS Publishers. New Delhi.
7. Stryer, L. (1995). Biochemistry. 4th ed. W.H. Freeman Co., New York.

	TOPIC	**LECTURE HOURS**	**MODE OF TEACHING**
UNIT 1: 6 hours			
	Scope, importance and future prospects. Classification and therapeutic uses of phytochemicals	3	Lecture Video, PPT
	phenolics, terpenes, terpenoids, nitrogen containing compounds and sulphur containing compounds.	3	Lecture
UNIT II : 6 hours			
	Sources of phytochemicals-vegetables, fruits and seeds. Properties and functions of phytochemicals	2	PPT

	antioxidants, antimicrobial agents, immunomodulators and anticancer agents.	2	Lecture
	Phytochemicals as neutraceuticals.	2	Peer Teaching
UNIT III : 6 hours			
	Role of phytochemicals in therapeutics-morphology of plant parts used, phytoconstituents and therapeutic uses of: Rhizome (*Curcuma longa*)	3	Video, PPT
	Leaves (*Eucalyptus globulus*), Flower (*Cassia auriculata*), Fruits (*Emblica officinalis*), Seeds (*Foeniculum vulgare*).	3	ICT
UNIT IV : 6 hours			
	Process in the preparation of crude drugs-drying-decoction-maceration-infusion.	3	Lecture
	Methods of choice of solvents used for extraction of plant compounds-solvent extraction.	3	Lecture, Video, PPT
UNIT V : 6 hours			
	Structural elucidation of Phytoconstituents-UV, IR, NMR, HPLC and GCMS using UV-visible spectrophotometric analysis	3	Lecture, Video, PPT
	IR spectroscopy, NMR spectroscopy, HPLC and GCMS analysis.	3	ICT

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	3	3	2	2	2	2	2.6
CO2	4	4	4	4	4	4	4	4	3	3	3.8

CO3	4	4	4	4	4	4	4	4	3	3	3.8
CO4	4	4	4	4	3	4	4	4	3	3	3.7
CO5	4	4	4	3	3	4	4	4	2	2	3.4
Mean Overall Score											3.5

Result: The Score for this Course is 3.5 (High relationship)

Programme: M.Sc. **Core Course V**
Semester : II **Hours: 5 hrs / wk 75 hrs/ Sem**
Sub. Code : P22CF5 **Credits: 4**

TITLE OF THE PAPER: PLANT ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	ICT
	6	3	1	1	1

PREAMBLE:

As a core paper providing for classical aspects of plant development, this course presents a comprehensive outlook on structural components of land plants. The specific patterns in the internal arrangement of tissues forming a base for understanding the varied functions of plant organs are discussed. A glimpse on the early events of development within the ovarian environment and the process of flowering with a special mention on microsporogenesis, megasprogenesis along with pre and post fertilization changes explaining plant development as the orderly progression events controlled by space and time is presented.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: acquire a holistic understanding of plant development that the learner will have skills to experimentally deal with plants and involve in entrepreneurial ventures	1	15
UNIT 2 CO2: understand and appreciate the nuances in internal organization of plant organs that they shall develop perspective to experimentally manipulate growth	2	15

UNIT 3 CO3: gain knowledge to describe and understand microsporogenesis, megasporogenesis and syngamy, and apply the learning to pursue experiments in plant breeding and pomology with a conceptual clarity	3	15
UNIT 4 CO4: understand concealed events like embryogenesis and endoderm formation and in the process hone skills in microscopy and plant microtechnique to turn into a competent technician or an independent researcher	4	15
UNIT 5 CO5: interpret the technical details they had learnt in the course to skilfully manipulate the developmental process for seed and fruit production and preservation	5	15

SYLLABUS

Unit-I:

General account and theories of organisation of apical meristem of shoot apex and root apex, Meristeme d'attente, Quiescent centre. Structural diversity and phylogenetic trends of specialization of xylem and phloem. Cambium:origin, cellular structure, cell division, storied and non-storied types. Role of Cambium in budding, grafting and wound healing. Trichomes, periderm and lenticels.

Unit-II:

Anatomical characteristics and vascular differentiation in primary and secondary structure of root and stem in Dicot and Monocot, Anomalous secondary growth. Origin of lateral roots, Root-stem transition, Anatomy of Dicot and Monocot leaves. Leaf abscission, stomatal types, nodal anatomy.

Unit-III:

Microsporangium: Microsporogenesis, Microspores: arrangement, morphology, ultrastructure. Microgametogenesis. Pollination: Types, methods to overcome self-pollination, pollen storage. Pollen-Stigma Incompatibility, Methods to overcome incompatibility. Megasporangium: Megagametogenesis, Female gametophyte: Monosporic, Bisporic and Tetrasporic

Unit-IV:

Nutrition of embryo sac and fertilization. Endosperm: Types, Functions of Endosperm, Endosperm haustoria. Embryo development in Dicot and Monocot, Nutrition of embryo.

Unit-V:

Polyembryony - Causes, Apomixis - Causes, Apospory - Their role in plant improvement programmes and seed development. Fruit-Biochemical and physical factors in fruit development structure of pericarp. Parthenocarpy.

REFERENCES:

ANATOMY:

TEXT BOOKS:

1. Easu, K. (1953). Plant Anatomy. John Wiley & Sons Inc., New York.

REFERENCE BOOKS:

1. Fahn, A. (1989). Plant Anatomy. Maxwell Pvt. Ltd., Singapore. 14

2. Metcalfe and Chalk (1950). Anatomy of the Dicotyledons and Monocotyledons. Vol. I and II. Clarendon Press, Oxford, UK.
3. Clowers, F. A. L. (1961). Apical Meristems. Blackwell Scientific Publication, Oxford.

EMBRYOLOGY:

TEXT BOOKS:

1. Agarwal, S. B. (1990). Embryology of Angiosperms - a fundamental approach. Sahitya Bhawan, Agra.
2. Bhojwani, S. S. and Bhatnagar, S. P. (1981). Embryology of Angiosperms. Vikas Publishing House Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. Maheswari, P. (1963). An Introduction to Embryology of Angiosperms. International Society of Plant Morphologies, University of Delhi.
2. Raghavan, V. (1976). Experimental Embryogenesis in Vascular Plants. Academic Press, London.

	TOPIC	**LECTURE HOURS**	**MODE OF TEACHING**
UNIT 1: 15hours			
	General account and theories of organisation of apical meristem of shoot apex, Meristeme d'attente	3 hours	Chalk–talk techniques to familiarize and internalize terms, definitions and key words
	General account and theories of organisation of apical meristem of root apex, Quiescent centre	3 hours	Use of AV aids, charts and OHP to present the concepts and schemes of plant growth and differentiation
	Structural diversity and phylogenetic trends of specialization of xylem, Structural diversity and phylogenetic trends of specialization of phloem	3 hours	Black board techniques and Power Point Presentation Presenting video clips and explanations through OHP
	Cambium:origin, cellular structure, cell division, storied and non-storied types.	3 hours	Use of power point presentation with animation, Peer teaching
	Role of Cambium in budding, grafting and wound heal in Trichomes, periderm and lenticels	3 hours	Experiential learning with demonstration and hands-on training Use of AV aids, charts and Peer teaching
UNIT II : 15 hours			

	Anatomical characteristics and vascular differentiation in primary and secondary structure of root in Dicot and Monocot	3 hours	Explanation through animated projections and presentation, Peer teaching
	Anatomical characteristics and vascular differentiation in primary and secondary structure of stem in Dicot and Monocot	3 hours	Personalized learning through sectioning and micropreparations, Peer teaching
	Anomalous secondary growth.	2 hours	Presentation of slides and charts
	Origin of lateral roots, Root-stem transition.	2 hours	Animations and slide shows
	Anatomy of Dicot and Monocot leaves	3 hours	Comparative description with live specimen, Peer teaching
	Leaf abscission, stomatal types Nodal anatomy.	2 hours	Slide show and Animations Using POP Model and time lapse movie clips
UNIT III : 15 hours			
	Microsporangium: Microsporogenesis, Microspores: arrangement, morphology, ultrastructure.	3 hours	Explanation using 3-D models and Peer teaching
	Microgametogenesis. Pollination:Types,	3 hours	Animated description using ICT
	Methods to overcome self-pollination, pollen storage. Pollen-Stigma Incompatibility, Methods to overcome incompatibility	4 hours	Short movie clips and slide shows
	Megasporangium : Megagametogenesis	3 hours	Explanation with charts and slide, Peer teaching
	Female gametophyte: Monosporic, Bisporic and Tetrasporic	2 hours	Comparative account using models and charts
UNIT IV : 15 hours			
	Nutrition of embryo sac and fertilization	4 hours	Power Point Presentation

	Endosperm : Types, functions of endosperms Endosperm haustoria	5 hours	Power Point Presentation with animations and video clips, Peer teaching
	Embryo development in Dicot	3 hours	Short movie clips and ICT tools
	Embryo development in Monocot, Nutrition of embryo.	3 hours	Slide show and Short movie clips
UNIT V : 15 hours			
	Polyembryony - Causes, Apomixis - Causes, Apospory - Their role in plant improvement.	5 hours	Use of OHP to present schemes of classification and GD
	Programmes and seed development.	3 hours	Animations and slide shows
	Fruit – Biochemical and physical factors in fruit development structure of pericarp.	4 hours	AV aids and collection of different types of fruits a d seeds for display and making museum mounts
	Parthenocarpy.	3 hours	Animations and slide shows

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	3	4	3	2	3	3	4	4	3	3.2
CO2	4	3	4	2	2	3	3	2	3	3	2.8
CO3	4	4	4	3	2	4	4	3	4	4	3.6
CO4	4	3	4	3	2	4	4	3	4	3	3.4
CO5	4	4	4	4	2	4	4	4	4	4	3.8
Mean Overall Score											3.36

Result: The Score for this Course is 3.36 (High relationship)

Programme: M.Sc. **Core Course VI**
Semester : II **Hours : 5 hrs/wk 75 hrs /sem**
Sub. Code : P22CF6 **Credits: 4**

TITLE OF THE PAPER: CELL AND MOLECULAR BIOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES /TUTORIAL	ICT
	6	3	1	-	2

PREAMBLE:

1. To acquaint students with the principles, scientific techniques and applications of cell and molecular biology.
2. To expose students the methodologies of chromosome replication and organelles concerned with it.
3. To introduce students the biological process taking place inside the living cell.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Understand and distinguishes various functions of the cell organelles.	1	15
UNIT 2 CO2: Gain knowledge about chromosomal functions, its replication and its role in heredity.	2	15
UNIT 3 CO3: Understand and pictures the process of transcription in prokaryotes.	3	15

UNIT 4 CO4: Differentiate prokaryotic and eukaryotic transcription and recalls the enzymes involved in transcription.	4	15
UNIT 5 CO5: Analyze the different steps involved in translation and the organelles involved in the process.	5	15

SYLLABUS

UNIT-I

Prokaryotic and Eukaryotic cell, Structural and ultra structural details: Cell wall - primary and secondary . Plasma membrane: structure, models- Fluid mosaic model and functions, membrane transport: Passive transport - simple diffusion, facilitated diffusion. Active transport - ion pump, calcium ATPase. Molecular structure of Chloroplast and Mitochondria.

UNIT II.

Structure and variations in Chromosomes and their significance. Special types of chromosomes: Giant chromosomes and super numerary chromosomes. DNA types, Prokaryotic Replication- Rolling circle and Eukaryotic replication-enzymes, DNA super coiling, DNA repair mechanisms-Direct repair, Excision Repair, Mismatch repair. RNA types and functions.

UNIT III:

Concept of gene. Transcription in prokaryotes: promoter structure, Initiation-RNA polymerase, Elongation – elongation complex, process of RNA synthesis. Termination-Lac operon, Trp operon.

UNIT IV:

Transcription in eukaryotes: Types, structure and role of RNA polymerases. Structure of Promoter. General transcription factors and formation of pre-initiation complex, Elongation factors, termination factors, Post-transcriptional events - RNA editing**.**

UNIT V:

Translation: Important features of mRNA-ORF, RBS. Fine structure, composition and assembly of prokaryotic and eukaryotic Ribosomes. Stages in translation: Initiation-formation of initiation complex in prokaryotes and eukaryotes, initiation factors in prokaryotes and eukaryotes. Elongation-process of polypeptide synthesis, elongation factors. Termination-process of termination, release factors.

REFERENCES:

CELL BIOLOGY:

TEXT BOOKS:

1. Verma, P. S. and Agarwal, V. K. (1998). Concept of Molecular Biology. S. Chand and Co. Ltd., New Delhi.

2.David Freifelder (2000). Molecular Biology. 2nd ed. Narosa Publishing House, New Delhi.

REFERENCE BOOKS:

1. De Robertis, E. D. P. and De Robertis, E. M. F. (1980). Cell and Molecular Biology. Saunders

International Education, Philadelphia.
2. Gomperts, B. D. (1976). The Plasma Membrane: Models for its Structure and Function. Academic Press, New York.
3. Leadbetter, M. C. (1970). Introduction to the Fine Structure of Plant Cells. Springer Verlag. 23
4. Rastogi, S. C., Sharma, V. N. and Anuradha Tandon, V. N. (1993). Concepts in Molecular Biology. Wiley Eastern Ltd., New Delhi.
5. Rost, T. L., Gifford, Jr. and Ernest, M. (1977). Mechanism and Control of Cell Division. Academic Press, New York.
6. S egal, H. L. and Doyle, D. J. (1978). Protein Turnover and Lysosomal Functions. Academic Press, New York.

MOLECULAR BIOLOGY

TEXT BOOKS:

1. Rastogi, S. C., Sharma, V. N. and Anuradha Tandon, V. N. (1993). Concepts in Molecular Biology. Wiley Eastern Ltd., New Delhi.
2. Geoffrey M Cooper, Robert E Hausman (2009). The Cell: A molecular approach (V Edn). Sinaeur.

REFERENCE BOOKS:

1. Gerald Karp (2008). Cell and Molecular biology: Concepts and experiments (V Edn). John Wiley & Sons.
2. Harvey Lodish, Arnold Berk, Lawrence Zipursky, Paul Matsudaira, David Baltimore, James Darnell (2000). Molecular cell biology (IV Edn). W H Freeman & Company.
3. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (2002). Molecular biology of the cell (IV Edn). Garland Science, Taylor and Francis group.
4. Robert J Brooker (2009). Genetics: analysis and principles (III Edn). McGraw Hill.
5. James D Watson, Tania A Baker, Stephen P Bell, Alexander Gann, Michael Levine, Richard Losick(2009). Molecular biology of the gene (V Edn). Pearson.
6. Robert F Weaver (2002). Molecular biology (II Edn). Mc Graw Hill.
7. Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (2010). Essential Cell Biology. Garland Science.
8. Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Anthony Bretscher,Hidde Ploegh, Paul Matsudaira (2007). Molecular cell biology (VI Edn). W H Freeman & Company.
9. James D. Watson, Amy A. Caudy, Richard M. Myers, Jan A. Witkowski (2007). Recombinant DNA (III Edn). W H Freeman.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1(15 hours)			
	Prokaryotic and Eukaryotic cell, Structural and ultra structural details: Cell wall - primary and secondary .	4	Chalk and talk ICT
	Plasma membrane: structure, models- Fluid mosaic model and functions	3	Chalk and talk

	Membrane transport: Passive transport - simple diffusion, facilitated diffusion. Active transport - ion pump, calcium ATPase.	5	Chalk and talk
	Molecular structure of Chloroplast and Mitochondria.	3	Chalk and talk
UNIT II(15 hours)			
	Structure and variations in Chromosomes and their significance.	4	ICT
	Special types of chromosomes: Giant chromosomes and super numerary chromosomes.	4	Chalk and talk
	DNA types - Prokaryotic Replication- Rolling circle and Eukaryotic replication-enzymes, DNA super coiling, DNA repair mechanisms – Direct repair, Excision Repair, Mismatch repair.	4	Chalk and talk
	RNA types and functions.	3	Chalk and talk
UNIT III(15 hours)			
	Concept of gene. Transcription in prokaryotes: promoter structure, Initiation	4	Chalk and talk
	RNA polymerase, Elongation – elongation complex	4	Chalk and talk
	Process of RNA synthesis.	4	ICT
	Termination- Lac operon, Tryp operon.	3	Chalk and talk
UNIT IV(15 hours)			
	Transcription in eukaryotes: Types, structure and role of RNA polymerases.	3	ICT Chalk and talk
	Structure of Promoter. General transcription factors and formation of pre-initiation complex	4	Chalk and talk
	Elongation factors, termination factors	4	Chalk and talk
	Post-transcriptional events - RNA editing**.**	4	Chalk and talk
UNIT V(15 hours)			
	Translation: Important features of mRNA – ORF, RBS.	4	ICT
	Fine structure, composition and assembly of prokaryotic and eukaryotic ribosomes.	3	Chalk and talk
	Stages in translation: Initiation – formation of initiation complex in prokaryotes and eukaryotes	3	Chalk and talk
	initiation factors in prokaryotes and eukaryotes. Elongation – process of polypeptide synthesis, elongation factors.	3	Chalk and talk
	Termination – process of termination, release factors.	2	Chalk and talk

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	3	3	3	3	3	3	2	4	3.2
CO2	4	4	3	4	4	3	3	4	2	3	3.4
CO3	4	4	3	3	3	3	3	3	2	3	3.2
CO4	4	4	3	4	4	3	3	3	2	4	3.4
CO5	4	4	4	4	4	3	3	3	2	3	3.4
Mean Overall Score											3.32

Result: The Score for this Course is 3.32 (High relationship)

Programme: M.Sc. **Core Course VII**
Semester : II **Hours : 5 hrs/wk 75 hrs / sem**
Sub. Code : P22CF7 **Credits: 4**

TITLE OF THE PAPER: MICROBIOLOGY AND PLANT PATHOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	-	-	1

preamble:

1. To provide practical training as well as theoretical knowledge of microbiology
2. To improve skills for identifying the various disease causing pathogens.
3. To create awareness about plant diseases and its control measures.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: understand the general characters of microbes and its ultrastructure	1	15
UNIT 2 CO2: understand the bacterial culture techniques and the economic importance	2	15
UNIT 3 CO3: understand the microbes causing food spoilage and water spoilage	3	15
UNIT 4 CO4: know the defense mechanism performed by plants and classifies the plant diseases	4	15

UNIT 5 CO5: identify the plant diseases and understands remedial measures to prevent the disease	5	15

SYLLABUS

Unit-I:

Bergey's system of Bacterial classification (8thedn.). Prokaryotic and Eukaryotic microbes. General features of Viruses - Classification and Ultra structure, isolation, purification, chemical nature, replication, transmission, economic importance. viroids and prions, phytoplasma (including mycoplasma).

Unit-II:

Eubacteria, Archaebacteria, Cyanobacteria and Actinomycetes. Bacteria-General account, ultrastructure, nutrition, growth, reproduction, bacterial culture techniques and economic importance.

Unit-III:

Microbial spoilage of food: meat, fruits, vegetables, egg, milk. Food poisoning- Food Intoxication and Food infections. Different methods of Food Preservation-Drying, Freezing, Smoking, Salting and Pickling. Microbial flora: fresh and polluted water, bacteriological examination of water.

Unit-IV:

Plant pathology: Classification of plant diseases-based on symptoms, causal organism and host plants affected. Infection process: entry of pathogens, establishment of pathogen, defense mechanisms-pre-existing structural defense mechanisms-waxes, thick cuticle and epidermal cell wall-structure and natural openings, internal structural barriers-post infectional structural defense-histological defense (cork layer ,abscission layer, tyloses and gum deposition), cellular defense structures, biochemical defense-preexistingbiochemical defense-inhibitors released by plantin its environment (protocatechuic acid, catechol)and inhibitors present in plant cells-phenolic compounds-chlorogenic acid), post inflectional defense mechanism-phytoalexins,hypersensitive reactions-defense through antibodies, Antibiosis.

Unit-V:

Plant diseases: symptoms, casual organism , disease cycle and prevention and control methods for the following plant diseases: Fungal disease-Tikka disease of groundnut and wheat rust. Bacterial disease-Red Rot of Sugarcane and Citrus Canker. Viral disease-TMV and cucumber mosaic. Phytoplasma disease-Little leaf of brinjal and sesamum phyllody.

REFERENCES:

MICROBIOLOGY:

TEXT BOOKS:

1. Dubey, R. C. and Maheshwari, D. K. (2007). A Textbook of Microbiology. S. Chand and Co. Ltd., New Delhi.
2. Pelczar, M. J., Chan, E. C. S. and Krieg, N. R. (1993). Microbiology. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3. Sharma, P. D. (1992). Microbiology. Rastogi & Co., Meerut.

REFERENCE BOOKS:

1. Staley, J. T. et al. (1991). Bergey's Manual of Systematic Bacteriology. Vol I to IV. Williams & Wilkins,London.
2. Darnell, J., Lodish, H., Baltimore, D., 1990, Molecular Cell Biology, Scientific American Books, New York.
3. Freifelder, D., Malacinski, G.M., 1987, Essentials of Molecular Biology, John and Bartle Publishers, London.

PLANT PATHOLOGY:

TEXT BOOKS:

1. Bilgrami, K. S. and Dube, H. C. (1990). A Textbook of Modern Plant Pathology. Vikas Publishing House Pvt. Ltd., New Delhi.
2. Pandey, B. P. (1982). A Textbook of Plant Pathology, Pathogen and Plant Diseases. S. Chand and Co. Ltd., New Delhi.

REFERENCE BOOKS:

1. Rangaswamy, G. (1972). Diseases of Crop Plants in India. Prentice Hall of India Pvt. Ltd.
2. Smith, K. M. (1957). A Textbook of Plant Virus Diseases. Little Borwn & Co., Boston.
3. Cooper, J. I. (1995). Viruses and the Environment. 2nd ed. Chapman & Hall, London.
4. Mehrota, R. S. (1994). Plant Pathology. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1(15 hours)			
	Bergey's system of Bacterial classification	5	Chalk and talk ICT
	Prokaryotic and Eukaryotic microbes . General features of Viruses - Classification and ultrastructure, isolation, purification, chemical nature , replication, transmission, economic importance.	5	Peer discussion Chalk and talk
	viroids and prions, phytoplasma (including mycoplasma).	5	ICT Chalk and talk
UNIT II(15 hours)			
	Eubacteria, Archaebacteria, Cyanobacteria and Actinomycetes.	5	Chalk and talk ICT
	Bacteria- General account, ultrastructure, nutrition, growth, reproduction.	5	ICT
	techniques and economic importance.	5	Chalk and talk

UNIT III(15 hours)			
	Microbial spoilage of food: meat, fruits, vegetables, egg, milk. food poisoning, preservation of food Termination,Rho dependent and Rho independent	6 2	ICT Chalk and talk Chalk and talk
	Microbial flora: fresh and polluted water, bacteriological examination of water	4	ICT
	Biological sewage treatment, Food adulteration-causes, types, methods and some commonly adulterated foods in the market.	5	Chalk and talk ICT
UNIT IV(15 hours)			
	Plant pathology: Classification of plant diseases – based on symptoms, causal organism and host plants affected.	3	Chalk and talk
	Infection process: entry of pathogens, establishment of pathogen	3	ICT Chalk and talk
	defense mechanisms –pre-existing structural defense mechanisms-waxes, thick cuticle and epidermal cell wall –structure and natural openings, internal structural barriers-post infectional structural defense –histological defense (cork layer ,abscission layer, tyloses and gum deposition)	3	Chalk and talk
	cellular defense structures, biochemical defense-preexisting biochemical defense-inhibitors released by plant in its environment	3	ICT
	Inhibitors present in plant cells-phenolic compounds-chlorogenic acid), post inflectional defense mechanism-phytoalexins, hypersensitive reactions-defense through antibodies, Antibiosis.	3	Chalk and talk
UNIT V(15 hours)			
	Plant diseases : symptoms , casual organism, disease cycle and prevention	5	ICT Chalk and talk

	Control methods for the following plant diseases: Fungal disease –Tikka disease of groundnut and wheat rust.	5	Chalk and talk Chalk and talk
	Bacterial disease – Red rot of sugarcane and citrus canker. Viral disease – TMV and cucumber mosaic. Phytoplasma disease – Little leaf of brinjal and sesamum phyllody. .	5	Chalk and talk

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	4	3	4	4	4	4	3	4	3.6
CO2	3	3	4	4	4	4	4	4	3	4	3.7
CO3	3	4	4	4	3	4	4	4	3	3	3.6
CO4	3	4	4	4	4	4	4	4	3	3	4.0
CO5	3	3	4	3	4	4	4	4	4	4	3.7
Mean Overall Score											3.6

Result: The Score for this Course is 3.6 (High relationship)

Programme: M.Sc. **Core Course VIII**
Semester: II **Hours : 8 hrs/wk 120 hrs /sem**
Sub. Code : P22CF8P **Credits: 4**

TITLE OF THE PAPER: PRACTICAL PAPER II

Pedagogy	Hours	Lab experimentation	Peer Teaching	Gd/Vidoes/Tutorial	ICT
	8	8	-	-	-

PREAMBLE:
The main objective is to provide basic knowledge of Anatomy, Embryology, Cell biology, Microbiology and Plant Pathology techniques.

COURSE OUTCOME

At the end of the Semester, the Students will be able to

1. Analyse, characterize and identify Dicot and Monocot primary and secondary structures.
2. Understand to differentiate the stages of embryo.
3. Identify the cell division stages.
4. handle microbiological techniques
5. Develop the ability to analyze plant diseases and identify remedial measures.

Syllabus:

Plant anatomy and Embryology of Angiosperms:

1. Internal morphology of Monocot and Dicot root and stem
2.Investigation of secondary growth and anomalous secondary growth. (Boerhaavia, Nyctanthus)
3. Study of leaf anatomy (measurement of stomatal size).
4. Nodal anatomy (Justicea, Neem, Dracaena)
5. Study of plant tissues – Tracheids, Vessels and fibres (Cucurbita and Bombax)
5. Study of pollen morphology and germination.
6. Isolation of plant embryos. Identification of stages-Globular and heart shaped. (Cucurbitaceae, Brassicaceae)

Cell Biology:

1. Cell biology: squash and smear techniques-Onion root tip (mitosis), Rheo flower buds (meiosis)
2. Microscopic view of cell components in plant cells-viewing Cystolith & Raphides, Chloroplast (Hydrilla leaf).

Microbiology:

1. Sterilization and culture media preparation.
2. Isolation of microbes from soil / milk /food
3. Serial dilution and Plating
4. Identification by Simple staining and Grams staining and Biochemical tests(bacteria)
5. Hanging drop.
6. Coliform Test.
7. Microbial analysis of milk by methylene - blue reduction test.

Plant Pathology:

1. Tikka disease of ground nut.
2. Citrus canker.
3. Tobacco mosaic / Cucumber mosaic.
4. Little leaf of brinjal.
4. Red rot of sugarcane.
5. Section cutting of specimens showing fungal diseases.
6. Submission of five Herbarium sheets.
7. Campus Walk.

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	3	3	4	4	3	3	4	4	3.6
CO2	4	4	4	4	3	4	4	4	4	3	3.8
CO3	4	4	3	4	3	4	4	4	3	3	3.6
CO4	4	4	4	4	4	4	4	4	4	4	4.0
CO5	4	4	4	4	3	4	4	3	4	4	3.8
Mean Overall Score											3.76

Result: The Score for this Course is 3.76 (High relationship)

Programme: M.Sc. **Discipline Specific Elective Course II (a)**
Semester : II **Hours : 5 hrs/wk 75 hrs /sem**
Sub. Code : P22DSF2A **Credits: 5**

TITLE OF THE PAPER: HORTICULTURE AND PLANT BREEDING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	2	1	1	1

PREAMBLE:

- Acquire sufficient practical knowledge on plant propagation techniques and plant nursery establishment.
- Discover Theoretical knowledge of Horticulture to establish home garden scientifically.
- Develop entrepreneurial skills in Pomeculture, Olericulture and Floriculture.
- Understand the fundamental mechanisms and principles of plant breeding and heredity and gene expression and regulations.
- Acquire knowledge on hybridization techniques and methods involved in improvement of crop plants.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Identify various plants and tools used in horticulture and comprehend vegetative propagation techniques.	1	15
UNIT 2 CO2: Understand the Greenhouse farming methods and indoor and outdoor gardening.	2	15
UNIT 3 CO3: Appreciate the art of flower arrangement and cultivation of flower, vegetables and fruit crops.	3	15
UNIT 4 CO4: To Understand the concepts of plant breeding and crop improvement.	4	15
UNIT 5 CO5: Develop knowledge on Hybridization techniques Heterosis and Mutation breeding.	5	15

SYLLABUS

Unit-I:

Importance and scope of horticulture. Divisions of horticulture. Irrigation methods. Plant propagation methods: Cutting- Root, Stem, Leaf cuttings. Layering-Simple, Compound Mound and Air Layering. Grafting-Approach, Tongue, Cleft grafting. Budding. T and Chip cutting. Transplanting, potting, Repotting. Containers and tools used in gardening. Irrigation-surface, Spray, Drip irrigation. Training and pruning.

Unit-II:

Principles and methods of designing, outdoor garden: hedges, edges, fences, trees, climbers, rockeries, arches, Lawn making and maintenance. Water garden - cultivation of water plants. Indoor gardening: hanging basket, bottle garden and Bonsai. Establishment of kitchen garden-principles, selection of crops, basic techniques involved in layout. Terrace garden-organic farming-organic manures (farmyard manure, vermicompost, panchakavya)-biopesticides, hydroponics, soilless culture - aeroponics.

Unit-III:

Floriculture: Cultivation of commercial flower crops – Rose and Jasmine. Hi tech horticultural practices – Green House Types Shade net, Polyhouse Cultivation, Conditioning of cut flowers, Packing. Flower arrangement – Principles and types, Preparation of Bouquet, Dry flower arrangement – Methods of drying, Pressing, Use of dried pressed plant materials. Cultivation of important vegetables - Tomato, Onion and snake gourd. Cultivation of important fruit crops - Mango, Grapes and Guava.

Unit-IV:

Aim, objectives, scope and importance of plant breeding, methods of crop improvement. Centers of Origin plant introduction, Acclimatization. Mass, Pure line and Clonal selection. Advantages, disadvantages and achievements.

Unit-V:

Hybridization: Objectives, achievements, types and techniques, advantages and disadvantages. Heterosis: effect of hybrid vigour, causes and achievements. Mutation breeding and its applications.

REFERENCES:

TEXT BOOKS:

1. Arora, J. S. (1992). Introductory Ornamental Horticulture. Kalyani Publishers, New Delhi.
2. Chowdry R.C. (1991) Introduction to plant breeding. Oxford & IBH publishing house, New Delhi.
3. Edmond, J. B. *et al*. (1977). Fundamentals of Horticulture. Tata McGraw Hill Publishers Co. Ltd., New Delhi.

REFERENCE BOOKS:

1. George Acquaah (2004). Horticulture Principles & practices. Prentice hall of India Pvt. Ltd., New Delhi.
2. Kumar N (1977). Introduction to Horticulture. Rajalakshmi Publications. Nagercoil, India.
3. Manibushan Rao, K. (1991). Textbook of Horticulture. Macmillan Publishing Co., New York.
4. Randhawa (1997) Ornamental Horticulture in India. Today & Tomorrow Publishers, New Delhi.
5. Rao, K. M. (2000). Text Book of Horticulture. Macmillan India Ltd., New Delhi.
6. Singh B.D (1999) Plant Breeding: Principles & Methods. Kalyani Publishers, Nagercoil, India.
7. Vijendra Das L.D (1998) Plant Breeding: Theory & Practice, Oxford & IBH Publishing house, New Delhi.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1(15 hours)			
	Importance and scope of horticulture. Divisions of horticulture. Irrigation methods. Plant propagation methods: Cutting- Root, Stem, Leaf cuttings. Layering – Simple, Compound Mound and Air Layering.	7	Lecture ICT PPT
	Grafting – Approach, Tongue, Cleft grafting. Budding. T and Chip cutting. Transplanting, potting, Repotting. Containers and tools used in gardening. Irrigation – surface, Spray, Drip irrigation. Training and pruning.	8	Lecture ICT PPT
UNIT II(15 hours)			
	Principles and methods of designing, outdoor garden: hedges, edges, fences, trees, climbers, rockeries,	7	PPT

	arches, Lawn making and maintenance. Water garden - cultivation of water plants. Indoor gardening: hanging basket, bottle garden and Bonsai.		Lecture
	Establishment of kitchen garden – principles, selection of crops, basic techniques involved in layout. Terrace garden – organic farming – organic manures (farmyard manure, vermi compost, panchakavya) – biopesticides, hydroponics, soilless culture - aeroponics.	8	PPT Lecture
UNIT III(15 hours)			
	Floriculture: Cultivation of commercial flower crops – Rose and Jasmine. Hi tech horticultural practices – Green House Types Shadenet, Polyhouse Cultivation, Conditioning of cut flowers, Packing.	7	Lecture Video
	Flower arrangement – Principles and types, Preparation of Bouquet, Dry flower arrangement – Methods of drying, Pressing, Use of dried pressed plant materials. Cultivation of important vegetables - Tomato, Onion and snake gourd. Cultivation of important fruit crops - Mango, Grapes and Guava.	8	Lecture Video
UNIT IV(15 hours)			
	Aim, objectives, scope and importance of plant breeding, Centers of Origin, methods of crop improvement Introduction, acclimatization.	7	Lecture PPT
	Mass,Pureline and Clonal selection. Advantages, disadvantages and achievements.	8	Lecture PPT
UNIT V(15 hours)			
	Hybridization: Objectives, achievements, types and techniques, advantages and disadvantages.	8	ICT Lecture
	Heterosis: effect of hybrid vigour, causes and achievements. Mutation breeding and its applications.	7	ICT Lecture

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	3	4	4	4	4	4	3	4	4	3.8
CO2	4	3	4	4	4	4	4	3	4	4	3.8

CO3	4	3	4	4	4	4	4	3	4	4	3.8
CO4	4	3	4	4	3	3	4	3	4	3	3.5
CO5	4	3	4	4	3	3	4	3	4	4	3.6
Mean Overall Score											3.7

Result: The Score for this Course is 3.7 (High relationship)

Programme: M.Sc. **Discipline Specific Elective Course II (b)**
Semester : II **Hours : 5 hrs/wk 75 hrs / Sem**
Sub. Code : P22DSF2B **Credits: 5**

TITLE OF THE PAPER: ENVIRONMENTAL BIORESOURCE MANAGEMENT

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT

	5	2	1	1	1

PREAMBLE:

- To gain knowledge about plants and environment
- To understand the environmental issues
- To study the value of Biodiversity
- To understand various threats to Biodiversity
- To find out the methods to conserve Biodiversity

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: To understand the basic concepts of ecosystem	1	15
UNIT 2 CO2: To preserve the depleting bioresources and prepare action plans to conserve the bioresources.	2	15
UNIT 3 CO3: To handle issues that are considered threat to the environment	3	15
UNIT 4 CO4: To understand the values and uses of biodiversity	4	15
UNIT 5 CO5: Involve in focussed efforts directed in saving nature and biodiversity.	5	15

SYLLABUS

UNIT I:

Basic concepts of Ecology-ecosystem-structure and function, types of ecosystem-crop plant and aquatic ecosystem-fresh water, marine water and mangroves. Succession - causes and types.

UNIT II:

Environmental resources – natural-forest resources (with reference to Tamil Nadu and India). Land resources-water and wild life. Energy resources –renewable and non-renewable energy resources.

UNIT III:

Environmental issues- causes and consequences of air pollution, soil and water pollution. Deforestation, conservation of disease management-floods, cyclones, land slides and earth quakes.

UNIT IV:

Biodiversity- definition, scope, levels of biodiversity (genetic, species and ecosystem), values, uses and loss of biodiversity, threats to biodiversity. Conventions on biodiversity-Rio Summit, Kyoto Protocol. Climate change Summit 2021.Characteristic features of biosphere reserves: Gulf of Mannar, Nilgiris Biosphere reserves.

UNIT V:

Conservation of biodiversity: practices in conservation-ecosystem approaches-species based approaches-in situ conservation-protected area, Afforestation, Social forestry, Agroforestry, *Ex situ* conservation-Botanical Garden, Cryopreservation, Seed bank, Role of IUCN, BSI and NBPGR in biodiversity conservation.

Text Books:

1. Agrawal, K.C. 1987. Environmental Biology. Agro-botanical Publications, India.
2. Ignacimuthu, S. 2013. Environmentaln studies. MJP Publishers, India.
3. Sharma, p.D. 2019. Ecology and Environment 13th edition, Rastogi Publications.

References:

1. Levitt, J. 1980. Resdponces of plants to Environmental stresses. Acad. Press, New York.
2. Odum, E.P. 1975. Ecology. 2nd ed. Oxford and IBH Publications, New Delhi.
3. Vashista, P.C. 1974. A Text book of Plant Ecology. Vishal Publications, Jullunder.
4. Sharma, P.D. 2017. Ecology and Environment, Rastogi Publications.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1(15 hours)			
	Basic concepts of Ecology-ecosystem-structure and function, types of ecosystem-crop plant and aquatic ecosystem.	7	Lecture ICT PPT
	Fresh water, marine water and mangroves. Succession - causes and types.	8	Lecture PPT
UNIT II(15 hours)			
	Environmental resources – natural-forest resources (with reference to Tamil Nadu and India).	7	PPT Lecture
	Land resources-water and wild life. Energy resources –renewable and non-renewable energy resources.	8	PPT Lecture
UNIT III(15 hours)			
	Environmental issues- causes and consequences of air pollution, soil and water pollution.	7	Lecture Video
	Deforestation, conservation of disease management-floods, cyclones, land slides and earth quakes.	8	Lecture Video
UNIT IV(15 hours)			
	Biodiversity- definition, scope, levels of biodiversity (genetic, species and ecosystem), values, uses and loss of biodiversity, threats to biodiversity.	7	Lecture PPT
	Conventions on biodiversity-Rio Summit, Kyoto Protocol. Climate change Summit 2021.Characteristic features of biosphere reserves: Gulf of Mannar, Nilgiris Biosphere reserves.	8	Lecture PPT
UNIT V(15 hours)			
	Conservation of biodiversity: practices in conservation-ecosystem approaches-species based approaches-in situ conservation-protected area, Afforestation, Social forestry, Agroforestry.	8	ICT Lecture

	Ex situ conservation-Botanical Garden, Cryopreservation, Seed bank, Role of IUCN, BSI and NBPGR in biodiversity conservation.	7	ICT Lecture

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	4	4	4	3	3	3	3	3.3
CO2	3	3	4	4	4	4	3	4	4	3	3.6
CO3	3	3	4	4	4	4	3	4	4	3	3.6
CO4	3	3	4	4	4	4	3	4	4	3	3.6
CO5	3	4	4	4	4	4	3	4	4	3	3.7
Mean Overall Score											3.56

Result: The Score for this Course is 3.56 (High relationship)

Programme: M.Sc. **Skill Enhancement Course II**
Semester : II **Hours : 2hrs/wk 30 hrs /sem**
Sub. Code : P22SEF2 **Credits: 2**

TITLE OF THE PAPER: TECHNIQUES IN MUSHROOM CULTIVATION

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	ICT
	5	2	1	1	1

PREAMBLE:

- To create awareness about the mushroom among the people
- To increase the production and consumption of mushroom
- To enable the students understand the nutritive value of mushroom
- To develop interest in cultivating mushroom

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: To understand the basic knowledge of edible and non edible mushroom	1	6
UNIT 2 CO2: Learns the techniques of mushroom cultivation	2	6
UNIT 3 CO3: Understand the raw materials used for a growing mushroom	3	6
UNIT 4 CO4: Enable the student know the cultivation of different mushroom	4	6
UNIT 5 CO5: Understand the harvesting and storage of mushroom	5	6

SYLLABUS

UNIT I:

Introduction: History of Mushroom cultivation, Morphology of Mushroom, Nutritional value of mushrooms -Uses of mushroom, edible and non-edible, identifications of poisonous mushrooms.

UNIT II:

Infrastructure, equipments in mushroom cultivation. Spawn: types of spawn, preparation of spawn, Mushroom bed preparation and factors affecting Mushroom bed preparation.

UNIT III:

Compost preparation, raw materials used for casing, preparation of casing material, sanitation during various stages of mushroom cultivation.

UNIT IV:

Cultivation of Button mushroom, Oyster mushroom and Paddy straw mushroom. Common pathogens affecting mushroom- Bacteria, Fungi and Nematodes.

UNIT V:

Harvesting: Methods of storage of mushrooms – Long term and short term storage. Marketing, reuse of spent mushroom substrate. Recipes from mushrooms – omelet, soup, pakoda and mushroom biriyani.

TEXT BOOKS

1. Shubhrata R. Mishra, 2014. Techniques of mushroom cultivation, Discovery Publishing house Pvt. Ltd. New Delhi.
2. Kannaiyan. S and Ramasamy, K, 1980. A hand book of edible mushrooms today and tomorrows. Printers and Publishers, New Delhi, 104 p.

3. Tewari, S. C. and Pankaj Kapoor, 2018, Mushroom cultivation, Mittal Publication, New Delhi.

REFERENCE BOOKS

1. Pathak V. N, Nagendra Yadav and Maneesha Gaur. 1998.
2. Mushroom Production and Processing technology. Agrobios (India) Jodhpur, 179 p.
3. Suman, B. C. and Sharma, V. P. 2007, Mushroom cultivation in India. Daya Publishing house New Delhi.
4. Chauhan, M., Gajre. K. and Prajapati. P.2013, Scientific cultivation of mushroom. Biotech books New Delhi.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1(6 hours)			
	Introduction: History of Mushroom cultivation, Morphology of Mushroom, Nutritional value of mushrooms.	3	Chalk and talk
	Uses of mushroom, edible and non-edible, identifications of poisonous mushrooms.	3	ICT
UNIT II(6hours)			
	Infrastructure, equipments in mushroom cultivation. Spawn: types of spawn, preparation of spawn.	3	Chalk and talk
	Mushroom bed preparation and factors affecting Mushroom bed preparation.	3	Chalk and talk
UNIT III(6 hours)			
	Compost preparation, raw materials used for casing, preparation of casing material.	3	PPT
	Sanitation during various stages of mushroom cultivation.	3	Lecture and Vedio
UNIT IV (6 hours)			
	Cultivation of Button mushroom, Oyster mushroom and Paddy straw mushroom.	3	PPT
	Common pathogens affecting mushroom-Bacteria, Fungi and Nematodes.	3	Lecture and Vedio
UNIT V(6hours)			
	Harvesting: Methods of storage of mushrooms – Long term and short term storage. Marketing, reuse of spent mushroom substrate.	3	Chalk and talk
	Recipes from mushrooms – omelet, soup, pakoda and mushroom biriyani.	3	Chalk and talk

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	4	4	3	3	3	4	3.4
CO2	3	4	4	3	2	3	4	4	4	3	3.3
CO3	3	3	4	4	2	3	3	3	3	3	3.1
CO4	3	4	4	4	2	4	4	4	4	4	3.7
CO5	3	3	3	4	2	3	4	4	3	3	3.2
Mean Overall Score											3.34

Result: The Score for this Course is 3.34 (High relationship)

Programme: M.Sc. **Core Course: IX**

Semester : III **Hours : 5 hrs/wk 75 hrs /sem**
Sub. Code : P22CF9 **Credits: 4**

TITLE OF THE PAPER: TAXONOMY OF ANGIOSPERMS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	ICT
	5	2	1	1	1

PREAMBLE:

- To know the etymology of Taxonomy as a science of identifying naming and classifying the plants and understands the history of taxonomy
- To categorize the organisms that enables easy biological communication
- To make them understand the evolution of taxonomy from alpha level to omega level
- To evluvate taxonomy as a tool to study the evolutionary relationship
- To analyse the differences between families of different classes and their economic values.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Define the term taxonomy and understands the history of taxonomy.	1	15/S
UNIT 2 CO2: know about the various taxonomic resources and Develops an aesthetic sense to appreciate the various botanical gardens (Royal botanical garden Kew)	2	15/S
UNIT 3 CO3: appreciate how the various branches of botany help in solving taxonomical problems	3	15/S
UNIT 4 CO4: Correlate the evolutionary relationship between various groups of plants	4	15/S
UNIT 5 CO5: Develop practical knowledge about phytochemical analysis and economically important plants	5	15/S

SYLLABUS

UNIT I:

A brief historical account on the classification of angiosperms up to the present day. Systems of classification: Detailed study of classification of Linnaeus, Bentham and Hooker, Engler and Prantl, Cronquist, APG III system-Merits and demerits. International Code for Botanical Nomenclature, Typification, Principles of priority and their limitations, Effective and valid publication, Author citation, retention, choice and rejection of names. Identification of plants-Dichotomous key (Bracted Key, Indented Key) Web identification-IPNI, Biodiversity Portal and Plants of World Online.

UNIT II:

Sources of Taxonomic information: Herbarium, Flora, Monograph and Botanical gardens. Sources of Taxonomic information: Herbarium, Flora, Monograph and Botanical gardens Modern trends - Anatomy, Embryology, Palynology, Cytology and Phytochemistry in relation to taxonomy.

UNIT III:

Biosystematics its aim and scope, biosystematic categories, Phenotypic plasticity, Phylogeny terms and concept (Mono, Para, Polyphyly) Turresons work, Taxonomic Hierarchy, Species concept, Numerical Taxonomy, Sero Taxonomy, and Molecular systematics.

UNIT IV:

Salient features and Economic importance of the following families: Polypetalae - Magnoliaceae, Portulacaceae, Oxalidaceae, Rosaceae, Combretaceae, Lythraceae. Gamopetalae-Oleaceae, Asclepiadaceae, Bignoniaceae, Pedaliaceae, Acanthaceae, Verbenaceae.

UNIT V:

Salient features and economic importance of the following families: Monochlamydeae-Nyctaginaceae, Amaranthaceae. Monocotyledon-Liliaceae, Commelinaceae and Cyperaceae.

TEXT BOOKS:

1. Pandey, B.P.(1997).Taxonomy of Angiosperms , S.Chand & Co., New Delhi.
2. Singh, V. & Jain, K.K. (1989). Taxonomy of Angiosperms – Rastogi, Meerut
3. Vashista, P.C. (1990). Taxonomy of Angiosperms – S.Chand & Co., New Delhi

REFERENCE BOOKS:

1. Lawrence, GHM. (1995). The Taxonomy of vascular Plants (Vol I-IV) ,Central Book, Dept., Allahabad
2. Heywood VH. (1967). Plant Taxonomy, Edward Arnold, London
3. Jeffery C. (1982). An introduction to Plant Taxonomy, J& A Churchill Ltd., London
4. Mathew, K.M. (1983). The Flora of Tamil Nadu Carnatic, The Rapinat Herbarium, Trichy.
5. Sivarajan,V.V. (1989). Introduction to Principle of Plant Taxonomy, Oxford and IBH, New Delhi.
6. Hutchinson, J. (1973). The Families of Flowering plants, Oxford University press, London.
7. Gamble,J.S , Fisher, L.E.F .(1967). The Flora of The presidency of madras (Vol-III) BSI, Calcutta.
8. Davis, P.H and Heywood,V.M. (1965). Principles of Angiosperm Taxonomy, Oliver and Boyd, Edinburgh.
9. Kress J.W, Wurdack, K.J., E.A C., Zimmer, L.A .Weigt and Janzen D.H. (2005). Use of DNA bar codes to identify flowering plants. Proc. Natl. Acad .Sci USA 102, 8369-374.
10. Stoeckle , M.(2003).Taxonomy, DNA and the bard code of life .bioscience 53: 796- 797.
11. Simpson M.G.(2006). Plant systematics, Elsevier Academic Press,USA
12. Takhtajan, A.L. (1969). Flowering Plants – Origin and dispersal – Oliver & Boyed
13. Takhtajan A. (1991). Evolutionary trends in flowering plants, Bishen Singh Mahendra Pal Singh, Dehradun.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1(15 hours)			
	A brief historical account on	4 4	Group discussion

	the classification of angiosperms up to the present day. Systems of classification: Detailed study of lassification of Linnaeus, Bentham and Hooker, Engler and Prantl, Cronquist, APG III system – Merits and demerits		
	International Code for Botanical Nome	4	Lecture

	nclature, Typification, Principles of priority and their limitations, Effective and valid Publication		
	Author citation,retention, choice and rejection of names Identification of plants –Dichotomous key (Bracted Key, Indented Key) Web identification	3	Group discussion

UNIT II(15 hours)			
	Sources of Taxonomic information : Herbarium, Flora, Monograph and Botanical gardens	7	ICT
	Modern trends - Anatomy, Embryology, Palynology, Cytology and Phytochemistry in relation to taxonomy.	8	Lecture
UNIT III(15 hours)			
	Biosystematics its aim and scope, biosystematic catego	8	Tutorial

	ries, Phenotypic plasticity, Phylogeny terms and concept (Mono, Para, Polyphyly)		
	Turresons work, Taxonomic Hierarchy, Species concept, Numerical Taxonomy, Sero Taxonomy, and Molecular systematics.	7	ICT
UNIT IV (15 hours)			
	Salient features and Economic importance of the	8	Lecture

	following families: Polypetalae - Magnoliaceae,Portulacaceae, Oxalidaceae, Rosaceae, Combretaceae, Lythraceae		
	Oleaceae, Asclepiadaceae, Bignoniaceae,Pedaliaceae, Acanthaceae, Verbenaceae.	7	Lecture
UNIT V(15 hours)			
	Salient features and economic importance of the follow	7hrs	Lecture

	ing families: Monochlamydeae – Nyctaginaceae, Amaranthaceae.		
	Monocotyledon - Liliaceae, Commelinaceae, and Cyperaceae.	7hrs	Lecture

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	3	3	3	4	3	4	4	4	3.6
CO2	4	4	4	4	4	4	4	4	4	3	3.9
CO3	4	4	4	4	3	4	4	4	4	3	3.8
CO4	4	3	3	3	4	4	3	3	4	4	3.5
CO5	4	3	3	3	4	4	3	3	4	4	3.5
Mean Overall Score											3.66

Result: The Score for this Course is 3.66 (High relationship)

Programme: M.Sc. **Core Course X**
Semester : III **Hours : 5 hrs/wk 75 hrs/sem**
Sub. Code : P22CF10 **Credits: 4**

TITLE OF THE PAPER: PLANT PHYSIOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	4	-	--	1

PREAMBLE:

- To understand plant physiological processes and metabolism.
- To explain the role of micro nutrients in plant growth and development.
- To relate photosynthesis with the formation of primary and secondary metabolites.
- To clarify the mechanism of respiratory activity in plants.

- To know the methods used for the bio-production of plant secondary metabolites.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: impart an insight into the various water relationship in plants.	1	15
UNIT 2 CO2: Take students to higher levels of learning about the mineral nutrition in plants and mechanism of nitrogen fixation in plants.	2	15
UNIT 3 CO3: Understand the mechanism of photosynthetic process in plants and various metabolic activities in Plants.	3	15
UNIT 4 CO4: Acquire basic knowledge about growth and respiratory pathways in plants	4	15
UNIT 5 CO5: Gain knowledge in biochemical activities of plants.	5	15

SYLLABUS

UNIT I:

Water relations of plants: Physicochemical properties of water, chemical potential and water potential in the plant, bulk movement of water, soil-plant atmosphere continuum.

Transpiration: Types, cuticular, lenticular and stomatal. Factors affecting transpiration. Stomatal physiology- Potassium Ion Theory and Starch Hydrolysis Theory and regulation. Ascent of Sap.

UNIT II:

Mineral nutrition: Macronutrients and Micronutrients. Modern concepts of mineral salt absorption and translocation. Active and passive absorption of minerals. Mechanism of nitrogen fixation, Physiological role, Nitrogen uptake and assimilation.

UNIT III:

Photosynthesis: Photophysical and photochemical phase: Light reactions, sequence of photosynthetic pathway - Electron Transport Chain, Photophosphorylation. Pathways of CO_2 fixation in C3, C4-(NAD-ME and NADP-ME) plants and CAM pathway. Factors affecting photosynthesis.

UNIT IV:

Respiration: Aerobic and Anaerobic, fermentation, respiratory quotient, Glycolysis, Kreb's cycle, Oxidative phosphorylation. Factors affecting respiration. Photorespiration HMP Pathway. Cyanide Resistant Respiration.

UNIT V:

Plant growth regulators: Auxin, Gibberellin, Cytokinin, Ethylene and Abscisic acid their physiological role and mode of action. Flowering: Photoperiodism - Short day plants, Long day plants and Day neutral plants. Role of phytochrome in flowering. Seed dormancy, causes and methods of breaking dormancy. Programmed cell death -Physiological and biochemical changes. Physiological stress-Water and salt-Physiological role and adaptive mechanism.

REFERENCES:

TEXT BOOKS:

1. Devlin, R. M. (1969). Plant Physiology. Van Nostrand, Reinhold Co., New York.
2. Fang, F. K. (1982). Light Reaction Path of Photosynthesis. Vol. 35. Molecular Biology, Biochemistry and Biophysics. Springer Verlag.
3. Jain, V. K. (2007). Fundamentals of Plant Physiology. S. Chand & Co., New Delhi.

REFERENCE BOOKS:

1. Leopold, A. C. (1973). Plant Growth and Development. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2. Meyer, Anderson and Bonning (1965). Introduction to Plant Physiology. D. Van Nostrand.
3. Noggle, R. and Fritz, G. I. (1989). Introductory Plant Physiology. 2nd ed. Prentice Hall, New Delhi
4. Norton, G. (1978). Plant Proteins. Butterworth, London.
5 Palmer, J. M. (ed.). (1984). The Physiology and Biochemistry of Plant Respiration. Cambridge University Press,UK.
6. Salisbury, F. B. and Ross, E. (1992). Plant Physiology. Wadsworth, Belmont, California, USA.
7. Verma, S. K. (1999). Plant Physiology. S. Chand & Co., New Delhi.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I(15 hours)			
	Water relations of plants Physicochemical properties of water, chemical potential and water potential in the plant, bulk movement of water, soil-pl	7	Lecture

	ant atmosphere continuum.		
	Transpiration: Types, cuticular, lenticular and stomatal.	1	ICT
	Factors affecting transpiration. Stomatal physiology and regulation. Ascent of Sap.	7	Lecture
UNIT II(15 hours)			
	Mineral nutrition: Macronutrients and Micro	7	Lecture

	nutrients. Modern concepts of mineral salt absorption and translocation.		
	Active and passive absorption of minerals.	1	ICT
	Mechanism of nitrogen fixation, Physiological role, Nitrogen uptake and assimilation.	7	Lecture
UNIT III(15 hours)			
	Photo synthe	7	Lecture

	sis: Photo physic al and photo chemi cal phase: Light reacti ons, seque nce of photos ynthet ic pathw ay - Electr on Trans port Chain, photo phosp horyla tion.		
	Pathw ays of CO_2 fixatio n in C3, C4-(N AD-M E and NAD P-ME) plants and factor s	7	Lecture

	affecting photosynthesis.		
	CAM pathway.	1	ICT
UNIT IV(15 hours)			
	Respiration: Aerobic and Anaerobic, fermentation, respiratory quotient,	7	Lecture
	Glycolysis, Kreb's cycle, Oxidative phosphorylation. Factors affecting respiration. Photorespiration.	7	Lecture
	HMP Pathway.	1	ICT

	Cyanide Resistant Respiration.		
UNIT V(15 hours)			
	Plant growth regulators: Auxin ,Gibberellin , Cytokinin, Ethylene and Abscisic acid their physiological role and mode of action .	7	Lecture
	Flowering: Photoperiodism -. Short day plants, Long day plants and Day neutral plants.	1	ICT

	Role of phyto chrom e in flower ing. Seed dorma ncy causes and metho ds of breaki ng dorma ncy .Progr amme d cell death -Physi ologic al and bioche mical chang es. Physi ologic al stress-Water and salt-P hysiol ogical role and adapti ve mecha nism.	7	Lecture

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	

CO1	4	4	4	4	3	4	4	4	4	2	3.7
CO2	4	4	4	4	3	4	4	4	3	2	3.6
CO3	4	4	4	4	3	4	4	4	4	4	3.9
CO4	4	4	4	4	3	4	4	4	3	2	3.6
CO5	4	4	4	4	3	4	4	4	4	4	3.9
Mean Overall Score											3.74

Result: The Score for this Course is 3.74 (High relationship)

Programme: M.Sc. **Core Course XI**
Semester : III **Hours: 5 hrs/wk 75 hrs/sem**
Sub. Code : P22CF11 **Credits: 4**

TITLE OF THE PAPER: BIOINSTRUMENTATION AND BIOSTATISTICS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/ TUTORIAL	ICT
	5	2	1	1	1

PREAMBLE:

- To enable the students to uunderstand the working principles and applications of instruments used in various disciplines of biological sciences.
- To study the concepts of various spectroscopic techniques and its instrumentation.
- To learn the basic concepts of separation techniques and its applications.
- To acquire basic information regarding radiochemical analysis along with industrial analyzers.
- To understand the scope & importance of Biostatistics.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Understand and analyze the principle, operation and applications of various instrumentation techniques used in the field of biological research.	1	15
UNIT 2 CO2: Differentiate the principle, instrumentation and working mechanism of chromatographic and spectroscopic instruments.	2	15

UNIT 3 CO3: Elucidate the various separation techniques, its instrumentation and applications in biology.	3	15
UNIT 4 CO4: Describe the principle and working mechanism of various radiation detectors and gas analyzers.	4	15
UNIT 5 CO5: Apply statistical tools and techniques to biological data for testing different hypothesis in their research works and understand the technical experimental statistics.	5	15

SYLLABUS

Unit I:

Microscopy- Resolving power, types: Electron microscope: TEM, SEM, Phase contrast microscope, AFM, STM, Camera Lucida. pH metry- pH concept, Conductivity meter standardization. Buffers – acetate, Phosphate,Tris,Glycine, pKa value.

Unit II:

Centrifugation: Principle, types of rotors, types of Centrifuges – Clinical, refrigerated and Ultra Centrifuge and their applications. Chromatography: Principles (Absorption, partition, ion exchange, affinity), components, methodology and applications of TLC, GC, HPTLC.

Unit III:

Spectroscopy: Principles, components and working mechanism of Colorimetry, Spectrophometer, UV visible and Infra Red (IR), Nuclear magnetic resonance (NMR), Electron paramagnetic resonance (EPR) and Atomic absorption spectroscopy (AAS).

Unit IV:

Electrophoresis: Principles, procedure and applications: AGE, SDS-PAGE, 2-D Electrophoresis, Isoelectrofocusing. Radiometry: Isotopes, measurement of radioactivity: Radioactive counters (Scintillation counter, GM counter), Autoradiography and its applications.

Unit V:

Biostatistics: Scope .Collection, classification, tabulation and presentation of data –Diagramatic and Graphical, measures of central tendency: mean, median and mode. Standard deviation, Standard error probability analysis , test of significance : 'T' test, Chi-square test. Permutation and combination, correlation and Regression analysis, ANOVA, Usage of SPSS.

REFERENCES:

TEXT BOOKS:

1. N. Gurumani 2010. Research Methodology for Biological Sciences. MJP Publishers, Chennai.
2. David T. Plummer 1988. An introduction to practical biochemistry, Tata Mc Graw Hill pub. Co. Ltd, New Delhi.
3. J. Jeyaraman 1981. Laboratory Manual in Biochemistry. New Age International publishers, New Delhi.
4. S. Palanichamy and M. Shunmugavelu 2009. Research methods in biological sciences. Palani paramout Publications, Palani.

REFERENCE BOOKS:

1. Marimuthu, R. (2008). Microscopy and Microtechnique. MJP Publishers,Chennai
2. Wilson K, Walker, J. (1994). Principle and techniques of practical biochemistry, 4thed) Cambridge university press, Cambridge
3. Khan, I.A., and Khannum, A., (1994).Fundamentals of Biostatistics, Vikas Pub., Hyderabad
4. Sree Ramulu, V.S., (1988). Thesis Writing, Oxford & IBH Pub., New Delhi.
5. Bryan Bergeron, M.D. (2006). Bioinformatics Computing, Prentice – Hall of India. New Delhi.
6. Stephen Misener and Stephen A. Krawetz. (2000). Bioinfromatics-Methods and Protocols. Humana Press, Totowa, New Jersey.
7. Kothari, C.R., (1991).Research Methodology – Methods and Techniques, Wiley Eastern Ltd., New Delhi.
8. Zar, J.H. (1984). Biostatistics Analysis, Prentice Hall International, England Cliffs, New Jersey.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1 : (15 hours)			
	Microscopy- Resolving power, types: Electron microscope: TEM, SEM, Phase contrast microscope. Camera Lucida.	6 hours	Chalk–talk method; Use of AV aids and videos.
	pH metry- pH concept, Conductivity meter	4 hours	Peer teaching techniques, Power Point Presentation with animations.
	Standardization of Buffers-acetate, phosphate, Tris, Glycine, pKa value**.**	5 hours	Use of AV aids and chalk-talk method.

UNIT II : (15 hours)			
	Centrifugation: Principle, types of rotors, types of centrifuges – Clinical, refrigerated and Ultra centrifuge and their applications.	6 hours	Use of Blackboard and Use of AV aids
	Chromatography: Principles (absorption, partition , ion exchange ,affinity),	3 hours	Peer teaching techniques and Power Point Presentation
	Components, methodology and applications of TLC, GC, HPLC.	6 hours	Use of AV aids, use of PPT with videos and Peer teaching techniques
UNIT III: (15 hours)			
	Spectroscopy: Principles, components and working mechanism of Colorimetry.	4 hours	Chalk–talk method and discussion by forming groups.
	Spectrophometer-UV visible and Infra Red (IR**).**	5 hours	Lecture method and use of AV aids, Peer teaching.
	Nuclear magnetic resonance (NMR), electron paramagnetic resonance (EPR) and atomic absorption spectroscopy (AAS**).**	6 hours	AV aids, Video animations and Peer teaching techniques.
UNIT IV: (15 hours)			
	Electrophoresis: Principles, procedure and applications: AGE, SDS- PAGE.	5 hours	Lecture method and use of videos.
	2 D Electrophoresis, Isoelectrofocusing	2 hours	AV aids and chalk-talk method.
	Radiometry: Isotopes, measurement of radioactivity: Radioactive counters (Scintillation counter, GM counter).	5 hours	ICT enabled techniques, peer interactions
	Autoradiography and its applications.	3 hours	chalk-talk technique and use of AV aids.
UNIT V: (15 hours)			
	Biostatistics:Scope.Collection, classification,tabulation and presentation of data –Diagramatic and Graphical.	3 hours	Lecture method, Use of OHP and Peer participation through GD
	Measures of central tendency: mean, median and mode.	2 hours	Lecture method, GD
	Standard deviation ,standard error	2 hours	Use of AV aids and Peer participation techniques.
	Test of significance: ‘T’ test, Chi-square test.	2 hours	Lecture method and problem solving methods

	Probability analysis, permutation and combination	2 hours	AV aids.
	Correlation and Regression analysis	2 hours	AV aids.
	ANOVA, Usage of SPSS.	2 hours	GD through peer group techniques and AV aids.

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	4	3	3	4	4	3	3	2	3.4
CO2	4	4	4	3	3	4	4	3	3	2	3.4
CO3	4	4	4	3	3	4	4	3	3	2	3.4
CO4	4	4	4	3	3	4	4	3	3	2	3.4
CO5	4	3	3	4	3	4	3	3	3	2	3.2
Mean Overall Score											3.36

Result: The Score for this Course is 3.36 (High relationship)

Programme: M.Sc. **Core Course XII**
Semester : III **Hours: 8 hrs/wk 120 hrs /sem**
Sub. Code : P22CF12P **Credits: 4**

TITLE OF THE PAPER: PRACTICAL PAPER III

Pedagogy	Hours	Lab experimentation	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	8	8	-	-	-

PREAMBLE:

- To acquire skills in carrying out experiments related to taxonomy, biochemistry and biophysics and bioinstrumentation and biostatistics.
- To provide hands on experience in plant identification techniques.
- To learn the analytical techniques used in the study of biomolecules and experimentally study the enzyme activities.
- To enable the students to gain a comprehensive understanding of various concepts used in plant physiological systems through simple experiments.
- To train the students to gain knowledge about the principles of instrumentation in biological research.

COURSE OUTCOME

At the end of the Semester, the Students will be able to

CO1: understand technical description of plants and construct and use keys for identification of the respective plant groups.

CO2: identify common plant families based on the morphological features.

CO3: independently work on various instruments by understanding its principle and apply statistical tools in their research.

CO4: analyze biochemical and physiological phenomenon and carry out experiments in biological research pertaining to physiology.

CO5: Impart skill to students to be able to work in R & D and quality control laboratories and to to use modern instrumentation and classical techniques.

Syllabus:

1. Morphology of flowering plants: General description and traits of taxonomic interest.
2. Studying phenology of selected tree species in the campus.

3. Herbarium preparation

4. Analysis of plant characters- polypetalae- gamopetalae, monochlamydeae and monocot

5. Dichotomous Key.

6. Field Trip.

7. Verification of Beer's Law.

8. Chromatography-TLC

9. Absorption Spectrum of Chlorophyll pigment.

10. Preparation of buffer – Acetate buffer and Phosphate buffer.

11. pH – Titration curve.

12. Estimation of proline and phenol in plant tissues under different environmental and Physiological Stress.

13. Chlorophyll Estimation.

14. Isolation of Chloroplast and estimation of Photosystem II activity.

15. Measurement of water potential.

16. Problems related to Chi square, Correlation, Regression and ANOVA.

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	4	4	3	4	4	3	3	4	3.7
CO2	4	4	4	4	4	4	4	4	4	4	4.0
CO3	4	4	4	4	3	3	4	4	3	3	3.6
CO4	4	4	4	4	3	3	4	4	3	3	3.6
CO5	4	3	3	3	3	2	3	3	2	3	2.9
Mean Overall Score											3.56

Result: The Score for this Course is 3.56 (High relationship)

Programme: M.Sc. **Discipline Specific Elective Course III (a)**
Semester : III **Hours : 5 hrs/wk 75 hrs /sem**
Sub. Code : P22DSF3A **Credits: 4**

TITLE OF THE PAPER: PLANT TISSUE CULTURE

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	3	-	-	2

PREAMBLE:

1. To acquaint students with the principles, technical requirement, scientific and commercial applications of plant tissue and cell culture.
2. To expose students to supporting methodologies of plant tissue and cell culture, micropropagation techniques,
3. To introduce students the applications of tissue and cell culture to plant improvement.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Understand the basic knowledge about tissue culture techniques, medium, sterilization and able to analyse the requisite for tissue culture Laboratory organization.	1	15
UNIT 2 CO2: isolate single cells from plant tissue and and gain knowledge to grow single cells by various techniques based on the requirement.	2	15
UNIT 3 CO3: Understand the fundamentals of totipotency plant tissue culture techniques and apply the technique of micropropagation such as somatic embryogenesis, organogenesis and the production of synthetic seeds and its significance.	3	15
UNIT 4 CO4: gain theoretical and practical knowledge about *in vitro* production of plants.	4	15
UNIT 5 CO5: design and develop the protocols for enhanced production of bioactive compounds in cell suspension culture.	5	15

SYLLABUS

UNIT I:

Introduction: History and Scope .Concepts of basic techniques in plant tissue culture: Laboratory requirements and organization, Sterilization methods -filter, heat and chemical. Media preparation inorganic nutrients, organic supplements, carbon source, gelling agents, growth regulators Composition of important culture media (MS, Whites and Gamborg's media**).**

UNIT II:

Cell, tissue and organ culture: Isolation of single cells, selection and types of cells, tissue explants and organs for culture - Paper raft nurse technique, Plating method, Microchamber techniques, cell suspension cultures: batch, continuous, chemostat culture. Synchronization of suspension culture, cellular totipotency, Totipotency of epidermal and crown gall cells.

UNIT III

Micropropagation - Clonal propagation of elite germplasm, organogenesis -formation of shoots and root Role of growth regulators and other factors, somaclonal and gametoclonal variations. Somatic embryogenesis – Process of somatic embryogenesis, structure, factors affecting embryogenesis, synthetic seeds.

UNIT IV:

Haploid production: Androgenesis, gynogenesis. Techniques of anther culture, diploidisation, factors influencing androgenesis, utilization of haploids in plant breeding. In vitro pollination-ovule and ovary culture, importance, techniques overcoming incompatibility barriers, embryo rescue. Protoplast culture: Isolation of protoplasts - mechanical and enzymatic, culture of protoplasts. Protoplast fusion: Methods and selection of somatic hybrids, cybrids.

UNIT V:

Classification of secondary metabolites, *in vitro* production of secondary metabolites. Immobilized cell cultures and biotransformation, elicitors and hairy root culture. Cryopreservation and gene bank: Modes of preservation, application and limitations. Application of tissue culture in forestry, Horticulture, Agriculture.

TEXT BOOKS:

1. Kalyan Kumar, De. (1992). An Introduction to Plant Tissue Culture. New Central Book Agency, Calcutta.
2. Ramawat, K. G. (2000). Plant Biotechnology. S. Chand & Co., New Delhi.
3. Razdan, M. K. (2004). Introduction to Plant Tissue Culture. 2nd ed. Oxford & IBH Publishing Co. Pvt. Ltd.,

REFERENCE BOOKS:

1. Reinert, J. and Bajaj, Y. P. S. (1977). Plant Cell Tissue and Organ Culture: A
2. Laboratory Manual, Narosa Publishing House, New Delhi.
3. Vasil, I. K. (1986). Cell Culture and somatic Cell Genetics of Plants. 3 Volumes. Academic Press Inc.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1(15 hours)			
	History and Scope .Concepts of basic techniques in plant tissue culture	3	Chalk and talk
	Sterilization methods -filter, heat and chemical. Media preparation inorganic nutrients, organic supplements, carbon source, gelling agents growth regulators	4 4	ICT Chalk and talk

	Composition of important culture media (MS, Whites and Gamborg's media).	4	Peer discussion Chalk and talk
UNIT II(15 hours)			
	Isolation of single cells, selection and types of cells, tissue explants and organs for culture.	4	Chalk and talk
	Paper raft nurse technique, Plating method, Microchamber techniques, cell	3	ICT
	suspension cultures : batch, continuous, chemostat culture. Synchronization of suspension culture cellular totipotency, Totipotency of epidermal and crown gall cells.	2 2 4	Chalk and talk Chalk and talk Chalk and talk
UNIT III(15 hours)			
	Clonal propagation of elite germplasm, organogenesis -formation of shoots and root Role of growth regulators and other factors	2 2	Chalk and talk
	somaclonal and gametoclonal variations	4	ICT
	Somatic embryogenesis – Process of somatic embryogenesis, structure factors affecting embryogenesis, synthetic seeds	4 3	Chalk and talk ICT Chalk and talk
UNIT IV(15 hours)			
	Androgenesis, gynogenesis. Techniques of anther culture, diploidisation, factors influencing androgenesis, utilization of haploids in plant breeding.	4	ICT Chalk and talk
	In vitro pollination - ovule and ovary culture, importance, techniques overcoming incompatibility barriers, embryo rescue.	4	Chalk and talk
	Protoplast culture: Isolation of protoplasts - mechanical and enzymatic, culture of protoplasts. Protoplast fusion: Methods and selection of somatic hybrids, cybrids.	7	Chalk and talk ICT
UNIT V			
	Classification of secondary metabolites, in vitro production of secondary metabolites	4	Chalk and talk

	Immobilized cell cultures and biotransformation, elicitors and hairy root culture.	3 3	Chalk and talk Chalk and talk
	Cryopreservation and gene bank: Modes of preservation, application and limitations. Application of tissue culture in forestry, Horticulture, Agriculture.	2 3	Chalk and talk Chalk and talk

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	4	4	3	3	4	4	3	3	3.6
CO2	4	4	4	4	4	4	4	4	4	4	4.0
CO3	4	4	4	4	4	4	4	4	4	4	4.0
CO4	4	4	4	4	4	4	4	4	4	4	4.0
CO5	4	4	4	4	4	4	4	4	4	4	4.0
Mean Overall Score											4.04

Result: The Score for this Course is 4.04 (High relationship)

Programme: M.Sc. **Discipline Specific Elective Course III (b)**
Semester : III **Hours : 5 hrs/wk 75 hrs /sem**
Sub. Code : P22DSF3B **Credits: 4**

TITLE OF THE PAPER: RESEARCH METHODOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	3	-	-	2

PREAMBLE:

- Basic knowledge in biological research
- To learn statistical techniques for research
- To acquire basic knowledge about various instruments and techniques

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Training the students to participate in active research activity	1	15
UNIT 2 CO2: Acquire knowledge in research and learning to write thesis by their own		15
UNIT 3 CO3: Creating novel ideas and techniques in biology	3	15
UNIT 4 CO4: Training the students in academic and professional levels	4	15
UNIT 5 CO5: Defining and formulating the research problem	5	15

SYLLABUS

UNIT I:

Research Methodology: Choosing problem for research- indexing and abstracting-reference collection- bibliography-Journal format-editing and proof correction-full paper and short communication-impact factor-plagiarism-oral and poster presentation.

UNIT II:

Data collection-methods of data collection- representation of data- Pie diagram, bar diagram, frequency polygon and measures of central tendency (mean, median, mode, SD)-ANOVA.

UNIT III:

Experimental Designs- hypothesis and null hypothesis-Sampling Unit-Experimental Error-Replication-Controls-measurement.

UNIT IV:

Citing and Listing references-Different systems of reference citation - Report writing-significance of report writing- different steps in report writing - conclusion.

UNIT V:

Research ethics-ethical issues-ethical committee-IPR-Intellectual Property Rights-Patent Law-copyright-TRIPS (Trade Related aspects of Intellectual Property Rights)-Scholarly publishing – Acknowledgement.

TEXT BOOKKS:

1. N. Gurumani, 2009. An introduction to Biostatistics, MJP Publishers, New Delhi.
2. N. Gurumani, 2011. Research methodology in biological sciences, MJP Publishers, New Delhi.

REFERENCES:

1.Daniel, W.W, 1995. Biostatistics. 7th edition, John Wiley and Sons, Newyork, USA.
2. Green, M.R. and Sambrook, J. 2012. Molecular cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York.
3. Khan, I.A. and Khanum, A. 1994. Biostatistics. Vikas Publishing House Pvt. Ltd. New Delhi.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1(15 hours)			
	Research Methodology: Choosing problem for research-bibliographs-indexing and abstracting-reference collection.	7	Chalk and talk
	Journal format-editing and proof correction-full paper and short communication-impact factor-plagiarism-oral and poster presentation.	8	ICT Chalk and talk
UNIT II(15 hours)			
	Data collection-methods of data collection-sampling methods-data processing.	7	Chalk and talk
	Strategies and tools -ANOVA -Hypothesis testing.	8	ICT
UNIT III(15 hours)			
	Computing introduction to evolutionary algorithems-data preparation.	7	Chalk and talk
	Universal analysis (table, bar, chart, pie chart, percentage) tabulations.	8	ICT

UNIT IV(15 hours)			
	Research ethics-ethical issues-ethical committee-IPR-Intelectual Property Rights-Patent Law.	7	ICT Chalk and talk
	Copy writer-TRIPS-Trade Related aspects of Intelectual Property Rights-Scholarly publishing – Acknowledgement.	8	Chalk and talk
UNIT V (15 hours)			
	Report writing-significance of report writing-different steps in report writing.	7	Chalk and talk
	Layer of research report- types of report conclusion.	8	Chalk and talk Chalk and talk

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	3	3	3	3	3	3	3	2	2	3.0
CO2	4	3	3	3	4	4	3	3	2	2	3.1
CO3	4	4	4	3	3	3	4	4	2	2	3.3
CO4	4	4	3	3	3	3	3	3	2	2	2.9
CO5	4	3	4	4	4	4	4	4	2	2	3.5
Mean Overall Score											3.16

Result: The Score for this Course is 3.16 (High relationship)

Programme: M.Sc. **Non -Major Elective Course**
Semester : III **Hours : 2 hrs/wk 30 hrs /sem**
Sub. Code : P22NMF1 **Credits: 2**

TITLE OF THE PAPER: GARDENING

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	2	1	-	-	1

PREAMBLE:

- To provide practical training as well as theoretical knowledge about garden and maintenance.
- To improve skills for growing fresh vegetables without use of any pesticide.
- To create awareness about kitchen gardening.
- Students are introduced to the methods of plant propagation ,preparation of soil ,landscape construction

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: understand the concept of gardening, knowledge ,different features and techniques of gardening (types, methods and tools)	1	6
UNIT 2 CO2: perceive the gardening skills , as well as personal, social and work-related skills	2	6
UNIT 3 CO3: understand the various methods of propagation of plants and appreciates the development of self confidence	3	6
UNIT 4 CO4: develop a keen understanding of home garden , growing fresh and vegetables without use of any pesticide.	4	6
UNIT 5 CO5: appreciate the importance of embarking on employment, create awareness to the society about the role of organic farming	5	6

SYLLABUS

UNIT I:

Introduction-History of gardening. Types of gardens: Outdoor gardening-design and preparation of garden-Containers, suitable soil, transplanting, potting, repotting, setting out**.** Irrigation -Surface, Drip.

UNIT II:

Ornamental Gardening: garden components-Lawns, Topiary, Rockery, Hedges. Pruning-objectives and types of pruning (pinching, heading back)-thinning out. Indoor gardening-hanging basket terrarium, bonsai

UNIT III:

Propagation by seeds (brief), Vegetative propagation: Cuttage -root, stem, leaf. Layerage-Simple, Compound, and Air layering. Budding -T and Patch budding. Grafting-Tongue, Clef grafting.

UNIT IV:

Terrace Garden-Importance, Containers commonly used suitable plants. Kitchen gardening: importance, layout, suitable plants and cropping patterns.

UNIT V:

Manures-Types, FYM, Panchakavya, Fish Gunabajalam, Seaweed Manure. Management of Garden waste Composting, importance. Women Enterpreneurship and value addition.

TEXT BOOKS:

1. Manibhushan Rao K. (1991) Text book of Horticulture. University of Madras, Madras.

2. Kumar Dr. N. (2010) Introduction to Horticulture. New Delhi.

REFERENCE BOOKS:

1. Sheela V. L. (1959) Horticulture .College of Agriculture, Thiruvananthapuram.

2. Hudson T. Hartmann, Dale E. Kester, Fred T. Davies, Jr, Robert L. Geneve (2002) Plant Propagation: Principles and Practices.

UNITS	**TOPIC**	**LECTURE HOURS**	**MODE OF TEACHING**
UNIT I(6hours)			
	History of gardening Types of gardens: Outdoor gardening – design and	3	Chalk and talk

	preparation of garden - Containers		
	suitable soil, transplanting, potting, repotting, setting out	2	ICT
	Irrigation – Surface, Drip.	1	Chalk and talk
UNIT II(6hours)			
	Ornamental Gardening : garden components – Lawns, Topiary, Rockery, Hedges	3	Chalk and talk ICT
	Pruning –objectives and	2	Chalk and talk

	types of pruning (pinching, heading back) – thinning out.		
	Indoor gardening – hanging basket terrarium, bonsai	1	Chalk and talk
UNIT III(6hours)			
	Propagation – by seeds (brief), Vegetative propagation : Cuttage – root, stem, leaf.	2	ICT
	Layerage - Simple,Compound, and Air layering.	2	ICT

	Budding - T and Patch budding. Grafting – Tongue, Cleft grafting	2	Chalk and talk ICT
UNIT IV(6hours)			
	Terrace Garden – Importance, Containers commonly used, suitable plants	2	Chalk and talk
	Kitchen gardening :importance, layout, suitable plants and cropping patterns	4	ICT
UNIT V(6hours)			
	Types, FYM, Panchakavya, Fish	1	Chalk and talk

	Gunabajalam		
	Management of Garden waste - Composting, importance.	2	Chalk and talk
	Women Enterpreneurship and value addition	3	ICT

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	4	4	4	4	3	3	4	4	4	3.4
CO2	3	4	4	4	4	3	3	4	4	4	3.4
CO3	3	4	4	4	4	3	3	4	4	4	3.4
CO4	3	4	4	4	4	3	4	4	4	4	3.8
CO5	3	4	4	4	4	3	4	4	4	4	3.8
Mean Overall Score											3.56

Result: The Score for this Course is 3.56 (High relationship)

Programme: M.Sc. **Core Course XIII**
Semester : IV **Hours : 6 hrs/wk 90 hrs/sem**
Sub. Code : P22CF13 **Credits: 5**

TITLE OF THE PAPER: PLANT BIOTECHNOLOGY AND BIOINFORMATICS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	6	4	-	-	2

PREAMBLE:

- To familiarize the students with the inter disciplinary and multidisciplinary approach in biotechnology at molecular level.
- To familiarize the students on various different types of vectors used in genetic engineering and transformation.
- Understanding the molecular techniques involved in structure and functions of nano-biomolecules in eukaryotes .
- Intended to provide an overview and current developments in different areas of gene cloning in eukaryotes.
- To discuss the application of various bioinformatics tool.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: understand different tools in biotechnology.	1	18
UNIT 2 CO2: know various types of vector used during gene transfer in plants.	2	18
UNIT 3 CO3: Understand the processes involved in plant genome organization.	3	18

UNIT 4 CO4: Understand Gene cloning in eukaryotes and cloning strategies.	4	18
UNIT 5 CO5: Understand and explain about databases and bioinformatics tools.	5	18

SYLLABUS

UNIT I:

Biotechnology: Interdisciplinary and multidisciplinary approach. Tools of Genetic Engineering- restriction enzymes-types-exonuclease and endonuclease-S1 nuclease, ligase, alkaline phosphatase, reverse transcriptase, DNA polymerase, T4 kinase, terminal transferase, adaptors and linkers.

UNIT II:

Vectors: plasmid - types, properties, uses of plasmids, pBR322, PUC vectors, organization of Ti plasmid in Agrobacterium tumifaciens, Ti plasmid mediated gene transfer**,** bacteriophage vector-phage insertion vector, replacement vector (EMBL3) M13, cosmids, phagemids, BAC, YAC , CaMV, shuttle and expression vectors.

UNIT III:

Gene cloning in eukaryotes –Gene transfer mechanism: particle bombardment, liposome mediated gene transfer, electroporation, microinjection. Cloning strategies: Basic methods, rDNA technology, genomic and cDNA library, transfer of recombinant DNA into bacterial cell. Hybridization techniques: PCR, RAPD, RFLP. Blotting techniques. Southern, Northern and Western - rocedure and applications. Nucleotide sequencing- Maxam Gilbert and Sanger method.

UNIT IV:

Plant genome organization: Structural features of plant genome, organisation of chloroplast genome, mitochondrial genome, heat shock proteins, cytoplasmic male sterility, regulation of gene expression in plant development, reporter gene, selectable markers.

UNIT V:

Introduction to bioinformatics: Databases and bioinformatic tools .Classification of biological data bases: Nucleic acid sequence databases: Gene Bank, EMBL. Protein sequence databases: SWISS-PROT, PDB. Genome Databases at NCBI. Sequence analysis: Basic concepts of sequence similarity, identity and homology. Sequence-based Database Searches: BLAST and FASTA algorithms. Pairwise and Multiple sequence alignments- Applications. Bibliographic data bases: PubMed, Medline.

REFERENCES:

PLANT BIOTECHNOLOGY

TEXT BOOKS:

1. Robert F Weaver (2002). *Molecular biology* (II Edn). McGraw Hill.
2. S S Bhojwani, M K Razdan (1996*). Plant tissue culture: Theory and Practice*. Elsevier.

REFERENCE BOOKS:

1. William J Thieman, Michael A Palladino (2009). *Introduction to biotechnology* (II Edn). Pearson.
2. T A Brown (2002). *Genomes* (II Edn). Bios.
3. R A Dixon, R A Gonzales (2004). *Plant cell culture, a practical approach* (II Edn). Oxford University Press.

4. T A Brown (1995). *Gene cloning: an introduction* (III Edn). Stanley Thomas (Publishers) Ltd.
5. S B Primrose (1999). *Molecular biotechnology* (II Edn). Panima Publishing Corporation.
6. Bernard R Glick, Jack J Pasternak, Cheryl L Pattein (2010). *Molecular biotechnology, principlesand applications of recombinant DNA*. ASM press.

BIOINFORMATICS:

TEXT BOOKS:

1. Introduction to Bioinformatics - T.K. Attwood, D.J.P. Smith and S. Phukan, Pearson Education
2. Trends in Bioinformatics – P. Shanmughavel, Scientific Book Center.

REFERENCE BOOKS:

1. David W Mount (2001). *Bioinformatics: Sequence and genome analysis*. CBS publishers & Distributors.
2. Paul G Higgs, Teresa K Attwood (2005). *Bioinformatics and molecular evolution*. Blackwell Publishing
3. C W Sensen (2002). *Genomics and Bioinformatics*. Wiley – VCH.
4. Orpita Bosu, Simminder Kaur Thukral (2007). *Bioinformatics: Databases tools and algorithms*.Oxford University press.
5. Teresa K Attwood, David J Parry-Smith, Simiron Phukan (2007). *Introduction to Bioinformatics*.Pearson Education. *algorithms*.Oxford University press.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I(18 hours)			
	Interdisciplinary and multidisciplinary approach. Tools of Genetic Engineering	6	Lecture
	restriction enzymes – types – exonuclease and endonuclease – S1 nuclease, ligase, alkaline phosphatase, reverse transcriptase, DNA polymerase, T4 kinase.	8	ICT
	terminal transferase, adaptors and linkers	4	Lecture
UNIT II(18 hours)			
	Vectors : plasmid – types, properties, uses of plasmids, pBR322, PUC vectors, organization of Ti plasmid in Agrobacterium tumifaciens	6	Lecture
	Ti plasmid mediated gene transfer, bacteriophage vector-phage insertion vector, replacement vector (EMBL3) M13.	6	Lecture
	Cosmids, phagemids, BAC, YAC , CaMV, shuttle and expression vectors.	6	Lecture
UNIT III(18 hours)			
	Gene cloning in eukaryotes –Gene transfer mechanism: particle bombardment, liposome mediated gene transfer, electroporation, microinjection. Nucleotide sequencing: Maxam Gilbert and Sanger method. Cloning strategies: Basic methods.	6	Lecture
	rDNA technology , Genomic and cDNA library, transfer of recombinant DNA into bacterial cell.	4	ICT
	Hybridization techniques: PCR, RAPD, RFLP. Blotting techniques. Southern, Northern and Western -procedure and applications.	8	Lecture
UNIT IV(18 hours)			
	Plant genome organization: Structural features of plant genome, organisation of chloroplast genome, mitochondrial genome, Heat shock proteins.	8	Lecture
	Cytoplasmic male sterility, regulation of gene expression in plant development.	6	Lecture
	Reporter gene, selectable markers.	4	Lecture
UNIT V(18 hours)			
	Introduction to bioinformatics: Databases and bioinformatic tools .Classification of biological data bases: Nucleic acid sequence databases: Gene Bank,	7	Lecture
	EMBL, Gene Bank, EMBL. Protein sequence databases: SWISS-PROT, PDB. Genome Databases at NCBI. Sequence analysis: Basic concepts of sequence similarity, identity and homology.	8	Lecture
	Sequence-based Database Searches: BLAST and FASTA algorithms. Pairwise and Multiple sequence	3	ICT

	alignments- Applications. Bibliographic data bases: PubMed, Medline.		

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	4	4	3	4	4	4	3	3	3.7
CO2	4	4	4	4	3	4	4	4	4	3	3.8
CO3	4	4	4	4	3	4	5	5	4	4	4.1
CO4	4	4	4	4	3	4	5	5	4	4	4.1
CO5	4	4	4	4	4	4	5	5	3	4	4.1
Mean Overall Score											3.96

Result: The Score for this Course is 3.96 (High relationship)

Programme: M.Sc. **Core Course XIV**
Semester : IV **Hours : 6 hrs/wk 90 hrs /sem**
Sub. Code : P22CF14 **Credits: 4**

TITLE OF THE PAPER: BIOCHEMISTRY AND BIOPHYSICS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	ICT
	6	2	1	1	2

PREAMBLE:

- To know about the various kinds of bonds that hold the atoms together and identifies the five classes of polymeric biomolecules and their monomeric building blocks.
- List and name the 20 amino acids that commonly occur in proteins and classify them. Describe the various bonds and forces that contribute to the conformation of proteins.
- To understand the structure and functions of fats and process of metabolism.
- Understands how an enzyme functions as a catalyst Explain Michaelis-Menton kinetics.
- To analyse the principles of bioenergetics; define and explain briefly the role of entropy, and enthalpy in biochemical reactions. Define and explain gibbs free energy, standard free energy.

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Mention the five classes of polymeric biomolecules and their building blocks, able to differentiate various kinds of bonds.	1	18/S
UNIT 2 CO2: List and name the 20 amino acids that commonly occur in proteins and classify them. Describe the various bonds and forces that contribute to the conformation of proteins.	2	18/S
UNIT 3 CO3: Explain the structure of lipids and how they are metabolized.	3	18/S
UNIT 4 CO4: Explain Michaelis-Menton kinetics and be able to apply the Michaelis-Menton equation to calculate velocity, maximum velocity (Vmax) and the Michaelis-Menton constant Km.	4	18/S
UNIT 5 CO5: Define and explain briefly the role of entropy, and enthalpy in biochemical reactions demonstrate knowledge and understanding of the molecular machinery of living cells.	5	18/S

SYLLABUS

UNIT I:

Structure of atoms, molecules and chemical bonds. Chemistry of biological molecules. Carbohydrates: Classification. Structure and properties of mono, di, oligo and polysaccharides. Amino acids – general structure, properties and classification. Non protein amino acids and nonstandard amino acids. Essential and non essential amino acids.

UNIT II:

General structure of protein – classification – chemical bonds involved in protein structure -primary secondary, tertiary, quaternary structure. Ramachandran Plot.

UNIT III:

Lipids: Classification, general structure and properties of acyl lipids and phosphates. Saturated fatty acids, unsaturated fatty acids. Biosynthesis of fatty acids, Break down of Fatty acid synthesis. Phytochemical analysis.

UNIT IV:

Enzymes-Nomenclature, classification, mode of action, Energy kinetics-km value, coenzymes & isoenzymes.

UNIT V:

Bioenergetics, Energy and work. Laws of Thermodynamics. Energy transductions in biological systems. Redox potential, Redox couples, ATP bioenergetics, Order of reactions. Photobiology: Dual nature of light, characteristics of solar radiation, solar energy - Efficiency of atoms - Absorption spectra in molecules, energy states, De- excitation.

REFERENCES:

BIOCHEMISTRY:

TEXT BOOKS:

1. Cohn, E. E. and Stumpf, P. K. (1994). Outlines of Biochemistry. Wiley Eastern Ltd., New Delhi.
2. Keshav Trehan (1987). Biochemistry. Wiley Eastern Ltd., New Delhi.

REFERENCE BOOKS:

1. Blonstein, A. B. and King, P. J. (1987). A Genetic Approach to Plant Biochemistry. Narosa, New Delhi.
2. Brett, C. T. and Hillman, J. R. (ed.) (1985). Biochemistry of Plant Cells Walls. Cambridge University Press, UK.
3. Goodwin, F. W. and Mercer, F. I. (1983). Introduction to Plant Biochemistry. 2nd ed. Pergamon Press, New York.
4. Lehinger, A. L. *et al.* (1993). Principles of Biochemistry. CBS Publishers, New Delhi.
5. Stryer, L. (1995). Biochemistry. 4th ed. W. H. Freeman Co., New York.

BIOPHYSICS:

TEXT BOOKS:

1. Casey, E. J. (1962). Biophysics: Concepts and Mechanics. Van Nostrand Reinhold Co. and East-West Press, New Delhi.
2. Salil Bose, S. (1982). Elementary Biophysics. Vijaya Printers, Madurai.

REFERENCE BOOKS:

1. Lehinger, A. L. (1971). Bioenergetics: The Molecular Basis of Biological Energy Transformation. Addison Wiley.
2. Stryer, L. (1995). Biochemistry. 4th ed. W. H. Freeman Co., New York.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I (18 hours)			
	Structure of atoms, molecules and chemical bonds, Chemistry of biological molecules.	6	Group discussion
	Carbohydrates: Classification. Structure and properties of mono, di, oligo and polysaccharides.	6	Lecture method

	Amino acids – general structure, properties and classification. Non protein amino acids and nonstandard amino acids. Essential and non essential amino acids.	6	ICT
UNIT II(18 hours)			
	General structure of protein – classification – chemical bonds involved in protein structure.	9	ICT
	Primary secondary , tertiary , quaternary structure, Ramachandran Plot.		Lecture method
UNIT III (18 hours)			
	Lipids: Classification, general structure and properties of acyl lipids and phosphates.	6	Tutorial
	Saturated fatty acids, unsaturated fatty acids. Biosynthesis of fatty acids	6	ICT
	Phytochemical analysis. A general account of alkaloids and flavonoids.	6	Group discussion
UNIT IV (18 hours)			
	Enzymes- Nomenclature, classification.	6	Lecture method

	mode of action, Energy kinetics-km value,	6	ICT
	Coenzymes & isoenzymes.	6	ICT
UNIT V (18 hours)			
	Bioenergetics, Energy and work. Laws of Thermodynamics. Energy transductions in biological systems. Redox potential, Redox couples	6	ICT
	ATP bioenergetics, Order of reactions. Photobiology: Dual nature of light, characteristics of solar radiation, solar energy.	6	ICT
	Efficiency of atoms - Absorption spectra in molecules, energy states, De- excitation.	6	ICT

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	4	4	4	4	4	3	3	3	3.7
CO2	4	4	4	4	4	4	4	3	3	3	3.7
CO3	4	4	4	4	4	4	4	3	3	3	3.7
CO4	4	4	4	4	4	4	4	3	3	3	3.7
CO5	4	4	4	3	3	4	4	2	2	3	3.0
Mean Overall Score											3.56

Result: The Score for this Course is 3.56 (High relationship)

Programme: M.Sc. **Core Course XV**
Semester : IV **Hours: 5 hrs/wk 75 hrs/sem**
Sub. Code : P22CF15P **Credits: 4**

TITLE OF THE PAPER: PRACTICAL PAPER IV

Pedagogy	Hours	Lab experimentation	Peer Teaching	Gd/Vidoes/Tutorial	ICT
	5	5	-	-	-

PREAMBLE:

1. To provide practical, "hands-on" experience in some of the techniques of cell culture, that are fundamental to many areas of biotechnology
2. To gain experience in critical thinking and experimental design to address interesting problems in biology or biotechnology.
3. Develop an information strategy on new technologies on biotechnology.

4. Students should be able to use basic laboratory skills and apparatus to obtain reproducible data from biochemical experiments.

5. Provide and demonstrate knowledge and understanding of the principles and basic mechanisms of metabolic control and enzymatic activity.

COURSE OUTCOME

At the end of the Semester, the Students will be able to

CO1: Analyze structural-functional relationships of tissue culture lab techniques that are basic fundamentals to biotechnology.

CO2: Develop analytical and critical thinking skills in biological phenomena through scientific methods.

CO3: Acquire advanced knowledge in biotechnological experiments.

CO4: Use current biochemical and molecular techniques to plan and carry out experiments.

CO5: Understand quantification and estimation of carbohydrates, Proteins and Fats.

SYLLABUS

1. Organizing Plant Tissue Culture Lab.
2. Preparation of Tissue Culture Media
3. Callus initiation using different explants viz, leaf, shoot, node.
4. Separation of Protein by PAGE.
5. Isolation of Genomic DNA and separation using Agarose Gel.
6. Protein visualization using Rasmol (supply structure of a few proteins downloaded from PDB).
7. Multiple sequence alignment using CLUSTAL X (give DNA or protein sequence).
8. Phylogenetic analysis by Phylip (give some protein or DNA sequence data).
9. Exploring NCBI database system, querying the PUBMED and Gen Bank databases , EBI. server and searching the EMBL Nucleotide database, Exploring & Querying SWISSPROT.
10. Measurement of enzyme activity – Amylase, Cellulase.
11. Factors affecting enzyme activity- substrate concentration, pH and temperature.
12. Quantitative and Qualitative estimation of carbohydrates, Proteins and Fats.

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	4	4	4	4	4	3	3	3	3.7
CO2	4	4	4	4	4	4	4	3	3	3	3.7

CO3	4	4	4	4	4	4	4	3	3	3	3.7
CO4	4	4	4	4	4	4	4	3	3	3	3.7
CO5	4	4	4	3	3	4	4	2	2	3	3.0
Mean Overall Score											3.56

Result: The Score for this Course is 3.56 (High relationship)

Programme: M.Sc. **Discipline Specific Elective Course IV (a)**
Semester : IV **Hours : 5 hrs/wk 75 hrs /sem**
Sub. Code : P22DSF4A **Credits: 4**

TITLE OF THE PAPER: APPLIED BOTANY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	3	1	--	1

PREAMBLE:

- To enable the students to know about the various microbes used as biofertilizers
- To emphasize the importance and application of various bioinoculants.
- To help to understand the symbiotic and non-symbiotic association of plant –microbe interaction
- To help the students to acquire the basic knowledge, develop suitable skills involved in mushroom cultivation and motivates entrepreneurship in an individual.

□ To enable the students to acquire knowledge on biopesticides used in the management of plant pathogens.

COURSE OUTCOME At the end of the Semester, the students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Learn the scope and importance of various biofertilizers.	1	15
UNIT 2 CO2: Recognise the characteristics, identification, cultural methods and maintenance of Rhizobium, Azospirillum, Azotobacter and Phosphobacter.	2	15
UNIT 3 CO3: Know about Mycorrhiza – VAM association, types, occurrence, collection, isolation and inoculum production.	3	15
UNIT 4 CO4: Gain knowledge about the nutritional, medicinal and cultivation aspects of edible mushrooms.	4	15
UNIT 5 CO5: Get acquainted with method of large scale production of biopesticides and its importance.	5	15

SYLLABUS

Unit-I:

Biofertilizers: Introduction, scope**.** General account of Biofertilizer organisms - Cyanobacteria (BGA), Bacteria and Mycorrhizae. Cyanobacteria (BGA) as biofertilizers – *Anabaena and Nostoc. Azolla – Anabaena as* biofertilizers, Isolation of cyanobacteria, Mass cultivation, Field application.

Unit-II:

Bacterial biofertilizers: Introduction and scope. Isolation, characterization, mass production and application of *Azospirillum, Azotobacter, Phosphobacteria* and *Rhizobium*.

Unit-III:

Mycorrhizal fungi as biofertilizers: General account of Ecto, Endo and Arbuscular Mycorrhizae (AM). Isolation, method of collection and cultural characteristics of ecto and endomycorrhizal fungi. Endomycorrhizae of orchids.

Unit-IV:

Vermicomposting-advantages-waste characterization-process and mass production of vermicomposting-microorganisms as vermicompost accelerators-maturity and harvesting-vermiwash. Cultivation of seaweeds and Preparation of Seaweed Manure-Liquid, Gel and Granules.

Unit-V:

Definition, scope and importance of biopesticides- Classification, types and applications. Bacteria- *Bacillus thuringiensis*; Virus- Nuclear polyhedrosis virus; Fungi-*Trichoderma*, *Beauveriana bassiana* - isolation, mass production and applications.

REFERENCES:

TEXT BOOKS:

1. Dubey, R. C. (2008). A Textbook of Biotechnology. S. Chand & Co., New Delhi.

2. Subba Rao, N. S. (1982). Advances in Agricultural Microbiology. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Subba Rao, N. S. (2002). Soil Microbiology. 4th ed. Soil Microorganisms and Plant Growth. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.Publishing Co. Pvt. Ltd., New Delhi.
4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
5. Tripathi, D. P. (2005). Mushroom Cultivation. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. Schwintzer, C. R. and Tjepkema, J. D. (1990). The Biology of *Frankia* and *Actinorhizal* Plants.Academic Press Inc., San Diego, USA.
2. Stewart, W. D. P. and Gallon, J. R. (1980). Nitrogen Fixation. Academic Press, New York.
3.Subba Rao, N. S. and Dommergues, Y. R. (1998). Microbial Interactions in Agriculture and Forestry. Vol. I, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Verma, A. (1999). Mycorrhiza. Springer Verlag, Berlin.
5. Wallanda, T. *et al*. (1997). Mycorrhizae. Backley's Publishers, The Netherlands.
6. Alice, D., Muthusamy and Yesuraja, M. (1999). Mushroom Culture. Agricultural College, Research Institute Publications, Madurai.
7. Marimuthu, T. *et al*. (1991). Oster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.
8. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH
9. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I (15 hours)			
	Biofertilizers: Introduction, scope. General account of Biofertilizer organisms - Cyanobacteria (BGA), Bacteria and Mycorrhizae.	6	Lecture method, Use of AV aids.
	Cyanobacteria (BGA) as biofertilizers – *Anabaena and Nostoc. Azolla – Anabaena as* biofertilizers	6	Chalk and Talk Peer teaching techniques.
	Isolation of cyanobacteria, Mass cultivation, Field application	3	Lecture method and PPT.
UNIT II(15 hours)			
	Bacterial biofertilizers: Introduction and scope. Isolation, characterization, mass production and application of *Azospirillum.*	5	Lecture method and PPT.
	Isolation, characterization, mass production and application of *Azotobacter.*	4	Lecture method, Use of AV aids.
	Isolation, characterization, mass production and application of *Phosphobacteria* and *Rhizobium*. Phosphate solubilization and application.	6	Chalk and Talk Peer teaching techniques.
UNIT III (15 hours)			
	Mycorrhizal fungi as biofertilizers : general account of Ecto, Endo and Arbuscular mycorrhizae (AM).	4	Lecture method, Use of AV aids.

	Methods of collection, preparation of inoculums, Culture of mycorrhizae in Modified Melin – Norkrans (MMN) agar medium,Cultural characteristics of Ecto mycorrhizal fungi.	5	Chalk and Talk Peer teaching techniques.
	Techniques of Ectomycorrhizal inoculum, Endo mycorrohizae of orchids. Isolation and method of inoculation of Arbuscular mycorrhizae (AM), Legume - AM interactions.	6	Lecture method, Use of AV aids and PPT.
UNIT IV (15 hours)			
	Mushroom Technology - Scope and importance - Edible and Poisonous Mushrooms. Nutritive value of edible mushrooms, Structure of basidiocarp - *Agaricus*.	5	Lecture method, peer teaching techniques and PPT.
	Recipies-soup, cutlet, vegetable curry, samosa, omlette and pickle. Cultivation of button mushroom (*Agaricus bisporus*) and oyster mushroom (*Pleurotus sajorcaju*) by Polythene bag method.	5	Lecture method, Use of AV aids.
	Preparation of mother spawn, Cultivation technology -Substrates, composting technology, bed & polythene bag preparation, spawning - casing - Cropping -Mushroom production – Harvest, Storage and preservation	5	Chalk and Talk technique, Peer teaching techniques.
UNIT V (15 hours)			
	Definition, scope and importance of biopesticides – types and applications. Plant incorporated protectants.	5	Lecture method, peer teaching and PPT.
	Herbal- Azdirachtine, Pyrethrin ; Bacteria- *Bacillus thuringiensis* ; Virus- Nuclear polyhedrosis virus;	5	Lecture method, Use of AV aids.
	Fungi – Trichoderma, Beauveriana bassiana - isolation, mass production and applications.	5	Chalk and Talk Peer teaching techniques.

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	4	4	4	4	4	4	5	4	4.1
CO2	4	4	4	4	4	4	4	5	5	4	4.2
CO3	4	4	4	4	4	4	4	5	5	4	4.2
CO4	4	4	4	4	3	4	4	4	5	4	4.1
CO5	4	4	4	4	3	4	4	5	5	4	4.1
Mean Overall Score											4.14

Result: The Score for this Course is 4.14 (High relationship)

Programme: M.Sc. **Discipline Specific Elective Course IV (b)**
Semester : IV **Hours : 5 hrs/wk 75 hrs /sem**
Sub. Code : P22DSF4B **Credits: 4**

TITLE OF THE PAPER: ETHNOBOTANY AND PHAMACOGNOSY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	3	1	--	1

PREAMBLE:

- Gain Knowledge about the ethnobotanical resources of our country.
- Learn the various techniques used in ethnobotany.
- Understand the scope and types of therapeutically active phytochemicals.

Study the methods of conservation of medicinal plants.		
COURSE OUTCOME At the end of the Semester, the students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Ability to understand, appreciate and conserve floristic and cultural heritage of the region.	1	15
UNIT 2 CO2: Document list of ethnobotanicals with potential utility and applications in health care.	2	15
UNIT 3 CO3: Inventory of sustainably usable plant resources that serve as crude drugs and/or those which provide for drug development and optimization of safe and rational use of herbal preparations.	3	15
UNIT 4 CO4: Proficiency in field and laboratory skills in handling and testing of herbal drugs and new commercial products.	4	15
UNIT 5 CO5: Recognition of intellectual property rights and evolving strategies of benefit sharing to people and society who own knowledge and wisdom.	5	15

SYLLABUS

ETHNOBOTANY

UNIT I:

Introduction, relevance, scope and status of Ethnobotany. Tribal, ethnic and indigenous communities of Tamil Nadu. Sociological and Anthropological approaches-Customs and Beliefs with particular reference to Madurai region-Centers of Ethnobotanical studies in India and Coordinated Research Project on Ethnobotany, FRLHT (Foundation for the Revitalization of Local Health Traditions): a case study. Role of Ethnobotany in conservation and sustainable development.

UNIT II:

Methods and techniques used in Ethnobotany-Field level activities for data collection-(Audio, Video recording, Photographs, Interview techniques, Questionnaire, and Datasheet), Consent forms, Authentication of plant species (Field Book, Herbarium) Preparation of Data Sheet and Data Base. Peoples Biodiversity Register (PBR).Impact of Ethnobotany in herbalmedicine industry, land-use development, agriculture, forestry, betterment of rural livelihoods and education. Plants used by ethnic food, medicines, beverages, fodder, fibre, resins, oils and fragrances. NWFP (Non Wood Forest Produces).

PHAMACOGNOSY

UNIT III:

Introduction, methods, scope and relevance of pharmacognosy. Brief account of Phytochemistry and therapeutically active phytochemicals. Pharmacognosic traits. Difference between herbal / botanicals and pharmaceutical medicine. Classificationand sources of crude drugs. Quality, safety and efficacy of herbal medicines / nutraceuticals. Brief account on Tribal/Folk community medicine. Role of ethnopharmacognosy in drug development.

UNIT IV:

Biological screening and preparation of crude drugs: Outline procedures for phytopharmacognosic screening. Isolation, purification and screening methods used for herbal drugs: Antimicrobial screening. Principles and procedures of preclinical studies using animal models with a stress on screening for selected ailments

Basic definition and types of toxicology, Regulatory guidelines for conducting toxicity studies as per OECD, methods on animal toxicity testing.

UNIT V:

Biodiversity and conservation of certain useful medicinal plants. Plants used in ethno and folk medicine Preparation of home remedies ad community medicine with notes on their uses. Intellectual Property Rights (IPR). Ethnopharmacognosy and IPR issue. Integrated Drug Development Program, Patents -Technology transfer and commercialization of Traditional medicine. Benefit Sharing of wealth concept with few examples from India. (Jeeevani and Kani tribes). Role of ethnomedicine and its scope in modern times. Biopiracy checks and safe guards.

REFERENCE

1. Traditional plant medicines as sources of new drugs. P J Houghton in Pharmacognosy Trease andEvan's.16Ed.2009.
2. Ethnobotany-Principles and application. John Wiley& Sons Ltd., West Sussex, England
3. In vivo and in vitro assays Glimpses of ethnopharmacology 1994 Eds. P Pushpangadan,V GeorgeandU.Nyman.
4. Jain, S. K. (1981). Glimpses of Indian Ethnobotany. Oxford & IBH publishing Co. Pvt. Ltd., NewDelhi
5. Jain, S. K. (1989). Methods and approaches in Ethnobotany. Society of Ethnobotanists, Lucknow.
6. Phytochemical Methods. Harborne JB. 1984 .Chapman and Hall, London
7.Snehalatha and Jain, S. K. (1998). Historical Archive in Ethnobotany. Institute of Ethnobotany, NBRI,Lucknow.
8. Medical Pharmacology, Padmaja Udaykumar. Sixth Edition, CBS Publishers & Distributors Pvt Ltd.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I (15 hours)			
	Introduction, relevance, scope and status of ethnobotany. Tribal, ethnic and indigenous communities of Tamil Nadu. Sociological and Anthropological approaches-Customs and Beliefs with particular reference to Madurai region.	6	Lecture method, Use of AV aids.
	Centers of Ethnobotanical studies in India and Coordinated Research Project on Ethnobotany.	6	Chalk and Talk Peer teaching
	FRLHT (Foundation for the Revitalization of Local Health Traditions): a case study. Role of Ethnobotany in conservation and sustainable development.	3	Lecture method and PPT.
UNIT II(15 hours)			
	Methods and techniques used in Ethnobotany-Field level activities for data collection- (Audio, Video recording, Photographs, Interview techniques, Questionnaire, and Datasheet), Consent forms, Authentication of plant species (Field Book, Herbarium).	5	Lecture method and PPT.

	Preparation of Data Sheet and Data Base. Peoples Biodiversity Register (PBR).Impact of Ethnobotany in herbalmedicine industry, land-use development, agriculture, forestry, betterment of rural livelihoods and education.	4	Lecture method, Use of AV aids.
	Plants used by ethnic food, medicines, beverages, fodder, fibre, resins, oils and fragrances. NWFP (Non Wood Forest Produces).	6	Chalk and Talk Peer teaching techniques.
UNIT III (15 hours)			
	Introduction, methods, scope and relevance of pharmacognosy. Brief account of Phytochemistry and therapeutically active phytochemicals. Pharmacognosic traits.	4	Lecture method, Use of AV aids.
	Difference between herbal / botanicals and pharmaceutical medicine. Classification and sources of crude drugs. Quality, safety and efficacy of herbal medicines / nutraceuticals.	5	Chalk and Talk Peer teaching techniques.
	Brief account on Tribal/Folk community medicine. Role of ethnopharmacognosy in drug development.	6	Lecture, Use of AV aids and PPT.
UNIT IV (15 hours)			
	Biological screening and preparation of crude drugs: Outline procedures for phytopharmacognosic screening. Isolation, purification and screening methods used for herbal drugs: Antimicrobial screening.	5	Lecture, peer teaching techniques and PPT.
	Principles and procedures of preclinical studies using animal models with a stress on screening for selected ailments.	5	Lecture method, Use of AV aids.
	Basic definition and types of toxicology, Regulatory guidelines for conducting toxicity studies as per OECD, methods on animal toxicity testing.	5	Chalk and Talk Peer teaching techniques.
UNIT V (15 hours)			
	Biodiversity and conservation of certain useful medicinal plants. Plants used in ethno and folk medicine Preparation of home remedies ad community medicine with notes on their uses. Intellectual Property Rights (IPR).	5	Lecture method, peer teaching techniques and PPT.
	Ethnopharmacognosy and IPR issue. Integrated Drug Development program, Patents -Technology transfer and commercialization of Traditional medicine.	5	Lecture method, Use of AV aids.
	Benefit Sharing of wealth concept with few examples from India. (Jeeevani and Kani tribes). Role of ethnomedicine and its scope in modern times. Biopiracy checks and safe guards.	5	Chalk and Talk Peer teaching techniques.

Course Out comes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	4	4	4	4	4	4	4	4	3	3.9
CO2	4	4	4	4	4	4	4	4	5	4	4.1
CO3	4	4	4	4	4	4	4	4	4	4	4.0
CO4	4	4	4	4	4	4	4	4	4	4	4.0
CO5	4	4	4	4	4	4	4	4	4	4	4.0
Mean Overall Score											4.0

Result: The Score for this Course is 4.0 (High relationship)

Programme : M.Sc. **Core Course XVI**
Semester : IV **Hours : 8 P/W 120 Hrs P/S**
Sub. Code : P22CFPW **Credits : 5**

TITLE OF THE PAPER: PROJECT

The project needs to be completed by working across the regular teaching hours and under the supervision of the faculty .Students may also be allowed to do their project work in a research or industrial organization on recommendation. The Final evaluation of the Project

work is based on submission of the dissertation and Viva-voice. At the end, student may be in a position to design a minor project.

Code:

Sri Meenakshi Government Arts College for Women (A), Madurai-2

M.Sc. Degree Examination - Nov / April

(For those who joined in 2022)

TITLE OF THE PAPER

Duration: 3 hours **Maximum Marks: 75**

Section-A **(5x5=25 Marks)**

Answer all Questions **Choosing either A or B** (Each answer not exceeding Two pages)

(Q.No:1-5)

Section-B **(5x10=50Marks)**

Answer all Questions **Choosing either A or B** (Each answer not exceeding Four pages)

(Q.No:6-10)

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Section / Unit	I	II	III	IV	V
A	2	2	2	2	2
B	2	2	2	2	2