

DEPARTMENT OF BOTANY

COURSE STRUCTURE & SYLLABI
(For the students admitted from year 2023-2024 onwards)

Programme : M.Phil. Botany



JAMAL MOHAMED COLLEGE (AUTONOMOUS)
Accredited with A++ Grade by NAAC (4th Cycle) with CGPA 3.69 out of 4.0
(Affiliated to Bharathidasan University)
TIRUCHIRAPPALLI – 620 020

M.Phil. BOTANY

Sem	Course Code	Course	Course Title	Ins. Hrs/Week	Credit	Marks		Total
						CIA	ESE	
I	23MPBO1CC1	Core - I	Research Methodology	4*	4	25	75	100
	23MPBO1CC2	Core - II	Recent Advances in Plant Science	4*	4	25	75	100
	23MPBO1CC3	Core - III	Teaching and Learning Skills (Common Paper)	4*	4	25	75	100
	23MPBO1CC4	Core - IV (Elective)	Paper on Topic of Research (The syllabus will be prepared by the guide and examination will be conducted by the COE)	4*	4	25	75	100
	*One hour library for each course							
Total				16	16			400
II	23MPBO2PD		Dissertation [#]	-	8	-	200	200
Grand Total				16	24			600

[#] Evaluation of the Dissertation Viva voce shall be made jointly by the Research Supervisor and the External Examiner.

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPBO1CC1	Core – I	4	4	25	75	100
Course Title		Research Methodology					

SYLLABUS		
Unit	Contents	Hours
I	<p>Microscopic techniques: Microscopy – Principle and applications of bright field, dark field, phase contrast, fluorescent microscopy, Electron Microscopy (SEM & TEM) and Confocal microscopy. Staining techniques – simple stain, negative stain, *Gram stain* and acid-fast stain. Freeze-etch and freeze fracture methods for EM, image processing methods in microscopy.</p>	12
II	<p>Analytical methods: Electrochemical techniques: Principles, measurement of pH and types of electrodes. *Preparation of biological buffers*. Spectroscopic techniques: Principle, types and application. UV and Visible, Infrared, Fluorescence and Raman spectroscopy. Nuclear magnetic resonance, Electron spin resonance, Surface Plasmon resonance and Atomic absorption spectroscopy. Radio labeling techniques: Properties of different types of radioisotopes, detection, measurements of radioactivity and applications. Geiger Muller and scintillation counter and autoradiography.</p>	12
III	<p>Separation techniques: Chromatography: Principle, types and applications (*Paper, Thin layer*, Column, HPLC, HPTLC, UHPLC, GC and LC-MS). Centrifugation: Principles, types, different types of rotors and applications. Molecular techniques: DNA and RNA isolation and purification. Polymerase Chain Reaction (PCR) and its types. Electrophoretic techniques: Principles, types and applications (Agarose gel, SDS-PAGE, 2D and 3D gel electrophoresis). Blotting techniques (Southern, Northern and Western blotting).</p>	12
IV	<p>Statistical methods: Population and sample – data collection, sampling methods and *diagrammatic representation of data*. Measures of central tendency (mean, median and mode). Measures of dispersion (range and standard deviation). Correlation and regression analysis. Probability distributions: binomial, Poisson and normal. Types of error. Statistical inference: F-test, t-test and chi-square test. Analysis of variance (one way and two-way), Duncan multiple ranges test and multi variant analysis. Discriminate analysis using SPSS and SAS software's.</p>	12
V	<p>Documentation of Research: Research, meaning, objective, types (qualitative, quantitative and applied research). Role of a researcher, supervisor/guides. Research problem, design, sample survey, measurement and scaling, data collection and preparation. Literature and reference collection. *Role of libraries and internet in research*. Browsing tools, virtual libraries, e-journals and e-books. Interpretation and report writing (Grammarly software). Components of dissertation and thesis writing.</p>	12
VI	<p>Current Trends (For CIA only) – Preparation of short communication, research and review articles. Endnote and Mendeley software in Bibliography preparation. Plagiarism and Research ethics.</p>	

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Text Book(s):
<ol style="list-style-type: none"> 1. Bajpai PK, Biological Instrumentation and Methodology, Revised Edition, Chand S & Company Pvt Ltd, New Delhi, India, 2010. 2. Mustafa A, Research Methodology, 1st Edition, AITBS Publishers, New Delhi, India, 2010. 3. Kothari CR and Garg G. Research Methodology Methods and Techniques. 4th Edition. New Age International Publishers Pvt Ltd, New Delhi, India, 2019.
Reference Book(s):
<ol style="list-style-type: none"> 1. Gurumani N, Research Methodology for Biological Sciences, Revised Edition, MJP Publishers Pvt Ltd, Chennai, India, 2011. 2. Shefali P. Research Methodology. 1st Edition. APH Publishing Corporation Pvt Ltd, New Delhi, India, 2017.
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the working principles, components, staining techniques of tissues and application of microscopes.	K2
CO2	Explain theoretical aspects of important analytical techniques and instruments used in life science.	K3
CO3	Design the suitable separation techniques to characterize the functional biomolecules.	K4
CO4	Conclude the correct approach to process and analyze the data.	K5
CO5	Appraise the research by using primary and secondary data and document the same.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	03	01	02	02	02	03	02	02	02	01	2.0
CO2	02	03	02	01	01	02	03	02	02	01	1.9
CO3	01	02	02	02	02	02	01	02	03	02	1.9
CO4	02	02	01	03	01	02	03	02	03	02	2.0
CO5	02	01	03	02	02	02	02	01	02	03	2.0
Mean Overall Score											2.0
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

1. Dr. H. Syed Jahangir

Semester	Course Code	Course Category	Hours/Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPBO1CC2	Core – II	4	4	25	75	100
Course Title		RECENT ADVANCES IN PLANT SCIENCE					

SYLLABUS		
Unit	Contents	Hours
I	<p>Plant Biodiversity and climate change:</p> <p>Biodiversity: Endemism, variation, biodiversity hotspots, biodiversity indicators, biodiversity conservation, invasive alien species –*Activities of IUCN, NBPGR, national biodiversity authority (NBA) and Centre for biological diversity*. Anthropogenic impact on ecosystems and climate change; ozone depletion, global warming, carbon budgeting, trading and sequestration.</p>	12
II	<p>Molecular taxonomy:</p> <p>Molecular markers – Random Amplified Polymorphic DNA (RAPD), Restriction Fragment Length Polymorphism (RFLP), Amplified Fragment Length Polymorphism (AFLP), Internal transcribed spacer (ITS), Inter Simple Sequence Repeats (ISSR), Simple Sequence Repeats (SSR). *DNA barcoding*, chloroplast markers – matK, ndhF, rbcL, trnH-psbA, SCAR (Sequence Characterized Amplified Region), SSCP (Single-Strand Conformation Polymorphism) and its applications. Molecular systematics.</p>	12
III	<p>Plant genomics and proteomics:</p> <p>Genomics: Whole genome sequencing and functional genomics. Proteomics: Protein engineering – Achievements and prospects. <i>Arabidopsis thaliana</i> and rice genome projects and their importance. *Chloroplast and mitochondrial structure* and genome organization. Brief account on transcriptomics.</p>	12
IV	<p>Plant tissue culture and genetic engineering:</p> <p>Secondary metabolites production through <i>in vitro</i> culture. *Biofermenters – Types, designs*, industrial scaling, upstream and down-stream processing. Direct and indirect gene transformation technology. Transgenic plants – viral, fungal, bacterial, pest and herbicidal resistant. Food vaccines, bioplastics, plantibodies and plantigens. Brief account on molecular farming.</p>	12
V	<p>Nano-biotechnology:</p> <p>Nanoparticles – Definition and historical background. Principles and properties of nanoparticles and nanomaterials. Biological synthesis, biomimetics, microbial nanoparticle production, magnetosomes, bacteriorhodopsins. Nanoproteomics – role of biomolecules, reducing or capping agents, proteins, *carbohydrates and viruses*.</p>	12
VI	Current Trends (For CIA only) – Nanomaterials and their applications	

..... Self Study

Text Book(s):
<ol style="list-style-type: none"> 1. Krishnamoorthy KV, An Advanced Text Book on Biodiversity, Oxford and IBH Book House Pvt Ltd, New Delhi, India, 2003. 2. Govil CM, Aggarwal A and Sharma J, Plant Biotechnology and Genetic Engineering, PHI Learning Pvt Ltd, New Delhi, India, 2017. 3. Suresh Kumar G, Raj Kumar S, Priyanka S, Joginder Singh D and Pawan K, Plant Biotechnology: Recent Advancements and Developments, Springer, 2017.
Reference Book(s):
<ol style="list-style-type: none"> 1. Murty BS, Shankar P, Raj B, Rath BB and Murday J, Textbook of Nanoscience and Nanotechnology, Springer, 2013. 2. Anis M and Ahmad N. Plant Tissue Culture: Propagation, Conservation and Crop Improvement, Springer, 2016.
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Discover the importance of molecular markers in modern taxonomy.	K2
CO2	Explain the different applications of proteomics and genomics.	K3
CO3	Appraise the significance of plant tissue culture and genetic engineering.	K4
CO4	Summarize mediated nano-materials for pharmaceutical applications.	K5
CO5	Justify the recent consents of plant biodiversity and climate change.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	03	01	02	02	02	01	02	01	02	02	1.8
CO2	02	03	02	02	01	02	02	02	02	01	1.9
CO3	01	02	02	02	03	02	02	02	02	02	2.0
CO4	02	02	01	03	01	02	03	02	03	02	2.0
CO5	02	01	03	02	02	02	02	03	03	02	2.2
Mean Overall Score											2.0
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: 1. Dr. A. Shajahan

Semester	Course Code	Course Category	Hours/Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPBO1CC3	Core – III	4	4	25	75	100
Course Title		TEACHING AND LEARNING SKILLS					

SYLLABUS		
Unit	Contents	Hours
I	Higher education: Historical perspective, objectives and role of higher education, social, curricular and administrative focus. Need for teaching methodology, learning and teaching. Learning – definition, hierarchy, *events and outcomes*.	12
II	Teaching technology designs: Teaching technology – Instructional and education technology. Instructional designs – objective, skill, competency, learning style and model based. Combination of teaching strategies and instructional designs. Psycho dynamics of *group learning, lecture method*, modified forms of lecture, seminar, symposium and team teaching.	12
III	Class room management: Teacher and class room management – A conceptual analysis, discipline, class room management, strategies for class room management, behaviour problems of students in colleges and *human relations in educational institutions*.	12
IV	Remedial teaching: Remedial teaching – diagnosis, principles of diagnosis, steps in diagnosis and reading. Remedial education in reading – causes of reading disability, reading programmes, development of reading programme, corrective and *remedial instruction*.	12
V	Guidance and counselling in higher education: Meaning and scope of guidance, principles of guidance, counselling, vocational guidance. Professional growth – Need and importance of professional growth and *professional ethics*.	12
VI	Current Trends (For CIA only) – Remedial teaching for academic low achievers.	

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Text Book(s):
<ol style="list-style-type: none"> 1. Vedanayagam EG, Teaching Technology for College Teachers. Revised Edition, Sterling Publishers Pvt Ltd, Chennai, India, 1988. 2. Aggarwal JC, Principles, Methods & Techniques of Teaching, 2nd Edition, Chand & Company Pvt Ltd, New Delhi, India, 2009. 3. Mangal SK and Uma M, Essential of Educational Technology, 1st Edition, Prentice Hall India Learning Pvt Ltd, New Delhi, India, 2009.
Reference Book(s):
<ol style="list-style-type: none"> 1. Aggarwal JC, Development and Planning of Modern Education, 9th Edition, Vikas Publishing House Pvt Ltd, New Delhi, India, 2009. 2. Mohamed M, Learning Skills at the University, 1st Edition, Lambert Academic Publishing Pvt Ltd, Germany, 2013.

Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Practice teaching and learning pedagogy.	K2
CO2	Design modern teaching methods.	K3
CO3	Appraise methods and materials used in curative teaching.	K4
CO4	Construct new class room management techniques.	K5
CO5	Support the process of guidance and counseling through recent research information.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	01	02	01	03	01	03	02	02	02	02	1.9
CO2	02	02	02	01	03	02	02	02	02	01	1.9
CO3	01	02	03	02	02	02	02	02	02	02	2.0
CO4	02	02	01	03	01	02	03	02	03	02	2.1
CO5	02	01	03	02	02	02	02	03	02	01	2.0
Mean Overall Score											1.9
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

1. Dr. R. Ravikumar

Semester	Course Code	Course Category	Hours/Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPBO1CC4	Core – IV (Elective)	4	4	25	75	100

Course Title	ETHNOBOTANY AND SACRED GROVES
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SYLLABUS

Unit	Contents	Hours
I	Ethnobiology: Ethnobotany definition, terminologies, Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. Significance of the common plants in ethno botanical practices. *Relevance of ethnobotany in the present context*.	12
II	Ethnopharmacology: Traditional Systems of Medicine: Brief history of use of medicinal herbs; Introduction to indigenous systems of medicines-Ayurveda, Unani and Siddha system of medicine. *Role of ethnobotany in modern Medicine*.	12
III	Methodology of Ethnobotanical Studies: a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places. Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Biopiracy and Traditional Knowledge, *TKDL*.	12
IV	Ethnoecology and Sacred Groves: Major and minor ethnic groups or Tribal of India, and their life styles. Role of ethnic groups in conservation of plant genetic resources. Participatory forest Management – Sacred Groves – Definition, Concepts, beliefs, Sthalvirshas. Plants used: Ecosystem Service Provisioning Services Regulating Services Supporting Services Cultural and *Amenity services*.	12
V	Sacred Groves and Conservation: Sacred groves in India, Names of Sacred groves in Indian States, Sacred Groves in Eastern, Western Ghats and in Plains. Major Threats to the Sacred Groves Conservation of Sacred Groves the Sacred Groves and *Their Significance in Conserving Biodiversity*.	12
VI	Current Trends (For CIA only) – Intellectual Property Rights	

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Text Book(s):
<ol style="list-style-type: none"> Ghoush AK, Ethnobiology: Therapeutics and Natural Resources, 1st Edition, Daya Publishing House, New Delhi, India, 2009. Jain AK, Indian Ethnobotany: Emerging Trends, 1st Edition, Scientific Publishers Pvt Ltd, New Delhi, India, 2016. Pullaiah T, Krishnamurthy KV and Bahadur B, Ethnobotany of India, 1st Edition, CRC press, Taylor and Francis Group, 2017.
Reference Book(s):
<ol style="list-style-type: none"> AmrithalingamM, Sacred Trees of Tamil Nadu, 1st Edition, CPR Environmental Education Centre, Chennai, Tamil Nadu, India, 1998. Sacred Groves of India: An Annotated bibliography http://www.ces.iisc.ernet.in/biodiversity/sahyadri_eneews/newsletter/issue4/Yogesh_Anno_bib.pdf
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the significance of ethnobotany.	K2
CO2	Apply various ethnopharmacological skills.	K3
CO3	Analyze and preserve Traditional Knowledge.	K4
CO4	Appraise the major and minor ethnic group and their life style.	K5
CO5	Develop threats and conservation of sacred grooves.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	02	01	03	02	02	01	03	02	02	02	2.0
CO2	02	03	02	01	01	02	03	02	02	01	1.9
CO3	01	02	03	02	02	02	02	03	02	02	2.1
CO4	01	02	01	03	01	02	03	02	02	02	1.9
CO5	02	01	03	02	02	02	02	03	01	02	2.0
Mean Overall Score											2.0
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

- Dr. M. Ghouse Basha**

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPBO1CC4	Core – IV (Elective)	4	4	25	75	100
Course Title		APPLIED MICROBIOLOGY					
		SYLLABUS					
Unit	Contents						Hours
I	Microbial Genetics: Mendel's laws of inheritance; genetic notations; Transfer of genetic material in prokaryotes; Transformation; competence, mechanism of transformation, transfection; Conjugation; role of surface properties in conjugation; The F- factor; The conjugal transfer process; Barriers to conjugation; High frequency recombination (Hfr) strains; The order of chromosome transfer and conjugation mapping, high resolution mapping; Formation of F primer (F); *Transduction; Generalized transduction; Abortive transduction; specialized transduction (LFT lysate and HFT lysate)*.						12
II	Industrial Microbiology Fermentation and fermentable microbes; Basic function of fermenters; Types of fermenter (Fluidized bed bioreactor; membrane bioreactor; pulsed column bioreactor; photobioreactor; packed tower bioreactor); construction of fermenters (control of temperatures, aeration and agitation); Design and operation; The achievement and maintenance of aseptic condition (sterilization, aeration and agitation); Aseptic operation and contaminant; Batch fermentation, Fed-batch fermentation, continuous fermentation, scale up of fermentation (sterilization of gases and nutrient solutions, stock cultures), *Fermentation; Malt beverages; Production of Beer; Production of Wine Microbial production of organic acids; vinegar production (substrate method)*.						12
III	Environmental Microbiology: Waste as a resource; Organic compost (Definition, process of composting – microorganisms, soil and organic matter, Role of compost), Vermi-composting – process of vermin composting Biogas (Benefits from biogas plants, Feed stock materials, Biogas production; solubilization, acetogenesis and methanogenesis), Microbial leaching *Uranium leaching; microbial degradation of xenobiotics; characteristics of microbial metabolism (enzymatic process, non-enzymatic process), common process of insecticidal metabolism (hydrolytic process, reductive process, oxidation)*.						12
IV	Food Microbiology and Public Health: Food hazards; significance of Foodborne disease, Incidence of Foodborne Illness, Risk Factors Associated with Foodborne Illness, The site of Foodborne Illness. *The Alimentary tract; its Function and Microflora. The pathogenesis of diarrheal disease*.						12
V	Pharmaceutical Microbiology: Good Manufacturing Practice (GMP); Good laboratory practice (GLP); Quality control (QC); Quality Assurance (QA); Sterile clean Area (SAC); Environmental Monitoring (LM); Sterilization; Disinfectants and Antiseptics; Sterility test.						12
VI	Current Trends (For CIA only) – Antibiotic assay; Microbial Limit Test (MLT); Pyrogen (Endotoxin), Preservative Efficacy test.						

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Text Book(s):
<ol style="list-style-type: none"> 1. Trivedi PC, Applied Microbiology, 2nd Edition, Agrobios Publishers Pvt Ltd, Rajasthan, India, 2006. 2. Purohit SS, Microbiology Fundamentals and Applications, 7th Edition, Agrobios Publishers Pvt Ltd, Rajasthan, India, 2008. 3. Casida LEJR, Industrial Microbiology, 2nd Edition, New Age International Publishers Pvt Ltd, New Delhi, India, 2019.
Reference Book(s):
<ol style="list-style-type: none"> 1. Anathanarayan R and Jayaram Paniker CK, Text Book of Microbiology, 10th Edition, Universities Press (India) Pvt Ltd, New Delhi, India, 2017. 2. Willey JM, Sherwood LM and Woolverton CJ, Prescott's Microbiology, 10th Edition, McGraw Hill Education Pvt Ltd, New York, 2017.
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Observe the facets of microbiology.	K2
CO2	Apply various lab skills for economic use of microbes.	K3
CO3	Analyze novel ideas of using microbes in human life.	K4
CO4	Distinguish alternative applications of microbes to solve human health related problems.	K5
CO5	Develop opportunities of jobs and entrepreneurship in microbiology.	K6

Relationship Matrix:

Course Outcome s (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	03	01	02	02	02	03	02	02	02	01	2.0
CO2	02	03	02	02	02	02	03	02	02	02	2.2
CO3	01	02	02	02	03	02	02	02	02	02	2.0
CO4	02	02	03	03	01	02	03	02	03	02	2.1
CO5	02	01	03	02	02	02	02	03	03	02	2.2
Mean Overall Score											2.1
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

1. Dr. H. Syed Jahangir

Semester	Course Code	Course Category	Hours/Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPBO1CC4	Core – IV (Elective)	4	4	25	75	100
Course Title		CONSERVATION OF BIODIVERSITY					

SYLLABUS		
Unit	Contents	Hours
I	Basic concepts and values of biodiversity: Biodiversity basic concepts – genetic diversity – *species diversity* - economic diversity – scopes – value of biodiversity.	12
II	Loss of Biodiversity: Loss of genetic diversity loss of species diversity – threatened species – threatened categories loss of economic diversity – *Red Data Book*.	12
III	In situ conservation of biodiversity: Protected areas – Biosphere reserves National parks – World Biosphere – Reserves programmes – Design of biosphere reserves – Biological aspects of reserves design – Vest pockets and Garrison reserves.	12
IV	Ex situ conservation of biodiversity: Germplasm collection – botanical garden – seed bank – test tube gene banks – pollen bank – field gene bank – *DNA bank* – important of plant tissue culture in conservation of plant diversity.	12
V	Social approaches of biodiversity conservation: Sacred groves – chipko movement – chipko river dam – *tribal campaign*– participatory forest management – role of education institution in biodiversity conservation.	12
VI	Current Trends (For CIA only) – On farm and garden conservation.	

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Text Book(s):
<ol style="list-style-type: none"> 1. Prithi palsingh, An Introduction to biodiversity, 1st Edition, ANE Books Pvt Ltd, New Delhi, India, 2009. 2. Mahanty S and Anjali S, Biodiversity and its conservation, 1st Edition, Disha International Publishing House Pvt Ltd, New Delhi, India, 2016. 3. Krihnamoorthy KV, An Advanced Textbook on Biodiversity: Principles and Practice, 2nd Edition, Oxford & IBH Publishing House Pvt Ltd, New Delhi, India, 2018.
Reference Book(s):
<ol style="list-style-type: none"> 1. Joshi PC, Biodiversity and Conservation, 1st Edition, APH Publishing House Pvt Ltd, New Delhi, India, 2004. 2. Fitzgerald J, Biodiversity: An Introduction, 1st Edition, Larsen and Keller Education Pvt Ltd, Auckland, 2017.
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Explain the basic concepts of biodiversity.	K2
CO2	Determine the societal importance of biodiversity and its loss.	K3
CO3	Analyze the importance of conserving natural resource.	K4
CO4	Choose the facets of <i>ex situ</i> conservation for human welfare.	K5
CO5	Generalize the social and ethical values of sacred groves.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	02	03	02	01	02	01	02	03	02	02	2.0
CO2	02	01	02	03	01	02	01	02	02	03	1.9
CO3	02	02	03	02	01	03	02	02	02	02	2.1
CO4	01	02	02	03	02	02	03	02	01	02	2.0
CO5	02	01	03	02	02	02	02	03	02	02	2.1
Mean Overall Score											2.2
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

1. Dr. A. SHAJAHAN

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPBO1CC4	Core – IV - (Elective)	4	4	25	75	100

Course Title	HERBAL BOTANY
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SYLLABUS		
Unit	Contents	Hours
I	Pharmacognosy: Herbal medicines: History and scope – Indian system of medicines – siddha, ayurveda and unani. *Classification of Crude drugs*.	12
II	Collection and processing of herbal drugs: Collection – harvesting – processing (drying, dressing, packing, storage and preservation) – cultivation of medicinal plants.	12
III	Collection of crude drugs: Collection of crude drugs – harvesting of crude drugs – drying of crude drugs (natural drying and artificial drying) – garbling – packing of crude drugs – storage of crude drug, marketing and *drug adulteration*.	12
IV	Phytochemical compounds: Drugs obtained from leaves – <i>Gymnema sylvestre</i> , <i>Ocimum sanctum</i> . Drugs Obtained from Flower – <i>Syzygium aromaticum</i> . Drugs from fruits – * <i>Coriandrum sativum</i> *.	12
V	Phytochemical compounds: Brief description, bioactive compounds and medicinal uses of Aloe (glycosides) – Amla (tannins) – Black pepper (terpenoids) – Ginger (resin) – * <i>Vinca</i> (alkaloids)*.	12
VI	Current Trends (For CIA only) – Aromatic plants in India.	

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Text Book(s):
<ol style="list-style-type: none"> 1. Kumar GS and Jayaveera KN, A Textbook of Pharmacognosy and Phytochemistry, 1st Edition, Chand & Company Pvt Ltd, New Delhi, India, 2014. 2. Prajapati, Purohit, Sharma, Kumar, A Handbook of Medicinal Plants, 1st Edition, Agrobios Publishers Pvt Ltd, Rajasthan, India, 2018. 3. Roseline A, Pharmacognosy, 1st Edition, MJB Publishers, Chennai, Tamil Nadu, India, 2019.
Reference Book(s):
<ol style="list-style-type: none"> 1. okhale SB, Kokate CK and Purohit AP, A Textbook of Pharmacognosy, 38th Edition, Nirali Prakashan, Pune, Maharashtra, India, 2017. 2. Sen A and Chakraborty R, Herbal Medicine in India: Indigenous Knowledge, Practice, Innovation and Its Value, 1st Edition, Springer, 2020.
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Recognize the facets of herbal botany.	K2
CO2	Summarize the collection of herbal products.	K3
CO3	Develop methods to process crude drugs.	K4
CO4	Enumerate the types of phytochemical drugs.	K5
CO5	Justify the use of phytochemical compounds for human welfare.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	02	01	03	02	02	03	02	01	02	02	2.0
CO2	01	02	02	03	02	02	01	03	02	02	2.0
CO3	02	02	03	02	01	03	02	02	02	02	2.1
CO4	03	01	02	01	02	01	02	02	03	01	1.9
CO5	01	03	02	02	01	02	01	03	01	02	1.9
Mean Overall Score											1.9
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

1. Dr. M. Kamaraj

Semester	Course Code	Course Category	Hours/Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPBO1CC4	Core – IV (Elective)	4	4	25	75	100
Course Title		PLANT BIOTECHNOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to biotechnology: Definitions – scope of biotechnology – biotechnology in the world – biotechnology in India – *commercial potential of biotechnology*.	12
II	Plant tissue culture – Definitions – maintenance of Aseptic conditions in laboratory – *totipotency of cells*– nutrient media – methods of tissue culture – embryo culture – anther culture – pollen culture – micropropagation – somatic embryogenesis.	12
III	Applications of plant genetic engineering – crop improvement, herbicide resistance, insect resistance, virus resistance and plant as bioreactors.	12
IV	Genetic modification in agriculture – transgenic plants, genetically modified foods application, future applications.	12
V	Medical and environmental biotechnology – biotechnology in medicine, vaccines, diagnostic, forensic, gene therapy. Sequence databases EMBL, *NCBI*, and DDBJ, protein structural databank and sequence.	12
VI	Current Trends (For CIA only) – Ecological impact of transgenic plants.	

..... Self Study

Text Book(s):
<ol style="list-style-type: none"> 1. Satyanarayana U. Biotechnology. 1st Edition. Books and Allied Pvt Ltd. Kolkata, India, 2005. 2. Slater A, Scott N and Fowler M, Plant Biotechnology: The genetic manipulation of plants, 2nd Edition, Oxford University Press Pvt Ltd, New Delhi, India, 2008. 3. Dubey RC, A Textbook of Biotechnology, 5th Edition, Chand & Company Pvt Ltd, New Delhi, India, 2014.
Reference Book(s):
<ol style="list-style-type: none"> 1. Glick BR and Pasternak JJ, Molecular Biotechnology, 3rd Revised Edition, American Society of Microbiology, Washington, America, 2002. 2. Smith JE, Biotechnology, 4th Edition, Cambridge University Press Pvt Ltd, United Kingdom, 2004.
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Recognize the commercial potential of plant biotechnology.	K2
CO2	Summarize the nuances of plant tissue culture.	K3
CO3	Develop crop improvement strategies.	K4
CO4	Appraise the plants as living bioreactors.	K5
CO5	Justify the applications of plant biotechnology for human values.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	01	02	02	03	01	02	02	02	03	02	2.0
CO2	02	01	03	02	02	01	02	03	02	02	2.0
CO3	01	03	02	02	02	02	01	02	03	02	2.0
CO4	02	02	03	01	02	01	02	03	02	02	2.0
CO5	02	02	03	02	01	01	03	02	02	02	2.1
Mean Overall Score											2.1
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

1. Dr. R. Ravikumar

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPBO1CC4	Core – IV (Elective)	4	4	25	75	100
Course Title		TROPICAL PALYNOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Pollen preparations: laboratory procedures – acetolysis of fresh material – acetolysis of herbarium specimens and surface soil samples – *other alternative methods (Woodhouse preparation)*.	12
II	Pollen and spore morphology: terminologies and glossary – Pollen diagnostics – Descriptions and illustrations of major types (porate, aporate, colpate, colpporate types) – typical pollen morphology in selected pollen types (Poaceae type, Compositae-echinate type, <i>Syzigium</i> type, * <i>Croton</i> type*).	12
III	Pollen analyses – Graphic presentation of results – tabulation and calculation of percentages – pollen spectra and pollen diagrams. Applications of pollen analysis – Correlations: palaeo-climatology, geology and *archaeology*.	12
IV	Modern pollen rain – surface samples - composition of pollen rain – flotation and water transport of pollen – surface receptivity - *pollen flora of surface samples* .	12
V	Pollen flora of peat samples and sediments: Differential resistance of pollen: specific resistance to decay – Individual resistance to decay downwash of pollen through peat pollen frequency.	12
VI	Current Trends (For CIA only) – Quantification of absolute pollen frequency of sediment samples.	

..... Self Study

Text Book(s):
<ol style="list-style-type: none"> 1. Moore PD and Webb JA, An Illustrated Guide to Pollen Analysis, 1st Edition, Hodder and Stoughton Pvt Ltd, London, UK, 1978. 2. Faegri K, Kaland PE and Krzywinski K, Textbook of Pollen Analysis, 4th Edition, The Blackburn Press Pvt Ltd, New Jersey, United State of America, 2000. 3. Bhattacharya K, Majumdar MR and Bhattacharya SG, A Textbook of Palynology, 3rd Revised Edition, New Central Book Agency Pvt Ltd, Kolkata, India, 2011.
Reference Book(s):
<ol style="list-style-type: none"> 1. Erdtman G, Pollen Morphology and Plant Taxonomy: Angiosperms (In Introduction to Palynology Series-Volume 1), Almqvist and Wiksell Pvt Ltd, Stockholm, Sweden, 1952. 2. Kremp G, Morphologic Encyclopedia of Palynology: An international Collection of Definitions and Illustrations of Spores and Pollens, 1st Edition, University of Arizona Press Pvt Ltd, Arizona, United State of America, 2019.
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Identify pollen and spores as a suitable tool to study in fresh and fossil forms.	K2
CO2	Calculate the types of pollen grains based on morphology and ornamentation.	K3
CO3	Experiment pollen analysis as a tool applied in various fields.	K4
CO4	Appraise factors affecting modern pollen rain and its relevance to investigations.	K5
CO5	Justify the pollen as a suitable plant remain for studying spacio-temporal marker in tropics.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	01	02	02	03	01	02	02	02	03	02	2.0
CO2	02	01	03	02	02	01	02	03	02	02	2.0
CO3	01	03	02	02	02	02	01	02	03	02	2.0
CO4	02	02	03	01	02	01	02	03	02	02	2.0
CO5	02	02	03	02	01	01	03	02	02	02	2.0
Mean Overall Score											2.0
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

1. Dr. A. ASLAM

Semester	Course Code	Course Category	Hours/Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPBO1CC4	Core – IV (Elective)	4	4	25	75	100
Course Title		PLANT BIOTECHNOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Introduction – History of plant tissue culture – laboratory organization. Tools and techniques of plant tissue culture. Mass production of plantlets – hardening and mist chambers – transplantation to field – techniques for maintaining plantlets in the field.	12
II	*Sterilization – methods of sterilization* – medium and its preparation – plant growth regulators (PGR), macro & micro nutrients, vitamins and its role in tissue culture. Inoculation – methodology, types of cultures – Solid – Liquid.	12
III	Culture initiation – explant – totipotency – dedifferentiation – redifferentiation – various types of culture – callus culture, cell culture, anther culture, *meristem culture*. Organogenesis – direct & indirect method and somatic embryogenesis.	12
IV	Micropropagation – methods of micropropagation – plant protoplast – isolation, culture and somatic hybridization – *Somaclonal variation*. Secondary plant products – secondary metabolites of plants, factors affecting the production in culture, elicitors and roots.	12
V	Bio-transformation – immobilization of cells and its application – cryopreservation – germplasm conservation and establishment of gene banks – Synseed technology, Markers based on PCR amplification – RAPD – AFLP, golden rice and *delayed fruit ripening*.	12
VI	Current Trends (For CIA only) – Importance and application of tissue culture – impacts on industry, forestry, agriculture and horticulture.	

..... Self Study

Text Book(s):
<ol style="list-style-type: none"> 1. Satyanarayana U. Biotechnology. 1st Edition. Books and Allied Pvt Ltd. Kolkata, India, 2005. 2. Slater A, Scott N and Fowler M, Plant Biotechnology: The genetic manipulation of plants, 2nd Edition, Oxford University Press Pvt Ltd, New Delhi, India, 2008. 3. Dubey RC, A Textbook of Biotechnology, 5th Edition, Chand & Company Pvt Ltd, New Delhi, India, 2014.
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<ol style="list-style-type: none"> 1. Glick BR and Pasternak JJ, Molecular Biotechnology, 3rd Revised Edition, American Society of Microbiology, Washington, America, 2002. 2. Smith JE, Biotechnology, 4th Edition, Cambridge University Press Pvt Ltd, United Kingdom, 2004.
Web Resource(s):

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the facets of plant biotechnology.	K2
CO2	Examine the types and applications of plant tissue culture media.	K3
CO3	Appraise various types and applications of different culture methods.	K4
CO4	Evaluate various <i>in vitro</i> methods for secondary metabolite production.	K5
CO5	Justify the plant biotechnology interventions to use them as living bioreactors.	K6

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	01	02	02	03	01	02	02	01	03	02	1.9
CO2	02	01	03	02	02	01	02	03	02	02	2.0
CO3	01	03	02	02	01	02	01	01	02	02	1.9
CO4	02	02	03	01	02	01	02	03	02	02	2.0
CO5	02	02	03	02	01	01	03	02	02	02	2.0
Mean Overall Score											1.9
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. K. MOHAMED RAFI