

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS) CHENNAI-600 008**  
**DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**  
**Revised syllabus for M.Phil 2021-2022**

Department of Plant biology and Plant Biotechnology is revising syllabi with effect from the academic year 2021-2022 with CBCS components as specified by the Government of Tamil Nadu. Every academic year is divided into two semester sessions. Each semester will have a minimum of 90 working days and each day will have five working hours. Candidates are assessed based on components like internal assessments, assignments and seminars in each semester.

**REGULATIONS**

**1. Eligibility for Admission**

Candidates for admission to the M.Phil Course in Plant Biology and Plant Biotechnology course shall be required to have passed the Master of Science conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereof by the Syndicate of the University of Madras.

**2. Eligibility for the Award of Degree**

A candidate shall be eligible for the award of the Degree only if she has undergone the prescribed course of study in a college affiliated to the University for a period of not less than two academic years, passed the examinations of all the four semesters prescribed.

**3. Course of Study**

A candidate should complete 2 semesters with a total credit 36 which includes course work and dissertations.

**4. Passing Minimum**

A candidate shall be declared to have passed in each paper of the course wherever prescribed, if she secured NOT LESS THAN 50% of the marks prescribed for the examination.

**5. Classification of successful candidates**

Successful candidates passing the examination & securing i) 60% and above and ii) 55% and above but below 60% in the aggregate shall be declared to have passed the examination in the FIRST and SECOND class respectively.

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DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**CHOICE BASED CREDIT SYSTEM OUTCOME BASED EDUCATION**

**M.Phil. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY  
(OFFERED FROM THE ACADEMIC YEAR 2021-2022)**

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

On obtaining a research degree the scholar will be able to:

- PEO1** Demonstrate advanced domain knowledge competencies and display high order discerning and synthesizing capabilities to address local, regional and national concerns through innovative well researched solutions.
- PEO2** Continue to serve the community of professionals and experts as both independent and team player with a strong grounding in ethics, inclusivity, gender parity and environmental sustainability.

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**CHOICE BASED CREDIT SYSTEM OUTCOME BASED EDUCATION**

**M.Phil. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY  
(OFFERED FROM THE ACADEMIC YEAR 2021-2022)**

**PROGRAMME OUTCOMES (POs)**

**PO1** – Acquire in depth knowledge in their area of specialization and integrate into the research culture of the department.

**PO2** – Gain expertise and confidence in handling of all analytical tools, interpretation of spectra to characterize materials by using software and theoretical knowledge.

**PO3** – Recognize and integrate life-long learning skills to become pro-active in personal and professional life.

**PO4** –Pursue Ph.D programme in their field of research and enhance leadership and teaching skills.

**PO5**- Apply the scientific knowledge to develop innovative ideas, products and methods for the benefit of biosphere at large.

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**M.Phil. PLANT BIOLOGY AND PLANT BIOTECHNOLOGY  
(OFFERED FROM THE ACADEMIC YEAR 2021-2022)**

**PROGRAMME SPECIFIC OUTCOME (PSO)**

After completion of the course the students will be enable to

1. Acquire contextual knowledge in the process of developing new products and gain expertise of well define area of research in Plant Biology and Plant Biotechnology.
2. Apply innovative methodologies to carry out independent research leading to pursue Ph.D programme and empower student's personal and professional development.
3. Analyse the impact of new emerging areas of Plant Biology and Plant Biotechnology in the industrial environmental and social contexts.
4. Employ the scientific skills and analyse data using appropriate statistical methods and tools to design and execute the research projects.
5. Promote leadership and teaching skills to evolve as excellent professionals in academic institutes and in public sector units-CSIR, DBT, DST, DRDO laboratories and to contribute towards the growth of the country.

**DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**M.Phil PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**(from candidates admitted from 2021-2022 onwards)**

**PROGRAMME PROFILE**

<b>S.NO</b>	<b>TITLE OF THE PAPER</b>	<b>ELECTIVE /CORE</b>	<b>PAPER CODE</b>	<b>CREDITS</b>
<b>I SEMESTER</b>				
1	Research Methodology	Core	10M21/REM	5
2	Advanced Plant Biotechnology	Core	10M21/ADP	5
<b>II SEMESTER</b>				
3	Genetics	Elective	10M21/GES	5
	Herbal Botany	Elective	10M21/HEB	
	Plant Pathology	Elective	10M21/PLP	
	Dissertation		10M21/DSN	21
		<b>TOTAL</b>		<b>36</b>

**DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**M.Phil PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**(from candidates admitted from 2021-2022 onwards)**

**EVALUATION PATTERN FOR CIA AND END SEMESTER EXAM**

CODE	TEST		ASSIGNMENT		SEMINAR		TOTAL CIA MARKS	END SEMESTER MARKS	TOTAL MARKS
	NUMBER	MARKS	NUMBER	MARKS	NUMBER	MARKS			
10M21/REM	2	20	2	10	2	10	40	60	100
10M21/ADP	2	20	2	10	2	10	40	60	100
10M21/GES	2	20	2	10	2	10	40	60	100
10M21/HEB	2	20	2	10	2	10	40	60	100
10M21/PLP	2	20	2	10	2	10	40	60	100
10M21/DSN	2	20	2	10	2	10	40	60	100

**RUBRICS FOR CONTINUOUS ASSESSMENT**

Assignment	Content/originality/Presentation/Schematic Representation and Diagram/Bibliography
Seminar	Organisation/Subject Knowledge/Visual Aids/Confidence level/presentation-Communication and Language
Field Visit	Participation/Preparation/Attitude/Leadership
Participation	Answering Questions/Clearing Doubts/Participating in Group Discussions/Regular Attendance
Case Study	Finding the Problem/Analysis/Solution/Justification
Problem Solving	Understanding Concepts/Formula and Variable Identification/Logical Sequence/Answer
Group Discussion	Preparation/Situation Analysis/Relationship Management/Information Exchange/Delivery Skills
Flipped/Blended Learning	Preparation/Information Exchange/ Group interaction/Clearing doubts

**DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**M.Phil PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

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**DISSERTATION AND VIVA VOCE**

<b>PATTERN OF ASSESSMENT</b>	<b>MARKS</b>
INTERNAL ASSESSMENT (Supervisor)	50
EXTERNAL ASSESSMENT (Internal & External Examiner for Dissertation)	100
VIVA VOCE ( Internal & External Examiner)	50
<b>TOTAL</b>	<b>200</b>

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**DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**(For the candidates admitted during the year 2021-2022 onwards)**

**M.Phil DEGREE EXAMINATION**

**Draw diagrams wherever necessary**

**QUESTION PAPER PATTERN-M.Phil**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>
<b>K4/K5/K6</b>	<b>5/8 x 20</b>	<b>1200</b>	<b>100</b>	<b>100</b>



**DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**M.Phil PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**(from candidates admitted from 2021-2022 onwards)**

**COURSE PROFILE**

<b>CORE/ELECTIVE</b>	<b>TITLE OF THE PAPER</b>	<b>PAPER CODE</b>
<b>I SEMESTER</b>		
CORE 1	Research Methodology	10M21/REM
CORE 2	Advanced Plant Biotechnology	10M21/ADP

# **M.PHIL- PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

## **SEMESTER 1**

### **CORE PAPER I- RESEARCH METHODOLOGY**

**COURSE CODE: 10M21/REM**

**CREDIT-5**

#### **COURSE OBJECTIVES:**

To enable the students to

- Understand the application of different types of microscopic techniques
- Gain knowledge in general laboratory techniques of Biochemistry and Microbiology.
- Provide insight in analytical separation techniques and their applications in Research.
- Apply the fundamental concept of immunology to understand immunotechniques.
- Impart the application of various statistical tools used in research and the significance of quality research publication.

#### **UNIT I**

##### **Microscopic technique:**

Light microscope – Principle, construction and application –Dark field, Phase contrast, Fluorescence microscope, Polarization microscope and Confocal scanning microscope. Principle, construction, sample preparation and application of electron microscope – SEM , STEM, TEM.

#### **UNIT II**

##### **General Lab Technique:**

pH Buffering mechanism. Choice and preparation of common buffers – Potassium Phosphate buffer and Tris Acetate Buffer. pH measurements. Methods of sterilization of media and Glassware. Media – Choice of media, isolation, purification and maintenance of Algae, Fungi and Bacteria.Methods of Determining microbial number – Batch culture, continuous culture. Types and Application of Fermenters.

## UNIT III

### **Separation Technique:**

#### **Centrifugation:**

Principle of sedimentation, Relative Centrifugal Force (G), Types and uses of Centrifuge – Bench top Centrifuge, Large capacity centrifuge, High Speed Refrigerated Centrifuge, Preparatory centrifuge and analytical centrifuge. Zonation and Isopycnic Centrifuge.

**Chromatography-** Principle, procedure, applications-TLC, Column chromatography, Ion exchange chromatography, HPLC, HPTLC, GC-MS.

**Electrophoresis-** General principle-factors affecting electrophoresis samples, principle, procedure and applications-Agarose gel, PAGE and SDS-PAGE, Two dimensional and differential electrophoresis.

## UNIT IV

### **Immunotechnique:**

Properties and types of Antibody and Antigen. Application and Production of Monoclonal antibodies and Polyclonal antibodies. Immunodiffusion, Immunoelectrophoresis, Immunolabelling – Biotin. ELISA.

### **Research Writing:**

Designing the research work- components of a research report-thesis-plagiarism software – Review of Literature - Mendeley. Scientific writing – Manuscript preparation, citation style-citation index-H-index, impact factor.

## UNIT V

### **Statistical methods:**

Presentation of data-methods. Measurement of dispersion – range, variance, standard deviation, standard error. Test of significance based on large sample-small sample – Student t-test – ANOVA and DMRT. Probability – Probability distribution – Binomial, Poisson, and Normal. Simple correlation and Regression. Computer application - SPSS package.

### **REFERENCES:**

1. Principles of fermentation technology by Stanbury, P.F Whitaker A. and Hall 2295. Pergaman. Mc Neul and Harvey
2. Gurumani, N. (2005) Biostatistics, 2<sup>nd</sup> edn. MJP publications, India.
3. Keith Wilson and John Walker. 2010. Principles and techniques of biochemistry and molecular biology, Cambridge university Press.

4. Milton, J.s. (2292) Statistical method in Biological and Health Sciences. McGraw Hill Inc., New York.
5. Spiegel, M.R. (2281) Theory and Problems of statistics, Schaum's Outline series McGraw-Hill International Book Co., Singapore.
6. Conn. E. E. and P. K. Stump. 2276.Outlines of Biochemistry Wiley Eastern
7. Robert Horton, H. L. A. Moran, R. S. Ochs, J. D. Rawn and K. G. Scrimgeour. 2296. 22. Principles of Biochemistry. Printice hall International. NJ.
8. Principles of Biochemistry by A.L.Lehninger, D.L.Nelson & M.M.Cox. (2293) Worth Publishers, New York.
9. Gurumani, N. (2014) Research Methodology for Bilogical Science, MJP publications, India
10. Gurumani N. (2022) Scientific thesis writing and paper publication, MJP Pubishers.
11. Ahluwali V.K.(2017) Instrumental methods of chemical analysis.Ane Books Pvt Ltd.
12. R.A.Day. How to write a scientific paper, Cambridge University Press.
13. Methodology of Scientific Research Programs Cambridge University Press.
14. Research Methodology, Standford University.
15. Journal of Immunological Method, Elsevier Publication.
16. The Indian Journal of Statistics, Springer Publication.

#### **Journals:**

1. International Journal of Innovative and Applied Research
2. Indian Journal of Experimental Biology
3. Journal of Microscopy and Ultrastructure.
4. Bioscience Research Bulletin

#### **E-Learning Resources:**

1. <https://www.scribbr.com>
2. <https://study.com>
3. <https://www.sciencedirect.com>
4. <https://www.khanacademy.org>

## Course outcomes

After completion of the course students will be able to

CO.No.	CO Statement	Knowledge Level
CO 1	Provides Knowledge in using light and electron microscope.	K3,K4
CO 2	Analyze the general laboratory techniques in maintenance of algae, bacteria and fungi.	K3,K4
CO 3	Impart knowledge on separation techniques- Centrifugation, Chromatography and Electrophoresis and their application in the field of research.	K5, K6
CO 4	Acquire knowledge in production and application of antibodies and learn the immunotechniques.	K4, K6
CO 5	Apply the knowledge on application of statistical methods and tools and know the strategies leading to quality research publication in standard journals	K6

## Mapping of CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	3
CO 2	2	3	3	2	3
CO 3	2	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
Average	2.4	2.8	2.8	2.6	3

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**M.Phil DEGREE EXAMINATION - PLANT BIOLOGY AND PLANT  
BIOTECHNOLOGY**

**Draw diagrams wherever necessary**

**QUESTION PAPER PATTERN-M.Phil**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>
<b>K4/K5/K6</b>	<b>5/8 x 20</b>	<b>1200</b>	<b>100</b>	<b>100</b>

# **M.PHIL- PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

## **SEMESTER 1**

### **CORE PAPER II- TECHNIQUES IN PLANT BIOTECHNOLOGY**

**COURSE CODE:10M21/ADP**

**CREDITS -5**

#### **Course Objectives**

To enable the students to

1. Introduce students to the principles, practices and applications of different and applications of different culture techniques.
2. Get an advanced knowledge on techniques employed for isolation and characterization of biomolecules.
3. Explore the avenues in genetic engineering and prospects in recombinant DNA technology.
4. Gain knowledge on the use of molecular and bioinformatics tools for sequencing of genes and proteins.

#### **Unit I**

##### **Microbial and Cell Fraction Technique:**

Cell and Tissue culture-Microbial culture, plant cell and tissue culture, cell sorting, culture collection, cryopreservation. Cell fraction-Solid shearing, liquid shearing, high pressure extrusion, ultrasonic oscillation, use of proper osmoticum and antioxidants. French press. Isolation of mitochondria, chloroplast and nucleic acid.

#### **Unit II:**

##### **Phytochemical Techniques:**

Solvent Extraction- Maceration, Percolation, Cold Percolation, Steam distillation, Extraction of Essential Oils, Soxhlet Extractor.

Isolation of compounds – Quantitative estimation of the isolated compound- Characterisation and Identification.

#### **Unit III**

##### **Tools and Techniques**

Basic principle and biological applications - UV, FTIR, Mass spectroscopy and NMR. Cytophotometry – Flow Cytometry. Nanoparticles – Green Synthesis- Characterization –SEM,TEM, EDX,XRD.

#### **Unit IV**

##### **Genetic Engineering:**

Principles and Method-Southern Blotting,Northern Blotting,Western Blotting,Dot and Slot Blot. Enzymes used in genetic manipulation-Restriction endonucleases and Ligases. Gene transfer technique-

*Agrobacterium* mediated and physical methods - Microinjection, biolistic gun, electroporation -principles and applications. Social and Ethical issues in Biotechnology.

#### **Unit V :**

**rDNA technology:** Cloning vectors-Viral DNA, plasmid DNA, cosmids. Molecular marking system for microbes (Lac-Z and GUS), vectors of eukaryotes and their uses in transfer of DNA.DNA sequencing-Maxam and Gilbert method and Dideoxy method. Molecular probes, DNA fingerprinting, DNA microarray. Bioinformatics-sequence analysis and alignment, protein sequencing. Drug discovery-procedure and applications.

**Radiolabelling techniques**-Half life, types of radiation decay, measurement of radioactivity. Incorporation of radio isotopes in biological tissues and cells. Radio Immuno Assay . Safety guidelines.

#### **REFERENCES:**

1. Lewin, B. 2006. Genes VII, Oxford University Press, USA.
2. DeRobertis, E.D.P. and De Robertis, E.M.F. 2001. Cell and Molecular Biology, Lippineott Williams & Wilkins, Bombay.
3. Plant cell, tissue and organ culture. Springer Lab Manual. Potrykus, I, and G. Spangenberg (eds.). 2295.
4. Gurumani, N. (2006) Research Methodology for Biological Science, MJP publications, India.
5. Gene transfer to plants. Springer Lab Manual. Jones, H. 2296. Plant gene transfer and expression protocols. Methods in molecular biology . 49. Humana Press. Kreuzer, H, and A. Massey. 2296.
6. Recombinant DNA and biotechnology. A guide for teachers. ASM Press,2296.
7. Westhead, D.R. J.H. Parish & R.M. Twyman. Bioinformatics, Viva Books, 2010.
8. Phytochemical Analysis, N.Raaman, New India Publishing Agency, 2006.
9. Journal of Chromatography A, Selected Edition 2013,SCIE, SSCI,Thomson Reuters.
10. Journal of the American Society for Mass Spectrometry.
11. Essentials of Nanotechnology ,Jeremy Ramsden, Ventus Publishing,ISBN978-87-7681-421-2
12. Plant Biotechnology Journal ,Wiley Online Library
13. Journal of Advanced biotechnology and Bioengineering, Synergy Publication.

#### **JOURNALS:**

1. Journal of Plant Biochemistry and Biotechnology.
2. Indian Journal of Biotechnology
3. Biotechnology Research and Innovative
4. Research Journal of Biotechnology.

#### **E-Learning Resources:**

1. <https://www.nature.com>
2. <https://biovegen.org>
3. <https://www.sciencedirect.com>
4. <https://www.khanacademy.org>



## Course Outcomes

After completion of the course students will be able to

CO No.	CO statement	Knowledge Level
CO1	Separate and isolate cells and organelles using fractionation techniques.	K3,K4
CO2	Prepare crude and fine extracts from plants and to characterize and quantify the phytochemicals.	K5
CO3	Identify the tools and technique required for analyzing biomolecules.	K4 & K5
CO4	Utilize the knowledge gained in genetic manipulation using molecular tools.	K4 & K5
CO5	Compare and analyse genetic and protein sequences utilizing bioinformatics and radiolabelling techniques	K5 & K6

## Mapping of CO with PSO

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.8	3	3	3	3

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**(For the candidates admitted during the year 2021-2022 onwards)**

**M.Phil DEGREE EXAMINATION**

**Draw diagrams wherever necessary**

**QUESTION PAPER PATTERN-M.Phil**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>
<b>K4/K5/K6</b>	<b>5/8 x 20</b>	<b>1200</b>	<b>100</b>	<b>100</b>

**DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**M.Phil PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**(from candidates admitted from 2021-2022 onwards)**

**COURSE PROFILE**

<b>CORE/ELECTIVE</b>	<b>TITLE OF THE PAPER</b>	<b>PAPER CODE</b>
<b>II SEMESTER</b>		
ELECTIVE 1	Genetics	10M21/GES
ELECTIVE 2	Herbal Botany	10M21/HEB
ELECTIVE 3	Plant Pathology	10M21/PLP
	Dissertation	10M21/DSN

**M.Phil - DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**SEMESTER II**

**ELECTIVE - GENETICS**

**COURSE CODE: 10M21/GES**

**CREDITS: 5**

**Course Objectives:**

To enable students to

- Learn the concepts of cytogenetics and molecular genetics
- Understand the basics of genetics in prokaryotes
- Acquire knowledge in developmental genetics and sex determination
- Gain knowledge in radiation genetics and on the impact of environmental toxicants on genes
- Learn the molecular mechanism and application of mutagenesis

**UNIT I**

**Cytogenetics:** Chromatin and organization of chromosomes. Relation between structure and function of chromatin. Karyotype, Idiogram, Banding methods – Q,G,C,R,N banding.HRT technique. Origin and significance of chromosomal aberrations. Physical, Chemical mutagens and chromosomal damage Structural chromosomal changes.

**Molecular Genetics:** Introduction – Evidences for DNA as genetic material – Mechanism of DNA replication – The topological problem. Molecular events in transcription- Inhibition of Transcription, RNA-structure and types. Mechanism of Protein synthesis – Inhibition of protein synthesis. Extra Chromosomal protein synthesis.

**UNIT II:**

**Prokaryotic Genetics:** Plasmids – Properties and Classification, conjunctive plasmids – Resistance factors - Significance of plasmids. Bacteriophage – properties, Phage mutants, Genetic maps, Phage life cycle, Molecular and enzymatic mechanism. Principles of genetic engineering and gene cloning.

**UNIT III:**

**Eukaryotic Genetics:** Alleles – Ultra structure, allelic sites, complementation test, Multiple alleles. Multiple genes– Nature, Mechanism, Quantitative inheritance, Polygene concept. Developmental genetics - Mutation affecting early development, Birth defects due to abnormal

Karyotyping - Sex differentiation, Developmental Sex abnormalities – hormones in Development.

#### **UNIT IV:**

**Genes And Environment:** Introduction – Environmental toxicants – Chemical and physical mutagens, carcinogens, Teratogens and their relationship.

**Radiation Genetics:** Measurements of Radiation – its effect on cells. Cell kinetics and radiation response. Radiation pathology. Radiation alternations – Radiation protection – Clinical applications.

#### **UNIT V:**

Molecular mechanism of physical and chemical mutagenesis. Repair system. Test system in screening mutagenesis. Application of mutagenesis in screening environmental toxicants. Plant alkaloids as chemical mutagens.

#### **REFERENCES:**

1. Snustad Peter, D. Michael J. Simmons. Principles of Genetics, John Wiley Sons, 2297
2. Robert H. Tamarin. Principles of Genetics, Tata McGraw Hill Company, 2008
3. Benjamin Lewin . Genes VIII, Prentice Hall, 2006
4. Primrose, *et al.* 2005 .Principles of Gene Manipulation. Black Well Science, London,
5. Genome Biology And Evolution, Selected Edition 2013, SCIE, SSCI, Thomson Reuters.
6. Molecular Biology by David Freifelder, Jones & Bartlett Publishers, 2004.
7. Journal of Genetics And Genomics, Elsevier Publication.
8. Molecular genetics and Genomics, Springer Publication.
9. Journal of Genetics and Plant Breeding, Indian Academy of Sciences publications.
10. Molecular Genetics and Metabolism, Elsevier Publication.

#### **JOURNALS:**

1. Indian Journal of Plant Genetics and Resources.
2. Journal of Cytology and Genetics
3. Current Science
4. Indian Journal of Genetics and Plant Breeding

#### **E-Learning Resources:**

1. <https://www.sciencedirect.com>
2. <https://www.edx.org>
3. <https://www.khanacademy.org>
4. <https://www.dcu.ie>

## Course Outcomes

After completion of the course students will be able to

CO No.	CO statement	Knowledge Level
CO1	Apply banding methods, Karyotypes, Idiogram, aberrations, mechanisms of DNA replication and protein synthesis in cytogenetics	K3
CO2	Asses the significance of plasmid in gene cloning and genetic engineering	K6
CO3	Analyze and evaluate the effects of mutation in abnormal karyotyping and sex abnormalities leading to effects in the individuals	K4 & K5
CO4	Evaluate the effects of radiation and environmental toxicants on cells	K5 & K6
CO5	Analyze the molecular mechanism of mutagenesis and apply test system in screening environmental toxicants	K4 & K5

## Mapping of CO with PSO

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Average	2.8	3	3	3	3

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**M.Phil DEGREE EXAMINATION**

**Draw diagrams wherever necessary**

**QUESTION PAPER PATTERN-M.Phil**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>
<b>K4/K5/K6</b>	<b>5/8 x 20</b>	<b>1200</b>	<b>100</b>	<b>100</b>

**M.Phil - DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**SEMESTER II**

**ELECTIVE –HERBAL BOTANY**

**COURSE CODE: 10M21/HEB**

**CREDITS:5**

**Course objectives**

To enable the students to

- Explore the significance of plant drugs in human health.
- Understand the various techniques applied in the production of plant drugs.
- Impart knowledge in classifying plant drugs based on different sources and their medicinal properties
- Apply the fundamental techniques used in identification and characterization of plant drugs.
- Understand the conservation strategies adapted for the existing and endangered medicinal plants.

**UNIT I:**

Introduction, impact of plant drugs in human welfare. Classification of plant drugs (Taxonomical, morphological, chemical and pharmacological). Utilization of medicinal and aromatic plants in India. Recent trends and Socio – economic importance.

**UNIT II:**

Principles of collection, preparation/processing and storage of plant drugs. Extraction methods of phytochemicals. Factors influencing the quality and variability of plant drugs - geographical factors, climatic factors, soil and nutrients, genetic factors and biotechnology.

**UNIT III:**

Classification of plant drugs based on the source – Entire Plant, Root , Stem, Bark, Leaf, Flower, Fruit and Seed. Study of medicinal properties and uses with reference to the sources of plant drugs.

**UNIT IV:**

Identification of Plant Drugs – Acids, Alcohols, Esters, Carbohydrates, Proteins, Fixed oils and Lipids, Alkaloids, Glycosides, Saponins, Flavonoids, Terpenoids, Volatile oils, Phenolic compounds and Tannins, Phytosterols, Resins. Vitamins, Hormones and Antibiotics – Isolation, Purification and Characterization of phytochemicals.



## **UNIT V:**

Conservation- existing and endangered medicinal plants- conservation strategies (*In-situ*, *ex-situ* and *on-farm*).

## **REFERENCES:**

1. Pharmacognosy, C. K. Kokate, A. P. Purohit & S. B. Gokhale (2296), Nirali Prakashan, 4th Ed.
2. Harborne. 2012. Phytochemical methods –A guide to modern techniques of plant analysis. Science and Business media.
3. Raman, N. Phytochemical Techniques. New India Publishing Agency, New Delhi, 2006.
4. Natural Products in medicine: A Biosynthetic approach (2297), Wiley. Hornok,L. (ed.)
5. Kokata, Purohit and Ghokale, 2007. Pharmacognosy, Nirali Prakasham Publishers.
6. Cultivation & Processing of Medicinal Plants, Chichister, U. K: J. Wiley & Sons. Trease & Evans, 2292.
7. Pharmacognosy – William Charles Evans, 14th ed. (2289), Harcourt Brace & Company.
8. Medical Herbalism: The Science Principles and Practices of Herbal Medicine by David Hoffman, Healing Arts Press, 2003
9. Journal of Herbal Medicine, Elsevier Publication.
10. Journal of Natural Medicine, Springer Publication.
11. Journal of Botany and Plant Biology, Progress Academic Publishing House.

## **JOURNALS:**

1. International Journal of Herbal Science
2. Indian Journal of Natural Products and Resources
3. Indian Drugs.
4. International Journal of Pharmaceutical sciences and Research.

## **E-LEARNING RESOURCES:**

1. <https://www.sciencedirect.com>
2. <https://www.herbs.org.nz>
3. <https://www.khanacademy.org>
4. <https://www.theherbalacademy.com>

## Course outcomes

After completion of the course students will be able to

CO.No.	CO Statement	Knowledge Level
CO 1	Analyse the significance of plant drugs in human health.	K3, K4
CO 2	Apply the knowledge in processing and storage of plant drugs, the method of classification and factors influencing the plant drugs quality.	K3,K4
CO 3	Discuss the classification of plant drugs based on their sources, classification and medicinal properties.	K5
CO 4	Identify and characterise the plant drugs for Human welfare.	K5, K6
CO 5	Study the conservation strategies for enhancing sustainable utilisation of medicinal plants in Herbal industry.	K6

## Mapping of CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
Average	3	3	3	3	3

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS) CHENNAI – 600 008**  
**(For the candidates admitted during the year 2021-2022 onwards)**

**M.Phil DEGREE EXAMINATION**

**Draw diagrams wherever necessary**

**QUESTION PAPER PATTERN-M.Phil**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>
<b>K4/K5/K6</b>	<b>5/8 x 20</b>	<b>1200</b>	<b>100</b>	<b>100</b>

**M.Phil - DEPARTMENT OF PLANT BIOLOGY AND PLANT BIOTECHNOLOGY**

**SEMISTER II**

**ELECTIVE – PLANT PATHOLOGY**

**COURSE CODE: 10M21/PLP**

**CREDITS: 5**

**Course Objective:**

To enable the students to

- Understand the major principles of plant pathology.
- Recognize the etiology of the disease.
- Understand the mechanism of pathogenesis and host-pathogen interaction.
- Learn the techniques involved and in detection of pathogen and disease forecast.
- Gain knowledge on disease management strategies.

**UNIT I:**

History and principles of plant pathology. Causal agents of plant diseases – biotic and abiotic causes. Symptomatology and dissemination of pathogens. Study of plant infection-penetration and colonization, host –pathogen interaction. Role of enzymes and toxins in pathogenesis.

**UNIT II:**

Pathological physiology of diseased plants – plant water relations, Photosynthesis, Respiration and Growth, Disease resistance – Genetic of virulence and resistance, gene for gene concept – Methods of incorporation of resistance genes.

**UNIT III:**

Defense mechanisms – Structural and Biochemical, Elicitors for induction of defense. Physiological races, Molecular tools for detection of plant pathogens.

**UNIT IV:**

Plant diseases Epidemiology, Modern methods of Disease forecast. Epiphytotic –Causes and decline. Plant Protection – Cultural, Physical, Chemical, Biological. Genetical Breeding and Hybridization. Immunization.

**UNIT V:**

Common diseases of crop plants with special reference to South India. – Causal Organism, Symptoms and Disease management.

## **REFERENCES:**

1. Agrios, G.N. Plant pathology, IV Edition, Academic press 2008.
2. Bilgrami K.S. and Dube H.C., A Text Book of Modern plant Pathology, Chand & Co., 2298.
3. Chatterjee P.B., Plant protection techniques Bharati Bhavan 2297.
4. Das Gupta H.K. Principles of Plant pathology Allied Publishers 2288.
5. Mehrotra R.S. Plant Pathology Tata-Mc Graw Hill Publish, co., Ltd., 2017.
6. Rangaswami G and A. Mahadevan Diseases of Crop plants in India. IV Edition Practice Hall 2299.
7. Singh R.S. Plant Pathogens: The fungi Oxford & IBH Publisher Co. 2282.
8. Singh R.S. Plant Diseases Oxford and IBH publishing co., 2283.
9. Walker J.C. Plant Pathology Tata Mc Graw Hill Publishers 2269.
10. Mishra, A., A. Bohra and A. Mishra. 2011. Plant Pathology-Disease and Management. AgroBios, Jodhpur.
11. Pathak, Khatri and Pathak. 2296. Fundamentals of Plant Pathology. AgroBios, Jodhpur.
12. Pandey, B.P. 2282. Plant Pathology – Pathogen and Plant disease. S.Chand & Company Pvt. Ltd, New Delhi.
13. J.G.Manners – Principles of Plant Pathology.
14. Wheeler - Plant Pathology, Tata Mc Graw Hill.
15. Butler E.J. and Jones.S.G – Plant Pathology, Mac Millan , 2249.
16. European Journal of Plant Pathology, Springer Publication.
17. Journal of Plant Pathology And Microbiology, OMCS Publication.
18. Archives of Phytopathology And Plant Protection, Taylor & Francis Publication.
19. Molecular Plant Pathology, Willey Online Library.
20. Journal of General Plant Pathology, Springer Publication.

## **JOURNALS:**

1. Indian Journal of Pathology and Microbiology.
2. Indian Journal of Environmental Protection.
3. Journal of Plant Disease and Sciences
4. Journal of Mycology and Plant Pathology

## **E-Learning Resources:**

1. <https://www.dupont.com>
2. <https://www.plantpath.instate.edu>
3. <https://www.khanacademy.org>
4. <https://www.sciencedirect.com>

## Course outcomes

After completion of the course students will be able to

<b>CO No.</b>	<b>CO statement</b>	<b>Knowledge Level</b>
<b>CO1</b>	Apply the principles of plant pathology in understanding host-parasite interaction	K3
<b>CO2</b>	Analyse the pathological physiology of disease plants.	K3, K4
<b>CO3</b>	Identify the defense mechanism in plant diseases and to detect pathogen using molecular tools.	K4 & K5
<b>CO4</b>	Formulate disease forecasting and plant protection methods for control of plant diseases.	K5 & K6
<b>CO5</b>	Identify plant diseases and use appropriate strategies for disease management.	K5 & K6

## Mapping of CO with PSO

<b>CO/PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	3	3	3	3	3
<b>CO2</b>	3	3	3	3	3
<b>CO3</b>	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3
<b>CO5</b>	3	3	3	3	3
<b>Average</b>	3	3	3	3	3

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**Draw diagrams wherever necessary**

**QUESTION PAPER PATTERN-M.Phil**

<b>Knowledge Level</b>	<b>Section</b>	<b>Word Limit</b>	<b>Marks</b>	<b>Total</b>
<b>K4/K5/K6</b>	<b>5/8 x 20</b>	<b>1200</b>	<b>100</b>	<b>100</b>