

# **M.Phil. in Plant Molecular Biology**



## **General Course Structure**

Ist Semester:	Theory Courses	2
	Research Method Course	1
IInd Semester:	Dissertation	

Duration: As per normal University rules, the exact dates of commencement of course can be set after approval by appropriate University bodies of the course itself.

It is our intention that the M.Phil. course will be conducted basically in the style of seminars. The seminars may be given by the teachers, senior research scholars and the participating students, subject to overall guidance of the M.Phil. Committee. At the end of the course, theory question papers will be set on the basis of various seminars given, and the students examined in them. While, for satisfying statute requirements, a list of topics has been given for each course, it may be emphasized that a topic listed in the course may be substituted by another topic deemed to be of current interest by the teacher-in-charge. A candidate selected for the above programme has to take at least three courses out of the four courses being offered at present. Course IV is essential. Besides, a candidate will be required to submit a dissertation in partial fulfillment of the above degree on the basis of work done in the laboratory. The course being offered, at present, are as follows:

- Course I. Special Topics in Molecular Biology of the Cell
- Course II. Special Topics in Plant Cell and Molecular Biology
- Course III. Plant Biotechnology
- Course IV. Techniques in Plant Molecular Biology

## Course I

### **Special Topics in Molecular Biology of the Cell**

1. The Packaging of DNA in Chromosomes
2. Cell Cycle and Cell Division
3. HnRNA, split genes and Splicing
4. Upstream Promoter Sequences
5. Homeo Boxes and Other Downstream Regulatory Sequences
6. RNA Termination
7. Repetitive DNA; Ribosomal and Histone Genes; Amplification of DNA
8. Antisense RNA Regulation of Gene Expression
9. Heat Shock Proteins and Metallothionins
10. Transposons
11. Genetics of Antibody Production
12. RNA as Enzyme
13. Transport of Proteins
14. Membrane Receptors
15. Second Messengers and Amplification of Signals; cAMP; Calcium and Calmodulin; Polyphosphoinositides
16. Cytoskeleton and Cellular Movement
17. Phosphorylation as a Mechanism of Regulation
18. Any Other Topics of Current Interest

## Course II

### **Special Topics in Plant Cell and Molecular Biology**

1. Organization and Expression of Plant Genes
2. Light Regulation of Plant Gene Expression
3. Phytochrome Control of Plant Development
4. Molecular Genetics of Photosynthesis
5. Photochemical Reaction Centres: Structure and Organization
6. Mitochondrial Genome and Male Sterility
7. Transport of Proteins into Mitochondria and Chloroplast
8. bacterial and Cyanobacterial Nitrogen Fixation
9. Symbiotic Nitrogen Fixation
10. Storage Proteins and Their Genes
11. Developmental Mutants of Plants
12. Molecular Aspects of Incompatibility
13. Transposons in Plants
14. Adaptation of Plants to Stress
15. Biochemistry of Endogenous Rhythms
16. Plant Hormones: Current Status
17. Cytoskeleton in Plants
18. Lectins and Cell-Cell Recognition Problems
19. Current Status of Plant Cell Culture and Regeneration
20. Genetic Engineering of Plant Cells
21. Any Other Topic of Current Interest

## Course III

### **Plant Biotechnology**

1. Regeneration of Plant Cells with Special Reference to Legumes and Cereals
2. Haploids for Crop Improvement
3. Protoplasts and Somatic Cell Hybridization
4. Plant Cell Mutants and Somaclonal Variation
5. Forest Plant Biotechnology
6. Cell Culture for Secondary Metabolites
7. Germplasm Preservation
8. Micro-Manipulation of Plant Cells
9. Engineering of Plant Genes of Photosynthesis and Conferring Herbicide Resistance
10. Engineering of Plant Genes – Nitrogen Fixation
11. Engineering of Plant Genes – Storage Proteins
12. Vectors – Ti and Ri Plasmids
13. Vectors – CaMV and Other Viruses
14. Direct Gene Transfer and Microinjections
15. Any Other Topics of Current Interest

## Course IV

### **Techniques in Plant Molecular Biology**

1. Buffers, Cell Fractionation
2. Centrifugation (Preparative and Analytical Ultracentrifugation)
3. Chromatography
4. Electrophoresis
5. Spectrophotometry (UV and Visible, Dual Wavelength Spectrophotometry)
6. Radioisotope Techniques
7. Immunological Techniques
8. Transmission and Scanning Electron Microscopy
9. Mass and NMR Spectrometry, CD, ORD
10. Polarography and Redox Measurements
11. Cell and Protoplast Culture
12. Plant Cell Transformation
13. DNA Isolation from Nuclei, Chloroplasts, and Mitochondria
14. Isolation of RNA, Poly A<sup>+</sup> mRNA
15. Cloning of DNA; cDNA and Genomic Library
16. Southern, Western, Northern and Dot Blots
17. DNA and RNA Sequencing
18. Use of Computer in Biology
19. Any New Emerging Technique