

New Final

**MASTER OF PHILOSOPHY  
(M. PHIL.)  
DEGREE IN BOTANY**

**Proposed Syllabus**

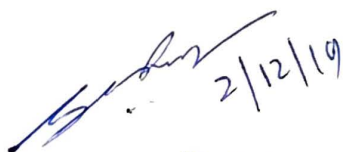


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*S. C. Roy*  
2/12/19  
Dr. S. C. Roy  
Professor & Head  
Department of Botany  
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**COURSE STRUCTURE FOR TWO YEAR**  
**M.PHIL. DEGREE**  
**BOTANY**

<i>Semester</i>	<i>Course code</i>	<i>Title of paper</i>	<i>Mode</i>	<i>Marks</i>	<i>Credit</i>	<i>No. of Hours per Week</i>
<b>I</b>	Course -I	Research Methodology	Theory	100	5	5
			Practical	100	5	15
<b>II</b>	Course-II	Advanced Course in Botany	Theory	100	5	5
			Practical	100	5	15
<b>III</b>	Course-III	Analytical Techniques in Plant Sciences	Theory	100	5	5
			Practical	100	5	15
<b>IV</b>	Course-IV	Research work and <i>viva voce</i>	Dissertation	200	10	20
<b>TOTAL:</b>				<b>800</b>	<b>40</b>	<b>80</b>

  
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## FIRST SEMESTER

Course Code-I:

Research Methodology (Theoretical)

Marks: 100

- 1. Introduction to Research:** Reflection, Science and Research. Basic and applied research. Essential steps in research. Literature collection- Need for review of literature; review process and bibliography; research reading; consulting source material. Literature citation. List of References. Citation-sequence system, Alphabet-Number system.
- 2. Research Reporting:** Components of research report-title, Authors and addresses, Abstract, Summary, Synopsis, Key words, Introduction, Materials and methods, Results, Discussion, Acknowledgements, general introduction and general discussion, summary and conclusion, appendixes, References. Research Report-Tables-components. Research Figures- Components. Research Report-Formatting and typing.
- 3. Laboratory Rules and Laboratory Safety:** Laboratory rules and General Safety measures. Chemical Hazards. Physical Hazards. Biological Hazards. Spillage and Waste Disposal. Laboratory- acquired infections. First Aid. Safety measures. Safety in Genetic engineering. Safety of Laboratory animals and animal ethics.
- 4. Intellectual Property Rights:** Protection of IPR in India. Terminology associated with IPR- Patent-Copyright-Trademark-Design-Geographical Indication-Plant Variety and Farmers' Rights Protection-Trade Secrets.
- 5. Microbial world:** General account of viruses and bacteria (structure, replication / reproduction and economic importance), Biological nitrogen fixation.

Course Code-I:

Research Methodology (Practical)

Marks: 100

1. Data collection, review of literature and preparation of research report. Citation of references. How to write a research paper.
2. Study of experimental designs, different sampling techniques. Experimental error, Replication, Controls, Measurement.
3. Windows and networking essentials. Internet and Linux operating system. Biological and chemical database-Sequences, enzymes, Data Bank-GenBank, PDB. DATA mining and Data curation.
4. Study of pH meter and preparation of different pH solutions.
5. Preparation of different stock solutions, working solutions, Buffer solutions, molar and normal solutions.
6. Differential staining (Gram positive and negative), Endospore staining.
7. Isolation of bacteria using streak-plate, pour plate and spread plate technique.
8. Isolation and enumeration of viable microorganisms from soil by serial dilution-agar plate method.
9. Study of bacteria growth by turbidometric method.
10. Antibiotics sensitivity tests.

## SECOND SEMESTER

Course Code-II:

Advance Course in Botany (Theoretical)

Marks: 100

1. **Molecular Taxonomy and Biosystematics:** Scope; Methods in Molecular taxonomy and Systematics; Processing molecular data and Phylogenetic inference using different Methods (Parsimony, Maximum Likelihood, Bayesian); Use of Chloroplast, Nuclear and Mitochondrial DNA sequences in Plant systematics; Phylogenetic trees and concepts; Applications of molecular Phylogenetics.
2. **Mycology and Molecular Plant Pathology:** Fungal biodiversity; Fungi in biotechnology; Fungi in Genetic Research; Endophytic fungi and their importance; Fungal interactions and practical exploitation; Major groups of plant pathogenic fungi. Host specialized necrotrophic pathogens; Mycorrhizae (VAM) and significance. Plant disease diagnosis and diagnostics; Molecular biology of Plant-Microbe interaction; R-genes and R gene mediated disease resistance; Genetic engineering and crop protection: Engineering resistance to viral, bacterial, fungal and insect diseases of crop plants. Potential of plant derived genes in the genetic manipulation of crops for insect resistance. Gene silencing and control of viral diseases.
3. **Medical Botany:** Medicinal plant research scenario in India; Diagnostic features, bioactive molecules and therapeutic value of some common medicinal plants; Standardization of herbal drugs; Nutraceuticals and medicinal food; Bio-prospecting, bio-piracy and protection of traditional medicinal knowledge (IPR). Methods of Plant Analysis; Phenolic compounds; Terpenoids; Alkaloids and other nitrogenous secondary metabolites; Organic acids, lipids and related compounds; Sugars and their derivatives; Macromolecules, peptides.
4. **Advanced Cell Biology:** Plant Cell Compartments, Membrane Structure and Membranous Organelles, Membrane transport mechanisms, Protein Sorting and Vesicle Trafficking. Cell division regulation - Recent developments in cell cycle research. Mechanism of cell cycle regulation. Cell cycle regulation in multi-cellular organisms; Cell cycle regulation and plant cell growth.
5. **Ecology and Conservation Biology:** Scope of ecology; Community organization-concept of habitat, functional role and niche, key stone species, dominant species, ecotone, edge effect. Natural Resources, Global warming and catastrophic threat to global biological diversity; Degradation and Restoration of Natural Ecosystems; Remote Sensing and its applications; Resource Policies, Conflict Management, Environmental Planning, International Environmental Policies and organizations and conventions.

**Course Code-II:**

Marks: 100

**Advance Course in Botany (Practical)**

- 1) Collection, fixation and processing plant materials, Embedding, Microtomy, Staining, Double staining.
- 2) Photomicrography, Camera Lucida drawings.
- 3) Assessment of plant and microbial biodiversity by different methods. Biodiversity maps of India.
- 4) Processing of morphological and molecular data and construction of a Phylogenetic tree using different Methods (Parsimony, Maximum Likelihood, Bayesian).
- 5) Estimation of polyphenols in diseased and healthy plants.
- 6) Isolation and study of endophytic fungi.
- 7) Study of interactions among fungi and their practical application.
- 8) Study of major groups of plant pathogenic fungi.
- 9) Study of Mycorrhizas (VAM). Chemical control of fungal growth.
- 10) Analysis of phenols, alkaloids, saponins, volatile oils, hydrocarbons, flavonoids, sugars in different plants.

### **THIRD SEMESTER**

**Course Code-III: Analytical Techniques in Plant Sciences (Theoretical)**

Marks: 100

1. **Imaging and related Techniques:** Principles of microscopy. Principles and applications of light microscopy, fluorescence microscopy, phase contrast, confocal microscopy and electron microscopy (Transmission and scanning electron microscopy).
2. **Chromatography and spectroscopy:** principles and application of following: paper chromatography, column chromatography, thin layer chromatography, molecular exclusion, ion exchange, partition, adsorption and affinity chromatography; HPLC and GC. Principles and applications of UV-VIS, Mass, Infra-Red and NMR Spectroscopy
3. **Electrophoresis, immunological and radioisotope Techniques:** AGE, PAGE, SDS-PAGE, Isoelectric focusing and 2-D, ELISA, western blotting, DOT blot, Immunofluorescence, Immunochemistry, Autoradiography, pulse chase experiment, use of radioisotopes in biology.
4. **Biostatistics:** Statistics, data, population, samples, parameters, tabulation of data, graphical and diagrammatic, measures of dispersion, variance, mean deviation, standard deviation, correlation and regression analysis, binomial and poisson distribution, test of hypothesis, ANOVA, Bivariate and multivariate analysis.
5. **Bioinformatics:** Introduction to Bioinformatics; Databases; Applications of Bioinformatics; Bioinformatics in business areas; Techniques in bioinformatics; Searching for genes; Bioinformatic Tools; Career and Training in Bioinformatics; Bioinformatics centres in India.

**Course Code-III: Analytical Techniques in Plant Sciences (Practical)**

Marks: 100

1. Separation of proteins/Nucleic acids in gradient solutions using centrifugation.
2. Determination of Sugars, Amino acids by Thin layer chromatography techniques.
3. Separation of proteins by vertical gel electrophoresis.
4. Separation of Alkaloids by column chromatography.
5. Isolation of Nucleic acid from plant tissues by CTAB method.
6. Isolation of genomic and plasmid DNA from bacteria, and purification by agarose gel electrophoresis.
7. Applications of biostatistics- Data; Measures of central Tendency; Measures of Dispersion; Tests of Significance; Student T Test; The Chi-Square test; Probability; Correlation; Regression.
8. Molecular Sequence Analysis- Gene Finding-GENSCAN, GRAIL, PairWise Alignment-BLAST, PSI-BLAST, FASTA.
9. Pair Wise Sequence Alignment ALIGN, Multiple Sequence Alignment-ClustalW. Protein software-ExpASy
10. Bioinformatics organization-NCBI, EBI, TIGR

## FOURTH SEMESTER

Course Code-IV:  
Marks: 200

### M. Phil. Research Work

			Marks
1.	M. Phil thesis	The research guide shall give research topic for the research work and thesis The thesis shall be evaluated both by research guide (75) and external examiner (75)	75+75=150
2.	Viva voce of thesis	<i>Viva-Voce</i> examination by external examiner	15
3.	Pre-submission of M. Phil thesis	Student will present his/her research work before thesis submission and shall be examined by Departmental Research Committee	15
4.	Report on field work/Industry visit/ Institute visit		10
5.	Internal assessment	Based on 1. Overall attendance for all the four semesters. 2. Sincerity	10
<b>Total marks</b>			<b>200</b>

# SCHEME OF EXAMINATION FOR M.PHIL BOTANY

## FIRST / SECOND / THIRD SEMESTER

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### Scheme of Examination (Theory)

Time - 4 Hrs

**Max. Marks: 100**

- |       |  |           |
|-------|--|-----------|
| Q1.   | Objective Questions: Ten in numbers (all compulsory)                 | 2×10 = 20 |
| Q2-Q6 | Broad answer type questions: Five in numbers (with adequate choices) | 16×5 = 80 |
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### Scheme of Examination (Practical)

Time - 6 Hours

**Max. Marks =100**

- |     |   |          |
|-----|---|----------|
| Q1. | Conduct the experiment 'A', record data, analyse and draw inferences. | 25 Marks |
| Q2. | Conduct the experiment 'B', analyse the data and draw inferences.     | 25 Marks |
| Q3. | Conduct the experiment 'C', analyse the data and draw inferences.     | 25 Marks |
| Q4. | Practical records   | 10 Marks |
| Q5. | <i>Viva voce</i>  | 15 Marks |
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## FOURTH SEMESTER

### Scheme of Examination

Evaluation of M.Phil Thesis, *Viva-voce* and Field report

200 Marks