



**UNIVERSITY OF RAJASTHAN**  
**JAIPUR**

**SYLLABUS**

**M.Phil. in Botany**

**Semester Scheme**

**Examination 2019-2020**

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**Dy. Registrar**  
**(Academic)**  
University of Rajasthan  
JAIPUR



**DEPARTMENT OF BOTANY**  
**UNIVERSITY OF RAJASTHAN, JAIPUR**

Syllabus for Pre. Ph.D. Course Work

and  
M.Phil. 1st Semester

**Paper I -Research Methodology (Common for all students)**

**Max. Marks-100**

- To understand and identify objectives of research problem and its importance to society and knowledge.
- To become familiar with public policy, biosafety and intellectual property rights issues related to life sciences nationally and globally.
- To learn good quality & quantitative skills to prepare reagents, buffers, stains and culture mediums for research experiments.
- To learn precautions and safety measures while handling instruments in laboratory and field.
- To learn physical, chemical and biological techniques to prevent nature and environmental balance.
- To learn preventive measures for protecting targeted and non targeted subjects from chemical residual toxicity.
- To learn methods for statistical analysis of data of research results.
- Technical letter, Report and paper writing.

**Paper II-Review of literature (To be done in consultation with supervisor)**

**Max Marks-100**

- Awareness of major issues at the forefront of the discipline.
- Formulation of research projects, objectives, hypothesis, work plan year wise observations, data collection
- Review of literature, national & international related to the research problem.

**Paper-III-Instrumentation and operation (Common for all students)**

**Max. Marks-100**

- A brief introduction to instruments & Scientific methods.
- Principles on which the instruments functions Microscopes, Weighing balance, pH Meter, Centrifuge, Spectrophotometer, Colorimeter, Chromatography (TLC, PC, HPLC, GLC) Microtome, Laminar flow, Electrophoresis, SDS page, PCR, Gel DOC, Microphotography, Lypholyser, MS (Mass spectroscopy), NMR ( Nuclear Magnetic Resonance), Atomic Adsorption Spectrophotometer.
- Experimental design, sampling and data structures.
- Basics of Computer, MS word, Excel, Power point presentation, use of scanners. Preparation of reports and editing of images.

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- Internet awareness, conversant with e-journals and e-books. Retrieval of electronic resources through internet. Prevention to plagiarism and duplication of research.
- General techniques used in broad areas of research; Isolation, Culture, identification of microbes, Preservation, Herbarium techniques, Methods of identification and preservation of lower & higher plants, Extraction, identification, quantification of compounds from plants and their screening for bioactivity.
- Histochemical procedure- fixation, embedding and sectioning.
- Techniques of biochemical analysis.
- Cytological preparations for chromosomal studies.

**Paper IV – Elective paper to be opted by the Candidate**

**Max. Marks-100**

- Algal Biotechnology
- Biotechnology including tissue culture.
- Environmental Science
- Microbiology
- Phytochemistry including secondary metabolites.
- Plant Morphology and Anatomy
- Plant Pathology
- Seed Pathology

Note- Detailed syllabi of paper IV will be framed by subject experts.

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## Group-IV

### Paper IV: Elective-1 (Algal Biotechnology)

1. Characteristic features and classification of algae
2. Economic importance of algae
3. Comparative study of prokaryotic and eukaryotic algae
4. Algal ecology and biotechnology
5. Isolation Purification and culturing of algae
6. Biochemical analysis of algae
7. Estimation of growth and biopigment in algae
8. Mutagenic effect on growth of algae

### Paper IV: Elective-2 (Biotechnology including Tissue Culture)

1. Laboratory Facilities, Operation and Management.
2. Media Preparation and Handling
3. Sterile Techniques
4. Micropropagation by Proliferation of Axillary Buds
5. Adventitious Shoot Proliferation
6. Plant Regeneration by Organogenesis from callus and cell suspension culture
7. Plant Regeneration from callus and Suspension Culture by Somatic Embryogenesis
8. Direct Somatic Embryogenesis.
9. Embryo Culture and embryo Rescue for wide cross Hybrids
10. Anther Culture for Double Haploid Production
11. Protoplast Isolation and Culture
12. *Agrobacterium* Mediated Transformation.
13. Direct DNA Transfer into Intact Plant cells

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14. Applications of Polymerase Chain Reaction (PCR) to Plant Genome Analysis.

15. Transgenic plants: Pest resistant and Herbicide tolerant plants

16. Plants as Bioreactors

17. Role of Bioinformatics in Biotechnology

18. Public Concerns about GMO, regulation of GMO & Biosafety Guidelines

### **Paper IV: Elective-3 ( Environmental Sciences)**

1. Global climate change
2. Carbon sequestration and carbon credits
3. Role of natural wetlands in biosphere and MOEF guidelines for their conservation in India
4. Environmental auditing in Industries in India
5. Bioremediation
6. Ecollevels and their role in conservation
7. Mangroves and their role in disaster management
8. Constructed wetlands and wastewater treatment
9. Rainwater harvesting and their relevance to state of Rajasthan
10. Joint forestry management
11. Biodiversity and its conservation

### **Paper IV: Elective-4 ( MICROBIOLOGY)**

1. Microorganisms: General Classification, Natural classification Distribution of microbes
2. Bacteria. Types, Morphology, ultra structure, Identification methods, gram negative, gram positive and acid fast bacteria, cultivation-aerobic and anaerobic Cultivation, shake flask and cultivation, Culture media-pure culture technique, preservation methods.  
Bacterial growth-culture media, growth curve, economic importance of bacteria
3. Virus and mycoplasma: general characteristics and economic importance
4. Fungi: classification and general features, natural and synthetic media for isolation of fungi.  
identification of fungi

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5. **Algae:** distribution, especially in Rajasthan, culture of algae, economic importance of algae.
6. **Food preservation methods:** By Radiation, UV gamma, microwave and temperature, chemical and naturally occurring antimicrobial agents.
7. **Application of microbiology:** food microbiology: contamination & spoilage of food products, application of microbial enzymes in food industry microbiology of fermented mild products. Industrial microbiology: In medicine, pesticides and other recalcitrant chemical (xenobiotics), biofilms, biochips, biosensors, biosurfactants, role of microbiology in agriculture and waste management.

### **Paper IV: Elective-5**

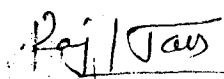
### **( PHYTOCHEMISTRY AND SECONDARY METABOLITES )**

1. **Protein & Enzymes-** Techniques of protein purification, General structure, properties and estimation, Enzymes kinetics, Michaelis-Menton equation, significance of Km Value.
2. **Carbohydrate & Fats-** General structure, properties, function and estimation.
3. **Stress physiology** with reference to secondary metabolites specifically phenolic compounds, alkaloids and terpenoids, Chromatography, principle and classification Strategies used to enhance their production in cultures.
4. **Applications of bioactive compounds**
5. **Plant growth regulators-**chemical structure, bioassay, physiology effects and mode of action of Auxins, Gibberellins, Cytokinins & Abscisic acid.

### **Paper IV: Elective-6 ( PLANT MORPHOLOGY AND ANATOMY )**

1. **Modular growth of Plant:** Branching Patterns and Canopy Architecture Plant Meristems
2. **Morphology and Internal Structure of Root and Shoot**
3. **Primary and secondary tissue differentiation:** Nodal structure and wood anatomy
4. **Leaf Morphology;** Phyllotaxy, Leaf meristems and internal structure of petiole and lamina, Stomata and trichomes
5. **Morphology of Flower;** Morphological nature of Stamen and Carpel; Placentation
6. **Pollination;** Male and Female. Gametophytes. Structure of Style and Stigma; Fertilization

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7. Endosperm and Embryo, Structure of Seed and Fruit, Seed coat and Pericarp, Spermoderm Patterns

#### **Paper IV: Elective-7 ( Plant Pathology)**

1. History & Landmarks in Plant Pathology (with special reference to India)
2. Disease-Concept, Components, Causes & Symptoms
3. Classification of Diseases.
4. Important Plant Disease of India with special reference to Rajasthan ( Fungal, Bacterial, Viral, Phytoplasmal, Insect & Nematode Galls)
5. Host-Parasite Interaction and Methods of Control of Plant Disease (Cultural, Chemical & Biological Control)
6. Tools & Techniques used in Plant Pathology-
7. Histochemical and Biochemical studies, SEM & TEM, Statistical Analysis of Data, Tissue Culture Techniques and Genetic Engineering techniques of Importance to Plant Pathology.

#### **Paper IV: Elective-8 ( Seed Pathology)**

1. To study the Structure of seeds, seed and embryo of crop seeds of some crop plants,
2. Dry seed examination of seed lots.
3. To study the seed disorders caused by important pathogens and extent of their infection in various parts of seed.
4. Isolation and identification of seed-borne mycoflora by Standard blotter method.
5. Plating seeds on PDA and identification of micro flora.
6. Study of any seed borne nematode disease (*Anguina tritici*).
7. Study of bacterial and viral infected seeds.
8. Localization of starch, protein, lipids, tannins, phenols and lignin in seed sections.
9. Study of seed germination and seedling abnormality.
10. Physical/chemical control of seed-borne pathogens.
11. Antibiotic/fungicidal assay against seed-borne pathogens.

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