

**Department of Botany  
Institute of Basic Science  
Bundelkhand University, Jhansi**

**Syllabus and Course Structure for M. Phil. Botany**

1. **Intake:** 30 seats (with reservation as per University/Govt. norms).
2. **Duration:** Minimum 01 year (02 Semesters)  
Maximum 02 year (04 Semester)
3. **Eligibility:** M. Sc. Botany/Applied Botany with at least 55% of marks (50% for SC/ST) candidates. Those appearing in the final year of qualifying examination shall also be eligible to apply, provided that they submit specific proof of having passed the final year examination.
4. **Procedure for Admission:** Strictly on merit drawn from Entrance Examination (ET).
5. (a). **Fee:** 30,000/-  
  
(b). **Refund of fee:**
  - i. Request for refund of fee should be made to the Hon'ble Vice Chancellor, Bundelkhand University within two weeks of deposition of fee. On approval of such candidate will be entitled for refund of 50% of prescribed fee.
  - ii. Request for refund of fee shall not be entertained under any circumstances if made after two weeks of deposition of admission fee by the candidate.
6. **Course Structure:** The detailed course structure shall be as follows:

**First Semester**

<b>Paper</b>	<b>Paper Code</b>	<b>Title</b>	<b>Internal</b>	<b>Theory</b>	<b>Total</b>
Paper - I	BOY MP - 101	Basic Research Methodology & Instrumentation	25	75	100
Paper - II	BOY MP - 102	Advancing Frontiers & New Vistas in Plant Science	25	75	100
Paper - III	BOY MP - 103	Specialization*	25	75	100
<b>Grand Total</b>					<b>300</b>

**Second Semester**

BOY MP - 104	Dissertation	Thesis Evaluation	Presentation	Viva	Total
		150	100	50	300

**Grand Total of Semester I and II = 600 Marks**

**NB:** \*One specialized paper from any one area offered shall be allocated by the Departmental Research Committee strictly on merit basis.

**Area I** : *Advance Ecology, Conservation & Environmental Biology.*

**Area II** : *Cytogenetics and Plant Breeding.*

**Area III** : *Phytopathology.*

# **M. PHIL. (BOTANY) SYLLABUS**

## **Paper I (BOY MP 101)**

### ***Basic Research Methodology and Instrumentation.***

1. Microscopy-light, dark field, phase contrast, fluorescent, transmission and scanning electron microscopy.
2. Molecular Biological techniques- Principles and Methods of electrophoresis, northern, southern and western blotting, PCR, RFLP, RAPD.
3. Principles and techniques Chromatography, TLC, HPLC, GLC.
4. Histological, Histo-chemical and cytological techniques.
5. Herbarium techniques and cytological techniques.
6. Plant tissue culture techniques.
7. Principles and techniques of colorimetry and spectrophotometry.
8. Microbial culture techniques.
9. Writing skills-research data compilation, thesis writing, report writing, manuscript writing.

# M. PHIL. (BOTANY) SYLLABUS

## Paper II (BOY MP 102)

### *Advancing frontiers and new Vista in Plant Sciences.*

1. Models of membrane permeability, membrane transport, metabolically coupled transport, properties of carriers.
2. Energy flow, principles of thermodynamics, Free energy and chemical potential, Redox reactions, structure and action of ATP, Structure and nomenclature of enzymes, mechanism of enzyme action, enzyme kinetics and regulation, Inhibitors, isoenzymes, allosteric enzymes, multienzyme complexes, regulatory enzymes, coenzymes.
3. Abiotic and biotic stress, moisture stress temperature stress, salinity stress, light stress, metal toxicity, oxidative stress.
4. Concept of disease symptoms, pathogenesis, epidemiology, defense mechanism and disease management (physical, chemical and biological).
5. Concept, productivity of different ecosystems, terrestrial ecosystem, secondary producers, determination of primary productivity, ecology of phytoplanktons. Megadiversity, causes of extinction.
6. Plant breeding through tissue culture, somatic hybridization, somaclonal variation, metabolic aspects of cultured tissues, bioreactors types, process, factors for efficiency, production of secondary metabolites. Biosensors in fermentation and environmental control, biotechnology and intellectual property right.
7. Laws of probability distribution, binomial distribution, poisson distribution, normal distribution, hypothesis testing, significance of mean, averages small samples, T test and F test, Chi square test, regression, experimental designs (RBD, split plot and factorial).

# M. PHIL. (BOTANY) SYLLABUS

## Specialization Paper III (BOY MP 103/1)

### Area-1: *Advanced Ecology, Conservation & Environmental biology.*

1. **Principles and concepts pertaining to the energy in ecological system:** The energy environment concept to productivity, food chain, food web, metabolism and size of individual, ecosystem energetic, trophic structure & ecological pyramids.
2. **Communities:** Nature, flux of energy through community, the flux of matter through community, the influence of competition on community structure.
3. **Pollution:**  
Air pollution: Air quality, causes of pollution sources of pollution, impact of air pollution on plants, animals, man, environment, air pollution tolerance index, control and abatement of air pollution.  
Water pollution: Water quality, sources of water pollution, impacts of water pollution, control and treatment of water pollution.  
Soil pollution: Sources and causes of soil pollution, subsequent ecological effects of soil pollution, the phases of waste treatment, the strategy of waste management and control, Pesticide and heavy metal
4. **Global climatic change:** Ozone depletion, green house effect, acid rains, modern control technologies to control pollution, environmental laws.
5. **Agro-ecosystem:** Features of Indian agriculture and forestry, production systems, cropping system, wasteland development by various agro-forestry systems, and management of trees in agro-forestry in agro-forestry systems.
6. **Conservation of natural resources:** Conservation of natural resources, Conservation of biodiversity in Indian scenario and future strategies, Biodiversity loss and threat, Biodiversity issues impact on diversity, Wildlife management and Range management.

### Suggested Readings:

1. Smith, R.L. 1996. Ecology and Field Biology. Harper Collins, New York.
2. Begon, M. Harper, J.L. and Townsend, C.R 1996. Ecology. Blackwell Science, Cambridge, U.S.A.
3. Odum, E.P. 1971. Fundamental of Ecology. Saunders, Philadelphia.
4. Odum, E.P. 1983 Basic Ecology. Saunders, Philadelphia.
5. Singh, M.P. Conservation of Biodiversity and Natural Resources. Daya Publications, India.
6. Dwivedi, A.P. Agroforestry Principles and Practices.
7. Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology. Wadsworth Publishing, Blemont, California.

## M. PHIL. (BOTANY) SYLLABUS

### Specialization Paper III (BOY MP 103/2)

#### Area-2: *Cytogenetics and Plant Breeding.*

1. Chromosome-structure a, number and polyploidy analysis, karasyotype analysis pattern and karyographic analysis, breeding relation on genome analysis. Ploidy in *Datura*, chromosome condensation and chromosome banding, crossing over in *Neurospora*.
2. Anther culture and haploid production, cultured isolated microscope; haploid production by chromosome elimination haploid induction in differ crops.
3. Protoplast isolation, culture and fusion. Somatic hybridization, hybrids and selection.
4. Nuclear DNA content, C-value paradox; cot cure and its significance; restriction mapping-concept and technique and multigene families and their evolution.
5. Origin and development of crop genetics, Mendelian principles of inheritance, Interaction of genes, Multiple Allelism, Lethal Atavism, Pleiotropy.
6. Quantitative and quantitative inheritance, Extra chromosomal inheritance, Evolution of crop plant such as Wheat, Rice, Cotton, Sugarcane, Gram and Mustard.
7. Apomixes, Incompatibility and male sterility system and their uses in plant breeding. Role of plant breeding in agriculture history and objectives of plant breeding, early breeders and their accomplishments.
8. Role of mutation and polyploidy in plant breeding.
9. Basic schemes for breeding pure line and inbred lines. Breeding methods for improvement of self pollinated plants cross pollinated plants and asexually propagated plants, Back crossing, single seed decent method, development of synthesis and composites.
10. Mechanism for disease and insect resistance, breeding for quality traits and for resistance to heat, frost and drought. Release seed production and distribution of cultivars, hybrid seed production, organization for crop improvement in India.

#### **Suggested Reading:**

1. Genetics by Strickberger, Prentice Hall, New Delhi.
2. Gene Biotechnology S.N. Jogdand Himalaya Publishing House.
3. Principles of genetics by Gardner, Snustad & Simmons John Wily Publications.
4. Molecular Biology of Cell by Albert et al.,
5. Cytogenetics: an advanced study P.K. Gupta Rastogi Publications.
6. Plant Biotechnology by H.S. Chawla, Oxford & IBh New Delhi.
7. Biotechnology & genomics P.K. Gupta Rastogi Publications.
8. Biotechnology Theory & Practic S.V.S. Rana Rastogi Publications.
9. Genetics by Gardener John Wiley and sons.
10. Genetics by P. Russell Benjamin and Cummings.
11. Introduction to Plant Breeding R.C. Chaudhary MJP Publishers.
12. Techniques in Plant Breeding by S.K. Gupta.
13. A Handbook of Agricultural statistics S.R.S. Chandel, Achal Prakashan Mandir, Kanpur.
14. Statistical Methods by S.P. Gupta, Sultan Chand & Sons, New Delhi.
15. Biostatistics by H. Prasad.

## **M. PHIL. (BOTANY) SYLLABUS**

### **Specialization Paper III (BOY MP 103/3)**

#### **Area-3: *Phytopathology.***

1. Classification of Plant diseases.
2. Symptomatology: Description of symptoms of fungal, bacterial and viral diseases, Identification of plant diseases.
3. Diseases forecasting, disease modules and remote sensing technique for crop protection.
4. Deficiency diseases: Khera diseases of Paddy. Diseases due to nitrogen born deficiency. Air pollution induced foliar abnormalities in plants. Impact of air pollutants on phylloplane microflora and disease development.
5. Enzymes and toxins in plant disease. Plant-pathogen interaction at molecular and genetic level.
6. Biopesticides, Bacterial, Fungal and Viral. Plant disease control: Physical, Chemical, Biological, Quarantine. Plant disease resistance and breeding of resistant varieties, role of biotechnology with special reference to plant pathology. Integrated Pest Management. Bio-fertilizers types, production and applications.
7. Techniques of isolation, purification of plant pathogens including biotrophic parasites culture testing efficacy of fungicides.
8. Disease appraisal and estimation of crop loss due to plant disease. Disease intensity and crop loss relationship, Mathematical expression.
9. Mycorrhizae Types and their applications in agriculture and forestry.

#### **Suggested Reading for Phytopathology I & II:**

1. Agrios, G.N. Plant Pathology. Academic Press London.
2. Singh, R.S. Plant Diseases. Oxford & IBH, New Delhi.
3. Singh, R.S. Principles of Plant Diseases. Oxford & IBH, New Delhi.