

Ph.D. Course Work in Botany/Environmental Science, 2018
Department of Botany
University of Lucknow, Lucknow

| Paper No. | Name | Max. Marks | *Internal Assessment | Theory | Time |
|------------------|---|-------------------|-----------------------------|---------------|-------------|
| I | Research Methodology 4 Credits | 100 | 30 | 70 | 3 hrs |
| II | Trends in Plant Science/Advances in Environmental Science 4 Credits | 100 | 30 | 70 | 3 hrs |

Criteria for Internal Assessment:

- a) Attendance : 5 marks
- b) Assignment Presentation : 10 marks
- c) Written test* : 15 marks (1hr)

Syllabus of Ph.D. Course Work in Botany (2018)

Paper I: Research Methodology

(4 Credits)

Unit-I

Research Formulation: Meaning of research in biological sciences; Research methods vs Research methodology; Motivation and objectives of research problem; Formulation of hypothesis and research plan; Types of research: Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical; Criteria of good research; Problem encountered by researchers.

Unit-II

Literature Survey: Necessity of and importance of review of literature in defining a research problem; Primary and secondary sources of literature-reviews, treatise, monographs, web as a source for searching literature. A brief idea about Government Research Funding Agencies eg. DBT, DST, CSIR, UGC, ICMR, ICAR, Ministry of Earth Science, Ministry of Environment and Forest.

Unit-III

Presentation and Analysis of Data: Data processing, analysis, presentation interpretation and their applications. Principles of biostatistics and bio-informatics, Computer application: Operating systems, software, molecular modeling using computer.

Unit-IV

Application of Results and Ethics: Environmental impacts; Ethical issues; Ethical committees; Commercialization; copy right; Royalty: Intellectual property rights and patent law; Trade related aspects of intellectual property rights; Reproduction of published material; Impact factor and citation index; Plagiarisms; Reference citation and acknowledgement; Reproducibility and accountability.

Paper II: Trends in Plant Science

(4 Credits)

Unit-I

Instrumentation: Principles, limitation and applications of various types of microscopes, spectrophotometer and mass spectrophotometer.

Unit-II

Bioseparation Studies: Qualitative and Quantitative analysis using electrophoresis, chromatography, centrifugation, PCR and Base sequencing.

Optional Units-III & IV

Specialized topics to be opted by the Candidate according to the chosen research area:

Bryology: General characteristics, criteria and classification of Bryophytes; Diversity, Distribution & Conservation of Bryophytes; Importance and uses of Bryophytes; Research Methods in Bryology.

or

Ecology: Diversity of plants – an ecological perspective; Ecology of aquatic and desert plants; Ecological indicators; Study of vegetation; Techniques used in the ecological studies; Industrial ecology; Quantification of ecological factors; Global ecological imbalance; Ecosystem: types and functions; Advanced ecological studies to save biodiversity; Population Ecology.

or

Genetics & Plant Breeding: Recent advances in cytogenetical research; Genetic variability - Scope and relevance, creation, exploitation and significant implications; Approaches of enhancement of genetic variation in crop plants; Biotechnological approaches of crop improvement and major achievements.

or

Microbiology:

Bacterial phylogeny on the basis of rRNA gene sequencing; Significance of rhizobacteria in biological control and plant growth promotion; Microbial aspects of recombinant DNA technology; Serological and molecular methods of plant virus identification; Importance of site-directed mutagenesis in plant virus research; Modern methods of plant virus control.

or

Mycology & Pl. Pathology:

Emerging trends in Mycology: Myco-remediation, Myco-hydrometallurgy, Myco-biosensors, Coal solubilisation, Myco-metabolites; Concept of plant diseases and their management: Disease triangle and diagnosis of abiotic and biotic diseases. Molecular basis of host – pathogen interaction, Management of biotic plant diseases.

or

**Phenomics, Floristics
& Biodiversity:**

Plant Microtechnique, Collection, documentation and analysis of data, International code of Botanical Nomenclature, Tools for assessment of Phytotaxonomic diversity, Microscopy in Pharmacognosy, Role of Herbarium and Botanic Garden in Plant systematic, Biosystematics, Taxonomy of Endemic plants, Medicinal plant diversity and their conservation.

or

Phycology:

Algal biodiversity; Economic Importance of Algae; Algal biotechnology; Algae as oldest eukaryotes for origin of life.

or

Physiology:

Plant nutrition; Ion transport and nutrient use efficiency; Biofortification. Concept of abiotic stresses, types, their effects and tolerance: Drought; Temperature – low and high; Light; Oxidative stress. Physiological effects of plant growth regulators. Carbon sequestration. Secondary metabolism and signal transduction and use of modern techniques in plant physiology and biochemistry. Soil fertility and its management.

or

Tissue Culture, Biotech & Genetic Transformation: Tissue culture and its applications – techniques, culture media and applications; Genetic transformation – tools, techniques and applications; Secondary metabolites – economic importance, metabolic pathways, upscaling; Seed plants and their evolutionary affinities – role in Agroforestry.

Project Work: Submission and presentation of Review article on the specialized field.

Syllabus of Ph.D. Course Work in Environmental Science (2018)

Paper I: Research Methodology

(4 Credits)

Unit-I

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Unit-II

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Unit-III

Presentation and Analysis of Data: Data processing, analysis, presentation interpretation and their applications. Principles of biostatistics and bio-informatics, Computer application: Operating systems, software, molecular modeling using computer.

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Paper II:

Advances in Environmental Science

(4 Credits)

Unit-I: Techniques – I

Instrumentation: Principles, limitation and applications of various types of microscopes, spectrophotometer and mass spectrophotometer.

Unit-II: Techniques - II

Bioseparation Studies: Qualitative and Quantitative analysis using electrophoresis, chromatography, centrifugation, PCR and Base sequencing.

Units-III & IV

Environmental Science

1. Scope and relevance of Environmental Science, Atmosphere, Lithosphere and Hydrosphere.
2. Conventional and Non Conventional sources of energy.
3. Ecosystem: Types and Functions, Plant Succession and Phytogeography.
4. Forests: Their importance, causes of their depletion and degradation, conservation and their management.
5. Biological diversity: their types, species richness, hot spot of world and India, Rare endangered, vulnerable, threatened and endemic plant species.
6. General concept, definition and kinds of Pollution: Air, Water, Soil, Noise and Radiation Pollution.
7. Chemistry of modern Environmental Problems: Acid rain, Ozone layer depletion, Green house effect (Global Warming), Genetic Engineering and Environmental management.

8. Natural, Accidental and manmade disasters and their effects.
9. Toxicity of common hazardous chemicals in the Environment with special reference to Heavy metal and Pesticide toxicity.
10. Environmental Education: their planning and management for sustainable development.
Environment Protection laws in India and their enforcement.

Project Work: Submission and presentation of Review article on the specialized field.