

**RABINDRANATH TAGORE UNIVERSITY**  
**SYLLABUS OF COURSE WORK OF Ph.D. (Sc.)**  
**DEPARTMENT OF BOTANY**

**Optional Paper- Plant Taxonomy**

**Code: Bot-OPT**

**Credit 4 (20 lectures)**

**Marks = 100**

**UNIT-I:** Taxonomy and Systematics- Basic components of taxonomy, advancement levels of taxonomy; Digital databases of Plant Taxonomy; Post-Darwinian and APG systems of Classification.

**UNIT-II:** Cladistic Taxonomy- Cladistic Concepts (Plesiomorphic and apomorphic characters; homology and analogy; parallelism and convergence; monophyly, paraphyly and polyphyly, diagrammatic representation of phylogenetic relationships), OETs (Operational Evolutionary Units), Character and their coding, Measurement of similarity, evaluating consensus tree.

**UNIT-III:** Character concepts; Variation and Speciation- Phenotypic plasticity, types of variation, variance analysis, isolating mechanism, speciation, vicariance biogeography and endemism; exotic elements in India; Process of Identification- Field work, Herbarium methods, Identification (taxonomic literature, taxonomic keys, computers in identification).

**UNIT-IV:** Botanical Nomenclature- Principles of Nomenclature and codes; Names of taxa (genus, species, infraspecific categories); Rules of Priority and its limitation; Type concepts; Effective and Valid publication; author citation; names of hybrids, names of cultivated plants. Phenetic Taxonomy- Principles, OTUs, taxonomic characters and their coding, application of phenetic approaches in angiosperms.

## **Optional Paper- Ecology**

**Code: Bot-OPE**

**Credit 4 (20 lectures)**

**Marks = 100**

**Unit I:** Field Survey. Field Sampling (Soil, Plant and Water Samples), Safety measures during field visit/trip, Food security, Self-care, Avoid in fields, Care from wild animals, Procedure for collection of hazardous samples, First Aid in the fields. Physicochemical analysis of Soil, Water and Plant samples, Overview of phytosociological methods used in ecological study.

**Unit II:** Laboratory Maintenance and Lab Safety Measures, Code of conduct - While entering in the lab, While working with the chemicals, While working with the Instruments, While disposal of chemicals, Storage and disposal of Chemical Wastes, Hazardous wastes and Broken Glass wares. How to perform experiments and recording of observations, Proper maintenance of data book. Basic biostatistics for ecological research.

**Unit III:** Instrumentation- Microscopy: Principles and Applications of Phase contrast, Fluorescence, Microscope, Spectrophotometry and Chromatography: Principle and Applications of UV-VIS, Optical Rotatory Dispersion, Infrared spectroscopy, NMR, AAS, Fluorescence Spectrophotometer, TLC, GCMS, HPLC, LCMS, Luxmeter, Relative humidity, Max-Min thermometer, Rain Gauge, Soil and water analysis tool kit, Anemometer. Data analysis (MS-Excel & SPSS) and interpretation. Carbon sequestration and carbon stock analysis, Climate change and its relevant issues, Modern trends in ecosystem modeling. Practical applications of GIS, GPS and Remote Sensing in ecosystem analysis.

**Unit IV:** Biodiversity research in regional prospective. Degraded Ecosystem research in NE India-Current status and future direction. Use of algae, microbes and plants for remediation of degraded ecosystem, Stress Ecology- biotic and abiotic, Plant-animal and plant microbe interaction-key concept and methods of study. Biological methods for treatment of waste water and solid waste. Biodegradation - key concept, xenobiotics, parent compounds, intermediate products and toxicity assay, bioaccumulation, Ecological Risk Analysis.

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