Syllabus for Ph.D. Course Work
Institute of Environmental Studies **4 Credits**
Paper I - Research Methodology **(100 Marks)**

Unit -1

Chromatography - Principles and methodology of Chromatographic Techniques:
Paper, Thin layer, Column, Gel, Gas and HPLC; Microscopy- Optical and Phase Contrast
Spectrophotometry – Principles, Atomic Absorption Spectrophotometry, Flame Photometry

Unit -2

Methods of vegetation analysis, estimating plant biomass and productivity.
Isolation and enumeration of microorganisms from soil, water and air; Isolation of microorganisms from rhizosphere and root nodules. Sterilization, cultivation, maintenance and staining of microorganisms. Methods of water quality assessment.

Unit -3

Methods for study of biodiversity; diversity indices, dominance diversity curves.
Methods of analysis of soil microbial diversity, soil enzymes, soil carbon.
Techniques of micro propagation, bioremediation and phytoremediation.
Methods for biochemical estimation of protein, DNA, RNA and oil content.

Unit -4

Measures of central location and dispersion, probability, test of significance-t test for mean, difference between two means, variance and correlation coefficients, Chi-square test; Correlation and regression; Standard error of estimate, Analysis of Variance, ANOVA (one way, two way); Types of research methods: Principles of experimental design-randomization; replication and local control, types of experimental design-CRD, RBD, LSD.

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Paper II (Subject Specific) **(100 Marks)**

Unit -1
Ecosystem- structure, functions, processes, energy flow and productivity; ecological efficiencies; Ecosystem stability and regulation. Biogeochemical cycles, gaseous and sedimentary cycles. Man's impact on nutrient cycles. Population regulation, ecological succession. Approaches of ecological restoration and ecological engineering.

Unit -2
Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution; Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
The scope of environmental biotechnology; Biotechnological approaches for solid waste management, Heavy metal pollution.

Unit -3
Biodiversity uses and ecosystem services; threats to biodiversity; Endangered and threatened species of India; Biodiversity assessment and monitoring; Biodiversity conservation.
Remote Sensing and Geographical Information Systems- Techniques, basic concept and applications in ecology and resource management, GPS. Basic concepts of aerial photography and photogrammetry.

Unit -4
Global climate change; Tools to study global climate change; Mitigation strategies for global warming; Indian initiative for mitigating global climate change. Concept and strategies of Sustainable development; Resource management, Disaster management.
Policy Frameworks on environment in India; Basic concepts of Environmental Planning; Environmental Impact Assessment and risk analysis. Scope and importance of ecological economics.