Semester VIII

Course Title: Applied Ecology

Assessment	
Maximum marks	100
Continuous Internal Assessment (CIA)	25
Mid Semester Exam (MSE)	25
End Semester Exam (ESE)	50
Passing Marks	50

Course Objectives

The course provides student with a thorough understanding and appreciation of ecosystems. The biotic and abiotic components; interactions; physical drivers and remote sensing that define major ecosystem types are described. It is imperative to have a firm grasp on the applicability of general ecological concepts (already dealt in IV sem).

Theory

Unit 1: Concept and Components of Applied Ecology

Introduction; utilization of ecological principles in relation to biotic and abiotic factors; natural systems versus anthropogenically influenced systems; effects of different land use changes on hydrological, chemical and biological processes in air, soil and water; Anthropogenic threats to aquatic ecosystems and associated hydro-morphological changes (construction of dams and dikes; drainage of land); current environmental issues; global carbon budget and cycling; waste and climate change.

Unit 2: Ecotoxicology and Ecological Restoration

Basics of ecotoxicology- sources and fate of toxicants; their routes of exposure, bioavailability, dose-response, biomarkers, risk assessment and biomagnifications; regulation, and monitoring of pollutants; recent developments in bioremediation, their advantages and disadvantages; ecological restoration of degraded ecosystems- methods and strategies for terrestrial and aquatic ecosystems; restoration of biological diversity- Augmentation by reintroduction and introduction of species.

t 3: Remote Sensing and Geographic Information System

ciples and concepts; spectral characteristic and reflectance of earth's surface features ks, soil, vegetation, water) in different wavelength regions of electromagnetic spectrum; plication of remote sensing and GIS in ecology- monitoring and natural resource nagement (vegetation mapping and forest resources management).

it 4: Ecological modelling

ndamentals of modelling, different models, statistical computing; skills and resources, ocess of formulating models of natural systems and confronting them with data; troduction to modelling platforms- R modelling platform; case studies using current pproaches for building, fitting and application of models.

nit 5: Society and Ecology

Sustainable development- goals, targets and challenges (energy, carbon and climate); Ecological literacy for the development of sustainable society with emphasis on population policy, carrying capacity and eco-footprint; Sustainable and organic agriculture; farm as an ecosystem- pest control, integrated crop and livestock production, and marketing systems; Fundamental concepts and strategies of industrial ecology– Material substitution and De-materialization (reuse and recycling).

Applied Ecology Lab

Assessment	
Max. Marks	50
Continuous Internal Assessment (CIA)	25
End Semester Exam (ESE)	25
Passing Marks	25

Practicals

1. Study of forest vegetation and structure by applying suitable sampling methods and vegetation indices.
2. Quantification of the soil carbon content using titration methods.
3. Quantification of major nutrients (Nitrogen and Phosphorus) of soil by titration.

4. To determine the soil moisture content on a dry weight basis. To measure the compactness and porosity of different soils (agricultural land, barren land or degraded compact soils).
5. To analyze the inorganic and organic contaminants from soil or water system for toxicity study.
6. To study and calculate of exposure risk of pollutants (air/water/soil) to human health using data from clinical centres.
7. To study the enrichment and isolation of bacteria that degrade 2,4-Dichlorophenoxyacetic acid.
8. To demonstrate the ability of a soil bacterial community to adapt to imposed metal stress.
9. To detect *E. coli* in water by the most probable number (MPN) method.
10. To determine the biodegradation rate of a synthetic phenol or other phenolic compounds.
11. To demonstrate, introduction and installation of R software platform.
12. To demonstrate hands on R software, data entry, basic plotting and basic calculation.
13. Practical modelling exercises as per theory classes.
14. Demonstration and hand on remote sensing sensors; data extraction and data processing.
15. Remote sensing imagery resources and image processing and interpretation.
16. Analysis of RS and GIS data and interpreting the data for modelling applications.

SUGGESTED READINGS:

1. Singh JS, Singh SP, Gupta SR (2014) Ecology Environmental Science and Conservation, S Chand & Co. New Delhi.
2. Barbour MG, Burk JH, Pitts WD (1987) 2nd Edition Terrestrial Plant Ecology, The Benzamin/Cummings Publishing Company, San Francisco.
3. Omasa K, Nouchi I, De Kok LJ (2005) Plant responses to air pollution and global change, Springer Japan, Tokyo.
4. Gurjar BR, Molina T, Ojha CSP (2010) Air Pollution Health and Environmental Impacts, CRC Press, Boca Raton, U.S.A.

5. Singh JS (1993) Restoration of degraded land: concepts & strategies. Rastogi Publications, Meerut.

6. Smith RL (2001) Ecology and Field Biology, 6th edition. Benjamin Cummings.

7. Soetaert K and Herman PMJ (2009) A Practical Guide to Ecological Modelling. Springer Publication.

8. Sven Erik Jorgensen and Brian D Fath (2011) Fundamentals of Ecological Modelling Academic Press. Elsevier.

9. Michael H, PhD, Dong (2014) An Introduction to Environmental Toxicology, 3rd Edition, Create space Independent Pub.

10. Basudeb Bhatta (2011) Remote Sensing and GIS, Oxford University Press, 2nd edition.

11. Lillesand, Kiefer and Chipman (2011) Remote Sensing and Image Interpretation. Wiley, Sixth edition.