BACHELORS WITH BOTANY AS MAJOR (CT - I)
7th SEMESTER

BOT722J1: BOTANY _ PLANT ECOLOGY

CREDITS: THEORY: 3; PRACTICALS: 1

***OBJECTIVES**:*

The course aims to familiarize the students with the fundamental principles of the discipline of ecology and the processes and interactions that shape the diversity, distribution, and abundance of organisms at multiple spatio-temporal scales.

***LEARNING OUTCOMES**:*

- *Appreciate the scope of scientific inquiry in the field of ecology in order to better understand the natural world.*
- *Develop an understanding of the structural and functional attributes of ecological entities at various levels of organizations, such as population, community and ecosystem.*
- *Become familiar with the variety of ways that organisms interact and evolve, communities develop and ecosystems' function and respond to biotic and abiotic environment.*
- *Learn techniques for collecting and analysing field data and conduct laboratory experiments on different aspects of ecology.*

THEORY (3 CREDITS)

UNIT-I

The Environment: Physical environment (atmosphere: composition, layering; lithosphere: properties of Earth's crust, mantle and core; hydrosphere: hydrologic cycle)
Habitat and Niche: Concept of habitat and niche; fundamental and realized niche, niche parameters, factors affecting niche parameters, niche width and overlap; ; resource partitioning; character displacement. Life history strategies (r and K selection); concept of metapopulation – demes

UNIT-II

Population Ecology: Characteristics of a population (Fecundity, mortality); presentation of demographic data (life tables and survivorship curves); population growth (Geometric, exponential and logistic population growth); population regulation: intraspecific competition and self-thinning in populations; age structure of populations.
Species Interactions: Types of interactions, interspecific competition, herbivory, parasitism and mutualism.

Community Ecology: Nature of communities (individualistic and organismic views); community characteristics; Species diversity (richness and evenness), latitudinal and elevational species diversity gradients; parametric and non-parametric measures of species diversity; ecotones and edge effect.
Ecological Succession: Types; mechanisms; changes involved in succession; concept and theories related to characterization of climax.

UNIT-III

Ecosystem Ecology: Ecosystem concept; structure (biotic and abiotic components, food chain, food web; trophic cascades; ecosystem function; energy flow and mineral cycling (C,N,P, reservoirs, fluxes, transformations and processes); primary production - Gross and Net Primary productivity; variations in net productivity across ecosystems; factors controlling primary productivity in terrestrial and aquatic ecosystems; decomposition (process of litter decompositions; influence of substrate quality, biotic and abiotic factors on litter decomposition).

Biogeography: Theory of island biogeography: immigration, extinction and equilibrium; species-area relationships, recent modifications of island biogeography theory; non-equilibrium ecology (basic idea); Major terrestrial biomes and aquatic ecosystems-general characteristics; biogeographical zones of India.

PRACTICAL EXERCISES (1 CREDIT):

1. Determining the minimum quadrat size using species-area curve approach.
2. Using random sampling to measure the frequency, density and abundance of various different species in a given plant community.
3. Assessment of soil texture, porosity, aggregate stability and bulk density.
4. Determining the soil pH and its ecological implications.
5. Determining the level of dissolved oxygen in given water samples and primary productivity on the basis of light-dark bottle methods.
6. Assessing primary productivity using biomass harvest approach.

SUGGESTED READINGS:

1. J.S. Singh, S.P. Sigh, S.R. Gupta (2014) Ecology, Environmental Sciences and Conservation. S. Chand & Company Pvt. Ltd. 7361, New Delhi
2. Paul A Keddy (2017) Plant Ecology: Origins, Processes and Consequences. Cambridge University Press
3. Manuel C. Molles Jr. (2015) Ecology: Concepts and Applications. McGraw-Hill Education
4. Eugene P. Odum and Gary W. Barrett (2017) Fundamentals of Ecology (5^{th} Edition) Cengage India Private Limited
5. Michael Begon, Colin R. Townsend, and John L. Harper (2005) Ecology: From Individuals to Ecosystems(4^{th}edition) Wiley-Blackwell.
6. Thomas M. Smith and Robert L. Smith (2015) Elements of Ecology (9^{th} Edition) Pearson Education India.
7. Michael L. Cain, William D. Bowman, and Sally D. Hacker (2017) Ecology (4^{th} edition) OUP USA.
8. F. Stuart Chapin III, Pamela A. Matson, and Peter M. Vitousek (2011) Principles of Terrestrial Ecosystem Ecology. Springer.
9. C. Barry Cox, Peter D. Moore, and Richard J. Ladle (2016) Biogeography: An Ecological and Evolutionary Approach. Wiley-Blackwell.

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