

Department of Botany, Govt. Degree College Baramulla (Autonomous)

(NAAC Re-accredited Grade A and CPE status)

Syllabus 7th Semester (4 years Honours with Research Degree Course)

Subject: Botany

Title: Advanced Ecology and Biogeography (Credits: 4 theory)

Paper Code: BOTR1722M

No. of Contact hours: 64

Course Learning Objectives (CLOs)

By the end of the course, students will be able to:

1. **Explain and analyze** population characteristics, habitat, niche, and species interaction dynamics within ecological systems.
2. **Describe and evaluate** community structure, diversity patterns, succession processes, and factors affecting community stability.
3. **Comprehend and assess** ecosystem structure, energy flow, productivity, decomposition, soil processes, and human impacts on ecosystems.
4. **Interpret and apply** biogeographic concepts, diversity gradients, and ecological theories to explain species distribution and ecosystem resilience.

Unit I: Population Ecology

Population characteristics: population growth curves; population regulation; life history strategies (R and K selection); concept of meta-population – demes and dispersal, inter-demic extinctions, age structured populations.

Habitat and niche: concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

Species interactions (competition, herbivory, carnivory, pollination, symbiosis).

Unit II: Community Ecology

Nature of communities: community structure and attributes; species diversity and its measurement, richness and evenness; Community development: temporal changes (cyclic and non-cyclic)

Mechanism of ecological succession: (relay floristics and initial floristic composition; facilitation, tolerance and inhibition models, resource ratio hypothesis); changes in ecosystem properties, concept of climax and its characterization.

Community stability: diversity- disturbance, and diversity stability relationships; plant invasion- process and invasive species.

Unit III: Ecosystem Organization

Biotic component: food chains, food web, trophic cascades; abiotic component-soil development, soil classification.

Ecosystem function: primary production (gross and net primary production, controlling factors and methods of measurement), energy flow pathways, ecological

efficiencies; litter accumulation and decomposition (mechanisms, substrate quality and climatic factors).

Anthropogenic pressures: Land use and land-cover change; Climate change, pollution and its control (including phytoremediation), Environmental Impact Assessment.

Unit IV: Biogeography

Phytogeography: concept, Phytogeographic regions of the world and India.

Soil types of India; Climatic regions of India.

Species abundance distribution, diversity patterns (latitudinal gradient- contributory factors and explanatory theories);

Equilibrium Ecology: Characteristics of equilibrium and non-equilibrium systems; Resilience theory and applications;

Biogeography: MacArthur and Wilson's Island biogeography equilibrium theory- limitations and modifications; colonization vs. extinction; species area relationship.

Biomes: types (terrestrial and aquatic) - distribution and unique features

Suggested Readings

- 1 Singh. J.S., 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* (5th Edition) Cengage India Private Limited.
5. Michael Begon, Colin R. Townsend, and John L. Harper (2005) *Ecology: From Individuals to Ecosystems* (4th edition) Wiley-Blackwell.
6. Thomas M. Smith and Robert L. Smith (2015) *Elements of Ecology* (9th Edition) Pearson Education India.
7. Michael L. Cain, William D. Bowman, and Sally D. Hacker (2017) *Ecology* (4th edition) Oxford University Press, USA.
8. Stuart F. Chapin III, Pamela A. Matson, and Peter M. Vitousek (2011) *Principles of Terrestrial Ecosystem Ecology*. Springer.
9. Barry C. Cox, Peter D. Moore, and Richard J. Ladle (2016) *Biogeography: An Ecological and Evolutionary Approach*. Wiley-Blackwell.