DISCIPLINE SPECIFIC CORE COURSE –9 :

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Functional Ecology (BS-DSC-303)	**4**	**2**	**0**	**2**	Class XII pass with Biology and chemistry, as one of the papers in Class XII	**NA**

Learning Objectives

The Learning Objectives of this course are as follows:

- To understand the basic concepts in ecology and levels of organization in an ecosystem
- Obtain a basic understanding of the various aspects of a 'population' and interactions among individuals of the same as well as different species.
- To understand the structure and functions of the community and its processes.
- To comprehend the components of an ecosystem, energy flow and nutrient cycling.
- To appreciate the applied aspects required in restoration of degraded ecosystems.
- To understand trade-offs in life history characteristics of organisms and various behaviors shownby organisms.

Learning outcomes

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

- To comprehend the principles and applications of ecology and ecosystem.
- Know about the importance of ecosystem in general and the effects of changes inecosystem.
- Understand the techniques used for the quantitative and qualitative estimation of bioticand abiotic components of an ecosystem.
- Gain knowledge about the density, frequency and diversity of species in an ecosystem.
- Understand about key interactions between organisms like competition , predation ,parasitism etc.
- Participate in citizen science initiatives from an ecological perspective

SYLLABUS OF DSC-9

Theory

Unit 1: Introduction to Ecology **03 Hours**

History of ecology, Autecology and synecology, levels of Organisation, Laws of limiting factors (Liebig's law of minimum, Shelford's law of tolerance), ecological range (Eury and Steno).

Unit 2: Population Ecology **12 Hours**

Population: Unitary and Modular populations; Metapopulation: Density, natality, mortality, life tables, fecundity tables, survivorship curves, sex ratio, age pyramids, dispersal and dispersion; carrying capacity, population dynamics (exponential and logistic growth equation and patterns), r and K selection, density-dependent and independent population regulation; Niche concept, Population interactions: Positive and negative interactions; Competition, Gause's Principle for competition with laboratory and field examples, Lotka-Volterra equation for predation.

Unit 3: Community Ecology 08 Hours

Community structure: Dominance, diversity, species richness, abundance, stratification; Diversity indices; Ecotone and edge effect; Community dynamics (succession): Primary and secondary succession, Succession on a bare rock. Climax: monoclimax and polyclimax concepts (preclimax, postclimax, disclimax etc.). Concept of keystone, indicator and flagship species with plant and animal examples.

Unit 4: Ecosystem Ecology 07 Hours

Concept, components, and types of ecosystems (example of Pond ecosystem in detail showing abiotic and biotic components), BOD, eutrophication. Energy flow (Grazing and Detritus food chain), linear and Y-shaped energy flow model, black box model, food web. Ecological pyramids and Ecological efficiencies.

PRACTICALS

CREDITS: 2 **Total weeks: 60 Hours**

1. To understand the principle and working of ecological instruments such as Anemometer, Hygrometer, Luxmeter, Rain gauge, turbidity meter, pH meter, Soil thermometer, Min-Max thermometer.
2. To study biotic interactions using specimens/ photographs/ permanent slides of Parasitic angiosperms, Saprophytic angiosperms, root nodules, velamen roots, lichens , corals
3. 3.To study plant-microbe interactions by preparing temporary stained mounts of VAM fungi / mycorrhizal roots/ root nodules.
4. Mark recapture method for determining population density of animals
5. 5.To determine a minimal quadrat area for sampling
6. To determine density, frequency and abundance of herbaceous vegetation by quadrat method
7. To estimate dissolved oxygen content of a given water sample using Winkler's method.
8. Plotting of survivorship curves from hypothetical life table data.

REFERENCES

1. Barrick, M., Odum, E. P., Barrett, G. W., (2005).*Fundamentals of Ecology*.5th Edition.Cengage Learning.
2. Smith, T. M..& Smith, R. L.(2012). *Elements of Ecology* 8th Edition. Pearson.
3. Ricklefs, R. E., & Miller, G. L., (2000).*Ecology*, 4thEdition W.H. Freeman.
4. Sharma, P. D. (2017). *Ecology and Environment*.13th Edition. Meerut: Rastogi Publications.

MOOCs

1. 'Ecology: Ecosystem Dynamics and Conservation from American Museum of Natural History on Coursera https://www.classcentral.com/course/coursera-ecology- ecosystem-dynamics-and- conservation-10618
2. https://alison.com/course/diploma-in-ecology-studies
3. https://swayam.gov.in/ Any ecology based online course that may be available during the semester, depending on its relevance to the present syllabus