

# **MINOR COURSES**

## **GENERAL ZOOLOGY**

**FOUNDATIONS OF ENVIRONMENTAL BIOLOGY AND ANIMAL BEHAVIOR**

Programme	B.Sc. Zoology				
Type of Course	Minor				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total hours
	4	3		2	75
Pre-requisites	+2 /VHSC Biology or equivalent online courses				
Course objectives	The student develops understanding in the organization and functioning of ecosystems, the concept of population, population interactions, biogeochemical cycle, behavioural patterns of animals, their social organisation, etc.				

### Course outcome

CO	CO statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe the various components of ecosystem along with their interactions and flow of energy in ecosystem and the importance of productivity of ecosystem, food chain and food web, and types of biogeochemical cycles and their importance [PSO2]	U	F&C	
CO2	Identify the terms related to population, biotic community, types of community interactions; the concepts of k and r species and Keystone species, characteristics of habitat and its types, policies and laws for environmental protection.. [PSO1]	R	F	
CO3	Describe innate behaviour and its components, concept of FAP, learned behaviour and its various types and examples, the concept of animal communication; the types of animal communication, emphasizing the relation between animal communication and social behaviour of animals. [PSO2]	U	F&C	
CO4	Describe sociobiology of different animals, the concept of social organisation in animals, and the concept of proximate factors[PSO2]	U	F&C	
CO5	Acquire skill in estimating ecological parameters like dissolved Oxygen, Carbondioxide, pH etc. . [PSO4]	Ap	C&P	
CO6	Compare the characteristics of different types of ecosystems, pattern of flow of materials and energy in ecosystem, etc.	U	F&C	

\* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

*Question paper pattern for external examination: Module 1 : short answer 3 x 3 = 9 marks, paragraph 1x 6 = 6 marks, Essay 1 x10 = 10 marks ; Module 2 : short answer 2 x 3= 6 marks, paragraph 2x 6 =12marks,; Module 3 : short answer 2 x 3= 6 marks, paragraph 3x 6 = 18 marks; Module 4 : short answer 3 x 3= 9 marks, paragraph 2 x 6 = 12 marks, Essay 1 x10 = 10 marks*

### **Module 1. Ecosystem (12hrs)**

**Unit 1: Introduction, Ecosystem & Energetics.(02 hrs)** Fundamentals of Environmental Sciences. Scope of Environmental Science. Ecology as an inter-disciplinary science, Sub division of Ecology- Autoecology, Synecology, Scope of Ecology.

**Unit 2: Ecosystem-Concept, Structure and functions:(08 hrs)** Structures - Biotic and Abiotic components. Functions - Energy flow in ecosystems & law of thermodynamics, energy flow models ,energy transfer & transformations.

Productivity of ecosystem- primary (GPP, NPP, NCP), secondary productivity, standing crop, material removed and production rate. Ecological efficiencies. Trophic structures and ecological pyramids.Trophic levels, food chains and food webs.

**Unit 3: Biogeochemical cycles(02hrs)** -Concept and Basic types. Gaseous cycle -carbon & nitrogen cycles, Sedimentary cycle- phosphorus cycle. Decomposition and transformation.

## **Module 2: Ecosystem classification and Habitat Ecology (11hrs)**

**Unit 1: Basics of Ecosystem classification(05 hrs):** *Types of Ecosystem:* Desert (hot and cold), forest, rangeland, wetlands, lotic, lentic, estuarine (mangrove), Oceanic.*Biomes:* Concept, classification and distribution. Characteristics of different biomes (mention): Tundra, Taiga, Grassland, Deciduous forest biome, Highland Icy Alpine Biome, Chaparral, Savanna, Tropical Rain forest.

### **Unit 2: Habitat ecology: (06hrs)**

Terrestrial ecology -Tropical wet evergreen, tropical dry deciduous forests- its characteristics. Faunal characteristics & adaptations.

Freshwater ecology- Lentic &lotic habitats- its characteristics. Faunal characteristics & adaptations.

Marine ecology- Biotic divisions and its characteristics. Pelagic realm-Plantonic& nektonic adaptations. Benthic realm-littoral & Abyssal adaptations. Adaptations of animals on sandy, muddy & rocky seashore.

## **Module 3: Population, Community and Habitat (10 hrs)**

**Unit 1: Population Ecology- (05hrs)** Characteristics of population, - Biotic potential, concept of carrying capacity, population growth (S and J shaped curves) and regulations. Population fluctuations, dispersion and metapopulation. Concept of 'r' and 'k' species. Keystone species.

**Unit 2: Community ecology: (03 hrs)**Biotic community: Definition, community concept, types and interaction - predation, herbivory, parasitism and allelopathy.

### **Unit 3 :Overview of Environmental Laws in India( 02hrs)**

National Water Policy, 2002; National Environmental Policy, 2006; The Plastic Waste Management Rules, 2016; The Solid Waste Management Rules, 2016; The e-waste (Management) Rules 2016.

## **Module 4: Animal Behaviour (12hrs)**

**Unit 1: Foundations of Ethology(02hrs)**-Introduction and historical development of ethology, Key figures in ethological approach, its scope and relation with other branches of biology.

**Unit 2: Innate/Stereotyped behaviour (02hrs)**- orientation -taxes, kinesis, simple reflexes, instincts, Fixed action patterns (FAPs) and releaser stimuli. Examples of instinctive behaviours in different species.

**Unit 3: Acquired behaviour/Learned behaviour (02hrs):** Habituation, Conditioned reflex, latent learning, Imprinting, Habituation and Trial and error and learning with suitable example.

**Unit 4.: Types of communication (03 hrs)** 1.Visual 2.Auditory3.Tactile 4.Chemical with suitable examples.

**Unit 5: Sociobiology (03hrs)** Social organization in Animals :Termites and Elephants.

Proximate factors.

## **Module 5: PRACTICALS (1 CREDIT, 30 Hrs)**

### **MANDATORY EXPERIMENTS**

22. Estimation of dissolved oxygen in water sample using winklers method (Pond water, well-water, Tap water). Discuss the ecological significance of dissolved oxygen in water.
23. Identify soil micro-organisms in soil samples collected from different localities-by floatation process & Berlese funnel method. Discuss the ecological significance of soil characteristics.
24. Demonstration of Phototaxis by earthworm
25. Demonstration of alarm pheromones in ants

**Of the remaining experiments any 4 can be selected by the Institution from the following list. Two experiments other than the listed should be selected by the Supervising teacher and introduced to the students.**

26. Estimation of dissolved CO<sub>2</sub> in water sample (Pond water, well-water, Tap water). Discuss the ecological significance of dissolved CO<sub>2</sub> in water.
27. Estimation of PH of water (Pond water, well-water, Tap water) Discuss the ecological significance of PH characteristics.
28. Locomotory behavior of dipteran larvae on different types of substrata
29. Determination of salinity of water
30. Determination of moisture content in different types of soil (sand, clay, laterite, etc.)
31. Estimation of water holding capacity of different types of soil.(sand, clay, laterite, etc.)

**Field study:** A). Conduct a field trip to assess the biodiversity of a chosen ecosystem- by preparation of food chains and food web. Add a note on its significance, B) A visit to natural habitat of wild animals or birds, or zoo, aviary etc, and observation of behaviour patterns of those animals; and submit a detailed field study report at the time of semester end practical examination.

### **REFERENCES:**

#### **ENVIRONMENTAL BIOLOGY**

- Odum, E. P. & Barrett. G. W. 2004- Fundamentals of Ecology 5th Ed. -Brooks/ Cole 624pp

- Goyal, M. K, 2020: .Essential Environment - Shri Vinod Pusstak Mandir 351pp
- Miller, G. T. & Spoolman, S.. 2010 Environmental Science 13 Ed. Brooks/ Cole 452pp
- Miller, G. T. Jr 2017 . Living in the Environment - Brools/ Cole 832pp
- Molles. M. 2015 - Ecology: Concepts and Applications McGraw-Hill Education 592pp
- Townsend, C. R. Begon, M. and Harpe, J. L. 2008 Essentials of Ecology John Willey & Sons 532pp.
- Cunningham, W. P & Cunningham, M. A Principles of Environmental Science McGraw-Hill Education 410pp

#### ANIMAL BEHAVIOUR

- Dugatkin, L. A. 2020 Principles of Animal Behavior 4th Ed. - University of Chicago Press 576pp
- Manning, O.2016 Introduction to Animal behaviour South Asia Ed, 6th Ed. Cambridge University Press, India 456pp
- Mathur, R. 2022 Animal Behaviour -Visionias 676pp
- Alcock, J. 2005 Animal Behavior - SP Oxford University Press 556pp

#### Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PS O5	PSO 6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1		3					3						
CO 2	3						3						
CO 3		3					3						
CO 4		3					3						
CO 5				3					3				
CO 6		3					3						