SUBJECT: ZOOLOGY
COURSE: MINOR 2
ECOLOGY AND ANIMAL BEHAVIOUR

Difficulty level: 100 Mode of instruction: Lecture and Practical

COURSE OBJECTIVES

Theory:

1. To form an understanding about the different ecological levels, components, and their functioning through the study of basic concepts, experiments, and laws.
2. To sensitize students about conservation of wildlife resources.
3. To form a preliminary idea about animal behaviour through the study of different modes of behaviour including behavioural patterns, social behaviour, communication, and biological rhythms.

Practical:

1. To train students to perform calculations of selected biodiversity indices, identification of zooplanktons and determination of selected parameters from water samples.
2. To give a cursory idea of the selected methods of the study of animal behaviour.

THEORY (Credits 4)

Group A: Ecology

Unit 1: Introduction to Ecology
Levels of organization; Laws of limiting factors: Liebig's Law of Minimum, Shelford's Law of Tolerance, Blackman's Law of Limiting factors.

Unit 2: Population
Population attributes: Density, natality, mortality, life tables, survivorship curves, age pyramids, exponential and logistic growth, r and k strategies; Population interactions; Gause's Principle of competitive exclusion.

Unit 3: Community
Community characteristics: species richness, dominance, diversity, abundance; ecotone and edge effect, ecotype; concept of ecological succession with hydrosere as example; theories pertaining to climax community-monoclimax, polyclimax and climax pattern theory.

Unit 4: Ecosystem
Definition of ecosystem; food chain: Detritus and grazing food chains; food web; energy flow models: single channel and Y shaped; ecological pyramids-pyramid of number, biomass and energy.

Unit 5: Wildlife & Conservation
Wildlife conservation (ideas of in-situ and ex-situ conservation); National Park, Wildlife sanctuary, Biosphere reserve; Project Tiger.

Group B: Animal Behaviour

Unit 1: Introduction to Animal Behaviour
Origin, history, and scope of ethology; proximate and ultimate causes of behaviour.

Unit 2: Patterns of Behaviour
Innate behaviour: concept of sign stimulus, fixed action pattern, innate releasing mechanism; study of egg rolling behaviour of greylag geese; learnt behaviour: classical conditioning (Pavlov's experiment), habituation, imprinting (Lorenz's experiment).

Unit 3: Social Behaviour
Altruism and kin selection, Hamilton's rule; Eusociality in honey bees.

Unit 4: Animal Communication
Round dance and waggle dance in honey bees; communication by pheromones in insects; echolocation in marine mammals.

Unit 5: Biological Rhythms
Types: circadian rhythms, tidal rhythms, lunar rhythms, circannual rhythms; hibernation and aestivation (brief discussion); biological clocks: concept of entrainment, *zeitzeber*, free running period, significance of biological clocks.

PRACTICAL (Credits 2)

Group A: Ecology

1. Calculation of Sorenson's Similarity & Shannon-Weiner diversity indices for a natural/hypothetical community.
2. Identification of zooplankton (from permanent slides/microphotographs): *Daphnia*, *Cyclops*, *Cypris*, *Anopheles* larva, *Culex* larva.
3. Estimation of dissolved oxygen content (Winkler's method) and free CO_2 of water sample.

Group B: Animal Behaviour

1. Identification of different types of bird nests (from filed study/photographs): cup nest, cavity nest, pendant nest, platform nest, floating nest.
2. Study of aggressive behaviour in *Betta* sp. (live demonstration/videographs).
3. Study of learning behaviour in mice through T maze (live demonstration/videographs).

SUGGESTED READINGS

- Smith and Smith (2012) Elements of Ecology. Pearson
- Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
- Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
- Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
- Robert Leo Smith Ecology and field biology Harper and Row publisher
- Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres
- David McFarland, Animal Behaviour, Pitman Publishing Limited, London, UK.
- Manning, A. and Dawkins, M. S, An Introduction to Animal Behaviour, Cambridge,University Press, UK.
- John Alcock, Animal Behaviour, Sinauer Associate Inc., USA.
- Paul W. Sherman and John Alcock, Exploring Animal Behaviour, Sinauer Associate Inc., Massachusetts, USA.
- Biological Rhythms: Vinod Kumar (2002) Narosa Publishing House, Delhi/ Springer-Verlag, Germany.