

# SYLLABUS OF ZOOLOGY (MINOR)

For 4-Year Undergraduate Programme Under  
NCCF, 2023



**Cooch Behar Panchanan Barma University**

Panchanan Nagar, Vivekananda Street, Cooch Behar,  
West Bengal - 736 101

# **3<sup>rd</sup> Semester**

**SUBJECT ZOOLOGY**  
**4 YEAR UG SYLLABUS\_CBPBU**  
**MINOR 3: ANIMAL DIVERSITY**

**Course Objectives:**

**Theory:**

1. To form a general understanding of the diversity of the Animal Kingdom through the study of general characters of each Phylum/Class.
2. To form an outline idea of the taxonomic classification of different non-chordate phyla and chordate classes through the study of classification scheme for each Phylum/Class.
3. To form an understanding of the body plan, structural adaptations, life history, physiological processes, behaviour and evolutionary relationships in different animals through the study of special topics included in each Phylum/Class.

**Practical:**

1. To be able to identify common and representative specimens from different Phyla/Classes through the study of identifying characters.
2. To be able to identify the body plan and developmental stages of common non-chordates through the study of histological sections and larval forms.
3. To acquire basic skills of dissection and mounting of invertebrate specimens.

## MINOR 3: ANIMAL DIVERSITY

### SUBJECT-ZOOLOGY

DIFFICULTY LEVEL: 200 MODE OF INSTRUCTION: LPT

#### THEORY (CREDITS 4)

#### Group A: Non -Chordates

##### **Unit 1: Kingdom Protista**

General characters and classification up to classes; Life cycle of *Plasmodium vivax*.

##### **Unit 2: Phylum Porifera**

General characters and classification up to classes; Canal System in Sycon.

##### **Unit 3: Phylum Cnidaria**

General characters and classification up to classes; Polymorphism in Hydrozoa.

##### **Unit 4: Phylum Platyhelminthes**

General characters and classification up to classes; Life history of *Taenia solium*.

##### **Unit 5: Phylum Nematoda**

General characters and classification up to classes; Life history of *Ascaris lumbricoides*.

##### **Unit 6: Phylum Annelida**

General characters and classification up to classes; Metamerism in Annelida.

##### **Unit 7: Phylum Arthropoda**

General characters and classification up to classes; Vision in Arthropoda.

##### **Unit 8: Phylum Mollusca**

General characters and classification up to classes; Respiration in *Pila globosa*.

##### **Unit 9: Phylum Echinodermata**

General characters and classification up to classes; Water-vascular system in *Asterias*.

#### Group B: Chordates

##### **Unit 1: Protochordates**

General features of Protochordata with examples.

##### **Unit 2: Agnatha**

General features of Agnatha and classification of cyclostomes up to classes

##### **Unit 3: Pisces**

General features and classification up to orders; Migration in fishes.

##### **Unit 4: Amphibia**

General features and classification up to orders; Parental care.

### **Unit 5: Reptiles**

General features and classification up to orders; Poisonous and non-poisonous snakes; Dos and don'ts after snake bite.

### **Unit 6: Aves**

General features and classification up to orders; Flight adaptations in birds.

### **Unit 7: Mammals**

General features and classification up to orders; Dentition in mammals.

*[Note: Classification of invertebrates to be followed from Invertebrate Zoology by Ruppert and Barnes VI edition (1987, 1994) Saunders College Pub, except for Protozoa (American Association of Protozoologist ref: Levine 1980) and Porifera (Brusca and Brusca 2002; IV edition. Invertebrate Zoology). For chordates classification from Young, J. Z. (2004), The Life of Vertebrates to be followed except fish (Talwar and Jhingran, 1991)]*

## **PRACTICAL (CREDITS 2)**

**1. Identification with reasons following specimens** (Preserved specimens/models/photographs as available to be used):

**Non-Chordates:** *Amoeba, Paramecium, Scypha, Aurelia, Metridium, Taenia solium, Ascaris lumbricoides, Nereis, Pheretima, Hirudinaria, Macrobrachium, Cyclops, Daphnia, Leptocoriza, Limulus, Julus, Scolopendra, Peripatus, Chiton, Achatina, Loligo, Octopus, Asterias, Echinus.*

**Chordates:** *Balanoglossus, Branchiostoma, Ascidia, Petromyzon, Scoliodon, Labeo, Catla, Channa, Anabus, Heteropneustes, Clarias, Bufo, Hyla, Chamaeleo, Naja, Columba, Cavia.*

**2. Study of following Permanent Slides** (Permanent slides/photographs as available to be used):

CS of sponges (syconoid and leuconoid), LS of *Metridium*, CS of *Ascaris* (male & female) through gonadal region.

Larvae: trochophore, glochidium, nauplius, echinopluteus, axolotl.

**3. Staining/slide preparation/mounting:**

*Hydra, Obelia* colony, *Cyclops, Daphnia, Tubifex*, digestive system of cockroach, mouth parts of cockroach, Cycloid and Ctenoid scales, hyoid apparatus and pecten of fowl.

**4. Key for Identification of poisonous and non-poisonous snakes.**

## **SUGGESTED READINGS**

- Barnes, R.D. (1982). Invertebrate Zoology, V Edition. Holt Saunders International Edition.
- Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
- Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson
- Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
- Pough H. Vertebrate life, VIII Edition, Pearson International.
- Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
- Brusca, J.G. and Brusca, C.R. (2003) Invertebrates: Second Edition. Sinauer Associates, Inc., Sunderland.
- Jhingran, V.G. (1983). Fish and fisheries of India. (Revised second edition). Hindustan Publishing Corporation. New Delhi.

# **4<sup>th</sup> Semester**

**SUBJECT: ZOOLOGY**  
**COURSE: MINOR 4**  
**ECOLOGY AND ANIMAL BEHAVIOUR**

Difficulty level: 200

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, *zeitgeber*, 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<sub>2</sub> 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.