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**Semester - I**

| <b>BRANCH</b>                  | <b>Subject Title</b>                  | <b>Subject Code</b> |
|--------------------------------|---------------------------------------|---------------------|
| <b>B.Sc. (Zoology – Major)</b> | <b>ANIMAL DIVERSITY: NON-CHORDATA</b> | <b>ZOM1</b>         |

**Course learning outcomes:**

1. Learn about the importance of systemic, taxonomy and phylogeny to get a concrete idea of evolution of non-chordate phyla.
2. Understand the various morphological, anatomical structures and functions of animals of different phyla.
3. Get the knowledge about economic, ecological and medical significance of various animals in human welfare.
4. Understand the important parasites and their control measures.

**CONTENT**

**Unit - 1**

**Taxonomy, Phylogeny and Protozoa**

**1. Taxonomy**

- 1.1 Elementary knowledge of Zoological Nomenclature and International Code
- 1.2 Classification of Animal Kingdom upto Phylum of acoelomate and coelomate non-chordates according to Parker and Haswell 7th edition

**2. Phylogeny**

- 2.1 Definition and Examples

**3. Protozoa**

- 3.1 Phylum Protozoa: General characters of the phylum and outline classification up to classes with distinctive characters and suitable examples
- 3.2 Structure, life history and pathogenicity of malarial parasite (Plasmodium vivax)



### 3.3 Protozoa and disease

## **Unit - 2**

### **Porifera, Coelenterata**

#### **1. Porifera**

1.1 Phylum Porifera: General characters of the phylum and outline classification up to classes with distinctive characters and suitable examples

1.2 Type study of Sycon

1.3 Canal system of Sponges

#### **2. Coelenterata**

2.1 Phylum Coelenterata: General characters of the phylum and outline classification up to classes with distinctive characters and suitable examples

2.2 Type Study of Obelia

2.3 Corals and Coral reef formation

## **Unit - 3**

### **Platyhelminthes, Nematelminthes, annelida**

#### **1. Platyhelminthes**

1.1 Phylum Platyhelminthes: General characters of the phylum and outline classification up to classes with distinctive characters and suitable examples

1.2 External morphology and life history of Liver fluke

#### **2. Nematelminthes**

2.1 Phylum Nematelminthes: General characters of the phylum and outline classification up to classes with distinctive characters and suitable examples

2.2 Pathogenic symptoms of Nematodes and diseases

#### **3. Annelida**



3.1 Phylum Annelida: General Characters of the phylum and outline classification up to classes with distinctive characters and suitable examples

3.2 Type study of Earthworm (Pheretima)

3.3 Structure and significance of Trochophore larva

#### **Unit - 4**

##### **Arthropoda, Mollusca**

###### **1. Arthropoda**

1.1 Phylum Arthropoda: General Characters of the phylum and outline classification up to classes with distinctive characters and suitable examples

1.2 Type study of Prawn

1.3 Larval forms of crustacea

1.4 Insects as a vector of human disease

###### **2. Mollusca**

2.1 Phylum Mollusca: General characters of the phylum and outline classification up to classes with distinctive characters and suitable examples

2.2 Type study of Pila

2.3 Structure and Significance of Glochidium larva

#### **Unit - 5**

##### **Echinodermata, Hemichordata**

###### **1. Echinodermata**

1.1 Phylum Echinodermata: General characters of the phylum and outline classification up to classes with distinctive characters and suitable examples

1.2 External features and water vascular system of Starfish (Asterias)

1.3 Larval forms of Echinodermata

###### **2. Hemichordata**



2.1 Phylum Hemichordata: General characters of the phylum hemichordate and relationship with non-chordates and chordates

2.2. Balanoglossus - External morphology

2.3 Structure and significance of Tornaria larva

**PRACTICALS:-**

**Topics**

1. Study of museum specimens and slides relevant to the invertebrates.
2. Dissection (Demonstration Only -Through You Tube Video or Models)
  - a. Earthworm-Digestive system, Nervous system, Reproductive system or Charts)
  - b. Prawn-Nervous system and appendages
  - c. Pila-Nervous System
  - d. Cockroach-Digestive System, Nervous System (Easily available animal in residential areas which can be used for dissection and mounting)
3. Mounting
  - a. Locally available small non-chordates, their larvae
  - b. Mouth Parts of Insects
4. Examination of pond water for study of different kinds of microscopic non-chordate organisms
5. Economic Importance of any two Insects
6. Parasitic Adaptation of any one parasite.



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**Semester II**

| <b>BRANCH</b>                  | <b>Subject Title</b>                                                | <b>Subject Code</b> |
|--------------------------------|---------------------------------------------------------------------|---------------------|
| <b>B.Sc. (Zoology – Major)</b> | <b>CELL BIOLOGY, REPRODUCTIVE BIOLOGY AND DEVELOPMENTAL BIOLOGY</b> |                     |

**Course Learning outcomes (CLO)**

1. Develop deeper understanding of what life is and how it functions at cellular level
2. Understand the nature and basic concepts of Cell biology, Reproductive and Developmental biology
3. Understand structure and functions of cell membrane and cellular organelles
4. Understand the importance of latest reproductive trends, reproductive techniques to be applied for human welfare.
5. Understand the general patterns and sequential developmental stages during embryogenesis; and understand how the developmental processes lead to establishment of body plan of multi-cellular organisms.
6. Understand about the evolutionary development of various animals.

**Unit - I**

**Cell Biology**

- 1.1 Concept of Prokaryotic and Eukaryotic Cells, difference between Prokaryotic and Eukaryotic Cells
- 1.2 Structure and functions of Plasma membrane
- 1.3 Structure and functions of Golgi body, Mitochondria, Endoplasmic reticulum, Ribosome and Lysosome
- 1.4 Structure and functions of Nucleus
- 1.5 Structure and functions of Chromosome and special type of chromosomes-Lampbrush and Polytene chromosome
- 1.6 Cell cycle, Mitotic and Meiotic cell division and their significance



## **Unit - II**

### **Reproductive Biology**

- 1.1 Structure of Male reproductive system of Lepus
- 1.2 Structure of Female reproductive system of Lepus
- 1.3 Histology of Testis, and Ovary of Lepus
- 1.4 Gametogenesis- Spermatogenesis and oogenesis, difference between spermatogenesis and oogenesis
- 1.5 Types of Eggs-based on amount and distribution of yolk with examples

## **Unit - III**

### **Recent Assisted Reproductive Techniques (ART)**

- 1.1 Stem cell- Types and their uses
- 1.2 Gene bank, Sperm bank, Superovulation, Cryopreservation
- 1.3 In Vitro Fertilization (IVF) and Embryo Transfer (ET)), Zygote Intra Fallopian Transfer (ZIFT), Intracytoplasmic Sperm Injection (ICSI)
- 1.4 Placentation -Types, examples and functions
- 1.5 Placenta Banking-Placenta preservation benefits

## **Unit - IV**

### **Developmental Biology**

- 1.1 Fertilization
- 1.2 Embryonic development of frog up to the formation of three germinal layers
- 1.3 Fate map construction in frog
- 1.4 Metamorphosis of Tadpole Larva
- 1.5 Parthenogenesis



## **Unit - V**

### **Embryonic Development of Chick**

- 1.1 Structure of hen's egg
- 1.2 Embryonic Development of chick embryo up to the formation of primitive streak
- 1.3 Fate map construction in chick
- 1.4 Extra embryonic membrane of chick: Formation and functions.

## **Practical**

1. Spotting related to the cytology
  - a. Prokaryote and Eukaryote Cell
  - b. Stages of Mitotic cell division
  - c. Stages of Meiotic cell division
  - d. Lamp brush Chromosome
2. Spotting related to Reproductive biology and Embryology
  - a. T.S. Testis of Mammal
  - b. T.S. Ovary of Mammal
  - c. Developmental stages of Frog embryology
  - d. Developmental stages of Chick embryology
3. Squash preparation of onion root tip to understand the stages of Mitosis
4. Squash preparation of Grasshopper testis to understand the stages of Meiosis
5. Trypan Blue exclusion test of cell viability
6. Squash preparation of salivary gland chromosome from Chironomus larva / Drosophila.