



**Syllabus Of  
Zoology  
B.Sc. (Hons.)  
Course Code: EZO**

**NETAJI SUBHAS OPEN UNIVERSITY**

**1, Woodburn Park, Kolkata-700 020**

**Tel.: 2283-5157**

**TeleFax: 033-2283 5082**



## Course Structure for the Bachelor's Degree Programme Zoology (EZO)

**Course Code : EZO 01**

**Course Title : Animal Diversity—1 (Non-chordate)**

### **Block I : Non-chordate 1**

- Unit 1. Origin and diversity of Life
- Unit 2. Symmetry, Form and Life Style of Animals
- Unit 3. Protozoa—classification upto phylum, functional anatomy of paramoecium, Amoeba and Plasmodium
- Unit 4. Sponges—classification upto subclass, canal system regeneration and reproduction
- Unit 5. Cnidarians—classification upto subclass—functional anatomy of obelia, aurelia and sea anemone.
- Unit 6. Flatworm or Platyhelminthes—classification, functional anatomy of planaria, liver fluke and tapeworm
- Unit 7. Pseudocoelomates or animals with false body cavity.
- Unit 8. Molluscs—classification upto subclass, functional anatomy of pila, lamellidens and sepia.

### **Block II : Non-chordate-2**

- Unit 9. Annelida—classification upto subclass, functional anatomy of Nereis, earthworm and leach.
- Unit 10. Arthropoda—classification upto subclass, functional anatomy of Scorpion and Prawn.
- Unit 11. Arthropoda—classification of insecta upto order, functional anatomy and social behaviour of Apis
- Unit 12. Bryozoans—structural features and colonial organization
- Unit 13. Echinoderms—classification upto subclass, functional anatomy of Asterias and sea urchins
- Unit 14. Hemichordates—classification, structural organization, affinities and systematic position of Balanoglossus.

### **Suggested References :**

- Unit 1. Biology of Animals—Sinha, Adhikary and Ganguly (Vol. I & II & III)
- Unit 2. General Zoology—Villev, walker and Barnes (Saunders)
- Unit 3. Invertebrate Zoology—Ruppert and Barnes (Saunders)
- Unit 4. Biology of Non-chordate—H. C. Nigam

**Course Code : EZO 02**

**Course Title : Cytogenetics & Molecular Biology**



### **Block I : Cytogenetics**

- Unit 1. Ultrastructure of plasma membrane, mitochondria, golgi bodies and endoplasmic reticulum.
- Unit 2. Structure of chromosome
- Unit 3. Cell cycle
- Unit 4. DNA and RNA properties
- Unit 5. Genetics of replication, transcription and translation
- Unit 6. Inheritance of autosomal and sex-linked genes in man
- Unit 7. Linkage and recombination
- Unit 8. Sex determination in drosophila

### **Block II : Molecular Biology**

- Unit 9. Introduction to Genetic Engineering
- Unit 10. Enzymes, foreign DNA, cloning vector, DNA clone bank
- Unit 11. Basic concept of PCR, RADP, RELP.
- Unit 12. Monoclonal antibodies, genes for vaccines DNA probe in forensic science.

### **Suggested Reference :**

- Unit 1. Cell Biology — C. B. Power
- Unit 2. The Cell—De Robertis
- Unit 3. Cell Biology—Cooper
- Unit 4. Genetics—Strickberger
- Unit 5. Cytogenetics—P. K. Gupta
- Unit 6. Biotechnology—P. K. Gupta
- Unit 7. Molecular Biology & Biotechnology—R. A. Meyers

**Course Code : EZO 03**

**Course Title : Developmental Biology and Ethology**

### **Block I :**

- Unit 1. Gametogenesis
- Unit 2. Fertilisation
- Unit 3. Cleavage
- Unit 4. Morphogenic movements, gastrulation in chick
- Unit 5. Organiser concept
- Unit 6. Extra-embryonic membranes in chick
- Unit 7. Placentation in rodent
- Unit 8. Organogenesis of brain in chick.

### **Block II : Ethology**

- Unit 9. Animal behaviour—Introduction



- Unit 10. Instinctive and learned behaviour
- Unit 11. Feeding behaviour in fish
- Unit 12. Nesting and migratory behaviour in birds
- Unit 13. Parental care in fish and amphibia
- Unit 14. Social behaviour in insects

**Suggested References :**

- Unit 1. Introduction to Embryology—Balinsky
- Unit 2. Chordate Embryology—Verma & Agarwal
- Unit 3. Development Biology—Gilbert.
- Unit 4. An introduction to Animal Behaviour - Manning & Dawkins
- Unit 5. Animal Behaviour - Drickamer & Vessey

**Course Code : EZO 04**

**Course Title : Laboratory work on animal diversity**

**Block I : Dissection on non-chordates & chordates**

- Unit 1. Major dissections on non-chordate : Periplanata, Achatina
- Unit 2. Major dissection on chordate : Oreochromis, lata, white rab
- Unit 3. Minor dissection on non-chordate and chordate : Periplanata, labeo rohita

**Block II :**

- Unit 4. Identification of non-chordates
- Unit 5. Identification of chordates
- Unit 6. Identification of larval forms
- Unit 7. Adaptive features of specimens



**Course Code : EZO 05**

**Course Title : Animal Diversity - II (Chordates)**

**Block I : (Chordate-I)**

- Unit 1. Protochordates
- Unit 2. Vertebrates-fishes 1
- Unit 3. Vertebrates-fishes 2
- Unit 4. Amphibia
- Unit 5. Reptiles
- Unit 6. Birds
- Unit 7. Mammals
- Unit 8. Primates

**Block II : Animal Diversity- (Chordate 2)**

- Unit 9. Skeletal System
- Unit 10. Feeding and digestion



- Unit 11. Respiration
- Unit 12. Circulation
- Unit 13. Excretion
- Unit 14. Nervous system

**References :**

- Unit 1. Life of vertebrates — J. Z. Young (OUP)
- Unit 2. Vertebrate life — Pough & McFerland
- Unit 3. The Vertebrate body—Romer and Parsons
- Unit 4. Elements of Chordate Anatomy—Weichert (McGraw Hill)
- Unit 5. Vertebrate, Anatomy, Evolution and Adaptation—Kardong (McGraw Hill)
- Unit 6. Analysis of Vertebrate Structure—Hilderbrand (J. W. Wiley)

**Course Code : EZO 06**

**Course Title : Taxonomy and Evolution**

**Block I : Taxonomy and Animal distribution**

- Unit 1. Taxonomy
- Unit 2. Species concept
- Unit 3. Classification
- Unit 4. Time scale
- Unit 5. Zoogeography



**Block II : Evolution and Evolutionary Biology**

- Unit 6. Origin of life
- Unit 7. Evolution: modern concept
- Unit 8. Speciation
- Unit 9. Isolation
- Unit 10. Adaptive radiation
- Unit 11. Functional adaptation
- Unit 12. Origin of birds and mammals.

**References :**

- Unit 1. Taxonomy—Kapoor
- Unit 2. Principles of Systematic Zoology—Mayr and Ashlock.
- Unit 3. Zoogeography—Darlington
- Unit 4. Evolution-Strickberger
- Unit 5. Organic evolution—R. S. Lull
- Unit 6. Chordate evolution-Veer Baal Rastogi

**Course Code : EZO 07**

**Course Title : Ecology and Environmental Biology**



### **Block I : Ecology**

- Unit 1. Introduction
- Unit 2. Ecosystem ecology
- Unit 3. Ecological factors
- Unit 4. Population ecology
- Unit 5. Population growth
- Unit 6. Community ecology
- Unit 7. Bio diversity

### **Block II : Environmental Biology**

- Unit 8. Concept of environment
- Unit 9. Environmental degradation
- Unit 10. Global warming
- Unit 11. Environmental toxicology
- Unit 12. Appiko and Chipko movements
- Unit 13. Wildlife and habitats
- Unit 14. Concept of Conservation

### **References :**

- Unit 1. Fundamentals of Ecology—E.P. Odum (Natraj)
- Unit 2. Basic Ecology—E. P. Odum (Natraj)
- Unit 3. Environment and Ecology—P. D. Sharma
- Unit 4. Ecology—Verma and Agarwal
- Unit 5. Fundamentals of Ecology—M. C. Dash
- Unit 6. Environmental Biology—B. Mukherjee
- Unit 7. Wildlife of India—Majupuria (Ed.) (Tecpress Service)

**Course Code : EZO 08**

**Course Title : Lab Course II**

**Block I : Ecology, Environmental Biology, Embryology, Histology.**

**Unit 1. Ecology :** Concept and determination of common water quality parameters like alkalinity, free CO<sub>2</sub> and salinity. Concept and determination of common soil quality parameters like pH, organic carbon (titrimetrically) and lime potential. Identification of zooplankton and aquatic plants. Biodiversity indices—Species richness index, Shannon's index, Importance value index.

**Unit 2. Environmental biology :** Determination of LG<sub>50</sub> of any toxic substance on experimental model.

**Unit 3. Embryology :** Whole mount of chick embryo (24h, 48h, 72h, 96h). Drawing and labeling of whole mount.



**Unit 4. Histology :** Staining, mounting and identification of prepared sections of liver, pancreas, thyroid, testes, ovary and adrenal—drawing and labeling.

**Block II :**

**Unit 5. Genetics :** Meiotic chromosome study of grasshopper — from testes squash preparation

**Unit 6. Biochemistry :** General qualitative determination of proteins, lipids and carbohydrates. Identification of unknown sample.

**Unit 7. Identification with reason :** Limb bones of toad, Pigeon, Guinea pig. Vertebrae of toad, swine, pigeon, guinea pig. Skull of toad, pigeon, calotes, guinea pig, turtle, dog, poisonous snake.

**Unit 8. Taxonomy :** Morphometry of a common fish. Preparation of taxonomic key.

**Suggested References :**

1. Practical Zoology : Ghosh and Manna.
2. Practical Zoology : Asim Chatterjee (Bengali)

**Course Code : EZO 09**

**Course Title : Biophysics, Biometry**

**Block I : Biophysics**

- Unit 1. Introduction
- Unit 2. Thermodynamics
- Unit 3. Optical microscopy
- Unit 4. Phase and fluorescence microscopy
- Unit 5. TEM and SEM
- Unit 6. Chromatography and electrophoresis
- Unit 7. Cell fractionation



**Block II : Biometry**

- Unit 8. Sample and population
- Unit 9. Central tendencies
- Unit 10. Dispersion and sampling errors
- Unit 11. Probability
- Unit 12. Hypothesis testing
- Unit 13. Correlation and regression
- Unit 14. Desktop computing devices

**References :**

1. Techniques—P. K. Gupta.
2. Statistics —N. G. Das (2 volumes)

**Course Code : EZO 10**



**Course Title : Histology, Histochemistry and Endocrinology**

**Block I : Histology**

- Unit 1. Histological techniques
- Unit 2. Staining, H/E
- Unit 3. Dyes
- Unit 4. Liver histology and histochemistry
- Unit 5. Thyroid and pituitary histology and histochemistry
- Unit 6. Adrenal and kidney histology and histochemistry
- Unit 7. Testes and ovary histology and histochemistry
- Unit 8. PAS, Sudan Black B and Bromophenol blue.

**Block II : Endocrinology**

- Unit 9. Endocrine glands
- Unit 10. Molecular mechanism of hormone action
- Unit 11. Vertebrate hormones
- Unit 12. Neurosecretion
- Unit 13. Estrous and menstrual cycles
- Unit 14. Invertebrate hormones

**References :**

1. General Endocrinology—Turner & Bagnara
2. Histology—Ross & Reith (Williams & Wilkins)
3. Histochemistry—Baker & Baker
4. Histology & Histological Techniques—Bankroft (Churchill)
5. Text book of Endocrinology—Turner & Bagnara
6. Endocrinology—Hadley

**Course Code : EZO 11**

**Course Title : Parasitology and Immunology**

**Block I : Parasitology**

- Unit 1. Animal associations
- Unit 2. Life cycle, Pathogenicity of *Plasmodium*, *Leishmania*
- Unit 3. life cycle, Pathogenicity of *Wuchereria*, *Echinococcus*
- Unit 4. Vector biology
- Unit 5. Host parasite interaction
- Unit 6. Classification of microbes
- Unit 7. Microbes and environment





Unit 8. Applied microbiology

**Block II : Immunology**

Unit 9. Structure and classification of immunoglobulins

Unit 10. Lymphoid and myeloid cells

Unit 11. T-cell receptors, Cytokines etc.

Unit 12. Antigen-antibody reaction

Unit 13. TIA, Elisa and IE

Unit 14. Tissue culture and Monoclonal antibodies

**Suggested References :**

1. Parasitology — K. D. Chatterjee
2. General Parasitology — Cheng
3. An Introduction to Parasitology—J.D. Smyth
4. Immunology—Roitt
5. Immunology—Janis Kuby
6. Immunology—A. K. Chatterjee

**Course Code : EZO 12**

**Course Title : Practical Zoology - III**



**Block I :**

Unit 1. Preparation of skeleton of toad

Unit 2. Identification of skull and skeleton : vertebrae limb bones, girdles of toad, pigeon and guineapig

Unit 3. Smear preparation of gut content of toad and cockroach

Unit 4. Smear preparation of seminal vesicle of earthworm

**Block II :**

Unit 1. Preparation of histological tissues (upto block making and one demonstration of section cutting) of liver and any part of gastrointestinal tract of toad

Unit 2. Blood film preparation of man and toad, staining with Leishman stain, Study of differential count of WBC and recognition of RBC and thrombocyte

Unit 3. Determination of blood group of man

**Course Code : EZO 13**

**Course Title : Animal Physiology and Biochemistry**

**Block I : Animal physiology**

1. Body fluids and their circulation
2. Intracellular and extracellular digestion ; digestive enzymes and absorption ; coordination.



3. Physiology of respiration
4. Excretion
5. Structure of neuron
6. Physiology of movement
7. Physiology of vision
8. Electric organs and bio-luminescence

### **Block II : Biochemistry**

9. Chemical components of cell
10. Enzymes
11. Carbohydrate metabolism
12. Lipid metabolism
13. Protein metabolism, Urea cycle
14. Biological oxidation, oxidative phosphorylation, ETC

### **Suggested References :**

1. General & Comp. Animal Physiology—William S. Hoar
2. Animal Physiology—Prosser & Brown
3. Human Physiology—C. C. Chatterjee
4. Biochemistry—Debojyoti Das
5. Biochemistry—Lehninger



### **Course Code : EZO 14**

### **Course Title : Economic Zoology**

### **Block I : Economic Zoology-I**

1. Aquaculture resources
2. Freshwater fish culture
3. Prawn and shrimp culture
4. Sericulture
5. Methods in sericulture
6. Pest and pest control
7. Life history, behavior, ecology, damage and control of brinjal, jute, termite and mammal pest
8. Insecticides, IPM

### **Block II : Economic Zoology-2**

9. Apiculture
10. Bee Production
11. Lac culture.

