



NETAJI SUBHAS OPEN UNIVERSITY

Bachelor Degree Programme (BDP) Elective Zoology Course (EZO)

Programme Objectives:

The specific objective of EZO is to provide systematic knowledge in the subject which will serve as the basis of further higher education in this area. Fundamentally, with the provision of obtaining the degree to everyone interested to learn in this area, but unable to attain the conventional system of education; the course is structured so that it can generate interest among learners with basic understanding of the subject. This course with theoretical and practical topics and evaluation system is serving as a screening process for students to gain interest, sufficient understanding and skill on the subjects which will influence them to proceed further in this subject and gain an educated outlook to observe and assess this living world.

Expected Programme Outcome:

This course is expected to make learners more enlightened regarding the life process and living world and its importance in overall aspects.

Increase the ability and performances of workforces and widen the employability for fresher.

This course will screen out some quality learners with a keen interest on the subject who will pursue next level of learning in this subject and serve the higher education with their skill and ability.

COURSE STRUCTURE:

Detailed Credit Structure:

Course Subjects	Number of Paper	Full Marks	Total Credit Value
Elective Zoology Subjects	13	800	64
Subsidiary Subjects	3	300	24
Foundation course Subjects	2	200	16
Application Oriented Course	1	100	8
Language Course Subjects	2	100	8
Environmental Studies	1	50	4
Total		1550 Marks	124 Credit

➤ The curriculum design and detailed syllabus of Under Graduate Zoology is given below:

Course	Course code	Block	Broad Heading	Credit	Marks
Elective Subject: Honours Course (Zoology) EZO	EZO-1	1 & 2	Animal Diversity-I (Non-chordate)	4	50
	EZO-2	1 & 2	Cytogenetics & Molecular Biology	4	50
	EZO-3	1 & 2	Development Biology and Ethology	4	50
	EZO-4	1 & 2	Practical Zoology –1	8	100
	EZO-5	1 & 2	Animal Diversity-II (Chordate)	4	50
	EZO-6	1 & 2	Taxonomy and Evolution	4	50
	EZO-7	1 & 2	Ecology and Environmental Biology	4	50
	EZO-8	1 & 2	Practical Zoology – 2	8	100
	EZO-9	1 & 2	Biophysics and Biometry	4	50
	EZO-10	1 & 2	Histology, Histochemistry and Endocrinology	4	50
	EZO-11	1 & 2	Parasitology and Immunology	4	50
	EZO-12	1 & 2	Practical Zoology - 3	8	100
	EZO-13 & 14	1 & 2	Animal Physiology and Biochemistry; and Economic Zoology	4	50
Total			Theory: 500 & Practical: 300 Marks	64	800

Course	Broad Heading	Credit	Marks
Subsidiary Botany	Subsidiary Botany (SBT), Paper-1	8	100
	Subsidiary Botany (SBT), Paper-2	8	100
	Subsidiary Botany (SBT), Paper-3	8	100
	Total	24	300
Compulsory Subject: Fundamental Course	Humanities and Social Science (FHS)	8	100
	Science and Technology (FST)	8	100
	Total	16	200
Application Oriented Course	Household Chemistry (AOC-3)	8	100
	Total	8	100
Language Course Subjects	Bengali (FBG)	4	50
	English (FEG)	4	50
	Total	8	100
Environmental Studies	Environmental Studies (ENVS)	4	50
		124	1550

Total Credit	64+24+16+8+8+4= 124 Credits	Total Marks: 1550
Evaluation System	Internal Assessment: 30%	Term End Examination: 70%
Examination System (Semester Wise)	Semester wise Paper	1550 Marks, 124 Credit
1st Semester	FBG, FEG, EZO-1, EZO-4	4+4+4+8 = 20 Credit
2nd Semester	FHS, EZO-2, EZO-3, EZO-5, ENVS	4+4+4+4+8 = 24 Credit
3rd Semester	FST, EZO-6, EZO-8	8+4+8 = 20 Credit
4th Semester	EZO-7, EZO-9, EZO-10, SBT-1	4+4+4+8 = 20 Credit
5th Semester	EZO-11, EZO-12, SBT-2	4+8+8 = 20 Credit
6th Semester	EZO-13 & 14, SBT-3, AOC-3	4+8+8 = 20 Credit

Programme Duration: *Course duration is 3 years.* However, the students have the liberty to complete its course *within 6 years.*

Detailed syllabus of 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 up to subclass, functional anatomy of Asterias and sea urchins

Unit 14. Hemichordates—classification, structural organization, affinities and systematic position of *Balanoglossus*

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

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

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 rat
- 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

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.

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

Course Title: 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 CO₂ 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 LG50 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

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

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

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

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

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.
12. Poultry.
13. Dairy management.

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