

**Indira Gandhi National Tribal University, Amarkantak**  
**Recommended course for Zoology Honours B.Sc. Course**

<b>Course No.</b>	<b>Papers</b>	<b>Marks</b>
	<b>SEMESTER I</b>	
BZT 01	NONCHORDATA	50
BZT 02	CHORDATA	50
BZP 01	PRACTICAL	50
	<b>SEMESTER II</b>	
BZT 03	CYTOGENETIC	50
BZT 04	BIOSYSTEMATICS AND BIODIVERSITY	50
BZP 02	PRACTICAL	50
	<b>SEMESTER III</b>	
BZT 05	BIOCHEMISTRY	50
BZT 06	MAMMALIAN (HUMAN) PHYSIOLOGY	50
BZP03	PRACTICAL	50
	<b>SEMESTER IV</b>	
BZT 07	TOOLS AND TECHNIQUES IN BIOLOGY	50
BZT 08	EVOLUTION AND BIOSTATICS	50
BZP 04	PRACTICAL	50
	<b>SEMESTER V</b>	
BZT 09	DEVELOPMENTAL BIOLOGY	50
BZT 10	CELL BIOLOGY AND GENETICS	50
BZT 11	MAMMALIAN ENDOCRINOLOGY & DEVELOPMENTAL BIOLOGY 50	50
BZT 12	BIOENERGETICS AND METABOLISM	50
BZT 13	WILD LIFE BIOLOGY AND CONSERVATION	50

BZT 14	COMPARATIVELY ANATOMY OF CHORDATES	50
BZP 05,	PRACTICAL	50
BZP 06,	PRACTICAL	50
BZP 07	PRACTICAL	50
	<b>SEMESTER VI</b>	
BZT 15	COMPRATIVE ANIMAL PHYSIOLOGY	50
BZT 16	MOLECULAR BIOLOGY AND GENETIC ENGINEERING	50
BZT 17	MICROBIOLOGY AND IMMUNOLOGY	50
BZT 18	ANIMAL BIOTECHNOLOGY	50
BZT 19	AQUACULTURE	50
BZT 20	APPLIED ZOOLOGY	50
BZP 08,	PRACTICAL	50
BZP 09,	PRACTICAL	50
BZP 10	PRACTICAL	50
	<b>GRAND TOTAL</b>	<b>1500</b>

- **\*All Practical to be done based on Corresponding Theory Paper**

## **BZT 01: NONCHORDATA**

### **Unit – I**

Introduction to principles of Taxonomy; Phylum Protozoa: General characters and classification upto class level, giving examples. Detailed Study: Paramecium. General Topics: 1. Protozoan parasites 2. Plasmodium 3. Entamoeba - life history, pathogenesis and control measures.

### **Unit – II**

Phylum Porifera : Detailed Study: Ascon sponge. General Topic: Canal system in sponges. Phylum: Coelenterata: General characters and classification upto class level giving examples. Detailed Study: Obelia. General Topics : Polymorphism in Hydrozoa, Corals & Coral reef.

### **Unit – III**

Phylum Platyhelminthes: General characters and classification upto class level with examples. Detailed study: Taenia solium. General Topic: Parasitic adaptation in Platyhelminths, Phylum Nematoda : Detailed Study: Ascaris. General Topics: Nematode parasites : Life history, Pathogenicity and Control measures of Ancylostoma, Enterobius, Wuchereria and Dracanculus; Parasitic adaptations in nematodes.

### **Unit – IV**

Phylum Annelida: General characters and classification upto class level with examples. Detailed Study: Nereis. General Topic: Adaptive Radiation in Annelida. Phylum Arthropoda: General characters and classification upto class level with examples. Detailed Study: Prawn. General Topics: Crustacean Larvae, Beneficial and harmful

## **BZT 02: CHORDATA**

### **Unit – I**

General characters of Chordata and its outline classification

Prochordata : General characters and its outline classification.

Detailed study : Amphioxus and Ascidian.

Vertebrata : General characters Cyclostomata : Petromyzon. Pisces : General characters and classification upto orders with common examples. Detailed study:

Scoliodon

General Topics : Accessory respiratory organs in fishes, Migration in fishes.

### **Unit – II**

Amphibia : General characters and classification upto orders. Detailed study :Frog. Parental care in Amphibia Neoteny in Salamanders Gymnophiona and their affinities.

Reptilia : General characters and classification upto orders. Type study : Calotes.

General Topics: Identification of poisonous and non-poisonous snakes of South India, Poison apparatus and biting mechanism, Nature of venom and antidotes.

### **Unit – III**

Aves : General characters and classification upto sub orders with examples.

Detailed Study : Pigeon

General Topics : Flightless Birds and their distribution, Migration in birds, Flight

adaptations in birds.

### **Unit – IV**

Mammalia : General characters and classification upto orders with examples.

Detailed Study : Rabbit. General Topic : Aquatic mammals. Brief study of Monotremes and Marsupials.

## **BZT 3: CYTOGENETIC**

### **Unit 1.**

Cell as a Basic unit of Living Systems, Discovery of cell, The Cell theory  
Comparison of a generalized Prokaryotic cell Structure and functions of cell organelles – Endoplasmic membrane Endoplasmic reticulum, Golgi complex, Mitochondria, Ribosomes, Lysosomes, Peroxisomes, Nucleus (Nuclear envelope with nuclear pore complex, nucleolus, nucleoplasm, and chromatin). Cytoskeletal structures Microtubules, Microfilaments and Intermediate filaments).

### **Unit 2.**

Discovery, morphology and structural Organization - centromere, secondary construction, telomere, chromonema, euchromatin and heterochromatin, chemical composition and karyotype. Ultrastructure: Single-stranded hypotheses, folded-fibre and nucleosome models. Special types of chromosomes; Salivary gland and Lampbrush chromosomes Cell Division Cell cycle, mitosis and meiosis.

### **Unit 3.**

Mendelism Mendel's work, laws of heredity, Test cross, Incomplete dominance and simple problems  
Sex Determination in Plants and animals, Concepts of autosomes and allosomes, XX-XY, XX-XO, ZW-ZZ, ZO-ZZ types. Linkage and Crossing Over Coupling and repulsion hypothesis, Linkage in maize and Drosophila, Mechanism of crossing over and its importance, Chromosome mapping – Linkage map in maize.

### **Unit 4.**

Chromosomal Variations

A General account of structural and numerical aberrations, Chromosomal evolution of wheat and cotton Cytoplasmic Inheritance Plastid inheritance in *Mirabilis*, petite characters in yeast and kappa particles in paramecium.

# **BZT 04: BIOSYSTEMATICS AND BIODIVERSITY**

## **Unit 1**

### 1. Systematics

Definition of taxonomy and relationship with systematics ,  
Zoological nomenclature, Binominal, Trinominal, Kinds of taxonomic  
characters , Morphological Embryological, Cytogenetical, Biochemical,  
Numerical, Kinds of Zoological classification , Components of  
classification, Linnaean hierarchy

## **Unit 2**

Concepts of species ,  
Typological,  
Nominalistic,  
Biological,  
Evolutionary

## **Unit 3**

Basic concept of Biodiversity – What is Biodiversity, Why should we  
conserve it, Elements of  
Biodiversity - Ecosystem Diversity, Genetic Diversity, Species Abundance  
& Diversity, Patterns of  
Species Diversity, & Conservation – Overexploitation threatening living  
species,  
International Trade, Animals threatened by International trade, Problems in

## **Unit 4**

Global patterns of Biodiversity – measuring biodiversity, Cataloging and  
Discovering Species,  
Geographical Patterns of Species Richness, Biogeography, Importance of  
Distribution Patterns  
(Local Endemics, Sparsely Distributed Species, Migratory Species), GAP  
Analysis.

# **BZT 05: BIOCHEMISTRY**

## **Unit 1**

### General

Chemistry of living system: its scope and importance, chemical bonds and energy

Biomolecules: configuration and conformation

Properties of water as biological solvent

Introduction to metabolism

Amino acids

Structure and classification

Properties of peptide bond

## **Unit 2**

Proteins Functions and diversity, Structural organisation and conformation

Enzymes ,General properties

Major classes of enzymes

Mechanism of enzyme action (binding to substrate, lowering of energy of activation,  $K_m$  and  $V_{max}$ )

## **Unit 3**

Carbohydrates Classification and nomenclature

Structure and conformation of monosaccharides

Reducing and non-reducing sugars

Oligosaccharides (disaccharides) and polysaccharides

Lipids Biological significance and classification

Fatty acids Formation of lipid bi-layer

## **Unit 4**

Nucleic acids

Bases, nucleosides and nucleotides

DNA structure: DNA double helix (Watson and Crick model)

DNA and RNA as genetic material

Concepts of replication, transcription & translation

## **BZT06 -- MAMMALIAN (HUMAN) PHYSIOLOGY**

### **Unit – I**

Nutrition – types – digestion in man – concepts of balance diet and vitamins

Respiration – Respiratory pigments transport of O<sub>2</sub> and CO<sub>2</sub> in man – control

### **Unit – II**

Circulation – blood composition - types of heart – origin and conduction of heart beat in man – blood pressure – coronary blood vessels – myocardial infarction – ECG, Angiogram, Angioplasty, Bypass surgery.

### **Unit – III**

Excretion – types of nitrogenous wastes – structure of the mammalian kidney and urine formation –

Muscle Physiology – types of muscles – structure of skeletal muscle – chemistry

and energetics of muscle contraction – physical principles of muscle contraction.

### **Unit – IV**

Co-ordinating systems – Nerve physiology- neuron – types – impulse transmission –

synapse – synaptic transmission- reflex action

Central and autonomic nervous system and neuromuscular functions

# **BZT 7 : TOOLS AND TECHNIQUES IN BIOLOGY**

## **Unit 1**

Microscopy Basic principal and its application of bright field ,Phase contrast ,Fluorescence ,DIC Microscopy  
Electron Microscopy SEM,TEM STEM, Confocal microscopy Histological Technique ,

## **Unit 2**

spectroscopy an outline  
UV-VIS, Spectrophotometry  
Spectrofluometry,Atomic Spectroscopy

## **Unit 3.**

Electrophoretic techniques ,Vertical Gel Electrophoresis (Native and SDS – PAGE,IEF and 2- D electrophoresis,Chromatography GAS Chromatography And mass Spectrometry  
HPLC

## **Unit 4**

Centrifugation ,Basic principles of centrifugation  
Ultracentrifugation and separation of cellular organelles

## **BZT 8: EVOLUTION AND BIOSTATICS**

### **Unit 1.**

Concept of organic evolution  
Evidence of Organic evolution from  
Comparative anatomy  
Comparative embryology  
Palaeontology  
Biochemistry and Genetics  
Zoogeography

### **Unit 2.**

Theories of organic evolution  
Lamarckism  
Darwinism  
Development and concept of synthetic theory  
Natural selection in action (industrial melanism, antibiotic and DDT resistance)  
Evolution of man

### **Unit 3.**

Importance and application  
Tabulation and classification of data, Frequency distribution and Graphical distribution of data  
Measures of central tendencies  
Mean, Median, Mode and their properties

### **Unit 4.**

Measures of Dispersion  
Mean deviation, Variance, Standard deviation and coefficient of Variation 3  
Hours  
Hypothesis testing  
Student T and Chisquare test

# **BZT 9: DEVELOPMENTAL BIOLOGY**

## **Unit 1.**

Gammatogenesis and fertilization

## **Unit 2.**

Cleavage, gastrulation and fate map

Comparison of cleavage in sea urchin, frog and chick

Comparison of fate map of sea urchin, frog and chick

Comparison of gastrulation in sea urchin, frog and chick

## **Unit 3.**

Determination and differentiation

Morphogenetic gradients in sea urchin egg

Mechanism of axis determination in amphibians and functions of the organizers

Induction and determination during vertebrate eye formation

Totipotency

## **Unit 4.**

Mechanism of metamorphosis in frog

Development and functions of placenta in mammals

# **BZT 10 : CELL BIOLOGY AND GENETICS**

## **Unit 1**

Membrane transport . Principles of membrane transport, Channel proteins, carrier proteins, Passive and active transport, Intracellular transport and protein sorting , Signal peptides and protein targeting, Entry and passage of proteins through endoplasmic reticulum, Processing and sorting of proteins in Golgi Apparatus, Endosomes and lysosomes, Nuclear pore complex and nuclear transport

## **Unit 2**

Cytoskeleton , Organisation and functions, Microtubular organelles, Cell-cell communication: Cell junctions, Cell adhesion and extracellular matrix, General principles of cell signaling, Cell proliferation, Events in different phases of cell cycle, Genetic regulation of cell proliferation  
Cell transformation and malignancy, Genetic basis of tumourigenesis

## **Unit 3**

Gene mapping

3-point test cross in *Drosophila*, Tetrad analysis in *Neurospora*, Elementary knowledge of modes of recombination in bacteria, Mutation and mutagenesis ,Molecular basis of mutation

Spontaneous and induced mutations, DNA Damage and repair, Detection of mutations (Ames' Test, nutritional mutations in *Neurospora*, *ClB* technique in *Drosophila*)

## **Unit 4**

Genetic determination of sex , *Drosophila*, Human Introduction to quantitative inheritance

Gene expression and gene regulation ,Inducible (*lac*) and repressible (*trp*) operones in *E.coli*

Basic concept of transcription unit and regulation of gene activity in eukaryotes, Basic concept of mobile elements

## **BZT 11: BIOENERGETICS AND METABOLISM**

### Unit 1

Laws of thermodynamics and their application concept of standard free energy ( $\Delta G^0$ ) Change ,ATp on the sources of biological energy and other high energy phosphate .

### Unit 2.

Types of metabolic pathways :Linear ,cyclic ,Spiral and branched Carbohydrates on the source of energy :Glucose and glycogen ,Glyogenesis and Shycopenolysis.

### Unit 3

Glycolysis TCA cycles ,Electron transfer chain and oxidative Phosphorylation.

### unit 4

Anaerobic and aerobic energy production Role of Amino acids And fatty acids in energy metabolism deamination ,transamination and  $\beta$ -Oxidation.

## **BZT-12: MAMMALIAN ENDOCRINOLOGY & DEVELOPMENTAL BIOLOGY**

### **Unit-1**

Classification of chemical messengers Hormones, Neurohormones and neurotransmitters Pheromones, General mechanism of hormone action , Hypothalamo-hypophysial system

### **Unit-2**

structure and function of hypothalamus, pituitary, Thyroid , Adrenal

### **Unit-3**

Endocrine pancreas structure and function of Testis, Ovary, Pineal  
Gastrointestinal hormones (gastrin, CCK, secretin and motilin)

### **Unit-4**

Hormonal dysfunctions and diseases

Dwarfism and acromegaly, Goiter, Addison's disease, Diabetes mellitus

## **BZT-13: COMPARATIVELY ANATOMY OF CHORDATES**

### **Unit -1**

Integument and its derivatives  
Structure of integument  
Scales, feathers, hair, beaks  
Endoskeleton Vertebral System, appendages.

### **Unit -2**

Digestive system  
Modifications in digestive system and feeding habits

Respiratory system  
Aquatic and Aerial respiration  
Accessory respiratory organs

### **Unit-3**

Circulatory system  
Aortic arches  
Portal systems  
Lymphatic system

### **Unit-4**

Urinogenital system  
Excretory system  
Types and evolution of kidney tubules  
Reproductive system  
General plan of gonads  
Accessory reproductive organs

## **BTZ 14: WILD LIFE BIOLOGY AND CONSERVATION**

### **Unit - I**

Definition - Concept – importance and perspective - need for wildlife management in

India, Wildlife ecology – habitat, climate and food availability – biodiversity.

### **Unit 2**

Indian Forests – characteristics, composition and distribution with reference to major types of vegetation, Healthcare of wildlife – major infectious and non - infectious diseases, causes and the control measures.

### **Unit – 3**

Live capturing and marking techniques of birds and mammals – Zoological Parks and Sanctuaries in India – Threats to Wildlife – Wildlife Protection Act (1972) and its amendments.

### **Unit- 4**

Threats to biodiversity, major causes, extinction's, vulnerability of species to extinction, IUCN threat categories, Red data book. Strategies for biodiversity conservation, principles of biodiversity conservation in-situ and ex-situ conservation strategies, theory of reserve design. Restoration of biodiversity, acceleration of ecological succession, reintroduction of biota.

# **BZT 15: COMPRATIVE ANIMAL PHYSIOLOGY**

## **Unit 1**

### **Respiration**

Types of respiration (cutaneous, branchial, tracheal and pulmonary)

Respiratory pigments

Circulation

Composition of blood

Functions of blood

## **Unit 2**

### **Nutrition and Digestion**

Mechanical and chemical digestion

Basic concept of absorption

Excretion: Mode of excretion of nitrogenous wastes: ammonotelism, ureotelism, uricotelism and guanotelism

## **Unit 3**

### **Movement**

Amoeboid, ciliary, flagellar and muscular

Basic concept of contractile proteins

### **Neuronal transmission**

Structure and type of neurons

Membrane potential and nature of nerve impulse

## **Unit 4**

### **Environmental adaptations**

Basic concept of thermal adaptation in poikilotherms and homeotherms

Osmoregulation in marine, fresh water and terrestrial animals

## **BZT 16: Molecular Biology and genetic engineering**

### **Unit 1**

DNA replication

Semi-conservative replication

Basic mechanism of replication (Prokaryotes), DNA repair

### **Unit 2.**

Types of RNA

Transcriptional unit and basic concept of transcription

### **Unit 3**

Genetic code and basic mechanism of translation ,post-translational modification ,Protein Folding.

### **Unit 4**

Introduction to recombinant DNA techniques and their application concept of gene cloning vector ,restriction enzyme ,PCR and its application

## **BZT 17: Microbiology and Immunology**

### **Unit 1**

Introduction

Microbial diversity

Viruses, Archaea, Bacteria, Eukaryotic microorganisms

Techniques in microbiology, Culture and growth of microorganisms

Classification of bacteria based on staining of microbes

### **Unit 2.**

Host-parasite relationship

Beneficial and harmful interactions of microbes with human

Virulence factors and toxins

Applied microbiology, Useful microbial products: antibiotics, amino acids, bioinsecticides and biopolymers Biodegradation

### **Unit 3**

Introduction to immunity and immunological disorder

Cells and organs of immune system ,Types of immune cells: lymphoid and myeloid

Primary and secondary lymphoid organs and lymphatic system

### **Unit 4.**

Humoral immunity ,Antigen ,Immunoglobulins: types, structure and function .Generation and diversity of antibodies,Complement system

Cell mediated immunity Structural organization of MHC complex

Antigen processing and presentation Functions of T-cells

## **BZT 18: ANIMAL BIOTECHNOLOGY**

### **UNIT 1**

Principles of animal breeding invitro fertilization, intracytoplasmic injection (ISCSI), nuclear transfer technology, generation of cloned animals.

### **UNIT 2**

Development of knockout and transgenic animals, transgenic animals as model for diseases. Production of pharmaceutical proteins and peptides(hormones, growth factor etc) using transgenic animals.

### **UNIT 3**

Concepts of of animal cell culture, Hybridoma technology, application of monoclonal antibody. Concepts of vaccination (smallpox, hepatitis B, rabies vaccine), Types of vaccines (classical and modern), Vaccine production.

### **UNIT 4**

Introducing to stem cells (embryonic and adult stem cells), and their potential application. DNA and protein databases, Homology modeling, animal genome sequence and its application

## **BZT: 19 AQUACULTURE**

### **UNIT – I**

Importance of aquaculture – over - exploitation of wild fish stocks – advantages of aquaculture – production trends in the world and in India. Scope for aquaculture in India. Basic Fish farm design : selection of site, grow - out and nursery ponds.

### **UNIT – II**

Cultivable species of fish, crustaceans, molluscs and algae. Selection of candidate species for aquaculture. Types of farming: extensive, intensive and semiintensive culture. Integrated farming. Advantages of polyculture, monosex and monoculture.

### **UNIT – III**

Culture of carp species –oyster culture: pearl oyster. Prawn culture: the problems in penaeid prawn culture due to socio-economic and environmental problems. Freshwater prawn culture. Potential for ornamental fish culture. Common species for ornamental fish farming.

### **UNIT – IV**

Fish disease management : Common bacterial, viral, fungal, protozoan and crustacean diseases, their symptoms and treatment. Water quality maintenance. Importance and composition of feeds; types of feed: wet and dry feeds.

## **BZT20: Applied Zoology**

### **Unit 1**

Applied Entomology

Importance of beneficial Honeybee, silkworm Lac insect and harmful insects  
Locust, Termites.

Brief idea about stored grain pests and crop pests, Pests control.

### **Unit 2**

Pests management tactics: Regulatory control, cultural control, biological control (with emphasis on microbial control Genetic manipulation of pests population, chemical control (emphasis on phytopesticide and growth Regulation. Molecular control (Target specific).

### **Unit 3**

Medical Zoology

Brief accounts of life history mode of infection and pathogenicity of the following pathogens with reference to prophylaxis and treatment in man  
Pathogenic Protozoan: Trypanosoma Entamoeba, Leishmania and Giardia  
Pathogenic helminthes: Ancylostomata and Wuchereria  
Arthropods as vector of human and livestock diseases.

### **Unit 4.**

Animal husbandry and Poultry

Dairy, Piggery and Poultry.