

**PART I: SEMESTER 1**  
**CORE COURSE 1. Non-Chordates I**  
**ZOOA-CC1-1-TH**

**Non-Chordates I: Protists to Pseudocoelomates**

**Unit 1: Basics of Animal Classification** Understanding basic concepts Classification, Taxonomy and Systematics. Explaining different concept of classification.

**Unit 2: Protista and Metazoa** Describing the general features and classification of the phylum Protozoa and understanding lifecycle and pathogenicity of some common Protozoans. Beside this, it is explaining the evolution of symmetry and segmentation of Metazoa.

**Unit 3: Porifera** Explaining the general features and classification scheme and canal system in sponges.

**Unit 4: Cnidaria** Explaining the general features and classification scheme and metagenesis and polymorphism in Cnidaria. In addition to that it is explaining the process of formation of corals and types. Explaining the effect of climate change on coral reef

**Unit 5: Ctenophora** Describing the general features of ctenophore

**Unit 6: Platyhelminthes** Describing the general features and classification of the phylum and understanding lifecycle and pathogenicity of two common disease causing species.

**Unit 7: Nematoda** Describing the general features and classification of the phylum and understanding lifecycle and pathogenicity of two common disease causing species. And in addition to that it also explains the parasitic adaptations in helminthes.

**Duration 50 hours**

**Non-Chordates I Lab; ZOOA-CC-1-1-P**

**Non-Chordates I: Protists to Pseudocoelomates**

Identification of organisms from each phylum and staining of protozoa or helminth from gut of *Periplaneta* sp

**Duration 60 hours**

**PART I: SEMESTER 1**  
**CORE COURSE 2: MOLECULAR BIOLOGY**  
**ZOOA-CC1-2-TH**

**Unit 1: Nucleic Acids:** Describing structure and features of DNA and RNA with types, their properties.

**Unit 2: DNA replication:** Describing the processes of copying the genetic materials i.e the DNA in prokaryotic as well as eukaryotic systems. To understand the details process we have to know the major enzymes that regulate the process of replication in a semi-conservative manner. After primer removal how telomerase enzyme solves the end replication problem.

**Unit 3: Transcription:** The process and mechanism of transcription in both prokaryotes and eukaryotes, detailed idea about transcription factors.

**Unit 4: Translation:** Describing the process of translation in prokaryotes, detailed idea on genetic code, wobble hypothesis.

**Unit 5: Post Transcriptional Modifications And Processing Of Eukaryotic RNA:** Detailed idea about 5'capping, splicing, polyadenylation and editing of eukaryotic RNA. Special emphasis on splicing, RNA editing.

**Unit 6: Gene Regulation:**

This topic includes lactose and tryptophan operon. The role of activator, enhancers, silencer, repressor, siRNA and miRNA mediated gene silencing and DNA methylations etc.

**UNIT7: DNA Repair Mechanism:**

Detailed study about the DNA repair mechanisms to understand how a cell identifies and corrects damage to the DNA molecules that encode its genome. DNA repair ensures the survival of a species by enabling parental DNA to be inherited as faithfully as possible by offspring. Various mechanisms are involved regarding this process.

**UNIT: Molecular Techniques:**

Understanding various functions i.e separation of DNA or protein their interactions etc. Our syllabus includes PCR and Blotting techniques.

**Duration 50 hours**

**ZOOA-CC1-2-P**

Genomic DNA isolation, agarose gel electrophoresis, demonstration of polytene and lampbrush chromosomes and histological staining of DNA RNA.

**Duration 60 hours**

**PART I: SEMESTER 2**  
**Core Course 3: Nonchordates II- Coelomates**  
**ZOOA-CC2-3-TH**

**UNIT 1: Introduction-** A brief idea on coelomates and their evolution.

**UNIT 2: Annelida-** Classification along with characterization of each class and detailed study on its excretion and metamerism.

**UNIT 3: Arthropoda-** Classification and characterization of each class along with special emphasis on the studies of cockroach eye, respiration of prawn and cockroach, termite social life and insect metamorphosis.

**UNIT 4: Onychophora-** Analysis of the evolutionary significance of Onychophora and general characteristics

**UNIT 5: Mollusca-** Classification along with characterization of each class and detailed study on nervous system, torsion, feeding and respiration in *Pila* sp

**UNIT 6: Echinodermata-** Classification and characterization of each class along with starfish water vascular system. A detailed study on echinoderm larvae and their affinities with chordates.

**UNIT 7: Hemichordata-** Analysis on characters of hemichordates and their relationship with non-chordates and chordates.

**Duration 50 hours**

**Nonchordates II- Lab ZOOA-CC2-3-P**

1. Study of specimens (including identification and distinguishing characters) of Annelids, Arthropods, Molluscs and Echinoderms.
2. Detailed study and analysis of nervous system, male and female reproductive system, mouth parts and salivary apparatus of cockroach.

**Duration 60 hours**

**PART I: SEMESTER 2**  
**CORE COURSE 4: CELL BIOLOGY**  
**ZOOA-CC2-4-TH**

**UNIT1: Plasma Membrane:** Detailed study about plasma membrane structure, fluid mosaic model, different types of transporters and junctions.

**UNIT2: Cytoplasmic Organelles 1:** Description of the structure and functions of ER, Golgi apparatus, Lysosome and their involvement in protein sorting and mechanism of vesicular transport.

**UNIT3: Cytoplasmic Organelles 2:** Dealing with the structure of mitochondria and their functions on ETC, chemi-osmotic hypothesis for ATP production. Brief idea on the structure of peroxisomes.

**UNIT4: Cytoskeleton:** Understanding the structure and function of of cytoskeleton i.e microfilaments and microtubules which provides an important structural framework for cell shape.

**UNIT5: Nucleus:** Studying the structure and function of nucleus with nuclear pore complex and nucleolus, how they restore the genetic materials i.e chromatin materials.

**UNIT6: Cell Cycle:** Detailed study on replication and reproduction of cells, any altered pathway leading to cancer , involvement of numerous genes in cell cycle regulations. Brief idea on the tumor suppressor gene and oncogenes.

**UNIT7: Cell Signalling:** Studying and understanding various cell signaling mechanisms, detailed process of apoptosis.

**Duration 50 hours**

**ZOOA-CC-2-4-P**

Studying various stages of mitosis, meiosis, permanent slide preparation for visualizing barr body of human female, visualizing DNA and studying cell viability.

**Duration 60 hours**

**PART II: SEMESTER 3.  
CORE COURSE 5: Chordata  
ZOOA-CC3-5-TH**

**Unit 1: Introduction to Chordates** Explaining general characteristics and outline classification of Phylum Chordata.

**Unit 2: Protochordata** Explaining general characteristics and classification of urochordata and cephalochordate.

**Unit 3: Agnatha** Explaining general characteristics and classification of cyclostomes up to order.

**Unit 4: Pisces** Describing general characteristics and classification up to living sub classes and in addition to that accessory respiratory organ, Migration in fishes; Parental care in fishes; Swim bladder in fishes.

**Unit 5: Amphibia** Describing general characteristics and classification up to living Orders Metamorphosis, Paedomorphosis, Parental care in Amphibia.

**Unit 6: Reptilia** Explaining general characteristics and classification upto living Orders . Poison apparatus and Biting mechanism in Snake. Poisonous & Non-Poisonous snake.

**Unit 7: Aves** Explaining general characteristics and classification up to living Sub-Classes, Exoskeleton and migration in Birds; Principles and aerodynamics of flight.

**Unit 8: Mammals** Describing general characters and classification. It explains exoskeleton derivatives of mammals and adaptive radiation in mammals. Beside this, it describe the Echolocation in Micro chiropterans.

**Duration 50 hours**

**Chordata Lab; ZOOA-CC-3-5-P**

**Chordata** Identification of organisms from each group of Chordata and Dissection of brain and pituitary – ex situ, digestive and Urino-genital system of Tilapia Pecten from Fowl head. This portion helps to know different organisms.

**Duration 60 hours**

**PART II: SEMESTER 3.**  
**Core Course 6:**  
**Animal Physiology: Controlling and Co-ordinating System**  
**ZOOA-CC3-6-TH**

**UNIT 1: Tissues-** Detailed explanation on structure, location and functions of different types of tissues (epithelial, connective, muscular and nervous)

**UNIT 2: Bone and cartilage-** Analysis of types of bones and cartilages along with ossification process.

**UNIT 3: Nervous system-** Explanation on neuron structure, action potential and its propagation, synapse, synaptic transmission and neuromuscular junction.

**UNIT 4: Muscular system-** Histological study on muscle, its ultra-structure, characters, muscle fiber and an elaborative study on muscle contraction.

**UNIT 5: Reproductive system-** Histological study of mammalian testis and ovary and detailed mechanism of menstrual and oestrous cycle.

**UNIT 6: Endocrine system-** Histological study and function of mammalian thyroid, pancreas, pituitary and adrenal. Detailed study on hormones along with classification and their mechanism of action.

**Duration 50 hours**

**Animal Physiology: Controlling and Co-ordinating System**  
**Lab ZOOA-CC3-6-P**

Study of muscle twitching with electrical stimulation, temporary mount preparation of slides, study of histological section of mammalian tissues, microtomy technique and permanent slide preparation of mammalian tissues

**Duration 60 hours**

**PART II: SEMESTER 3.**  
**Core Course 7:**  
**Fundamentals of Biochemistry**  
**ZOOA-CC3-7-TH**

**UNIT 1: Carbohydrates:** Detailed study about monosaccharides, disaccharides, polysaccharides; derivatives of monosaccharides; Study on carbohydrate metabolism: Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis. Through this course the students are exposed to importance of carbohydrate as biological molecules. Gather basic concepts of Cells along with various cellular functions.

**UNIT 2: Lipids:** Studying structure and significance: Physiologically important saturated and unsaturated fatty acids, Triacylglycerols, Phospholipids, Sphingolipid, Glycolipids, Steroids, Eicosanoids and terpenoids. Lipid metabolism:  $\beta$ -oxidation of fatty acids - a. Palmitic acid {saturated (C 16:0)}, b. Linoleic acid {unsaturated (C 18:2)}; Fatty acid biosynthesis. Acquiring knowledge about physiological significance of lipids in biological system.

**UNIT 3: Proteins:** Analysing amino acids: Structure, Classification, General and Electro chemical properties of  $\alpha$ -amino acids; Physiological importance of essential and non-essential amino acids, Proteins Bonds stabilizing protein structure; Levels of organization; Protein metabolism: Transamination, Deamination, Urea cycle, Fate of C-skeleton of Glucogenic and Ketogenic amino acids. Studying the influence and role of proteins in the process of biological regulation

**UNIT 4: Nucleic acids:** Students are expected to learn Structure of purines, pyrimidines, nucleosides and nucleotides; nucleic acid metabolism: Catabolism of adenosine, guanosine, cytosine and thymine. Understanding role of nucleic acids and basic concepts of molecular Biology along with functions of DNA and RNA.

**UNIT 5: Enzymes:** Detailed structure of nomenclature and classification of enzymes; Cofactors; Specificity of enzyme action; Isozymes; Mechanism of enzyme action; Enzyme kinetics; Derivation of Michaelis-Menten equation, Lineweaver-Burk plot; Factors affecting rate of enzyme-catalyzed reactions; Enzyme inhibition. It is important to acquire knowledge of function and significance of enzymes in biological process.

**UNIT 6: Oxidative phosphorylation:** Understanding mechanism of the metabolic pathway used to produce [energy](#) through ATP inside cells. Students are expected to know Redox systems; Mitochondrial respiratory chain, Inhibitors and un-couplers of Electron Transport System

**Duration 50 hours**

**Fundamentals of Biochemistry**  
**Lab ZOOA-CC3-7-P**

Qualitative tests for carbohydrates, proteins, lipids, urea, uric acid. Quantitative estimation of protein and paper chromatography of amino acids.

**Duration 60 hours**

**Skill Enhancement courses (SEC)**  
**SEMESTER 3**  
**SEC-1 Apiculture ZOOA-SEC(A)-3-1-TH**

**Unit 1: Biology of Bees:** Describing *Apis* and Non-*Apis* Bee species and their identification. General Morphology of *Apis* Honey Bees .Social Organization of Bee Colony

**Unit 2: Rearing of Bees:** Explaining bee rearing modern techniques and associated modern bee keeping equipment and methods of Extraction of Honey.

**Unit 3: Diseases and Enemies:** Describing disease and enemies of bee and control measures

**Unit 4: Bee Economy:** Explaining products of apiculture industry like Honey, Bees Wax, Propolis, Pollen etc. and uses

**Unit 5: Entrepreneurship in Apiculture:** Describing the recent scenario of Bee Keeping Industry and Modern Methods in employing artificial Beehives for cross pollination in horticultural gardens