Department of Zoology

Goals

Zoology is a branch of science that deals with the animal kingdom, including the structure embryology, evolution, classification, habits and distribution of all animals, both living and extinct and how they interact with their ecosystems. B. Sc. in Zoology is an undergraduate program which is premeditated to introduce students to the study of Zoology at the organismal and organ function levels. The theoretical part of the program deals with the general principles of classical as well as modern Zoology. The program provides the student with an introduction to the recent advances in Zoology in the areas of systematic, evolution, reproduction, development, animal diversity, biochemistry, cytology and animal ecology. This course is offered for candidates who are interested in the study of animals. The minimum time required to complete the course is three years.

Program Specific Outcomes (PO)

After successfully completing B. Sc. (Zoology) Program, the student will be able to:

PSO1: connect and apply biological knowledge to other disciplines and to integrate ability to connect and apply biological knowledge to other disciplines and to integrate;

PSO2: explain the origin of life with context to the origin of eukaryotic cell and endosymbiotic theory of origin, fossil records, Darwinism and Neo-Darwinism, experimental evidences;

PSO3: illustrate zoological science for its application in branches like medical entomology, apiculture, aquaculture and agriculture etc;

PSO4: understand animal interactions with the environment and identify the major groups of organisms with an emphasis on animals and classify them within aphylogenetic

Course Outcomes (CO)

F. Y. B. Sc.

Course: (Z – 101) Systematics and Animal Diversity

After successfully completing this course, students will be able to:

CO1: demonstrate anatomical and physiological attributes of each animal group and why these have led to their success;

CO2: identify a range of invertebrate and vertebrate animals;

CO3: describe various phenomena like torsion, metamorphosis, water vascular system, parasitic adaptations etc.in invertebrates;

CO4: describe the morphology, habit and habitat, systematic position and various systems in Liver fluke (Fasciola hepatica);

CO5: list the various animals in a given phylum;

CO6: state the animal classification with reference to vertebrate animals up to class level;
CO7: enlist the examples of the phylum studied;
CO8: comment on the modifications of common animal forms of the groups studied.

Course: (Z – 102) Cytogenetics, Ecology and Ethology

After successfully completing this course, students will be able to:

CO1: differentiate prokaryotic and Eukaryotic cells;
CO2: explain the principles of staining;
CO3: describe the structure and functions of cell organelles, label the various cell parts and cell organelles;
CO4: define the terminologies in genetics;
CO5: explain Mendel's principle, its extension and chromosomal basis and determination of gene action from genotype to phenotype and concepts of inheritance;
CO6: describe the chromosome anomalies and associated diseases;
CO7: know different types of ecosystems like desert, marine, wetland, fresh water etc. moreover they will be able to learn about different types of ecological adaptations also;
CO8: study different types of animal behavior e.g. social behavior, nesting behavior etc.

Course: Practical (Z – 101 and Z – 102) Systematics and Animal Diversity, Cytogenetic, Ecology and Ethology

After successfully completing this course, students will be able to:

CO1: identify various animals based on morphological features of non-chordate and chordate animas;
CO2: identify different animal adaptations, study histology of sponge, ethological study by hornbill, honey bees etc;
CO3: prepare stained slides of mitosis, identify the cell division phases;
CO4: detect human blood group, identify the human genetic traits;
CO5: identify the cell organelles. Study poisonous and non-poisonous snakes by identification key;
CO6: prepare album of animal photographs to study taxa so that students can know some extra details about the local animals.

Course: (Z – 201) Comparative Anatomy of Chordates, Applied Zoology, Wildlife Biology

After successfully completing this course, students will be able to:

CO1: integumentary System: Comparative study of glands and digital tips;
CO2: comparative study of digestive and respiratory systems;
CO3: evolution of heart and sensory organs like eye, ear, tongue and skin;
CO4: human diseases like swine flu, leptospirosis, chikungunya etc;
CO5: applied Zoology- Poultry breeds, bird keeping, egg as food, poultry appliances etc;
CO6: wild life biology- what is wild life?, importance of conservation, causes of depletion of wildlife, difference between Sanctuary and National Park;
CO7: Gir N. P., Marine N. P., Wild Ass sanctuary, Velavadar, Thol bird sanctuary etc. with special emphasis on Gujarat state.

Course: (Z – 202) Life Processes, Biochemistry, Immunology and Tissue System

After successfully completing this course, students will be able to:

CO1: describe nutrition and digestion in human and reproduction and its types in different animals;
CO2: explain pH and buffers in biological systems;
CO3: describe control and regulation of metabolism at cell, gene and hormonal level;
CO4: explain constituents, sources, functions and deficiency status of balanced diet;
CO5: describe basic concepts of immunology and types of immune responses;
CO6: explain the types, structure and functions of different types of tissues.

Course: Practical (Z – 201 and Z – 202) Comparative Anatomy, Applied Zoology, Wildlife Biology, Life Processes, Biochemistry, Immunology and Tissue System

After successfully completing this course, students will be able to:

CO1: describe the integumentary system in vertebrates;
CO2: explain, compare and draw labeled diagrams of the digestive system with respect to alimentary canal and digestive glands, the respiratory system with respect to gills, lungs, air sacs and swim bladder, the circulatory system with respect to evolution of vertebrate heart;
CO3: identify and describe different sense organs;
CO4: the human diseases - Dengue, Leptospirosis, Chikungunya and Swine flu;
CO5: poultry appliances- brooder, feeder, water appliances and candling;
CO6: the control of food ingestion and T. S. of intestine of mammals, different salivary glands in human;
CO7: various diseases caused due to vitamin deficiency – night blindness, Xerophthalmia, rickets, scurvy, Beriberi and Pellagra, different types of reproduction;
CO9: explain the types, structure and functions of different types of tissues.

S. Y. B. Sc.

Course: (Z – 301) Non-chordates, Evolution and Economic Zoology

After successfully completing this course, students will be able to:

CO1: describe the general study of Non-Chordate Phyla up to Subclass with examples: - Protozoa, Porifera, Coelenterata (Cnidaria), Helminthes and Annelida;
CO2: explain the structure and functions of various organs of all systems of Leech;
CO3: describe variation, fossorial, cursorial, deep sea and cave dwelling adaptations with suitable examples;
CO4: explain the importance of sericulture and apiculture in details.

Course: (Z – 302) Chordates, Histology and Osteology

After successfully completing this course, students will be able to:

CO1: explain the general study of the protochordates and chordates up to subclass with examples: Urochordata, Cephalochordate, Cyclostomes and Pisces;
CO2: describe the study of scoliodon (Dog Fish) with reference to its structure and functions of various organs of all the systems;
CO3: explain the histology of mammalian tissues– stomach, intestine, liver, salivary gland, pancreas, kidney and gonads;

CO4: describe the girdles in frog, scoliodon, varanus, pigeon and rabbit.

Course: (Z – 303) Biochemistry and Animal Physiology

After successfully completing this course, students will be able to:

CO1: explain basic structure of carbohydrates, proteins and lipids;

CO2: describe metabolic activities like Glycolysis, TCA cycle & Oxidative phosphorylation, Gluconeogenesis etc;

CO3: explain the types and structure of muscle fibers and physiology of muscle contraction;

CO4: describe the basic concepts of hematology as well as the composition of blood, Haemopoiesis and types of blood groups.

Course: Marine science (EG)

After successfully completing this course, students will be able to:

CO1: explain Scope of marine science;

CO2: describe Geology of the ocean with physico-chemical properties and zonation;

CO3: describe adaptations in deep sea fishes (bony fish in freezing water), sea birds and general characters of cartilaginous and bony fishes;

CO4: explain Microorganisms: - Phytoplanktons, zooplanktons, red algae, brown algae, green algae, multicellular algae as well as economic importance of algae.

Course: Practical (Z – 301, Z – 302 and Z – 303)

After successfully completing this course, students will be able to:

CO1: identify and describe the general characters of non-chordate phyla up to subclass with examples: Protozoa, Porifera, Coelenterata (Cnidaria), Helminthes and Annelida;

CO2: explain the structure and functions of various organs of all systems of earthworm;

CO3: identify and describe animals showing variation, deep sea and cave dwelling adaptations with suitable examples;

CO4: explain the importance of Vermiculture and Sericulture in details including its economic importance;

CO5: identify anddescribe the general characters of the Protochordata and chordates up to subclass with examples: Urochordata, Cephalochordate, Cyclostomes, Pisces and Amphibia;

CO6: describe Labeo rohita with reference to its structure and functions of various organs of all the systems and mountings;

CO7: explain the histology of mammalian tissues– Stomach, intestine, liver, kidney, ovary, testis, salivary gland and pancreas;

CO8: identify and describe the girdles and skulls in frog, scoliodon, varanus, pigeon and rabbit;

CO9: explain basic structure of carbohydrates, proteins and lipids with the help of atomic models and quantitative tests;

CO10: elaborate the structure of genetic material and types of RNA;

CO11: explain the types and structure of muscle fibers;

CO12: determine the clotting time of human blood;

CO13: estimate Hb content from human blood;

CO14: demonstrate the haemin crystals from human blood.

Course: (Z – 401) Non-chordates, Evolution and Economic Zoology

After successfully completing this course, students will be able to:

CO1: describe general study of non-chordate phyla up to subclass with examples: Arthropoda, Mollusca, Echinodermata and Hemichordates;
CO2: explain the structure and functions of various organs of all systems of Pila;
CO3: describe Homologous organs, analogous organs, vestigial organs and connecting link, atavism, protective coloration and mimicry etc;
CO4: explain the economic importance of Dairy farming- Indian and exotic breeds of cows and buffaloes, milk and milk products etc;
CO5: describe apiculture- life history of honey bees, types and casts of honey bees, structure of honey comb etc.

Course: (Z – 402) Chordates, Embryology and Osteology

After successfully completing this course, students will be able to:

CO1: explain general study of the following chordates up to subclass with examples: Reptilians, Aves and Mammals;
CO2: explain the animal type with reference to their structure and functions of various organs of all systems of Uromastix;
CO3: describe different types of eggs and cleavage patterns, development in Frog (up to neurulation);
CO4: explain comparative osteology of fore limbs, hind limbs and vertebral columns in frog, varanus, pigeon and rabbit.

Course: (Z – 403) Biochemistry, Genetics and Animal Physiology

After successfully completing this course, students will be able to:

CO1: classify carbohydrates, proteins and lipids;
CO2: explain epistasis genes and concept of lethal alleles and pseudo alleles;
CO3: describe synapse and mechanism of nerve impulse conduction;
CO4: describe the structure and function of sense organs (human) eye and ear;
CO5: elaborate the structure of uriniferous tubule, physiological process of excretion (including counter current mechanism) and urine formation; hormonal control (rennin angiotensin system and ADH)
CO6: explain osmoregulation in fresh and marine water organisms, osmosis, diffusion and Donnan's equilibrium.

Course: Marine science (EG)

After successfully completing this course, students will be able to:

CO1: explain scope of marine science;
CO2: describe the classification of prokaryotes and eukaryotes;
CO3: describe Geology of the ocean with physicchemical properties and zonation;
CO4: describe the adaptations in deep sea fishes (bony fish in freezing water), sea birds, whales and their relatives and general characters of cartilaginous and bony fishes
CO5: explain marine microorganisms-phytoplanktons, zooplanktons, red algae, brown algae, green algae, multicellular algae as well as economic importance of algae, marine sponges, molluscs, arthropods, scoliodon and marine mammals.

Course: Practical (Z – 401, Z – 402 and Z – 403)

After successfully completing this course, students will be able to:

CO1: identify and describe the general characters of non-chordate phyla up to subclass with examples: Arthropoda, Mollusca, Echinodermata and Hemichordates;
CO2: explain the structure and functions of various organs of all systems and mountings of Pila;

CO3: describe Homologous organs, analogous organs, vestigial organs and connecting link as well as importance of atavism, protective colouration and mimicry etc.;
CO4: explain the economic importance of Indian and exotic breeds of cows and buffaloes;
CO5: describe apiculture and its importance in details including life history of honey bees, types and casts of honey bees, structure of honey comb etc.;
CO6: identify and describe the general characters of the following chordates up to subclass with examples: Reptilians, Aves and Mammals;
CO7: explain the animal type with reference to their structure and functions of various organs of all systems of Uromastix;
CO8: demonstrate frog embryology with the help of models, charts, specimen, photographs or permanent slides;
CO9: compare osteology of fore limbs and hind limbs in frog, varanus, pigeon and rabbit;
CO10: perform qualitative test for carbohydrates and proteins;
CO11: explain epistasis genes, lethal alleles and pseudo alleles by chart;
CO12: determine normal and abnormal constituents of urine;
CO13: demonstrate structure and function of sense organs (human) eye and ear and different types of nerve cells.

Course: Practical (Z – 402) Chordates, Embryology and Osteology

After successfully completing this course, students will be able to:

CO1: identify and classify the following animals up to sub-class: Frog, hyla, bufo, salamander, amblystoma, caecilian, calotes, varanus, turtle, dhaman, Russel's viper, cobra, krait, pigeon, koel, sparrow, platypus, bat and rat;
CO2: describe and draw labeled diagrams of digestive system and mounting of hyoid apparatus; Circulatory system; Urino-genital system and mounting of pectin and brain and air sacs of Pigeon;
CO3: identify and describe amphioxus embryology: Uncleaved egg, 2, 4, 8, 16 and 32 cell stage, blastula, gastrula, T. S. passing through pharynx, intestine, testis, ovary and caudal region;
CO4: describe the osteology of fore limbs and hind limbs in Frog, varanus, pigeon and rabbit

Course: Practical (Z – 403) Cytogenetics and Biochemistry

After successfully completing this course, students will be able to:

CO1: demonstrate microtome and microtechniques;
CO2: prepare and study different stages of mitosis from onion root tip;
CO3: prepare and study different stages of meiosis from cockroach testis;
CO4: identify and describe cell division from permanent slides;
CO5: describe Cytoplasmic inheritance with example of coiling of shell in Lymnaea;
CO6: describe structure of carbohydrates- triose, pentose, hexose sugar, lipid and glycerol.

T. Y. B. Sc.

Course: (Z – 501) Non chordates Taxonomy, Animal type

After successfully completing this course, students will be able to:

CO1: identify and classify the invertebrate animals upto order;
CO2: understand Structural organization of different classes of invertebrates;

CO3: describe the morphology, habit and habitat, Systematic position and various systems in Leech (Hirudinaria granulosa);
CO4: understand the amplification of Protozoa, Porifera, Ctenidia, Helminthes and Annelida;
CO5: to know about phylogenetic relationships of the Ctenophora and Chaetognatha, the minor phyla;
CO6: enlist the examples of the phylum studied;
CO7: to comment on the modifications of common animal forms of the groups studied.

Course: Practical (Z – 501) Non chordates Taxonomy, Animal type

After successfully completing this course, students will be able to:

CO1: identify various animals based on morphological features of non-chordate animals;
CO2: identify different aquatic animals and able to classify them;
CO3: study permanent slides of spicules and gemmules and animal-Ascaris;
CO4: understand the different system and mountings of Leech.

Course: (Z – 502) Chordates Taxonomy, Animal type and Comparative Anatomy

After successfully completing this course, students will be able to:

CO1: identify a range of vertebrate animalsupto order;
CO2: classify and describe the vertebrate animals;
CO3: understand the animal type (Scoliodon) with reference to the structure and function of all system;
CO4: describe the amplifications like geological time scale, origin of vertebrates;
CO5: understand about Pisces, types of scale and parental care in fishes;
CO6: learn about origin and evaluation of Amphibia;
CO7: Able to comment on vertebrate animals.

Course: Practical (Z – 502) Chordates Taxonomy, Animal type and Comparative Anatomy

After successfully completing this course, students will be able to:

CO1: identify various animals based on morphological features of chordates;
CO2: learn to comparative characteristics of animals and able to differentiate them;
CO3: study animal type (Scoliodon), with all system and mounting;
CO4: learn about parental care in fishes;
CO5: identify the types of scale in fishes;
CO6: study comparative anatomy of vertebral column and skulls of various animals.

Course: (Z – 503) Enzymology and Biochemistry

After successfully completing this course, students will be able to:

CO1: define enzymes and describe its chemical nature along with its properties;
CO2: describe nomenclature and classification of enzymes;
CO3: elucidate the concept of enzyme activation and mechanism of enzyme action;
CO4: explain in detail the factors affecting the enzyme activity;
CO5: describe enzyme inhibition and enzyme kinetics;
CO6: derive Michaelis-Menten equation and Lineweaver-Burk plot;
CO7: discuss the concept of pH and buffers in details;
CO8: describe reaction kinetics and basic principles of thermodynamics;
CO9: demonstrate different types of solutions and colligative properties;
CO10: comment on composition, types, structure and function of DNA and RNA;
CO11: elucidate the composition, structure and formation of vitamins;

CO12: illustrate the reactions, energetics and regulation of glycolysis, glycogenesis, TCA cycle, gluconeogenesis and glycogenolysis with structure of biomolecules;
CO13: explain the electron transport system and oxidative phosphorylation;
CO14: describe with structures deamination, transamination and ornithine cycle;
CO15: illustrate β-oxidation and synthesis of long chain fatty acids and glycerol metabolism.

Course: Practical (Z – 503) Enzymology and Biochemistry

After successfully completing this course, students will be able to:

CO1: demonstrate the activation of salivary amylase under optimum condition;
CO2: demonstrate the effect of various physical factors like pH and temperature on enzyme activity;
CO3: explain the digestive enzymes from Human Saliva;
CO4: prepare pH, buffer and different solutions as per theory;
CO5: illustrate vitamins structure through model or chart;
CO6: demonstrate DNA with the help of model / chart;
CO7: demonstrate RNA with the help of model / chart;
CO8: illustrate A___, T___, G___, C___ by models;
CO9: explain water soluble vitamins and fat soluble vitamins.

Course: (Z – 504) Embryology and Wildlife Biology

After successfully completing this course, students will be able to:

CO1: study basics of embryology, developmental biology, scope and branches of embryology. They will also learn the process of gametogenesis;
CO2: know the types of fertilization, capacitation, acrosomal reaction and penetration, estrus and menstruous cycles, pregnancy, parturition and placenta –placentation;
CO3: know different aspects of chick embryology in detail viz. fertilized egg, stages and patterns of cleavage, as well as different hours of chick embryonic development;
CO4: learn what is wildlife biology, status of wildlife in India viz. Threatened, vulnerable, endangered etc., along with that conservation practices, legal aspects of conservation, National parks-sanctuaries, different wildlife conservation projects-tiger, wild ass, blackbuck etc. and recommendations of CITES.

Course: Practical (Z – 504) Embryology and Wildlife Biology

After successfully completing this course, students will be able to:

CO1: learn different types of mammalian placenta;
CO3: study in detail about Unfertilized egg, different stages cleavage, morula, blastula, gastrula, development of Structure of 8, 16, 21, 24, 33, 48 and 72 hrs;
CO3: study the Wild life Illegal trades, practices and its control measures of following: Tiger (Claws, Bones, Skins and Whiskers), Rhino (Horns), Elephant (Tusks), Musk Deer (musk), Turtle (Shells);
CO4: attend the Industrial Workshops/Laboratory Workshops/Training Program/ Symposia/ Seminar/Field visit/Educational Excursion organized by the department/college. So students can have first-hand experience.

Course: (Z – 505) Forensic science and Toxicology

After successfully completing this course, students will be able to:

CO1: get aware of Forensic science for Zoology students, different international perspectives are taken in consideration. How to study foot print, finger print, etc. is taken in consideration;

CO2: understand about different layer of hair, how to do primary investigation to identify animal hair, what is DNA finger print;
CO3: gain knowledge on toxicology;
CO4: gain knowledge on food contamination.

Course: Practical (Z – 505) Forensic science and Toxicology

After successfully completing this course, students will be able to:

CO1: study different types of Finger prints and Tattoo marks;
CO2: study the morphology of different hairs- Man, Dog, Cat, Cow, Buffalo, Horse, Goat;
CO3: study of various samples of food additives/preservatives and their usages (Vinegar, Benzoic acid, Formic acid, Citric acid and Gelatin);
CO4: study of food contaminants on - Bread, Chapati, Curd and Fruits;
CO5: learn tests (only two tests to be performed) of adulterated milk, black pepper, khoya (maava of milk), edible oil, coconut oil, ghee, rabdi;
CO6: study DNA finger printing method.

Course: (Z – 506) Genetics and Molecular Biology

After successfully completing this course, students will be able to:

CO1: define the basic terms in genetics;
CO2: elucidate gene concept;
CO3: discuss the location, size, its role and numbers of genes;
CO4: explain the chemical composition and ultrastructure of genes;
CO5: define and describe jumping genes, split genes and sex chromatin;
CO6: paraphrase the Central dogma of molecular biology;
CO7: discuss genetic code and the mechanism of DNA replication, transcription and protein synthesis;
CO8: discuss the basics of biotechnology;
CO9: illustrate the mechanism of DNA repair and recombi1nant DNA technology;
CO10: define and explain karyotyping;
CO11: illustrate various chromosomal banding techniques – G, Q, C and R banding;
CO12: explain chromosomal aberrations and syndromes, gene mutations;
CO13: discuss the overview of tumor growth, its development and metastasis.

Course: Practical (Z – 506) Genetics and Molecular Biology

After successfully completing this course, students will be able to:

CO1: demonstrate Barr body (dosage compensation) from cheek epithelial cells;
CO2: prepare DNA, RNA by models;
CO3: illustrate DNA replication using photographs or charts;
CO4: demonstrate normal human karyotype and syndromes viz. Down syndrome, Patau syndrome, Edward syndrome, Cri du chat, Jacob's syndrome, Klinefelter's syndrome, Turner syndrome, Super female and Philadelphia syndrome;
CO5: enlist types of cancer including blood cancer and skin cancer with charts/photos;
CO6: illustrate transgenic animal (Dolly sheep).

Course: Fisheries (EG)

After successfully completing this course, students will be able to:

CO1: describe natural and cultivated pond construction, layout, management and productivity;
CO2: explain induced breeding methods in major carp;

CO3: describe fish seed collection and transportation;
CO4: explain aquarium fishes and its management;
CO5: identify and describe crafts and gears used in fresh and marine water fisheries;
CO6: describe marine pollution in details.

Course: (Z – 601) Non-chordates Taxonomy, Animal type

After successfully completing this course, students will be able to:

CO1: identify non-chordate phylum with its characteristics upto order;
CO2: understand structural organization of different classes of non-chordates;
CO3: describe morphological characteristics of non-chordates;
CO4: describe the structure and function of various organs of all systems of Sepia;
CO5: understand respiration and excretion in Arthropoda;
CO6: explain torsion and detorsion in Gastropods;
CO7: understand autotomy and regeneration and evolutionary significance of Echinodermata;
CO8: describe phylogenetic relationships of endoprocta and ectoprocta as minor phyla.

Course: Practical (Z – 601) Non-chordates Taxonomy, Animal type

After successfully completing this course, students will be able to:

CO1: identify various animals based on morphological features of non- chordate animals;
CO2: comment on specific non-chordate animals;
CO3: describe animal type study with all systems and mountings;
CO4: explain digestive system and nervous system of Sepia;
CO5: identify and explain permanent slides of different larvae.

Course: (Z – 602) Chordates Taxonomy, Animal type and Histology

After successfully completing this course, students will be able to:

CO1: demonstrate anatomical and physiological attributes of each animal groups;
CO2: identify a range of vertebrate animals;
CO3: list the various animals in a given phylum;
CO4: explain animal study type with reference to the structure and function of various organs of all system of pigeon;
CO5: describe various phenomenon of reptiles like: rhyncocephalia, temporal fossae and arcades, carapace and plastron;
CO6: describe bird migration and flight adaptation in birds;
CO7: describe dentition, prototheria, metatheria, cetacea and primates;
CO8: identify the mammalian histology and able to describe it.

Course: Practical (Z – 602) Chordates Taxonomy, Animal type and Histology

After successfully completing this course, students will be able to:

CO1: identify various animals based on morphological features of chordate animals;
CO2: identify chordate animals and able to comment on them;
CO3: describe animal type study of pigeon with digestive system, Urinogenital system, Circulatory system and Brain;
CO4: explain mountings, pectin and hyoid apparatus;
CO5: identify Mesozoic reptiles;
CO6: describe types of feather;
CO7: describe and differentiate dentition in various animals;

CO8: study mammalian histology and able to explain the histological structure of various glands.

Course: (Z – 603) Animal Physiology and Endocrinology

After successfully completing this course, students will be able to:

CO1: explain aquatic & terrestrial respiratory mechanism;
CO2: illustrate O2 dissociation curve;
CO3: describe respiratory quotients, BMR and hypoxia;
CO4: diagrammatically represent the mechanism of respiration, gas exchange and transport of O2 and CO2;
CO5: explain various respiratory pigments;
CO6: describe the neural and chemical regulation of respiration;
CO7: diagrammatically explain the structure of mammalian heart and properties of cardiac muscles;
CO8: explain different types of internal circulation viz. systematic, pulmonary and coronary circulation;
CO9: illustrate blood pressure, ECG and blood coagulation;
CO10: elucidate the regulatory mechanism of heart beat including hormonal, ionic and nervous regulation;
CO11: describe cardiac cycle, cardiac output and stroke volume;
CO12: justify hormones as coordination molecules;
CO13: discuss the roles of hormones of pineal gland, hypothalamus, pituitary gland, thyroid gland, parathyroid gland, thymus, pancreas, adrenal gland, ovary and testes;
CO14: illustrate the chemical nature and mechanism of hormone action.

Course: Practical (Z – 603) Animal Physiology and Endocrinology

After successfully completing this course, students will be able to:

CO1: demonstrate principle and applications of various analytical instruments like pH meter, sphygmomanometer, stethoscope, Thoma's pipette and haemocytometer;
CO2: count total RBC in human blood;
CO3: estimate differential count of WBC in human blood;
CO4: demonstrate the measurement of systolic blood pressure, diastolic pressure, pulse pressure and mean pressure of an individual with the help of sphygmomanometer and stethoscope;
CO5: illustrate Electrocardiogram (ECG);
CO6: demonstrate the control, regulation and role of hormones of pituitary gland, thyroid gland, parathyroid gland, pancreas, adrenal gland, ovaries and testes.

Course: (Z – 604) Entomology

After successfully completing this course, students will be able to:

CO1: demonstrate insects and their body parts;
CO2: learn history, development, scope and applications of entomology;
CO3: explain branches of entomology;
CO4: classify insects;
CO5: identify pest of sugarcane, cotton and vegetables;
CO6: learn about management of agriculture pest;
CO7: identify stored grain insect pest and able to do their management;
CO8: explain morphology, vectorship, pathogenicity and control of mosquito, housefly, rat fleas, head louse, dog, cats and cattles;

CO9: learn about beneficial insects;
CO10: identify household insects and able to manage them;
CO11: describe insect pest control methods;
CO12: learn about appliances used for pest management.

Course: Practical (Z – 604) Entomology

After successfully completing this course, students will be able to:

CO1: know about branches of entomology at length;
CO2: learn about scope, development and applications of entomology;
CO3: identify pests, its pathogenicity and control of pests of: cereals, cotton, sugarcane and vegetables;
CO4: study morphology, vectorship, pathogenicity and control of anopheles, Culex and aedes mosquitos;
CO5: study and describe different pests of domestic animals;
CO6: learn in detail about economic importance of arthropods
CO7: differentiate beneficial insects, harmful insects, pollinators, scavengers, etc;
CO8: study usefulness of pest management appliances and their uses;
CO9: learn about biological pest controller.

Course: (Z – 605) Cell biology and Bioinstrumentation

After successfully completing this course, students will be able to:

CO1: Explain the basics of microscopy;
CO2: describe magnification and resolution of various microscopes;
CO3: demonstrate light microscope including simple and compound microscope;
CO4: demonstrate electron microscope and phase contrast microscope;
CO5: elucidate the basics of various cytological techniques;
CO6: demonstrate the examination of living cells through various cytological techniques like teasing, smear preparation, squash preparation, whole mount and microtomy;
CO7: justify the selection of various fixatives and cytological stains for histological procedures;
CO8: illustrate the process of fixation and cytological staining;
CO9: explain the importance and applications of different techniques in biochemistry;
CO10: demonstrate the principle and application of paper chromatography technique;
CO11: demonstrate the principle, working, applications of centrifugation;
CO12: explain the principle, working, materials used and applications of electrophoresis;
CO13: demonstrate the principle, working, applications of PCR;
CO14: describe the concept of light, electromagnetic spectrum and its application in absorption spectroscopy;
CO15: illustrate cell cycle and diagrammatically represent the phases of division of mitosis and meiosis respectively;
CO16: describe the composition, structure and functions of the plasma membrane;
CO17: elucidate the process of lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport and ion pumps;
CO18: Describe the mechanism of sorting and regulation of intracellular transport.

Course: Practical (Z – 605) Cell biology and Bioinstrumentation

After successfully completing this course, students will be able to:

CO1: identify and describe various types of microscopes;
CO2: perform the micro techniques to prepare permanent slides of different organs;
CO3: perform paper chromatography for separation of amino acids;

CO4: demonstrate meiosis and mitosis in given permanent slides;
CO5: prepare different stages of mitosis from onion root tip through squash method;
CO6: demonstrate principle, working and applications of various bio-instruments viz. electrophoresis, centrifuge, PCR and spectrophotometry through charts/models.

Course: (Z – 606) Ecology, Ethology and Evolution

After successfully completing this course, students will be able to:

CO1: know Animal Inter relationship in detail;
CO2: learn what is Biogeography? What is Zoogeography? And Zoogeographical Regions of world as well as diverse fauna of India;
CO3: describe Social behaviour in animals-Costs and Benefits of group living, will know Evolutionary Advantages and disadvantages of group living, Characteristics of Social Insect;
CO4: learn and explain Bioluminescence, Biological Clock and Insect Pheromones in depth;
CO5: study in detail about Direct Evidences of Evolution;
CO6: explain what the fossils are, Introduction, Different Branches of Paleontology, How Fossils formation takes place etc;
CO7: study in detail about different Conditions of Fossilization, Determination of age of Fossils, Nature of Fossils, Types of Fossils, Significance of Fossils and Conclusions drawn from Fossils

Course: Practical (Z – 606) Ecology, Ethology and Evolution

After successfully completing this course, students will be able to:

CO1: learn the methodology of Estimation of Alkalinity and Hardness as well as the amount present in the sample water;
CO2: study the method of Estimation of free CO2 and dissolved O2 and its amount present in sample water;
CO3: study of Habituation of mosquito larva;
CO4: study of Antennal grooming behavior (Chemotoxis);
CO5: study of alarming, attractant, aggression behavior;
CO6: know the different Types of Fossils with the help of photo graphs/charts.

Course: Fisheries (EG)

After successfully completing this course, students will be able to:

CO1: explain fish migration;
CO2: describe parental care in fishes;
CO3: explain electric organs in fishes;
CO4: explain preservation, processing and by-products of fishes;
CO5: describe fish pathology: bacterial, fungal, ectoparasitic and protozoan diseases of fishes;
CO6: describe dangerous and venomous fishes.