DEPARTMENT OF ZOOLOGY
MODERN COLLEGE, IMPHAL
NAME OF PROGRAMME: B.SC. ZOOLOGY

PROGRAMME OUTCOMES

After the successfully completion of B.Sc. Zoology Programme, the students will be able to:-

PO-1: Improve the quality of life with the application of the different branches of Zoology and Biology with the knowledge of environment and species conservation, pollution control, prevention of diseases and correct choice of quality food choices.
PO-2: Acquire basic skills in the scientific classification of animals.
PO-3: Understand the quality of life with their rich diversity of organisms and their ecological and evolutionary and sustainable development.
PO-4: Provide the knowledge of physiological, chemical, mechanical, behavioral, ecological systems of organisms with the help of various techniques, computer applications and scientific investigations.
PO-5: Obtain a graduate degree meant for job and higher studies.

PROGGRAMME SPECIFIC OUTCOMES

After the successful completion, the students will be able to:-

PSO-1: Analyze the relationship among animals with their ecosystems and enhance the technical skills for experimental purposes.
PSO-2: Understand the animal diversity, principles of ecology, comparative anatomy and developmental, physiology and biochemistry, genetics, evolutionary biology, biotechnology, applied biology, immunology, vector and diseases.
PSO-3: Understand the applications of Zoology in agriculture, medicine and economic Zoology such as sericulture, apiculture, aquaculture, industrial microbiology DNA technology and medicine for their career opportunities.
PSO-4: Enhance knowledge about research methodologies, effective communication and skills of problem solving methods
PSO-5: Contribute the knowledge for nation building.

COURSE OUTCOMES

ZOO 101; PRINCIPES OF CLASSIFICATION, ZOOGEOGRAPHY AND PALEOZOOLOGY

After successful completion of the course, students will be able to:-

CO-1: Attain the knowledge of the classification of animals, concepts of species, taxonomy, systematics, taxonomical hierarchy and morphological and cytological techniques and also understand the relationship of chemistry and taxonomy and mathematics and taxonomy.
CO-2: Understand the knowledge of the International Code of Zoological Nomenclature, concept of chemotaxonomy and basic concept of molecular techniques of taxonomy.
CO-3: Explain the Zoogeographical regions of the world with characteristics fauna and marine realms with characteristics, the barriers-its types and significance, continental drift and discontinuous distributions.

CO-4: Have the knowledge of paleozoology-fossils, its types, living fossils, dating and significance, geological time scale and associated fauna.

101P: PRACTICAL ON THE PRINCIPLES OF CLASSIFICATION, ZOOGEOGRAPHY AND PALAEOZOOLOGY

After the successful completion, students will be able to:-

CO-1: Show knowledge and skills of field collection trip in taxonomic procedure, methods, preservation, and identification description of species.
CO-2: Practical skills of labelling/tagging of species, narcotization, fixation and preservation techniques, Camera-Lucida drawing techniques, morphometric and meristic characters and identification using dichotomous keys.
CO-3: Demonstrate practical knowledge in zoological time table.

ZOO 202: FUNCTIONAL ANATOMY OF NON-CHORDATA

After successful completion of the course, students will be able to:-

CO-1: Understand about non-chordates/Invertebrates groups of animals starting from microscopic unicellular organisms to lower level multicellular organisms- Phylum Protozoa,Porifera,Coelenterata,Helmiinthes,Anelida,,Arthropoda,Mollusca and Echinodermata with their distinguishing characters and classifications.
CO-2: Knowledge about structure, physiology, life history and pathogenicity of *Entamoeba histolytica, Trypanosoma gambiense, Plasmodium vivax* and *P. falciparum*.
CO3: Concepts of reproduction and nutrition in Euglena and about origin, metamerism and symmetry of metazoan.
CO-4: Understand of canal system, skeleton and economic importance of Phylum Porifera.
PO-5: Knowledge of structural organization in Trematoda and Cestoda of Platyhelmenthes and life cycle and mode of parasitic adaptation in *Fasciola hepatica, Taenia solium* and *Ascaris limbricoides.*
CO-6: Gain knowledge of Minor Phyla.

ZOO 202 P : PRACTICAL ON FUNCTIONAL ANATOMY ON NON-CHORDATA

After successful completion of the course, students will be able to:-

CO-1: Show skill in dissection of organ systems of the invertebrates.
CO-2: Identify the permanent slides and museum specimens of invertebrates.
CO-3: Knowledge about the preparation of temporary slides on particular invertebrates.

ZOO 303 – FUNCTIONAL ANATOMY OF CHORDATA

After the successful completion of this course, students will be able to:-

CO-1: Know about the general characters of Chordate.
CO-2: Explain characters and classification of Protochordata, Cyclostomata, Fishes, Amphibia, Reptilia, Aves and Mammalia.
CO-3: Knowledge about the affinities of Amphioxus
CO-4: Understand the external features, digestive system and reproductive system of Petromyzon.
CO-5: Knowledge of external feature, respiratory system, reproductive system, brain and Cranial nerves of Scoliodon.

CO-6: Gain the specific knowledge about air bladder, accessory, respiratory organ of fishes and concepts on general characters and distribution of Dipnoi.
CO-7: Know about feather, digestive, respiratory, circulatory, urinogenital and skeletal system of pigeon.
CO-8: Knowledge about the characters of Ratitae, Carinatae and Archaeopteryx.
CO-9: Knowledge about perching mechanism of birds and origin of mammals.
CO-10: Knowledge about the skeletal, excretory and reproductive system of rabbit.
CO-11: Show the comparison of organ systems- integument, digestive, circulatory, skeletal, nervous, urogenital systems and also endocrine glands of Chordates.

ZOO 303P – PRACTICAL ON FUNCTIONAL ANATOMY OF CHORDATA

After the successful completion of this course, students will be able to:-

CO-1: Demonstrate practical skills in dissection of organ systems of the vertibrates.
CO-2: Identify the museum specimens of chordates.
CO-3: Explain the different structures of bones – analytical comparison.

ZOO 404 – ENVIRONMENTAL BIOLOGY, APPLIED ZOOLOGY & COMPUTER APPLICATON

After the successful completion of this course, students will be able to:-

CO-1: Understand the concept of biodiversity and hot spots, wild life and conservation in the context of Manipur and India as a whole.
CO-2: Explain the concept of ecosystem, biotic and abiotic factors, food chain and energy flow, biological cycles and biosphere, environmental pollution, toxic effect of pesticides and industrial wastes and the idea of bio magnification.
CO-3: Understand the idea of applied Zoology in apiculture, sericulture and pisciculture.
CO-4: Knowledge about the computer application in Biology using software packages.

ZOO 404P – ENVIRONMENTAL BIOLOGY, APPLIED ZOOLOGY & COMPUTER APPLICATON

After the successful completion of this course, students will be able to:-

CO-1: Identify and explain the biotic and abiotic components of a pond ecosystem, recording of parameters of water quality, demonstrate the tagging experiment of population study.
CO-2: Study of life history stages of honey bee, silk moth, fish etc.
CO-3: Visit and learn about wildlife sanctuaries, Zoo/National park and study about the animal available therein.

ZOO 505 – CELL BIOLOGY AND GENETICS

After the successful completion of this course, students will be able to:-

CO-1: Know the basic terms in Cell biology, types of cells, intercellular adhesions and interactions, extra nuclear organizations of the cells and transport systems between the cells.
CO-2: Understand the structure and functions of different cytoplasmic organelles of cell.
CO-3: Knowledge about nucleus and its different components and chromosomes and its different functions.
CO-4: Knowledge about cell cycle, cell division and cell regulation, DNA replication, protein synthesis, Lac Operon and Tryptophan Operon model.

CO-5: Grasp idea of overall view on Genetics, sex determination, blood groups, mutation, genetic diseases and counselling.
CO-6: Gain knowledge of molecular genetics and tools, human genome diseases project and improvement of human quality and research.

ZOO 506 – EVOLUTION, ADAPTATION, ETHOLOGY, BIOTECHNOLOGY & BIOINSTRUMENTATION

After the successful completion of this course, students will be able to:-

CO-1: Understand the origin of life, theory of organic evolution, role of evidences in support of evolution.
CO-2: Know about the adaption of animals with different modes of life and environments.
CO-3: Describe different types of animal behavior, types of insect communication, parental care in fishes, courtship behavior in fishes, birds, and migration of insects, fishes and birds.
CO-4: Explain the history, scope, types and importance of biotechnology.
CO-5: Understand the food production, health care, in-vitro fertilization in human using biotechnology.
CO-6: Gain the knowledge of different importance of bio-instruments.

ZOO 507 – PRACTICAL ON CELL BIOLOGY, GENETICS, EVOLUTION, ADAPTATION, ETHOLOGY, BIOTECHNOLOGY & BIOINSTRUMENTATION

After the successful completion of this course, students will be able to:

CO-1: Demonstrate the different stages of mitosis and meiosis using biological matters.
CO-2: Demonstrate the sex chromosomes of a grasshopper and mammal, the karyotypic of chromosomes and sex chromatin (Barr body).
CO-3: Gain the knowledge of mimicry inn different animals and types of nest and parental care.
CO-4: Demonstrate the estimation of amino acids and protein using spectrophotometer and measure cell size using micrometre.
CO-5: Demonstrate the separation of tissue extract using centrifuge and the process of electrophoresis.

ZOO 608 – ANIMAL PHYSIOLOGY, ENDOCRINOLOGY, IMMUNOLOGY

After the successful completion of this course, students will be able to:-

CO-1: Understand nutritional value of micro and macro nutrients including digestion and absorption.
CO-2: Explain blood circulation, heart, composition of blood, blood groups and Rh –factors.
CO-3: Discuss respiratory system, transport of oxygen and carbon-dioxide, Hemoglobin mechanism and control.
CO-4: Explain the physiology of urine formation, role of kidneys, salt and acid-base balance.
CO-5: Knowledge of muscle, nerve and sense organs-structural chemical and physiological basis.
CO-6: Gain of endocrine glands and neurosecretary cells and explain hormones of the body and their functions.
CO-7: Understand the knowledge of immune system and immunology and know about HIV and AIDS.

ZOO 609 – DEVELOPMENTAL BIOLOGY, HISTOLOGY AND BIOLOGICAL CHEMISTRY

After the successful completion of this course, students will be able to:-

CO-1: Knowledge about formation of eggs, fertilization, parthenogenesis, Oogenesis and vitellogenesis.
CO-2: Understand the stages of development, faetal membranes, pattern of cleavage, developmental stages of frog and chick, germ layers of fate maps, structure of extra-embryonic membranes and placenta.
CO-3: Describe the formation of organs, development of different organs.
CO-4: Explain the histological techniques and study of tissues – kidneys, lungs, liver, ovary, testis etc.
CO-5: Describe the chemistry of carbohydrate, protein, lipids, nucleic acids and enzymes.
CO-6: Understand electron transport system and bioenergetics.

ZOO 610 – PRACTICAL ON ANIMAL PHYSIOLOGY, ENDOCRINOLOGY, IMMUNOLOGY, DEVELOPMENTAL BIOLOGY, HISTOLOGY AND BIOLOGICAL CHEMISTRY

After the successful completion of this course, students will be able to:-

CO-1: Knowledge of skills on counting of RBC and WBC, estimation of hemoglobin percentage, demonstration of coagulation of blood, recording of heart beat, preparation of haemin crystals and effects of acetylcholine, atropine and epinephrine on heartbeat of frog.
CO-2: Determination of ABO and Rh blood groups.
CO-3: Know the skills of dissection of endocrine gland in rats/frogs.
CO-4: Identify and show carbohydrate, protein and lipid presence.
CO-5: Proceed calorimetric estimation of protein and amino acid contains.
CO-6: Demonstrate the section cutting and stretching of ribbon from paraffin block.

DEPARTMENT OF ZOOLOGY
MODERN COLLEGE, IMPHAL
NAME OF PROGRAMME: B.SC. ZOOLOGY GENERAL (PASS COURSE)

PROGRAMME OUTCOMES

After the successfully completion of B.Sc. Zoology General Course, the students will be able to:

PO-1: Apply the different applications of Zoology and Biology in their life; will have good knowledge of environment and species conservation, pollution control, prevention of diseases and correct choice of quality food choices.
PO-2: Acquire basic skills in the scientific classification of animals.
PO-3: Understand the rich diversity of organisms and their ecological, evolutionary and their sustainable development.
PO-4: Provide the knowledge of physiological, chemical, mechanical, behavioural, ecological systems of organisms with the help of various techniques, computer applications and scientific investigations.
PO-5: Equipped with the degree to acquire jobs and higher studies.

PROGGRAMME SPECIFIC OUTCOMES

After the successful completion, the students will be able to:

PSO-1: Analyse the relationship among animals with their ecosystems and enhance the technical skills for experimental purposes.
PSO-2: Understand the animal diversity, principles of ecology, comparative anatomy and developmental, physiology and biochemistry, genetics, evolutionary biology, biotechnology, applied biology, immunology, vector and diseases.
PSO-3: Understand the applications of Zoology in agriculture, medicine and economic Zoology such as sericulture, apiculture, aquaculture, industrial microbiology DNA technology and medicine for their career opportunities.
PSO-4: Enhance knowledge about research methodologies, effective communication and skills of problem solving methods
PSO-5: Contribute the knowledge for nation building.

COURSE OUTCOMES

ZOO-509 - CELL BIOLOGY, GENETICS, EVOLUTION & BIOLOGICAL TECHNIQUES

After the successful completion of this course, students will be able to:

CO-1: Know the basic terms in Cell biology, types of cells, intercellular adhesions and interactions, extra nuclear organizations of the cells and transport systems between the cells.
CO-2: Understand the structure and functions of different cytoplasmic organelles of cell.
CO-3: Knowledge about nucleus and its different components and chromosomes and its different functions.
CO-4: Knowledge about cell cycle, cell division and cell regulation, DNA replication, protein synthesis, Lac Operon and Tryptophan Operon model.

CO-5: Grasp idea of overall view on Genetics, sex determination, blood groups, mutation, genetic diseases and counselling.
CO-6: Gain knowledge of molecular genetics and tools, human genome diseases project and improvement of human quality and research.
CO-7: Understand the origin of life, theory of organic evolution, role of evidences in support of evolution.
CO-8: Know about the adaption of animals with different modes of life and environments.
CO-9: Have the knowledge of paleozoology-fossils, its types, living fossils, dating and significance, geological time scale and associated fauna.
CO-10: Explain the Zoogeographical regions of the world with characteristics fauna and marine realms with characteristics, the barriers-its types and significance, continental drift and discontinuous distributions.
CO-11: Describe different types of animal behaviour, types of insect communication, parental care in fishes, courtship behaviour in fishes, birds, and migration of insects, fishes and birds.
CO-12: Explain the history, scope, types and importance of biotechnology.
CO-13: Understand the food production, health care, in-vitro fertilization in human using biotechnology.
CO-14: Gain the knowledge of different importance of bio-instruments.

ZOO-510P - PRACTICALS ON CELL BIOLOGY, GENETICS, EVOLUTION, ADAPTATION, ETHOLOGY, BIOTECHNOLOGY & BIOINSTRUMENTATION

After the successful completion of this course, students will be able to:

CO-1: Demonstrate the different stages of mitosis and meiosis using biological matters.
CO-2: Demonstrate the sex chromosomes of a grasshopper and mammal, the karyotypic of chromosomes and sex chromatin (Barr body).
CO-3: Gain the knowledge of mimicry inn different animals and types of nests and parental care.
CO-4: Demonstrate the estimation of amino acids and protein using spectrophotometer and measure cell size using micrometer.
CO-5: Demonstrate the separation of tissue extract using centrifuge and the process of electrophoresis.

ZOO 611 – ANIMAL PHYSIOLOGY, HISTOLOGY, DEVELOPMENTAL BIOLOGY & BIOLOGICAL CHEMISTRY

After the successful completion of this course, students will be able to:

CO-1: Understand nutritional value of micro and macro nutrients including digestion and absorption.
CO-2: Explain blood circulation, heart, composition of blood, blood groups and Rh –factors.
CO-3: Discuss respiratory system, transport of oxygen and carbon-dioxide, Haemoglobin mechanism and control.
CO-4: Explain the physiology of urine formation, role of kidneys, salt and acid-base balance.
CO-5: Knowledge of muscle, nerve and sense organs-structural chemical and physiological basis.
CO-6: Knowledge about endocrine glands and neurosecretary cells, hormones of the body and their functions.

CO-7: Explain the histological techniques and study of tissues – kidneys, lungs, liver, ovary, testis etc.
CO-8: Knowledge about formation of eggs, fertilization, parthenogenesis, Oogenesis and vitellogenesis.
CO-9: Understand the stages of development, foetal membranes, pattern of cleavage, developmental stages of frog and chick, germ layers of fate maps, structure of extra-embryonic membranes and placenta.
CO-10: Describe the formation of organs, development of different organs.
CO-11: Describe the chemistry of carbohydrate, protein, lipids, nucleic acids and enzymes.
CO-12: Understand electron transport system and bioenergetics.