UNIVERSITY OF SCIENCE & TECHNOLOGY MEGHALAYA
Department of Zoology

Program Name: B.Sc. Zoology
Program Code: BSZ

Program Outcome (PO):

1. Gain knowledge about animal life, exchange knowledge and ideas with other stakeholders; make people aware about sustainable utilization of resources.

2. Learn the skill of peaceful coexistence with nature and solve problem analyzing critically with ethical approach.

3. Enhance academic and professional skills with developed scientific temper and attitude beneficial to the society.

Program Specific Outcome (PSO):

PSO-1: Enrich knowledge about the wide diversity of invertebrates and vertebrates, their classification, characters, distribution and their ecological and evolutionary significance.

PSO-2: Learn about the environment and its contribution for a sustainable development

PSO-3: To make aware about environmental degradation and formulations for its protection, conservation of the species with reference to local importance.

PSO-4: Gain knowledge about morphological, anatomical, biochemical, physiological and genetical aspect of animals.

PSO-5: Acquire the entrepreneurial knowledge about sericulture, apiculture, fisheries and poultry farming. To learn nature's photographic skills which aid in different fields of profession.

Course code: BSZ-101 (Theory)
Course Title: Invertebrate-I: Non-Chordates (Protista to Pseudocoelomates) (4 Credits)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Understand the fascinating world of invertebrates.

CO2: Understand the basics of systematic by learning the diagnostic and general characters of major and minor phyla.

CO3: learning in depth about major phylum- from protozoa to platyhelminthes and minor phylum- ctenophore and rotifera.

Course Code: BSZ-102 (Theory)
Course Title: Ecology (4Credits)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Understand the structure of ecosystem and its types.

CO2: Learn the basic concept of population & community ecology and process of ecological succession.

CO4: Understand biogeochemical cycles, natural resources and their conservation.

CO5: Understand the concept of wildlife conservation and management with special reference to NE India.

Course Code: BSZ-103 (Practical)
Course Title: Non-Chordates: Protista to Pseudoceolomates (2 Credits)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Familiarize the handling of microscope.

CO2: Learn about symmetry and its types in invertebrates.

CO3: Learn the identifying characters of invertebrates through permanent slides, models and specimen.

CO4: Gain practical experience of culturing Paramecium in the lab.

CO5: Learn the method of permanent slide preparation.

Course Code: BSZ-104 (Practical)
Course Title: Ecology (2 Credits)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Learn the procedure of determination of pH, DO, CO_2, total alkalinity and Chloride in pond water.

CO2: Learn how to how to determine the air temperature and humidity.

CO3: Learn the estimation of Primary productivity in ecosystem.

CO4. Study of Zooplanktons and its role in pond ecosystem.

CO5: Analyze the physical parameters of soil and estimate its moisture content.

Course Code: BSZ-711 (Theory)
Course Title: Invertebrate Diversity, Ecology and Biotechnology (4 Credit)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Learn the taxonomic status of the entire non-chordates up to echinoderms

CO2: Understand the general biology of few selected non-chordates useful to mankind.

CO3: Learn about the Minor Phyla

CO4: Understand the structure of ecosystem and its types. biogeochemical cycles, natural resources and their conservation

CO5: Analyze the causes of environmental degradation and measures of its control.

CO6: Learn the fundamentals of biotechnology and its applications

CO7: Get familiarized with the various biotechnological tools.

Course Code: BSZ-712 (Practical)
Course Title: Invertebrate Diversity, Ecology & Biotechnology (2 Credit)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Get familiar with the different types of invertebrate with the help of the preserved animals available in the laboratory.

CO2: Learn the techniques of preparations of the temporary & permanent slides.

CO3: Learn the procedure of amino acid detection through chromatography.

CO4: Evaluate the value of pH, DO and CO_2 in pond water.

CO5: Learn to determine the air temperature and humidity.

Course Code: BSZ-201 (Theory)
Course Title: Non-Chordates II: Annelida to Echinodermeta (4 Credit)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Understand the General characters and classification up to Orders in Annelids with coelom and metamerism.

CO2: Understand the General characters and classification up to Orders in Arthropoda. Also to understand the different larval forms of crustacia and different types of mouth parts in insect.

CO3: Understand the General characters and classification up to Orders in Mollusca and to understand the

gastrovascular system, torsion and detorsion.
CO4: Understand the General characters and classification up to Orders in Echinodermata and their water vascular system.

Course Code: BSZ-202 (Theory)
Course Title: Cell Biology (4 Credit)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Conceptualize cell as the basic unit of life and acknowledge its diversities and types

CO2: Understand the different cell components like Mitochondria, Golgi Complex, Endoplasmic reticulum, Ribsome, Lysosomes and Nucleus.

CO3: Gain knowledge about the structure and role of plasma membrane and cytoskeleton.

CO4: Learn about cellular reproduction, the structure and function of chromosome.

Course Code: BSZ-203 (Practical)
Course Title: Invertebrate-II (2 Credit)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Can identify and classify different types of invertebrate with the help of different Museum specimen.

CO2: Learn about the life cycle of Muga silk worm and larval forms of crustaceans.

CO3: Understand the differences of mouth parts of different types of Mosquitoes.

CO4: Understand the salivary apparatus of insect, urinogenital system of leech and statocyst of prawn by dissection.

CO5: Learn preparation of permanent slides of Euglena, Hydra, Obelia, etc.

Course Code: BSZ-204 (Practical)
Course Title: Cell Biology (2 Credit)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Understand the different types of cells with the help of observing the different types of Histological slides of liver, intestine, kidney, testis ovary and lungs.

CO2: Understand the mitotic stages with the help of onion root tip.

CO3: Learn the use and application of instruments like Different types of Microscope, Autoclave, Centrifuge machine, Micropipette, etc.

CO4: Understand about Sex chromatin from buccal epithelium observation, Prepare fixatives and stains,

culture of Protozoa, etc.

Course Code: BSZ-721 (Theory)
Course Title: Chordate Diversity, Comparative Anatomy & Evolution (4 Credits)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Understand the General Characteristics and Classification of different types of Chordates and to differentiate between Chordates and Non-chordates and to understand the affinities of Urochordata, Cephalochordata and Vertebrata.

CO2: Understand the Biological significance of Cyclostomata, Ostracodermi and Placodermi and the significance of air bladder of Pisces and the migration pattern of Pisces.

CO2: Describe the evolutionary knowledge through the concepts of coloration and mimicry.

CO3: Identify the contributions of various evolutionists.

CO4: Identify different zoogeographical realms with fauna.

CO5: Understand the knowledge of eras and evolution of species.

Course Code: BSZ-722 (Practical)
Course Title: Chordate Diversity, Comparative Anatomy & Evolution (2 Credit)
Course Outcome:
At the end of the course, the students will be able to:

CO1: Learn the mounting procedure of various tissue like blood film, epithelial tissue.

CO2: Gain knowledge about the skeletal system in vertebrates.

CO3: Recognise the systematic position of different vertebrates through laboratory specimens.

CO4: Gain knowledge about the phylogenic relationship between different vertebrate groups through evolutionary evidences.

Course Code: BSZ-301 (Theory)
Course Title: Diversity of Chordates (4 credits)
Course Outcome:
CO1: Understand the General Characteristics and Classification of different types of Chordates and to differentiate between Chordates and Non-chordates.
CO2: Understand the affinities of Urochordata, Cephalochordata and Vertebrata.
CO3: Understand the Biological significance of Cyclostomata, Ostracodermi and Placodermi.
CO4: Understand the significance of air bladder of Pisces and the migration pattern of Pisces.
CO5: Understand the skull types of Reptiles and biting mechanism of poisonous snakes.
CO6: Understand the Flight adaptation, Mechanism of flights and the migration of Birds.

CO7: Understand about the egg laying mammals, pouched mammals and primates.

Course Code: BSZ-302 (Theory)
Course Title: Physiology: Controlling and Coordinating Systems (4 credits)
Course Outcome:
CO1: Understand the General characteristics of Endocrine system and classification of Hormones.
CO2: Understand the structure of different endocrine glands like pituitary gland, Thyroid gland, pancreas, Adrenal and the functions of their different hormones.
CO3: Understand the mechanism of action of steroid and peptide hormones.
CO5: Understand the structure and function of testis and ovary.

Course Code: BSZ-303 (Theory)
Course Title: Fundamentals of Biochemistry (4 credits)
Course Outcome:
CO1: Understand the Chemical foundation of Biology, i.e., pH, Buffers, pK, Isomeristaion, etc.
CO2: Understand the Classification and Biological Significance of amino acids, carbohydrates, peptides, protein, lipids and nucleic acid.
CO3: Understand the metabolism of carbohydrates, protein and Lipids.
CO4: Learn about enzyme- its classification, kinetics and mechanism of action
CO5: Understand Ornithine cycle.
CO6: Understand the mechanism of Oxidation with special reference to mitochondrial electron transport system.

Course Code: BSZ-304 (Practical)
Course Title: Vertebrate (2 Credit)
Course Outcome:
CO1: Understand the General Characteristics and Classification of different types of Chordates and to differentiate between Chordates and Non-chordates.
CO2. Understand the affinities of Urochordata, Cephalochordata and Vertebrata.
CO3: Understand the Biological significance of different types of fish scales.
CO4: Understand about the comparative anatomy/haematology of vertebrates

Course Code: BSZ-305 (Practical)
Course Title: Physiology (2 Credits)
Course Outcome:
CO1: Learn the Quantative detection of Carbohydrates, Protein and Lipid.
CO2: Learn the Enzymatic activity of Salivary amylase.
CO3: Learn the detection of ascorbic acid in citrus fruits and vitamin A in oil.
CO4: Learn about the different Hematological parameters.

Course Code: BSZ-306 (Theory)
Course Title: Skills Development –I: Basic Skills Development and Economic Zoology (2 Credit)
Course Outcome:
CO1: to understand the importance of skill development with status of skill development in India and opportunities related to Entrepreneurship in Zoology.
CO2: To understand the scope of Economic Zoology in the field of Sericulture, Apiculture and Lac culture.
CO3: To understand the aspect of fish culture and Induced breeding.

CO4: To study the ornamental fish of NE India with its prospect & trade.

Course Code: BSZ-731 (Theory)
Course Title: Biosystematics, Taxonomy & Biostatistics (4 Credits)
Course Outcome:
CO1: Understand the principles and practice of systematics.
CO2: Understand and application of statistical methods to a wide range of topics in biology.
CO3: Learn the various methods of biostatistics and its applications.

Course Code: BSZ-732 (Practical)
Course Title: Biosystematics, Taxonomy & Biostatistics (2 Credits)
Course Outcome:
CO1: Learn the method of collection, preservation, identification and curation of museum specimens.
CO2: Learn the preparation and preservation of silk worm.
CO3. Understand the ANOVA Test (Mathematical and graphical representation, no formula, and real life example).
CO4: Understand the Chi-Square Test (Field work, graphical representation and real life example) Testing of hypothesis (two tailed only) a) for mean (one population).

Course Code: BSZ-401 (Theory)
Course Title: COMPARATIVE ANATOMY OF VERTEBRATES (4 Credits)
Course Outcome:
CO1: Learn to compare the integumentary and skeletal system of different vertebrates.
CO2: Understand the Alimentary canal of different vertebrates and associated glands, dentition, etc.
CO3: Learn the Respiratory System of different terrestrial and aquatic animals and different structure of respiratory organs in different animals.
CO4. Learn the digestive system of lower to higher animals and their accessory organs.
CO5: Create a comparative account of brain, Autonomic nervous system, spinal cord, cranial nerves in mammals.

Course Code: BSZ-402 (Theory)
Course Title: ANIMAL PHYSIOLOGY (4 Credits)
Course Outcome:
CO1: Understand the digestion and absorption of various nutrients of mammals.
CO2: Learn the structure of nephron and the mechanism of urine formation.
CO3: Conceptualize about the mechanism of respiration and respiratory pigments.
CO4: Learn about the structure of heart and the cardiac cycle.
CO5: Understand the structure and function of blood, blood groups and mechanism of blood clotting
CO6: Gain knowledge about the structure of neuron, propagation of nerve impulse and synaptic transmission.

Course Code: BSZ-403 (Theory)
Course Title: BIOCHEMISTRY OF METABOLIC PROCESSES (4 Credit)
Course Outcome:
CO1: Learn the basic concepts of different metabolic pathways and their interconnections with each other.
CO2: Enable the students to illustrate various Biochemical pathways.
CO3: Learn about the electron transport chain,their inhibitors and uncouplers.

Course Code: BSZ-405 (Practical)
Course Title: BIOCHEMISTRY (2 Credit)
Course Outcome:
CO1: Develop the skill of preparing fixatives, stains and other reagents.
CO2: Learn to evaluate total content of protein, carbohydrate, lipid and amino acid.
CO3: Analyze the enzymatic activity of trypsin and lipase.
CO4: Familiarize with blood glucometer.
CO5: Recognize different groups of vertebrates on the basis of haeminccrystal structure

Course Code: BSZ-406 (Theory)
Course Title: Skills Development –II: Fish and Poultry Farming, and Nature Photography (2 Credits)
Course Outcome:
CO1: Understand the definition of endemic fish species. Types of endemism, Endemic fish species of India Conservation measures.
CO2: Understand the definition of exotic fish species, Rules of introduction of exotic species, Preventive measures and Exotic fish species of India.
CO3: Understand the types of commercial layers and broilers, Selection of commercial layers.
CO4: Understand the Construction of poultry farm, Rearing of broilers and layers by visiting the commercial farms.
CO5: Understand the Poultry waste management.
CO6: Understand the basics about the camera, types of still camera, components of the camera (lens, aperture and other accessories), Good framing of the nature and wildlife photography and basic role of nature photography.

Course Code: BSZ-501 (Theory)
Course Title: Molecular Biology (4 Credits)
Course Outcome:
CO1: Learn about the historical background the molecular biology and different experimental evidences of DNA and RNA as genetic material.
CO2: Gain knowledge about the molecular structure of DNA and RNA and their process of synthesis in the cell.
CO3: Assimilate the mechanism of protein synthesis and the regulation of gene expression

Course Code: BSZ-502 (Theory)
Course Title: Principles of Genetics (4 Credits)
Course Outcome:
CO1. Understanding of basic concepts of genetics, laws of inheritance; varieties of gene expression and linkage
CO2. Gain knowledge about chemical structure and function of nucleic acids, structural changes in chromosomes and extrachromosomal inheritance.
CO3. Understand crossing over, genetic basis of sex determination and genetic disease in man.
CO4. Understand regulation of gene expression.
CO5: Understand Molecular basis and consequences of mutation.

CO6: Understand recombination in bacteria and viruses, complementation and transposable genetic material.

Course Code: BSZ-503 (Theory)
Course Title: Fish and Fishery (4 Credits)
Course Outcome:
CO1: Conceptualise the basics of fish and fishery industries.
CO2: Understood the physiology and reproductive mechanisms of important fishes.
CO3: Create awareness about different types of fisheries and fishery laws and regulations.
CO4: Understood the modern techniques and methods of fishery industries.
CO5: Attained knowledge about important cultivable fin fishes, shell fishes and importance of value-added fishery products.

Course Code: BSZ-504 (Theory)
Course Title: Parasitology (4 Credits)
Course Outcome:
CO1: Gain basic knowledge about parasites.
CO2: Understand in detail about protozoan diseases and pathogenicity.
CO3: Understand the general features, classification, life cycle of some parasitic helminthes, and their adaptations.

Course Code: BSZ-505 (Practical)
Course Title: Molecular Biology (2 Credit)
Course Outcome:
CO1: Evaluation of the content of DNA and RNA.
CO2: Understood the mechanism of mitosis.
CO3: Study and interpretation of DNA replication, transcription and split genes.
CO4: Learn to isolate and segregate protein.
CO5: Gain knowledge about giant chromosome from Drosophila larva.

Course Code: BSZ-506 (Practical)
Course Title: Principles of Genetics (2 Credits)
Course Outcome:
CO1: Acquire the skill of staining nucleus and nucleolus.
CO2: Detect the different stages of cell division.
CO3: Learn to demonstrate barr body and giant chromosome.
CO4: Analyze the pedigree chart.

Course Code: BSZ-507 (Practical)
Course Title: Fish and Fishery (2 Credits)
Course Outcome:
CO1: Identify the different species of Indigenous Indian Major Carps, Exotic Carps, commercial fishes and ornamental fishes.
CO2: Analyze fecundity and gastrosomatic index of fish.
CO3: Recognize different types of scales, crafts and gears used in fisheries.
CO4: Analyze turbidity/transparency, dissolved oxygen, free carbon-di-oxide, alkalinity of waterbody.
CO5: Locate air breathing organs/accessory respiratory organs of fishes.
CO6: Understand feeding habit by gut content examination.

CO7: Develop clear understanding of pisciculture by field visit.

Course Code: BSZ-508 (Practical)
Course Title: Parasitology (2 Credits)
Course Outcome:
CO1: Identify the different species of parasites.
CO2: Identify the insect vectors and compare their mouth parts.
CO3: Recognize the ecto and endo parasites of vertebrates.
CO4: Develop the skill of permanent slide preparation of different parasites.

Course Code: BSZ-601 (Theory)
Course Title: Developmental Biology (4 Credits)
Course Outcome:
CO1: Learn the basic concept of developmental biology.
CO2: Understand the process of organogenesis of selected organs, development of extra embryonic membrane and the nature and physiology of placenta.
CO3: Came to know the inducer and inductor role in embryogenesis and knowledge about metamorphosis and the process of regeneration.
CO4: Familiar with various stages involved in the developing embryo and types of placenta.
CO5: Understand the initial development al procedures involved in Amphioxus, frog and chick.
CO6: Familiarise with the principle of developmental biology.

Course Code: BSZ-602 (Theory)
Course Title: Evolutionay Biology (4 Credits)
Course Outcome:
CO1: Understand the theories of evolution and highlighted the role of evidences in support of evolution.
CO2: Learn the sources of variation.
CO3: Understand the different forces upsetting the Hardy-Weinberg equilibrium.
CO4: Learn about origin and evolution of man and mechanism of speciation.
CO5: Analyze the causes of mass extinction.

Course Code: BSZ-603 (Theory)
Course Title: Reproductive Biology (4 Credit)
Course Outcome:
CO1: Understand the fundamentals of the structure and function of the male and female reproductive tracts, gametogenesis, fertilization, early embryogenesis, fetal development and preparation for birth, and maternal adaptations to pregnancy.
CO2: Learn about male and female reproductive hormones and their functions.
CO3: Impart the knowledge of IVF and GIFT.
CO4: Understand the process of human implantation and decidualization of the endometrium.
CO5: Analyze the major hormonal signals controlling breast development and lactation.

Course Code: BSZ-604 (Theory)
Course Title: Wildlife Conservation and Management (4 Credits)
Course Outcome:
CO1: Understand the different types of Threatened species or Endangered species especially to North East india.

CO2: Understand Indian Wildlife protection Act and Indian Forest Act.
CO3: Understand different National Park and Wildlife Sanctuaries of North east.
CO4: Analyze how wildlife conservation and management relates to the economy and environment, both currently and in the future.
CO5: Evaluate current events and public information related to wildlife conservation and management as being scientifically-based or opinion-based and contribute to the knowledge base of information.

Course Code: BSZ-605 (Practical)
Course Title: Developmental Biology (2 Credits)
Course Outcome:
CO1: Develop knowledge on the life cycle of Drosophila from stock culture.
CO2: Understand the different developmental stages of animal by collecting the eggs of Frog from the field and rearing in the laboratory and then identify the different stages.
CO3: Expose to concepts and process in developmental biology.
CO4: Analyze different sections of placenta through slides.

Course Code: BSZ-606 (Practical)
Course Title: Evolutionary Biology (2 Credits)
Course Outcome:
CO1. Learn the application of Chi square test in the analysis of Hardy Weinberg principle
CO2. Understand allele frequency calculations.
CO3: Familiarise students with the use of bio informatics tools in phylogeny.

Course Code: BSZ-607 (Practical)
Course Title: Reproductive Biology (2 Credits)
Course Outcome:
CO1: To impart the knowledge of difference between the male and female reproductive system by dissecting cockroach.
CO2: Learn the basic surgical techniques of endocrinology.
CO3: Develop knowledge about breeding techniques and the maintenance of experimental animals.
CO4: Create awareness about the modern contraceptive devices.

Course Code: BSZ-608
Course Title: Practical: Wildlife conservation and management (2 Credits)
Course Outcome:
CO1: Learn to recognize different flora and fauna.
CO2: Demonstrate the basic equipments and field techniques needed in wildlife studies.
CO3: Learn the application of diversity index in field.

Course Title: Fundamentals of Human Values and Professional Ethics
Course Code: HVP-760
Non-Credit Compulsory Course

Course Description: The course aims at introducing the Undergraduate students with the fundamentals concepts and ideas on morality and ethics. It is also aimed to give basic understanding and an insight to the diverse elements and aspects relating to cultural and religious values, human virtues, and professional ethics in local and global context. On successful completion of the course students will be able to learn and maintain a good interpersonal relation in social and professional space.

Course Objectives:

1) To introduce the students to the fundamentals of human values and professional ethics and make its significance in the present day context.
2) To understand the ethical concerns in professional and personal space.