

PG & RESEARCH DEPARTMENT OF ZOOLOGY

B. BOROAH COLLEGE (Autonomous)

(Affiliated to Gauhati University)

GUWAHATI, ASSAM, 781007, INDIA

(Nationally reaccredited with 'A++' grade by NAAC with a CGPA of 3.62)



SYLLABUS FOR FYUGP IN ZOOLOGY (MINOR)

GENERAL CURRICULAR STRUCTURE

2 MINORS

SEMESTER 1			SEMESTER 2		
Type	Course	Credit	Type	Course	Credit
Minor	Course-1 (Minor-1)	4	Minor	Course-2 (Minor-1)	4
	Course-1 (Minor-2)	4		Course-2 (Minor-2)	4
SEC	SEC-1	3	SEC	SEC-2	3
MDC	MDC-1	3	MDC	MDC-2	3
AEC	AEC-1 (Language/Alt Eng)	4	AEC	AEC-2 (Comm English)	4
VAC	VAC-1	2	VAC	VAC-2	2
TOTAL		20	TOTAL		20
SEMESTER 3			SEMESTER 4		
Type	Course	Credit	Type	Course	Credit
Minor	Course-3 (Minor-1)	4	Minor	Course-5 (Minor-1)	4
	Course-4 (Minor-1)	4		Course-6 (Minor-1)	4
	Course-3 (Minor-2)	4		Course-4 (Minor-2)	4
SEC	SEC-3	3		Course-5 (Minor-2)	4
MDC	MDC-3	3		Course-6 (Minor-2)	4
VAC	VAC-3	2			
TOTAL		20	TOTAL		20
SEMESTER 5			SEMESTER 6		
Type	Course	Credit	Type	Course	Credit
Minor	Course-7 (Minor-1)	4	Minor	Course-9 (Minor-1)	4
	Course-8 (Minor-1)	4		Course-10 (Minor-1)	4
	Course-7 (Minor-2)	4		Course-9 (Minor-2)	4
	Course-8 (Minor-2)	4		Course-10 (Minor-2)	4
Internship	4	Course-11 (Minor-1 or 2)		4	
TOTAL		20	TOTAL		20

Structure of Four Year Undergraduate Programme (FYUGP) in Zoology (Minor)

Semester	Paper	Code	Credit
1	Diversity of Non-chordates		3
	Practical		1
2	Diversity of Chordates		3
	Practical		1
3	Elements of Genetics		3
	Practical		1
	Principles of Ecology		3
	Practical		1
4	Comparative Vertebrate Anatomy		3
	Practical		1
	Taxonomy, Biosystematics and Museology		3
	Practical		1
	Concepts of Parasitology		3
	Practical		1
5	Fundamentals of Biochemistry		3
	Practical		1
	Introduction to Cell Biology		3
	Practical		1
	Internship		4
6	Basic Immunology		3
	Practical		1
	Principles of Molecular Biology		3
	Practical		1
	Wildlife Biology and Conservation		3
	Practical		1

**FYUGP 1st SEMESTER (MINOR)
DIVERSITY OF NON-CHORDATES**

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
<p>Unit 1: Protista to Ctenophora Protista: General characteristics and classification upto classes, locomotion and reproduction. Metazoa: Evolution theories of symmetry and segmentation. Porifera: General characteristics and classification upto classes, canal system and spicules in sponges. Cnidaria: General characteristics and classification upto classes, polymorphism, corals and coral reef formation. Ctenophora: General characteristics and classification upto classes, affinities with other phylum.</p>	17
<p>Unit 2: Platyhelminthes to Annelida Platyhelminthes: General characteristics and classification upto classes, life cycle and adaptations of <i>Taenia solium</i> and <i>Fasciola hepatica</i>. Nematelminthes: General characteristics and classification upto classes, life cycle and adaptations of <i>Ascaris lumbricoides</i> and <i>Wuchereria bancrofti</i>. Annelida: General characteristics and classification upto classes, evolution of coelom and metamerism, excretion.</p>	12
<p>Unit 3: Arthropoda to Echinodermata Arthropoda: General characteristics and classification upto classes, larval forms of Crustacea, vision and respiration. Onychophora: General characters and affinities. Mollusca: General characteristics and classification upto classes, torsion and detorsion in Gastropoda, pearl culture, larval stages. Echinodermata: General characteristics and classification upto classes, water vascular system, larval stages.</p>	16

Practical (30 hours)

1. Study of whole mount of *Euglena*, *Amoeba* and *Paramecium* collected from water bodies
2. Study of two representatives from each phylum of non-chordates (specimen/slide/model)
3. Study of larval forms of Arthropoda and Echinodermata from slides/photomicrographs
4. Study of TS of pharynx, gizzard and typhlosolar intestine of earthworm
5. Project report on life cycle of any helminth parasite

Reference books

1. EE Ruppert and RD Barnes. Invertebrate Zoology
2. K Jordan and PS Verma. Invertebrate Zoology
3. RL Kotpal. Modern textbook of Zoology, Invertebrates
4. B Schierwater and R DeSalle. Invertebrate Zoology: A tree of life approach

FYUGP 2nd SEMESTER (MINOR)

DIVERSITY OF CHORDATES

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
Unit 1: Introduction to chordates Origin of chordates: Dipleurula concept and echinoderm theory, general characteristics and classification. Protochordates: General characteristics of hemichordata, urochordata and cephalochordate, larval forms	12
Unit 2: Pisces to Amphibians Advanced features of vertebrata over protochordate. Pisces: General characteristics and classification upto classes, migration. Cyclostomes: General characteristics and classification upto classes, affinities, phylogenetic status, differences between Lampreys and Hag fishes. Amphibia: Origin of tetrapoda, general characteristics and classification upto classes, parental care.	17
Unit 3: Reptiles to Mammals Reptiles: General characteristics and classification upto orders, biting apparatus and mechanism, differences between poisonous and non-poisonous snakes. Aves: General characteristics and classification upto orders, <i>Archaeopteryx</i> as a connecting link, flight adaptations. Mammalia: General characteristics and classification upto orders, affinities in Prototheria.	16

Practical (30 hours)

1. Study of museum specimens/models of Protochordata (*Balanoglossus*, *Herdmania*, *Amphioxus*) Agnatha (*Petromyzon*, *Myxine*), fishes (*Scoliodon*, *Torpedo*, *Mystus*, *Heteropneustes*, *Labeo*, *Hippocampus*, *Tetradon*), Amphibia (*Ichthyophis*, *Necturus*, *Bufo*, *Hyla*), Reptilia (*Chelone*, *Hemidactylus*, *Varanus*, *Chameleon*, *Bungarus*, *Naja*), Aves (peacock, sparrow, crow, king fisher, common myna, pigeon), Mammalia (bat, common primates and ungulates, Gangetic river Dolphin)
2. Study of TS of *Amphioxus* through pharyngeal, intestinal and caudal regions
3. Identification key of venomous and non-venomous snakes
4. Presentation on study of any two vertebrates from two different class

Reference books

1. JZ Young. The life of Vertebrates
2. FH Pough and CM Janis. Vertebrate Life
3. PS Verma and EL Jordan. Chordate Zoology
4. RL Kotpal. Modern textbook of Zoology: Vertebrates

FYUGP 3rd SEMESTER (MINOR 1)**ELEMENTS OF GENETICS****CODE:****CREDITS: 3 (T) + 1 (P) = 4****Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)**

Theory	Hours
Unit 1: Introduction to Genetics Principles of inheritance, incomplete dominance and co-dominance, multiple alleles, lethal alleles, penetrance and expressivity, epistasis, pleiotropy, sex-linked, sex-influenced and sex-limited characters, inheritance and concept of gene. Linkage and crossing over, Cytological basis of crossing over, recombination frequency as a measure of linkage intensity, two factor and three factor crosses, linkage map, coefficient of coincidence and interference.	15
Unit 2: Gene mutations Chromosomal aberrations: deletion, duplication, inversion, translocation, aneuploidy and polyploidy. Mutation: induced versus spontaneous mutations, backward and forward mutations, suppressor mutations, mutagens.	20
Unit 3: Genetic phenomena Basis of sex determination: genetic and environmental, sex determination in <i>Drosophila</i> and human, mechanism of dosage compensation. Comparison of nuclear and extra nuclear inheritance. Maternal effect: Shell coiling in <i>Limnaea</i> . Polygenic inheritance and transgressive variation.	10

Practical (30 hours)

1. To study Mendelian laws and gene interactions and their verification by Chi square analyses using seeds/beads/*Drosophila*
2. Study of linkage maps based on data from *Drosophila* crosses.
3. Identification of mutant types of *Drosophila* (through culture/photomicrograph)
4. Study of human karyotype (normal and abnormal) using photomicrograph

Reference books

1. DP Snustad and MJ Simmons. Principles of Genetics
2. B Lewin. Genes XI
3. PJ Russell. Genetics – A Molecular Approach
4. RH Tamarin. Principles of Genetics

FYUGP 3rd SEMESTER (MINOR 2)

PRINCIPLES OF ECOLOGY

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
Unit 1: Introduction to Ecology and Ecosystem Basic concept of ecology and ecosystem, Autecology, Synecology, level of organization, study of physical factors, laws of limiting factors, structural components of ecosystem, functional attributes of ecosystem - trophic structure, food chain, food web, energy flow, ecological pyramids, ecological efficiencies. Types of ecosystems with examples.	12
Unit 2: Population Ecology Definition, unitary and modular populations, population attributes - abundance, density, natality and mortality, life table and survivorship curve, dispersion, dispersal, age distribution, sex ratio, biotic potential and environmental resistance, population growth form - exponential and logistic, population regulation-density dependent and independent factors. Population interactions, Gauss's principle.	17
Unit 3: Community Ecology Definition of community, community characteristics, community structure, ecological succession and types, theories pertaining to climax community, ecotone and edge effect. Bio-geo chemical cycles: nitrogen and carbon cycle, impact of pollution on nutrient cycle.	16

Practical (30 hours)

1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided
2. Determination of population density by quadrat method and calculation of Shannon-Weiner diversity index in a natural/hypothetical community.
3. Measurement of temperature, pH, and turbidity of aquatic ecosystem
4. Estimation of dissolved oxygen content (Winkler's method) of water sample
5. Estimation of free CO₂ content of water sample

Reference books

1. EP Odum. Fundamentals of Ecology
2. PA Colinvaux. Ecology
3. CJ Krebs. Ecology
4. RE Ricklefs. Ecology

FYUGP 4th SEMESTER (MINOR 1)
COMPARATIVE VERTEBRATE ANATOMY

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
Unit1: Skeletal and Digestive tract Integumentary system – structure, functions and derivatives. Skeletal system – Overview of axial and appendicular skeleton, jaw suspensorium, visceral arches. Digestive tract – alimentary canals and associated glands in vertebrates, dentition in mammals.	15
Unit 2: Respiratory, Circulatory and Urinogenital system Respiratory System – skin, gills, lungs and air sacs; accessory respiratory organs in vertebrates. Circulatory system – general plan of circulation, comparative anatomy of heart and aortic arches. Urinogenital system – succession of kidney, evolution of urinogenital duct.	15
Unit 3: Nervous system Nervous system – comparative account of brain, autonomic nervous system, spinal cord, cranial nerves in mammals. Sense organs – classification of receptors, brief account of visual and auditory receptors in man.	15

Practical (30 hours)

1. Study of placoid, cycloid and ctenoid scales through permanent slides
2. Study of disarticulated skeleton of frog/fowl/rabbit
3. Study of human skeleton
4. Study of mammalian skulls: herbivorous and carnivorous animal
5. Study of permanent slides of neuron, bone, skin, cartilage, spinal cord and types of muscles
6. Project on comparative structure of any two organs (heart, lung, kidney, brain, eye, and ear)

Reference books

1. KV Kardong. Vertebrates' Comparative Anatomy, Function and Evolution
2. GC Kent and RK Carr. Comparative Anatomy of the Vertebrates
3. M Hilderbrand and GE Gaslow. Analysis of Vertebrate Structure
4. HE Walter and LP Sayles. Biology of Vertebrates

FYUGP 4th SEMESTER (MINOR 2)
TAXONOMY, BIOSYSTEMATICS AND MUSEOLOGY

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
<p>Unit 1: Animal Taxonomy Taxon and phenon, chemotaxonomy and cytotaxonomy, molecular taxonomy, taxonomic categories, concepts of species – typological, nominalistic, biological and evolutionary. Taxonomic keys – various types, dichotomous nature of keys. Taxonomic characters – morphological, behavioral, ecological, and geographical.</p>	15
<p>Unit 2: Biosystematics International Code of Zoological Nomenclature, homonymy and synonymy. Characters (ancestral vs. derived), homology and analogy, parallelism and convergence, monophyly, polyphyly, paraphyly; representing phylogenies – rooted and unrooted phylogenetic trees, clades, cladograms and phenograms.</p>	15
<p>Unit 3: Museology Establishment of museum, concept, development and types of museums, definition, scope and significance, characteristic features of ideal museum, collection of animals. Mounted Specimen - collection, preservation and embalming. Preservation techniques - cleaning, gutting, drying, refrigeration, deep freezing, chemical preservation. Taxidermy - definition, scope and significance, types and process of taxidermy.</p>	15

Practical (30 hours)

1. To identify and distinguish species of insects/fishes/amphibians/reptiles/birds of NE India using appropriate taxonomic keys
2. Analysis of morphometric and meristic variations in common Indian major/minor carps and insect species
3. Collection procedures and identification of phytoplankton and zooplankton
4. Collection, preservation, curation and identification of locally available animals
5. Preservation and mounting of Lepidoptera

Reference books

1. VC Kapoor. Theory and Practice of Animal Taxonomy
2. GG Simpson. Principles of Animal Taxonomy
3. E Mayr. Principles of Systematic Biology
4. RC Dalela and RS Sharma. Animal Taxonomy and Museology

**FYUGP 4th SEMESTER (MINOR 3)
CONCEPTS OF PARASITOLOGY**

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
Unit 1: Introduction to Parasitology and protozoan parasites Parasitism, parasite, parasitoid and vectors, host-parasite relationship; types of parasites and hosts; evolution of parasitism and parasitic adaptations. Study of morphology, life cycle, prevalence, epidemiology, pathogenicity, diagnosis, prophylaxis and treatment of <i>Entamoeba histolytica</i> , <i>Trypanosoma gambiense</i> , <i>Leishmania donovani</i> and <i>Plasmodium</i>	15
Unit 2: Helminthology Study of morphology, life cycle, prevalence, epidemiology, pathogenicity, diagnosis, prophylaxis and treatment of <i>Schistosoma haematobium</i> , <i>Paragonimus westermanni</i> , <i>Hymenolepis nana</i> , <i>Ancylostoma duodenale</i> , <i>Trichuris trichiura</i> , <i>Enterobius vermicularis</i> , and <i>Necator americanus</i> .	17
Unit 3: Ectoparasites External parasites in domesticated animals with examples (cattle, goat, sheep, buffalo and dogs), Study and control of ticks, mites, <i>Pediculus humanus</i> (head and body louse), <i>Xenopsylla cheopis</i> and <i>Cimex lectularius</i> . Parasitic vertebrates – Candiru and vampire bat.	13

Practical (30 hours)

1. Study of protozoan permanent slides: *Entamoeba histolytica*, *Plasmodium vivax*, *Trypanosoma gambiense*, and *Leishmania donovani*
2. Study of helminth specimens: *Schistosoma haematobium*, *Paragonimus westermanni*, *Hymenolepis nana*, *Ancylostoma duodenale*, *Trichuris trichiura*, *Enterobius vermicularis*, and *Necator americanus*
3. Study of trematode larval parasites from permanent slides: sporocyst larva, miracidium larva, redia larva, cercaria larva, and metacercaria larva

Reference books

1. JD Smyth. Introduction to Animal Parasitology
2. KD Chatterjee. Parasitology
3. MA Taylor, RL Coop, and RL Wall. Veterinary Parasitology
4. ES Loker and BV Hofkin. Parasitology – A Conceptual Approach

FYUGP 5th SEMESTER (MINOR 1)
FUNDAMENTALS OF BIOCHEMISTRY

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
Unit1: Carbohydrates and Lipids Carbohydrates - structure and biological importance, monosaccharides, disaccharides, polysaccharides and glycoconjugates. Lipids - structure and significance, physiologically important saturated and unsaturated fatty acids, triacylglycerols, phospholipids, glycolipids, steroids.	15
Unit 2: Proteins and Nucleic Acids Amino acids - structure, classification and general properties of α - amino acids, physiological importance of essential and non-essential α - amino acids. Proteins - bonds stabilizing protein structure, levels of organization, denaturation. Nucleic Acids – structure, purines and pyrimidines, nucleosides and nucleotides, types of DNA and RNA.	15
Unit 3: Enzymes Nomenclature and classification, cofactors, isozymes, specificity and mechanism of enzyme action, enzyme kinetics, factors affecting the rate of enzyme catalysed reactions, regulation of enzyme action, types of enzyme inhibition.	15

Practical (30 hours)

1. Study of activity of salivary amylase and determination of amylase number
2. Separation of standard amino acids by TLC and paper chromatography
3. Extraction and estimation of protein using Lowry's method
4. To determine the iodine number of given oil/fat
5. Estimation of a reducing sugar in a given sample

Reference books

1. MM Cox and DL Nelson. Lehninger's Principles of Biochemistry
2. D Voet, JG Voet and CW Pratt. Principles of Biochemistry
3. JM Berg, JL Tymoczko, and L Stryer. Biochemistry
4. RK Murray, DK Granner, PA Mayes, and VW. Rodwell. Harper's Illustrated Biochemistry

FYUGP 5th SEMESTER (MINOR 2)
INTRODUCTION TO CELL BIOLOGY

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
<p>Unit 1: Introduction to cell Overview of cells: prokaryotic and eukaryotic cells, virus, viroids, mycoplasma, prions. Plasma membrane: various models of plasma membrane structure. Transport across membranes: active and passive transport, facilitated transport, types of transporters. Cell junctions: structure and functions of tight junctions, desmosomes, gap junctions.</p>	15
<p>Unit 2: Organization of cell Endomembrane system: structure and functions of endoplasmic reticulum, Golgi apparatus and lysosomes. Mitochondria: structure, semi-autonomous nature, endosymbiotic hypothesis. Peroxisomes: structure and functions. Cytoskeleton: structure and functions of microtubules, microfilaments, and intermediate filaments. Nucleus (structure of nucleus, nuclear envelope, nuclear pore complex, nucleolus).</p>	15
<p>Unit 3: Chromosomes and Cell division Chromosomes: giant chromosome (polytene and lampbrush), types of eukaryotic chromosomes based on centromeres, euchromatin and heterochromatin, DNA packaging within the nucleus (nucleosome model). Cell division: mitosis, meiosis, cell cycle and its regulation. Cell deaths: necrosis and apoptosis, mechanism of apoptosis. Cell to cell communication – Types of signaling molecules, types of receptors, GPCR and role of second messengers (cAMP).</p>	15

Practical (30 hours)

1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis
2. Study of various stages of meiosis in testis from slides
3. Preparation of permanent slide to show the presence of Barr body in human female buccal mucosa cells
4. Study of liver, lung, stomach, intestine, and kidney from prepared slides
5. Study of epithelial cells from permanent slides

Reference books

1. GM Cooper. The Cell: A Molecular Approach
2. B Alberts et al. Molecular Biology of the Cell
3. J Hardin, GP Bertoni, LJ Kleinsmith, and WM Becker. The World of the Cell
4. G Karp. Cell and Molecular Biology

FYUGP 6th SEMESTER (MINOR 1)

BASIC IMMUNOLOGY

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
Unit 1: Introduction to Immunology Basic concepts of immunology, components of immune system, Innate and adaptive immune systems, Active and passive immunity (Artificial and natural immunity), Haematopoiesis and role of haematopoietic factors; cells of the immune system; primary and secondary lymphoid organs; lymphatic system.	15
Unit 2: Antigens and Antibodies Antigens and their properties, antigenicity and immunogenicity, B and T cells and their epitopes, immunogens, adjuvants and haptens. Immunoglobulins and their structure, properties and functions, antigenic determinants, monoclonal and polyclonal antibodies, types of antigen-antibody interactions in research and diagnosis.	15
Unit 3: Immune response MHC and its classes, structure and functions. Pathways of antigen presentation and processing, properties and functions of cytokines, complement system and its pathways and components, B lymphocytes and immune responsiveness, T lymphocytes and immune responsiveness. Immunodeficiency disorders, auto immune diseases, hypersensitivity reactions.	15

Practical (30 hours)

1. Study of permanent slides of spleen, thymus, lymph nodes, and tonsil
2. Preparation of blood smear to study and identify WBCs
3. ABO blood grouping and Rh factor determination
4. Antigen quantifications using single radial immunodiffusion
5. Demonstration: Dissection and display of lymphoid organs in rat

Reference books

1. J Punt, S Stranford, P Jones, and JA Owen. Kuby Immunology
2. DP Stites, AI Terr, and TG Parslow. Basic and Clinical Immunology
3. M David, B Jonathan, RB David, and R Ivan. Immunology
4. KA Abbas and AH Lechtman. Cellular and Molecular Immunology

FYUGP 6th SEMESTER (MINOR 2)
PRINCIPLES OF MOLECULAR BIOLOGY

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
Unit 1: Nucleic acids and Replication Nucleic Acids (DNA, RNA), structure and types, Watson and Crick model of DNA. DNA replication in prokaryotes and eukaryotes, enzymes in DNA replication, semiconservative, bidirectional and semi-discontinuous replication, telomere and replication of telomeres.	13
Unit 2: Transcription and Translation Transcription: RNA polymerase structure and transcriptional unit, mechanism of transcription in prokaryotes and eukaryotes, split genes: concept of introns and exons, splicing mechanism and alternative splicing. Translation: Genetic code, degeneracy of the genetic code and Wobble hypothesis, aminoacyl tRNA synthetases and charging of tRNA, proteins involved in initiation, elongation and termination of polypeptide chain.	18
Unit 3: Gene regulation Operon concept and models, Transcription regulation in prokaryotes (lac operon and tryptophan operon) Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencer, inducers elements, gene silencing and genetic imprinting. DNA damage and repair mechanisms, RNA interference.	14

Practical (30 hours)

1. Study of electron micrographs/ photograph showing: DNA replication, transcription, translation and split genes
2. Concept of primer designing using bioinformatics software
3. Demonstration of PCR
4. Demonstration of Agarose gel electrophoresis for DNA

Reference books

1. GM Cooper. The cell: A Molecular approach
2. G Karp. Cell and Molecular Biology
3. H Lodish et al. Molecular Cell Biology
4. B Alberts et al. Molecular Biology of the Cell

FYUGP 6th SEMESTER (MINOR 3)
WILDLIFE BIOLOGY AND CONSERVATION

CODE:

CREDITS: 3 (T) + 1 (P) = 4

Total marks: 100 (End semester: 45; Internal assessment: 30; Practical: 25)

Theory	Hours
Unit 1: Introduction to Wildlife Concepts of wildlife, definition, conservation, history, and conservation ethics. Values and importance of wildlife, drivers of wildlife decline in India and Northeast, wildlife habitat ecology and its management, biological and ecological basis of wildlife management. Conservation vs. preservation, wildlife population survey.	15
Unit 2: Wildlife Ecology and Techniques Concepts pertaining to wildlife population, density, types of density, natality, mortality, sex ratio and age structure, population growth patterns and concept of carrying capacity, habitat management of wildlife in a grassland ecosystem, definition of wildlife cover and cover characteristics.	15
Unit 3: Wildlife protected areas Protected areas (NP, WLS, Conservation reserve, Community reserve, Tiger reserve). Conservation of wildlife outside protected areas (elephant reserve, sacred grooves, community conserved areas, Ramsar sites), Biosphere reserve. Wildlife rescue and rehabilitation, human wildlife interactions.	15

Practical (30 hours)

1. Identification of flora (Common plant species associated with wildlife) and fauna (mammals, birds, herpetofauna, and butterflies)
2. Demonstration and applicability of basic equipment needed for wildlife studies (compass, range finder, GPS, camera traps)
3. Demonstrations of field study techniques: line transect and quadrat sampling
4. Estimation of population size of unknown sample by *Tribolium* mark recapture method
5. Project on diversity of animals in a particular area

Reference books

1. G Caughly and ARE Sinclair. Wildlife Ecology and Management
2. SK Shekhar. A field guide to tracks and signs of Indian Wildlife
3. M Raj. Wildlife Ecology and Management
4. TA Bookhout. Research and Management techniques for Wildlife and Habitats