

DEPARTMENT OF ZOOLOGY
NORTH LAKHIMPUR COLLEGE
(AUTONOMOUS)
SYLLABUS FOR UNDER GRADUATE LEVEL
(UNDER SYMESTER SYSTEM)
ZOOLOGY CORE PROGRAMME

TOTAL CREDIT 70

There shall be 27 (twenty seven) courses 14(fourteen) of theory and 13 (Thirteen) of practical courses for TDC Zoology Core Programme. The distribution of courses and marks will be as follows:

Semester-I Total Credit: 5

CT-3-Zoo-101:	Animal Diversity-I and Systematics	Credit 3
CP-2-Zoo-102:	Based on paper 101	

Semester II Total Credit: 5

CT-3-Zoo-201:	Animal diversity-II and Comparative anatomy	Credit 3
CP- 2 Zoo-202	Based on paper 201	Credit 2

Semester III Total Credit: 8

CT-3-Zoo-301:	Biochemistry	Credit 3
CT-3-Zoo-302:	Bioinstrumentation and Biostatistics	Credit 3
CP-2-Zoo-303:	Based on paper 301 & 302	Credit 2

Semester IV Total Credit: 10

CT-3-Zoo-401:	Parasitology and Ethology	Credit 3
CP-2-Zoo-402:	Based on paper 401	Credit 2
CT-3-Zoo-403:	Developmental Biology	Credit 3
CP-2-Zoo-404:	Based on paper 403	Credit 2

Semester V Total Credit: 21

CT-3-Zoo 501 :	Genetics and Evolution	Credit 3
CP-2-Zoo-502 :	Based on paper 501	Credit 2
CT-3-Zoo-503 :	Mammalian Physiology	Credit 3
CP-2-Zoo-504 :	Based on paper 503	Credit 2
CT-3-Zoo-505 :	Cell Biology	Credit 3
CP-2-Zoo-506:	Based on paper 505	Credit 3
CT-3-Zoo-507 :	Endocrinology , Histology and Histochemistry	Credit 3
CP-2-Zoo-508 :	Based on paper 507	Credit 2

Semester VI Total Credit: 21

CT-3-Zoo-601:	Environmental Biology and Wildlife Biology	Credit 3
CP-3-Zoo-602:	Based on paper 601	Credit 3
CT-3-Zoo-603 :	Immunology and Molecular Biology	Credit 3
CP-2-Zoo-604 :	Based on paper 603	Credit 2
CT-3-Zoo -605 :	Biotechnology and Bioinformatics	Credit 3
CP-2-Zoo-606:	Based on paper 605	Credit 2
CT-3-Zoo-607 :	Economic Zoology	Credit 3
CP-2-Zoo-608:	Based on paper 607	Credit 2

Grand Total=Semester (I+II+III+IV+V+VI) = Credit 70

NB: CORE PROGRAMME is the new nomenclature for the MAJOR COURSE of the recent syllabus of the Dibrugarh University.

Systematics**Unit-1:****6 classes**

Systematics: Systematics and classification, form and hierarchy of classification; Modern species concept; nomenclature – rules of zoological nomenclature. Biometry and its application in taxonomy.

Unit-2:**8 classes**

Modern approach to taxonomy (behavioral, cytotaxonomy, chemotaxonomy & molecular)

Unit – 3:**6 classes**

Collection and preservation of zoological specimen; Basic concepts of establishment of zoological museum.

SEMESTER- I Zoology Core (Major)
Code (Paper): CP – 2 – Zoo - 102
Title: (Practical): Based on Paper 101

Credit: 2

Total Marks: 40

L-0,T-0,P-2

1. Dissection of the following invertebrate system:

Earthworm: Urinogenital system.

Pila/ *Acatina*: Nervous system.

Cockroach: Digestive, nervous system and reproductive system.

2. Identification of following invertebrates with reason:

Paramecium, Trypanosoma, Giardia, Trichomonous, Sycon, Trychympha, Globigerina, Porpita, Taenia solium, Ancylostoma duodenale, Wechereria bancrofti, Chalinid sponge, Spongilla, Sea-anemone, Madrepora, Gorgonia, coral, Fungia, Pleurobranchia, Oxuris, Rotifer, Brachipod, Heteronereis, Chaetopterus, Pentobdella, Glycera, Limulus, Megascolex, Tubifex, Glossiphonia, Echiurus, Argulus, Ligia, Neptunus, Branchipus, Apus, Nauplius, Zoea, Megalopa, Millipede, Gryllus, Grylotalpa, Termites, Ephemerid, Larvae, Dragonfly larva, aphid, Ranatra, Bellostoma, Lady bird, Beetle, Ants, Rice-bug, Peripatus, Nautilus, Pearl Oyster, Mytilus, Limax, Solen, Planorbis, Heart -Urchin, Cake-Urchin, Brittle Star, Leaf insect, Stick insect.

3. Collection, identification and habitat information of any five common specimen with their taxonomic keys preferably from phylum Arthropoda, Annelida, and Mollusca.

4. Preparation of permanent slides & mounting of minimum five suitable non-chordate specimens and their submission.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

1. Dissection
2. Preparation of permanent mounting
3. Identification
4. Submission of specimen
5. Slide submission
6. Practical record book
7. Viva voce

SEMESTER- II Zoology Core (Major)
Code (Paper): CT – 3 – Zoo - 201
Title: Animal Diversity-II and Comparative Anatomy
Credit: 3
Total Marks: 60

L-2, T-1, P-0

Objective of the course: The main objective of this course is to introduce the students with the diverse forms and structures of vertebrate animals and their comparative anatomical study.

Animal Diversity-II (Chordates)

Unit –1: General characters of Chordata and classification upto class ; Classification of Protochordata up to orders; general characters of Hemichordata, Urochordata and Cephalochordata; structure and post embryonic development of larval forms and their significance in chordate phylogeny; affinities of protochordates. **10 classes**

Unit –2: Distinctive characters of Petromyzontia, Chondrichthyes & Dipnoi; Classification of Osteichthyes upto orders with examples; Ammocoete larva and its importance in evolution; structures of gills, accessory respiratory organs and swim bladders of fish; sense organs; locomotion, migration and parental care in fish. **10 classes**

Unit –3: Distinctive characters and classification of Amphibia up to orders with examples; parental care, metamorphosis and neoteny in Amphibia.

Distinctive characters and classification of Reptilia upto orders with examples; poisonous snakes of India; biting mechanisms of poisonous snakes; Snake venom and its implications in human welfare. **10 classes**

Unit –4: General characters and classification of Aves up to orders with examples; flight mechanism ; perching mechanism; flight adaptation in bird; migration in birds. Beak and foot modifications in birds. **10 classes**

Unit –5: General characters and classification of Mammalia upto orders with examples; affinities of Monotremata and Marsupilia; dentition in mammals; echo-location in bats; adaptation of aquatic mammals. Heat regulation in mammals **10 classes**

Comparative anatomy

Unit –1: Integument, pectoral and pelvic girdles, brain of vertebrates.

8 classes

Unit–2: Comparative account of circulatory, respiratory, alimentary and urino-genital system among reptiles, birds and mammals. **6 classes**

SEMESTER- II Zoology Core (Major)
Code (Paper): CP – 2 – Zoo - 202
Title: (Practical): Based on Paper 201

Credit: 2

Total Marks: 40

L-0, T-0, P-2

1. Dissection of the following vertebrate system.
Scoliodon: Efferent branchial vessels, internal ear, 9th and 10th cranial nerves;
Carp/ Goroï Fish: 5th, 7th, 9th and 10th cranial nerves, Efferent branchial system;
 Weberian ossicles of carp.
2. Identification of vertebrates with reasons:
Pyrosoma, Salpa, Doliolum, Oikopleura, Myxine, Sting ray, Hammer headed shark, Pristis, Electric ray, Tiger shark, Pipe fish, Protopterus, Hemiramphus, Ribbon fish, Sucker fish, Mugil, Eel, Belephtalamus, Ichthyophis, Trichogaster (Colisa), Scatophagus, Amphipneus, Glossogobius, Mystus, Harpodon, Tetraodon, Cryptobranchus, Axolotol larva, Ambystoms, Necturus, Amphiuma, Typhlops, Krait, Viper, Pit viper, Hydrophis, Drayophis, Natrix, Sea Snake, Tryonix (Asperedetes gangatica), Chelone, Leathery, Turtle, Echidna, Platypus.
3. Preparation of permanent slides & mounting of minimum five suitable slides of vertebrate exoskeleton (scale, feather etc.)
4. Study of vertebral column of mammals; pectoral and pelvic girdle of reptiles, bird and mammals.
5. Demonstration of digestive, circulatory, respiratory and urinogenital system of reptiles, bird and mammals through model/chart/electronic media .

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

1. Dissection
2. Identification of museum specimens and bones
3. Submission of slides (vertebrate material)
4. Preparation of slides
5. Practical record book
6. Viva voce

SEMESTER- III Zoology Core (Major)**Code (Paper): CT – 3 – Zoo - 301****Title: Biochemistry****Credit: 3****Total Marks: 60****L-2, T-1, P-0****Objective of the course:**

The main objective of this course is to introduce the students with the basic knowledge of biochemistry with special reference to macromolecules.

Biochemistry**Unit -1:**

Laws of thermodynamics and their application in biochemistry; free energy change in biochemical systems; ATP and other high-energy phosphates as energy carrier; concept of redox systems. Water, acid, base, pH and buffers and their significance in Biology.

12 classes**Unit-2:**

Structure and classification of carbohydrates, proteins, amino acids and lipids.

12 classes**Unit -3:**

Enzymes- nomenclature, IUB classification, kinetics and mechanism of action; enzyme inhibition.

10 Classes**Unit -4**

General concept of metabolism- anabolism and catabolism Glycolysis; Krebs cycle; electron transport system (ETS) and Phosphorylations(photo, substrate, oxidative) ; β -oxidation of fatty acids.

12classes**Unit -5**

Protein metabolism ,transamination ,deamination, interrelationship of carbohydrate and protein metabolism.

8 Classes**Unit-6:**

Vitamins (structure and functions) with special reference to co-enzymes ; Basic concept of antibiotics, probiotics and xenobiotics.

10 Classes

SEMESTER- III Zoology Core (Major)
Code (Paper): CT – 3 – Zoo – 302
Title: Bioinstrumentation and Biostatistics
Credit: 3
Total Marks: 60

L-2, T-1, P-0

Objective of the course: The main objective of this course is to introduce the students with the tools and techniques used in biological study with special reference to instruments & statistics.

Bioinstrumentation

Unit-1:

Chromatography- basic concept of paper, ion exchange and thin layer chromatography;
10 classes

Unit-2:

Microscopy- basic principle and applications of light, phase contrast and electron microscope.
9 classes

Unit-3:

Photometry- principle and uses of colourimeter and spectrophotometer and X –ray
 crystallography **8 classes**

Unit-4:

Principles and uses of kymography and microtomy **6 classes**

Unit-5:

Principles and practices of centrifugation **3 classes**

Biostatistics

Unit-1:

Scope and utility of statistics in Bioscience; Sampling, collection and graphical representation of
 data **8 classes**

Unit-2:

Measures of statistical average; mean deviation , variance ,standard deviation and standard error.
10 classes

Unit-3:

Probability tests; Correlation and regression; Significance tests (t, F and X² tests) **10 classes**

SEMESTER- III Zoology Core (Major)
Code (Paper): CP – 2 – Zoo - 303
Title: (Practical): Based on Paper 301 and 302

Credit: 2

Total Marks: 40

L-0, T-0, P-2

1. Separation of amino acids by paper chromatography
2. Qualitative test for carbohydrate (Glucose, fructose, sucrose, maltose, galactose, mannose, starch and glycogen).
- 3 Extraction and estimation of enzyme urease/ peroxidase by titrimetric method.
4. Demonstration of biological instrument
- 5 Estimation of ascorbic acids .
6. Statistical calculation of central tendency, deviations, correlation, regression & t test

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

1. Separation technique
2. a. Statistical calculation (central tendency/ deviation)
b. Graphical representation/ correlation/regression
3. Demonstration of instrument
4. Practical record book
5. Viva voce

SEMESTER- IV
ZOOLOGY (CORE)
CT – 3 – Zoo - 401
Parasitology and Ethology

Paper: 401**Total Marks :60****Credit: 3****L-2, T-1, P-0**

Objective of the course: The main objective of this course is to introduce the students with the complex interaction between animals and their social interrelationship.

Parasitology**Unit-1:**

Parasitism; types of parasites, hosts and vectors; parasitic adaptations and effects on hosts.

6 classes**Unit-2:**General organizations and pathogenicity of bacteria & viruses (*Rickettsia*, *Borrelia*, *Treponema* & *Leptospira*).**classes****10****Unit-3:**Life history and mode of infection and pathogenicity of *Entamoeba histolytica*, *Trypanosoma* spp., *Leishmania donovani*, *Giardia intestinalis*, *Trichomonas vaginalis* & *Plasmodium* spp.**12 classes****Unit-4:**Life history, parasitic adaptation and pathogenicity of *Taenia solium*, *Fasciola hepatica*, *Ancylostoma duodenale* and *Wuchereria bancrofti*.**8 classes****Unit-5:**

Vectors of human diseases- Malaria, Yellow fever, dengue, haemorrhagic fever, filariasis, Japanese B-encephalitis & dengue; vectors control measures.

classes**8****Ethology****Unit-1:**

Introduction to animal behaviour; brief history of ethology; patterns of behaviour; sense organs and behaviour; genetical, hormonal and ecological aspects of behaviour.

classes**10****Unit-2:**

Different types of orientation and communication in animals.

6 classes**Unit-3**

Comparative aspects of learning, offensive and defensive behaviour; social behaviour in insects.

4 classes

**SEMESTER- IV
ZOOLOGY (CORE)
CP – 2– ZOO – 402**

(PRACTICAL): Based on Paper 401

Paper: 402

Credit: 2

Total Marks :40

L-0, T-0, P-2

Based on course

1. Identification of mosquito species causing malaria, encephalitis and dengue fever.
2. Study of protozoan parasites (permanent slides)
3. Study of taxis behaviour of *Paramecium*/earthworm/cockroach.
4. Study of habituation in mosquito larvae/snail.
5. Behavioural pattern study.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

1. Parasitology
2. Ethology
3. Report submission on behavior
4. Practical record book
5. Viva voce

SEMESTER- IV
ZOOLOGY (CORE)
CT – 3 – Zoo – 403
Developmental Biology

Paper: 403

Credit: 3 Total Marks : 60

L-2, T-1, P-0

Objective of the course: The main objective of this course is to provide exposure to the students on the fundamentals of embryology of animals.

Unit-1:

Gametogenesis- formation of gametes (spermatogenesis; oogenesis); structure, maturation and growth of sperm and ovum; vitellogenesis. **12 classes**

Unit-2:

Fertilization- types and mechanism of fertilization; mono and polyspermy; parthenogenesis. Infertility and IVF.

12classes

Unit-3:

Cleavage and gastrulation- cleavage pattern, blastulation and gastrulation in chick; fate maps; fate of germ layers; primary organisers, induction, property and mechanism of action of inductive substances. Basic concept of cell differentiation. **15 classes**

Unit-4:

Organogenesis – development of sense organs (eyes and ears).

9 classes

Unit -5:

Extra embryonic membranes in birds and placentation in mammals.

10 classes

Unit -6.

Totipotency in animal cells ,basic concepts of stem cell and its implication in medical sciences.

6 classes

SEMESTER- IV
ZOOLOGY (CORE)
CP -2 – ZOO - 404
(Practical): Based on Paper 403
Credit: 2 Total Marks : 40

Paper: 404

L-0, T-0, P-2

1. Study of permanent slides of different embryonic stages of frog/toad.
2. Study of permanent slides of developmental stages in chick embryo.
3. Submission of permanent stained preparation of (at least two stages up to 72 hrs. development stages) chick embryo.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

1. Embryological slide preparation
2. Spotting (embryological slide)
4. Submission of slide
5. Practical record book
6. Viva voce.

SEMESTER- V
CT – 3 – Zoo – 501
Genetics and Evolution

Paper: 501

Credit: 3

L-2, T-1, P-0

Objective of the course: The main objective of this course is to introduce the students with the fundamentals of genetic principles and evolutionary trends.

Genetics

Unit-1:

Mendel's law of inheritance and their critical analysis; gene and allele concept **4 classes**

Unit-2

Physical basis of heredity; interaction of genes, incomplete dominance, complementary factors, supplementary factors, epistasis, inhibitory factors, lethal factors; Quantitative genetics.

13 classes

Unit-3:

Linkage and crossing over; basic knowledge of gene mapping **4 classes**

Unit-4:

Determination of sex, sex-linked inheritance; cytoplasmic inheritance **6 classes**

Unit-5:

Concept of gene and their fine structures; chromosomal (numerical and structural) and gene mutation, genetic significance of mutation and its practical implications. **6 classes**

Unit-6:

Human genetics- Human chromosome, Genetic disorders, inborn error in metabolism, human genome project, genetic counselling.

5 classes

Evolution

Unit-1:

Evidences and theories of evolution- palae-biological and molecular evidences; Lamarckism, Darwinism, Neo Darwinism, Mutation theory and Modern Synthetic theory. **8 classes**

Unit-2:

Origin of life (chemical and biological origin); variation- types and sources; isolation; speciation (sympatric, allopatric and peripatric); fossil and fossilization. **6 classes**

Unit-3:

Concept of population- gene pool and gene frequency (Hardy- Weinberg law); change in gene frequency (genetic drift, gene flow, genetic load). **6 classes**

Unit-4:

Continental drift; parallel, divergent and convergent evolution; endemism and adaptive radiation **6 classes**

SEMESTER- V
CP – 2– Zoo – 502
(Practical):Based on Paper 501

Paper: 502

Credit: 2

L-0,T-0,P-2

- 1.Preparation of temporary slides - Polytene chromosome of *Chironomus* or *Drosophila* larvae.
2. Simple calculation based on Mendel's monohybrid/dihybrid cross/test cross.
3. Study of permanent slides on chromosomes.
4. Study of materials/organisms of evolutionary significance (rocks, fossils and connecting links)

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

1. Slide preparation of chromosome
2. Simple genetic calculation
3. Spotting (chromosomal slides & materials of evolutionary importance)
4. Practical record book
5. Viva voce

SEMESTER- V
CT – 3 – Zoo – 503
Mammalian Physiology

Paper: 503

Credit: 3

L-2,T-1,P-0

Objective of the course: The main objective of this course is to provide knowledge on the physiological mechanisms of mammals.

Mammalian Physiology

Unit-1:

Muscle and its contraction- molecular composition of myofilaments; sarcoplasmic reticulum and T- tubules; mechanism of muscle contraction; characteristic of muscle twitch- isometric and isotonic contractions; summation and tetanus. **10 classes**

Unit-2:

Digestion- site and sequence of digestion; digestive secretions and their regulation; mechanism of digestion and absorption of carbohydrates, proteins and lipids; role of gastro-intestinal hormones, balanced diet, malnutrition **8 classes**

Unit-3:

Excretion- structure and functions of nephron; renal blood supply; mechanism and regulation of urine formation; renal failure and dialysis **7 classes**

Unit-4:

Circulation- Structure of heart ,coronary circulation; origin and conduction of cardiac impulse; cardiac cycle, ECG ; cardiac output and its regulation; basic concept of cardiovascular disorders ; haemostasis;

Respiration- structure and functions of haemoglobin; O₂ and CO₂ transport by blood; regulation of respiration; carbon monoxide poisoning.

12 classes

Unit-5:

Nervous system- neurons, resting membrane potential and its basis, action potential and its propagation in myelinated and non-myelinated nerve fibre; types of synapses and synaptic transmission; neuro-transmitters- their release and action; neuro-muscular junction; types of reflexes; reflex activity; reflex arc;

Physiology of vision and hearing

15 Classes

Unit –6

Types of drugs and drug addiction ,its physiological effects; socio-biological aspects of genesis of drug addiction, stimulants and depressants, physiological and social implications. **12 classes**

SEMESTER- V
CP – 2– Zoo – 504
(Practical): Based on Paper 503

Paper : 504

Credit :2

L-0,T-0,P-2

Based on Course

1. Determination of R.Q. of cockroach/Goroi fish.
2. Recording of heart beat of frog by kymograph.
3. Preparation of haemin crystals.
4. Demonstration of knee jerk reflex.
5. Demonstration of osmosis using toad/frog urinary, bladder/alimentary canal.
6. Recording of muscle twitch.
7. Qualitative test of salivary amylase.
8. RBC and WBC counting by haemocytometer.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

1. Physiological experiment-I
2. Physiological experiment II (blood)
3. Demonstration 5
4. Practical record book
5. Viva voce

SEMESTER- V
CT – 3 – Zoo – 505

Cell Biology

Paper: 505

Credit: 3

L-2,T-1,P-0

Objective of the course: The main objective of this course is to provide fundamental knowledge of structural and histochemical analysis of animal cell & tissues.

Cell Biology

Unit-1:

Overview of prokaryotic and eukaryotic cells; structure and functions of cell organelles- mitochondria, endoplasmic reticulum, lysosome, ribosome, Golgi bodies, nucleus, structure and functions of plasma membrane (lipid bilayer model); Membrane transport- Passive and Active transport, receptor mediated endocytosis; cytoskeleton

16 classes

Unit-2:

Structure and functions of chromosome; polytene and lamp brush chromosomes; chromatin-molecular organization, nucleosome, DNA packaging in prokaryotes and eukaryotes, heterochromatin and euchromatin; models of chromosomal movements.

12 classes

Unit-3:

Cell cycle- molecular events in different phases, regulation of cell cycle; apoptosis; cell division (mitosis and meiosis)

12class

Unit 4

Cancer-Characteristics of a cancerous cell, causes of cancer, oncogene, tumor suppressor gene, cancer treatment.

12 classes

Unit-5:

Basic concept of cell signalling (endocrine, paracrine and autocrine signalling); function of cell surface receptors- G protein-coupled receptors

12classes

SEMESTER- V
CP – 2 – Zoo – 506
(Practical): Based on Paper 505

Paper: 506

Credit: 2

L-0, T-0, P-2

1. Drawing of ultrastructure of cell and different cell organelles
2. Study of mitosis in tadpole tail, onion root tip
3. Meiosis in testes of grass hopper or cockroach
4. Histochemical localization of following-
 - a. General lipid by Sudan black B method.
 - b. Metachromatic substances by Toluidine blue method.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

1. Cell division
2. Preparation of histological slide
3. Spotting (histological slide)
4. Submission of histological slide
5. Practical record book
6. Viva voce

SEMESTER- V
CT – 3 – Zoo – 507
Endocrinology, Histology and Histochemistry

Paper: 507

Credit: 3

L-2, T-1, P-0

Objective of the course: The course focuses on the basic knowledge of endocrine glands of animals and their functions.

Endocrinology

Unit 1

General characters of hormones; mechanism of action of hormones; regulation of hormone secretion; hypothalamo-hypophysial system. **10classes**

Unit-2:

Hormones secreted by endocrine glands (pituitary, thyroid, adrenal and pancreas) and their functions in human; Hormonal abnormalities. **12 classes**

Unit-3

Neuroendocrine system in insects; role of hormones in growth and development of insects.

14 classes

Unit-4

Roles of hormones in reproductive cycle, pregnancy, parturition and lactation; methods of contraception; amniocentesis .

Histology and Histochemistry

Unit –1:

Animal tissues- types, structure and function; histological structure of muscles, epithelium, bone, cartilage, lung, kidney, liver, stomach, intestine and pancreas of mammals. **10 classes**

Unit –2:

Histological methods- basic principles of fixation, dehydration, embedding, sectioning and spreading **8 classes**

Unit-3:

Types of staining; vital staining; classification and properties of dyes; metachromatic dyes and staining **8 classes**

SEMESTER- V
CP –3– Zoo – 508
(Practical): Based on Paper 507

Paper: 508

Credit: 3

L-0, T-0, P-3

Based on Course

1. Histological preparation of thyroid, adrenal, pancreas and gonads.
2. Dissect and display the following endocrine gland in fish/rat: pituitary, thyroid, adrenal
3. Study of permanent slides of endocrine glands
4. Submission of chart/models related to endocrinology
5. Histological preparation and submission of the following tissues: liver, stomach, intestine, kidney, pancreas, testes and ovary of vertebrates.
6. Submission of Project report (To be start at 4th Semester)

SCHEME OF THE PRACTICAL EXAMINATION

Time: 4 hrs.

1. Dissect and display of endocrine gland
2. Stained slide preparation
3. Spotting
4. Submission of slides (at least 5)
5. Submission of project report
6. Practical record book
7. Viva voce

SEMESTER VI

CT – 3 – Zoo – 601

Environmental Biology and Wildlife Biology

(Paper : 601

Credit :3

L-2,T-1,P-0

Objective of the course: The main objective of this course focuses on the structural and functional interrelationship of animal kingdom with other components of nature and conservation strategies for conservation of wildlife.

Environmental Biology

Unit-1:

Concepts pertaining to ecosystem, species, community, biome and ecotone; biotic and abiotic environmental factors and their effect on animals; trophic relations and energy flow **10 classes**

Unit-2:

Shelfords law of tolerance; concept of productivity; population structure and dynamics; Lotka-Volterra model; population interactions . **10 classes**

Unit-3:

Biogeochemical cycles (carbon, nitrogen and hydrological cycles) **6 classes**

Unit-4:

Renewable and non-renewable resources of N.E. India and strategy for their sustainable utilization; basic concept on remote sensing, GIS and EIA **8 classes**

Unit-5:

Environmental pollution (water, air and soil); bio-indicators in pollution studies; ecological succession; ecological backlash; greenhouse effect; ozone layer depletion and its impact. **8 classes**

Wildlife Biology

Unit-1:

Basic concept of wild life and threats faced by them; Conservation status –rare,vulnerable threatened and extinct, IUCN , Red Data Book ; Important endangered species of N.E. India - Rhinoceros, Pangolin, Golden langur, Dancing deer, River dolphin, Pigmy hog and White winged wood duck. Major national parks of NE India. Indian Wildlife Protection Act, 1972. **12 classes**

Unit-2:

Basic concepts of biodiversity its threats ; Conservation strategies- Biodiversity Act *ex-situ* and *in-situ* conservation. Concept of biosphere reserve and biodiversity hot spot;. **10 classes**

CP – 3 – Zoo – 602**(Practical): Based on Paper 601****Paper: 602****Credit: 3****L-0, T-0, P-3**

1. Estimation of the size of the population by capture-recapture method (any vertebrate/invertebrate).
2. Find out the abundance and density of insect pests in some essential food commodities.
3. Determination of dissolved Oxygen/ free CO₂ /Alkalinity in the water samples.
4. Find out the abundance and densities of terrestrial invertebrates/macrophyte associated fauna by Quadrature method.
5. Study of structural components of an aquatic/ grassland ecosystem
6. Field study: Visit to a National park/ Wildlife Sanctuary / Ecological important place to study the habitat/ forest types .

SCHEME OF THE PRACTICAL EXAMINATION:**Time: 4 hrs.**

1. Ecological experiment
2. Estimation of abiotic parameter
3. Field study report submission
4. Practical record book
5. Viva voce

CT – 3 – Zoo – 603**Molecular Biology and Immunology****Paper: 603****Credit: 3****L-2,T-1,P-0**

Objective of the course: The main objective of this course is to focus on development of molecular aspects and immunological concepts in animal science.

Immunology**Unit-1.**

Concept of immunology- types of immunity; cells and organs involved in immunity; antigen-antibody reaction; Lymphoid organs 6 classes

Unit – 2.

Antigens: properties of antigens, adjuvant and haptens, vaccines and vaccinations .

6 classes**Unit – 3. .**

Immunoglobulin: basic structure, classes and functions, clonal selection theory, polyclonal and monoclonal antibodies, major histocompatibility complex: structure and functions 8 classes

Unit 4.

Immune system in health and disease: basic concept of immunodiagnostic techniques (immunodiffusion, RIA and ELISA), immunodeficiency and Autoimmune disorders, AIDS.

8 classes

Molecular Biology

Unit – 1.

Nucleic Acids, DNA as genetic material, structure and functions of DNA & RNA, Watson & Crick Model of DNA, other forms of DNA (A & Z).

8 classes

Unit 2.

Replication of DNA- prokaryotes and eukaryotes , Transcriptions in prokaryotes and Eukaryotes, RNA processing.

8 classes

Unit 3.

Genetic code and basic mechanism of translation, Wobble hypothesis, Post translational modification.

8classes

Unit 4.

Recombination in Prokaryotes; Transformation, Conjugation and Transduction; Genome organization in prokaryotes and eukaryotes, Concept of Transposons and Plasmids.

8 classes

Unit 5.

Regulation of Gene Expression in Prokaryotes- Operon concept (Lac)

4 classes

CP – 2 – Zoo – 604

(Practical) : Based on paper 603

Paper: 604

Credit: 2

L-0, T-0, P-2

Core Course Based on Course

1. Determination of blood group and Rh factor
2. Preparation of ball and stick model of Nucleotides.
3. Detection / estimation of RNA.
4. Study of Blood Cell types in blood smear slides.
5. Histology of Lymphoid organ.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs

1. Molecular biology
2. Immunology
5. Practical record book
6. Viva voce

CT – 3 – Zoo – 605

Biotechnology and Bioinformatics

Paper: 605**Credit: 3****L-2,T-1,P-0**

Objective of the course: The main objective of this course is to introduce the students with the basic knowledge of biochemistry & bioinformatics.

Biotechnology**Unit-1.**

Introduction, history and scope, basic knowledge of genetic engineering, protoplast fusion and somatic hybridization technique. **6 classes**

Unit –2.

Basic principles of recombinant DNA technology, cutting, joining and visualization of DNA fragments, cloning vectors and gene cloning; application of DNA technology in agriculture and health; industrial biotechnology with special reference to production of alcohol and SCP. **10 classes**

Unit 3.

Concept of DNA sequencing,
Concept of cell culture techniques, Culture media, animal cell culture **8 class**

Unit 4.

Regulation of biotechnology: production and application of transgenic animals, Genetically modified Organism, their benefits and risk assessment; IPR, patents and ethical issues related to biotechnology. **8 classes**

Bioinformatics**Unit-1.**

Fundamentals of bioinformatics: scope of bioinformatics; sources of information, internet world wide web and web browsers. **6classes**

Unit-2.

Biological database: introduction, basic concepts of primary and secondary databases; Nucleic acid and protein sequence database (NCBI, gene bank and SWISS-PROT); Data mining and data mining tools (ENTREZ). **10 classes**

Unit 3.

Database search and sequence alignment, Tools of sequence alignment – FASTA and BLAST; methods of sequence alignment. **8 classes**

Unit 4.

Phylogenetic analysis: basic concept, steps in evaluation of phylogeny and constructing phylogenetic trees. **8 classes.**

CP – 2 – Zoo – 606**(Practical): Based on Paper 605****(Paper : 606****Credit :2****L-0,T-0,P-2**

Based on course XXI

1. Different e-resources and database search.
2. Similarity search in sequence such as BLAST / FASTA.
3. Creation of databases.
4. Submission of charts and models etc.
5. Culture media preparation

SCHEME OF THE PRACTICAL EXAMINATION:

- Time: 4 hrs**
1. Biotechnology
 2. Bioinformatics
 3. Practical record book
 4. Viva voce

CT – 3 – Zoo – 607**Economic Zoology****Paper: 607****Credit: 3****L-2,T-1,P-0**

Objective of the course: The main objective of this course is to focus on the utilizations of animal resources for human welfare.

Unit-1:

Major insect pests of paddy, tea and stored grains and their biology **10 classes**

Unit-2:

Life histories of silkworm (eri, muga and mulberry); culture technique of silkworms; diseases of silkworms and its prevention **10 classes**

Unit-3

Life history of honey bee (*Apis indica*); rearing techniques of honeybee; Biology and culture of lac insect. **10 classes**

Unit-4:

Pest management- chemical, cultural and biological; integrated pest management. **10 classes**

Unit-5:

Principles and practices in aquaculture; fish and prawn culture; preparation and management of different types of ponds for fish culture; fish pathology; induced breeding and hypophysation technique in fishes; fish preservation methods; fish by-products; Periphyton and culture of live fish food. **12 classes**

Unit-6:

Piggery: management and practices of pig rearing; poultry: selection of breed (chicken and duck) and their scientific rearing methods; poultry diseases and its prevention/control. **12 classes**

CP – 2 – Zoo – 608**(Practical): Based on Paper 607****Paper : 608****Credit :2****L-0,T-0,P-2**

1. Identification and submission of life cycles of eri/ muga/ mulberry silkworms.
2. Determination of LC₅₀ and Ld₅₀.
3. Study of important pests of paddy, tea plants and stored grains, fish ectoparasites and their submission.
4. Identification of economically important fish and prawn available locally.
5. Identification of common aquatic macrophytes, plankton and insects.
6. Demonstration of induced breeding in fish

SCHEME OF THE PRACTICAL EXAMINATION:**Time: 4 hrs**

1. Collection and submission of life cycle/ pest/ local fish
2. Identification
3. Determination of LC₅₀ and LD₅₀.
4. Practical record book
5. Viva voce

BOOKS RECOMMENDED (for all Papers)

1. Arora, D.R. and B. Arora: Medical Parasitology.
2. Austin, C.R. and R.V. Shoot : Reproduction in Mammals, Cambridge Univ. Press.
3. Ayyar: A manual of Zoology Part I.: L.
4. Ayyar: A Manual of Zoology Part II : E.
5. Bailey, N.T.J.: Animal Taxonomy, English Language Society, 1959.
6. Blackwelder, R.E.: A Text and Reference Book: Taxonomy, John Wiley, N. Y. 1967.

7. Chandler, A.C. and C.P. Read: Introduction to Parasitology, Wiley East Prittd.
8. Colber: Evolution of Vertebrate.
9. Conn, B.E.E. and E.H. Cordes: Outline of Biochemistry.
10. Croxton, E.E.: Elementary statistics with application in Medicine and Biological Sciences, Doner publication.
11. Cunningham, W.P. and B.W. Saigo: Environmental Science, McGraw hill. 1989.
12. De Roberts, E.D. P. and E.M.F. De Roberts.: Cell & Molecular Biology
13. Gardner, E.J.: Principles of Genetics, John Wiley, N.Y. 1972.
14. Garg, K. , I. Bahl & M.A. Kaul: Text Book of Histology, CBS publishers.
15. Ghose, M.R.: Concept of Insect Control, Wiley Eastern Ltd. New Delhi 1989.
16. Giese, A.C.C. : Cell Physiology, Boxwood, 1975.
17. Gilbert, S.F.: Developmental Biology, Sinaeur Associates Inc. Publishers, 2003.
18. Guiton, A.C.: Functions of Human Body, 6th Edn. W.B. Saunders Co. Tokyo.
19. Haucourt, Cohn: Elements of Cytology.
20. Jordan, E.L.: Zoology of Chordates.
21. Kent, G.C. and R.K. Carr: Comparative Anatomy of the Vertebrates, Tata McGraw Hill.
22. Kobil, E. (eds): Physiology of Reproduction, Raven Press Ltd.
23. Kormondy, B.J.: Concept of Ecology, Prentice Hall, ND 1976.
24. Kotpal, R. L., A. Agarwal and Khetrapal: Modern Text Book of invertebrate Zoology.
25. Lodish, H. et al : Molecular Cell Biology, W.H. Freeman & Co. Tokyo.
26. Lull, R.S.: Organic Evolution, Light & Life Publishers, New Delhi, 1976..
27. Mahler, H.R. and E.H. Cordes Biological Chemistry.
28. Marshall, A.J. and W.D. Williams: Text Book of Zoology Vol. I Invertebrates.
29. Mayer, E.: Principles of Systematic Zoology, McGrew Hill, NY, 1969.
30. Miller, S.A. and J.B. Harley: Zoology, Tata McGraw Hill Publ. Co.
31. Mody, P.A.: Introduction to Evolution, Harper & Raw, NY 1964.
32. Odum, B.P. : Fundamental of Ecology, W.B. Saunders, Toftan Co. Tokyo
33. Odum, Eugene, P.: Fundamentals of Ecology, W.B. Saunders 1971.
34. Parker, T.J. and W.A. Haswall: Text Book of Zoology (Vertebrates); ELBS & McMillan, 1995.
35. Pedigo, L.P.: Entomology & Pest Management, Prentice Hall, New Delhi, 1996.
36. Prasad, S.N.: Chordate Zoology, Kitab Mahal.
37. Primrose, T.O.: Principles of Gene Manipulation, Blackwell, Oxford, 2003.
38. Pritom, R.: Biology of Human Reproduction, University Science Books.
39. Ridely, M.: Evolution, Blackwell Science, USA, 1996.
40. Roberts, E.D.P., W. Nowiski and F. Saez: Cell Biology, W.B. Saunders Co. London.
41. Shetty, N.: Immunology: Introduction Book, New Age International, 1996.
42. Strickburger, M.W.: Genetics, Mc Millan, NY 1968.
43. Taylor, N.B.: The Living Body: A Text Book of Human Physiology.
44. Trechan, K.: Biochemistry, Wiley Eastern Ltd., New Delhi.
45. Weiohert, E.K.: Comparative anatomy of Chordates, McGraw Hill, NY.
46. Winester, A.M.: Genetics, Oxford & IBH.