THREE YEAR DEGREE COURSE IN ZOOLOGY (MAJOR)

I SEMESTER

Paper No.	Name of the Paper	Total Marks	Credits
M-101	Biosystematics and Taxonomy	60+15=75	06
M-102	Animal Diversity-I (Non-Chordates)	60+15=75	06
M-103(P)	Practical	40+10=50	04
E-101		60+15=75	06
E-102		60+15=75	06
Eng-I	English-I	40+10=50	04
		400	**32**

II SEMESTER

Paper No.	Name of the Paper	Total Marks	Credits
M-201	Animal Diversity-II (Chordates)	60+15=75	06
M-202	Ecology, wildlife conservation and Management	60+15=75	06
M-203(P)	Practical	40+10=50	04
E-201		60+15=75	06
E-202		60+15=75	06
Eng-II	English-II	40+10=50	04
		400	**32**

III SEMESTER

Paper No.	Name of the Paper	Total Marks	Credits
M-301	Comparative Anatomy & Histology	60+15=75	06
M-302	Cell Biology	60+15=75	06
M-303(P)	Practical	40+10=50	04
E-301		40+10=50	04
E-302 (P)		40+15=50	06
E-304		40+10=50	04
E-305 (P)		40+10=50	04
Env.Stud. I	Environmental Studies-I	40+10=50	04
		450	**36**

IV SEMESTER

Paper No.	Name of the Paper	Total Marks	Credits
M-401	Developmental Biology	60+15=75	06
M-402	Genetics	60+15=75	06
M-403(P)	Practical	40+10=50	04
E-401		40+10=50	04
E-402 (P)		40+15=50	06
E-404		40+10=50	04
E-405 (P)		40+10=50	04
Env.St. II	Environmental Studies-II	40+10=50	04
		450	**36**

V SEMESTER

Paper No.	Name of the Paper	Total Marks	Credits
M-501	Animal Physiology	60+15=75	06
M-502	Biochemistry & Bioenergetics	60+15=75	06
M-503	Endocrinology & Immunology	60+15=75	06
M-504	Biological Techniques and Biostatistics	60+15=75	06
M-505(P)	Practical	60+15=75	06
M-506 (P)	Practical	60+15=75	06
		450	**36**

VI SEMESTER

Paper No.	Name of the Paper	Total Marks	Credits
M-601	Animal Behaviour	60+15=75	06
M-602	Evolution and Adaptation	60+15=75	06
M-603	Economic Zoology	60+15=75	06
M-604	Biotechnology, Bioinformatics and Computer application	60+15=75	06
M-605(P)	Practical	60+15=75	06
M-606 (P)*	Project	60+15=75	06
		450	**36**

M-606 either Practical Paper or Project

Total Marks for TDC (MAJOR) ZOOLOGY : 2600
Total Credits for TDC (MAJOR) ZOOLOGY : 208

TDC I SEMESTER (MAJOR)

PAPER M-101 **Total Marks-75 (60+15)**
Total Credits : 6

BIOSYSTEMATICS AND TAXONOMY

1. Definition, basic concept and importance of Systematics and Taxonomy
2. Concepts of different conventional and newer aspects in biosystematics
   a) Chemotaxonomy
   b) Cytotaxonomy
   c) Molecular taxonomy
3. Taxonomic procedures- taxonomic collections, preservation, method of identification, taxonomic keys- different types of keys.
4. Concepts of taxonomic terms.
5. Importance of classification.
6. Theories of Biological Classification : Essentialism, Nominalism, Empricism, Cladism and Evolutionary classification, their merits and demerits
7. Concept of species.
8. Process of typification and different Zoological types
9. International Code of Zoological Nomenclature (ICZN): Basic Concepts
10. Binominal nomenclature and Trinominal nomenclature

TDC I SEMESTER (MAJOR)

PAPER M-102 **Total Marks-75 (60+15)**
Total Credits : 6

ANIMAL DIVERSITY – I (NON-CHORDATES)

1. Classification of Animal Kingdom-Major and Minor Phyla

2. PROTOZOA : General characters and classification up to orders with examples. Nutrition, locomotion and reproduction in Protozoa.

3. PORIFERA : General characters and classification up to orders with examples Canal system of in Porifera

4. COELENTERATA : General characters and classification up to orders with examples. Polymorphism in Syphonophora, Coral and Coral Reef formation

5. PLATYHELMINTHES : General characters and classification up to orders with examples, Morphology and Life History of *Fasciola*.

6. ASCHELMINTHES : General characters and classification up to orders with examples. Morphology and life history of *Ascaris*. Life cycles and pathogenecity of parasites of man (*Plasmodium*, *Taenia, Ancylostoma, Wuchereria*), Parasitic adaptation in Helminthes.

7. ANNELIDA: General Characters and classification up to orders with examples. Coelom, Coelomoduct and Nephridia of Annelida, Structure and significance of *Trochophore* larva

8. ARTHROPODA: General characters and classification up to orders with examples. Appendages and digestive system of *Prawn*. Significance of *Peripatus* in evolution

9. MOLLUSCA : General character and classification up to orders with examples. Digestive and Nervous system of *Pila*, Torsion in Gastropoda

10. ECHINODERMATA : General characters and classification up to orders with examples, water-vascular system in Echinodermata, Larvae of Echinodermata.

TDC I SEMESTER (MAJOR)

PAPER M-103 (Practical) **Total Marks : (40+10= 50)**
Total Credits : 4

A. Dissection of the following invertebrate systems- (only one) **10 Marks**

1. Leech (i) Urinogenital system (ii) Nervous System
2. Prawn (i) Digestive system (ii) Nervous system
3. Cockroach (i) Nervous system (ii) Reproductive system (Male and Female)
4. *Pila* (i) Digestive system (ii) Nervous system.

B. Mounting

Temporary:- Setae of Earthworm, Statocyst of *Prawn*, salivary apparatus of Cockroach, Radula of *Pila* **3 Marks**
Permnent :- *Euglena*, *Hydra*, *Obelia* colony, Crustacean larvae **4 Marks**

E . Indentification of prepared slides **3 Marks**

Polystomella, Sponge spicules, T.S of *Asccaris*, Miracidium, Sporocyst and Cercaria larvae of liver fluke, T.S. of Leech (through crop region), Mouth parts of mosquito (*Culex*), Glochidium and Veliger larvae of Mollusca, T.S of arm of Starfish, Larvae of Echinodermata.

F. Study of Museum specimens **10 Marks**

(Identification and classification upto Order. Generic name must be given)
Grantia, Spongilla, Physalia, Vallela, Metridium (Seaanemone), *Pennatula* (Sea Pen), *Gorgonia, Fasciola, Taenia, Ascaris* (Male and Female), *Amphitrite, Sipunculus, Aphrodite, pontobdella, Chaetopterus, Lepas, Limulus, Scolopendra* (Centipede) *Julus* (Millipede), *Carausius* (Stick insect), *Lepisma, Mantis, Bellostoma* (Giant water bug), *Peripatus, Dentalium, Chiton, Achatina, Pinctada* (Pearl Oyster) *Loligo, Mytilus, Cucumaria* (Sea Cucumber), *Echinus* (Sea urchin), *Clypeaster* (Cake- Urchin) *Ophioderma* (Brittle star).

G. Practical note book **4 Marks**

H. Viva-voce **6 Marks**

TDC II SEMESTER (MAJOR)

Paper M-201 **Total mark : 60+15=75**
Total Credits : 6

ANIMAL DEVERSITY- II (CHORDATIES)

General characters, outline of classification and plan of body organization in chordates

1. PROTOCHORDATES : General characters, classification of Protochordata up to suborders with examples.

2. HEMICHORDATA : Morphology and affinities of *Balanoglossus*.

3. UROCHORDATA : Structure and Retrogressive metamorphosis in Urochordata

4. CEPHALOCHORDATA : Structure and affinities of *Amphioxus.*

5. AGNATHOSTOMATA : Distinctive characters and classification, Ammocoete larva - its importance in evolution, Differences between *Lamprey* and Hagfish

6. PISCES : General characters, Classification up to orders with examples, Circulatory system, Nervous system and Sense organ of *Scoliodon*. Accessory respiratory organ and swim bladder in fish. Migration of fishes.

7. AMPHIBIA :General characters, Classification up to orders with examples, Respiration in Amphibia, Parental care in Amphibia

8. REPTILIA :General Characters Classification up to order with examples. Anatomical peculiarities and affinities of *Sphenodon*, Biting mechanism of poisonous snake.

9. AVES :Distinctive characters and classification up to orders with examples. Air sacs-significance and importance , Flight and perching mechanism in birds, Migration of bird.

10. MAMMALIA : Distinctive characters and classification up to orders with examples. General organization and affinities of Monotremata and Marsupialia. Receptor and sense organs in Mammals. Dentition in Mammals.

TDC II SEMESTER (MAJOR)

Paper M-202 **Total mark : 60+15=75**
Total Credits : 6

ECOLOGY, WILDLIFE CONSERVATION AND MANAGEMENT

ECOLOGY

30

1. Definition, Aim and scope of ecology.
2. Ecological niche, habitat, biosphere, biome and ecotone.
3. Ecosystem - Types : Aquatic and Terrestrial, Food chain and ecosystem energetic
4. Biotic factors
5. Biogeochemical cycles- Nitrogen and phosphorus.
6. Pollution- Air, water, Soil and Noise.

WILDLIFE CONSERVATION AND MANAGEMENT 30

1. Definition of wildlife- Wildlife Act. 1972
2. Principles of wildlife conservation and management.
3. Wildlife Sanctuaries and National Parks of N.E Region with special reference to Kaziranga National Park and Manas National Park.
4. Conservation strategies of endangered species.
5. IUCN Red list categories. Endangered mammalian species of NE India.
6. Concept of Biosphere Reserve programmes
7. Ethology of Pigmy Hog and Golden langur.
8. Carrying capacity and its impact on wildlife population
9. Protective behaviour and family ties in primates

TDC II SEMESTER (MAJOR)

PAPER M-203 (PRACTICAL) **TOTAL MARKS : 40+10=50)**
Total Credits : 4

Dissection of the following vertebrate systems (any one) **10**

Scoliodon

i) Afferent branchial system
ii) Efferent branchial system.
iii) Interent ear
iv) IX th and X th cranial nerves

Pigeon

i) Flight muscles
ii) Arterial system

Rat

i) Arterial System (ii) Venous system

Mounting **3**

Temporary- Blood film of Frog and mammal, Placoid scales Squamous and ciliated epithelium, striated and non-straiated muscle, Ampullae of Lorenzini, Pecten of bird.

Permanent- *Salpa, Doliolum*, T.S. through pharyngeal region of Amphioxus, T.S. of skin, stomach, intestine, liver pancreas, kidney, testis, ovary of mammals

Study of Bones **2**

Axial and appendicular skeleton of fowl, Guineapig/ Rat. Different types of skull in birds.

Study of Museum Specimens **10**

(Identification and classification upto order. Generic name must be given)

Balanoglossus, Herdmania, Amphioxus, Petromyzon, Myxine, Torpedo (Electric Ray), *Pristis* (Saw Fish*) Hippocampus* (Sea horse) *Syngnathus* (Pipe fish) *Monopterus* (Kuchia) *Tetradon, Cyprinus* (Common carp) *Hypopthalmichthys* (Silver carp) *Ctenopharyngodon* (Grass carp) *Clarias* (Magur) *Mystus, Ichthyophis, Necturus, Ambystoma, Axolotl larva, Alytes, Kachuga, Draco, Chemeleon, Varanus, Naja, Hydrophis, Alcedo* (King Fisher), *Pisus* (Wood packere)

ENVIRONMENTAL BIOLOGY **5**

Estimation of dissolved O_2 in water. Estimation of free CO_2 in water, Measurement of temperature, PH of water sample (by meter/ Lovibund disc comparator), Relative humidity by wet and Dry bulb thermometer.

Practical Note Book **4**

Viva Voce **6**

TDC III SEMESTER (MAJOR)

Paper M-301 **Total mark : 60+15=75**
Total Credits : 6

COMPARATIVE ANATOMY AND HISTOLOGY

COMPARATIVE ANATOMY 30

1. Integument and its derivatives in vertebrates
2. Comparative anatomy of Heart, Aortic arches and succession of kidney in Vertebrates.
3. Organs of hearing and balancing in vertebrates.
4. Comparative anatomy of Thyroid
5. Comparative anatomy of respiratory system in vertebrates
6. Comparative anatomy of brain in vertebrates.

HISTOLOGY 30

1. Differentiation and organization of cells and maintenance of tissues.
2. Animal tissues - Types, structure and their functions : Epithelial, Muscular, Connective tissues (cartilage, bone, blood, lymph, areolar, adipose, reticular) and Nervous tissue.
3. Basic principles of fixation and staining
4. Classification, Composition and properties of dye.
5. Use of mordants and metachromatic dyes.
6. Principle and procedure of histological staining of carbohydrates, amino acids, proteins, lipids and nucleic acids.

TDC III SEMESTER (MAJOR)

Paper M- 302 **Total mark : 60+15=75**
Total Credits : 6

CELL BIOLOGY

1. Diversity of cell size and shape.
2. Cell theory.
3. Structure of prokaryotic and eukaryotic cells.
4. Physical and chemical properties of protoplasm
5. Structure of plasma membrane, its modifications and functions.
6. Chromosome- structure and functions.
7. Cell division - Cell division cycles. Mechanics of cell cycle, Membrane transport of small molecules and the ionic basis of membrane excitability. Intranuclear organization of the cell. Ultra structure and function of Mitochondria, Golgi bodies, Endoplasmic reticulum, Ribosome, Lysosome, exo and endocytosis.
8. Cellular energy transaction-role of Mitochondria and Chloroplast.
9. Cytoskeleton: Structure and function of centriole, Microtubules and Microfilaments - structure and dynamics. Mitotic apparatus and chromosome movements.
10. Cilia and flagella- Structure and cell movement.

TDC III SEMESTER (MAJOR)

M- 303 (PRACTICAL) **Total Marks- 40+10=50**
Total Credits : 4

1. Study of different types of cell (Representatives of prokaryotic and eukaryotic cell)
2. Staining techniques of nucleus and nucleolus
3. Preparation of physiological solution – buffers, Fixatives, stains (haematoxylin, Eosin, acetocarmine)
4. Preparation of histological slides from tissues as liver, Lung, Stomach, Intestine, Kidney, Pancreas, testes and Ovary.
5. Study of different tissue through permanent slides : Epithelial (Simple, squamous, cuboidal, columnar, Compound, stratified, transitional, muscular, bone, cartilage, areolar, tandon, adipose, reticular and nervous)
6. Laboratory Note Book 4
7. Viva Voce 6

TDC IV SEMESTER (MAJOR)

Paper M-401 **Total mark 60+15=75**
Total Credits : 6

DEVELOPMENTAL BIOLOGY

1. Developmental biology- aim and scope
2. Gametogenesis: spermatogenesis, Oogenesis, vitellogenesis, egg membrane.
3. Fertilization: sperm-egg interactions, biochemical events, post-fertilizations events.
4. Parthenogenesis- Natural haploid, diploid and cyclic parthenogenesis. Artificial stimulus for parthenogenesis and its significance.
5. Type of animal eggs.
6. Cellular dynamics in development.
7. Organizer and Induction
8. Fate map construction in frog and chick .
9. Organogenesis : Development of heart and eye in vertebrates
10. Development of chick embryo up to three germ layer formation.
11. Extra embryonic membranes in bird and mammal.
12. Placenta- different types, function and physiology.

TDC IV SEMESTER (MAJOR)

Paper M-402 **Total mark 60+15=75**
Total Credits : 6

GENETICS

1. Back cross and test cross.
2. Varieties of gene expressions- multiple alleles, lethal genes, pleiotropic genes, gene interactions, epistasis.
3. Linkage-its mechanism and significance, Experiment of linkage, Linkage map.
4. Crossing over- types and mechanism, Synaptinemal complex and genetic recombination, significance of crossing over.
5. Genetic basis of Sex determination
6. Genetic diseases in man
7. Nucleic acids-DNA and RNA, Chemical structure and function, Replication of DNA.
8. Structural changes in chromosomes (Chromosomal aberration)
9. Numerical changes in chromosome, Genetic consequences of changes in Chromosome.
10. Mutation- Molecular basis of mutation. Consequences of mutation.
11. Genetic code, transcription and regulation of protein synthesis
12. Regulation of gene expression
13. Sexuality and Recombination in Virus and bacteria.
14. Mitochondrial DNA
15. Human Karyotype - Nomenclature, Human genome
16. Cytogenetic effect of ionizing and non ionizing radiation.

TDC IV SEMESTER (MAJOR)

M- 403 (PRACTICAL) **Total Marks- 40+10=50**
Total Credits : 4

DEVELOPMENTAL BIOLOGY

Slide Preparation (one) and Identification from the following: 10

1. Study of frog development through prepared slides and models
2. Study of whole mount preparation of chick embryos from 16-18 hours, 24 -28 hrs. 33-36 hrs, 42-48hrs, and 72 hours of development.

GENETICS

Slide Preparation (Two) from the following: 20

1. Squash preparation for the study of mitosis in tadpole tail/ onion root tip.
2. Study of meiosis in tests of Gryllotalpa/ Grasshopper
3. Study of polytene chromosome in salivary glands of *Chironomous* or *Drosophila.*
4. Study of sex chromatin from buccal epithelium

Practical Note Book 4
Viva Voce 6

TDC V SEMESTER (MAJOR)

Paper M-501 **Total mark 60+15=75**
Total Credits : 6

ANIMAL PHYSIOLOGY

1. Nutrition : Nutritional requirements, Digestion and absorption of dietary components (Carbohydrates, fats, proteins, vitamins, and minerals), Co-ordination and control of digestive activity (nervous and hormonal regulation), Functions of liver and pancreas.

2. Respiration : Types of respiration- Anaerobic and aerobic, Properties and function of respiratory pigments, Exchange of gases, Breathing, O_2 dissociation curve, Control of breathing

3. Body Fluids : Type of body fluids, Composition and function of different body fluids, Haemopoiesis, Buffer system in blood, Chloride shift, Blood groups and transfusion, Blood clotting mechanism

4. Heart and circulation : Types of heart- Myogenic and Neurogenic, Origin, conduction and regulation of heart beat, Cardiac cycle, Blood pressure.

5. Excretion: Types of nitrogenous wastes- ammonotelic, ureotelic and uricotelic, Physiology of urine formation. Regulation of urine formation

6. Nerve Physiology : Initiation and conduction of nerve impulse, Synapse and synaptic transmission through myelinated and nonmyelinated nerve fibres, Neuromuscular co-ordination
7. Muscle protein, chemistry of muscle contraction

8. Osmoregulation in vertebrates

TDC V SEMESTER (MAJOR)

Paper M-502 **Total mark 60+15=75**
Total Credits : 6

BIOCHEMISTRY AND BIOENERGETICS

BIOCHEMISTRY 40

1. Chemical foundation of biology- pH. pK, acids, bases, buffers free energy, isomerisation.
2. Classification and biological significance of carbohydrate, protein and lipid.
3. Assembly of macromolecular complexes, ribosome, chromatin and plasma membrane.
4. Enzymes- Nature and classification- Mechanism of enzyme action, Enzyme Kinetics.
5. Ornithine cycle.
6. Oxidation and biosynthesis of fatty acids.

BIOENERGITICS 20

1. First and second laws of thermodynamics
2. Oxidation- reduction potential with special reference to mitochondrial electron transport system. ATP in metabolism and in free energy production
3. Theories of oxidative phosphorylation

TDC V SEMESTER (MAJOR)

Paper M-503 **Total mark 60+15=75**
Total Credits: 6

ENDOCRINOLOGY AND IMMUNOLOGY

ENDOCRINOLOGY 30

1. Brief account of structural features histological structure and function of endocrine glands -Pituitary, Thyroid, Pancreas Adrenal and Gonads
2. Hypothalmo- hypophysial axis
3. Classification of hormones.
4. Mechanism of hormone action.
5. Synthesis of thyroxin.
6. Pancreatic hormones and metabolic regulation, physiological action of insulin and glucagon
7. Hormonal control of calcium homeostasis, chemistry and control of secretion of parathormone, calcium and vitamin D

IMMUNOLOGY 30

1. Basic immunological concepts
2. Innate and Acquired immunity
3. Components of immune system.
4. Cell mediated and humoral immune system.
5. Structure and function of antibodies.
6. Antigen- antibody interaction.
7. Immunization (Vaccination)
8. Hyper immunity (allergy, Immune deficiency, Autoimmunity, Basic concept).

TDC V SEMESTER (MAJOR)

Paper M-504 **Total mark : 60+15=75**
Total Credits : 6

BIOLOGICAL TECHNIQUES AND BIOSTATISTICS

BIOLOGICAL TECHNIQUES 30

1. Principle and uses of analytical instruments : pH meter, Colorimeter, Spectrophotometer, Ultra centrifuge.
2. Microsocopy- Working principle of light, electron Phase contrast and fluorescence microscopy.
3. Separation techniques in biology- elemetary knowledge of chromatography and electrophoresis.
4. Microtomy
5. Cryopreservation of egg and sperms
6. Use of radioisotope in biology. Autoradiography

BIOSTATISTICS 30

1 Statistics in Biology
2 Sampling techniques- Sample units and their selection
3 Correlation and regression analysis-linear.
4 Analysis of Variance, t-test.
5 Chi Square test (XY)
6 Use of computers in biology, computer application-data processing, language, computer Programmes for Biostatistical Analysis.
8 Utility of biostatistics.
9. Mean-Arithmetic, Geometric and Harmonic mean. Median and Mode
10 Standard deviation, Standard error of mean
11 Graphic representation of data- Histogram,. Bar-diagram, Piediagram and O-give

TDC V SEMESTER (MAJOR)

Paper M- 505 (PRACTICAL) **Total Marks- 40+10=50**
Total Credits : 4

PHYSIOLOGY

1. Demonstration of osmosis.
2. Effect of isotonic, hypertonic and hypotonic solution, acid and alkali on RBC.
3. Haemoglobin estimaration
4. Human blood grouping, ABO and Rh factor
5. Total count of RBC and WBC
6. Differential count of WBC
7. Preparation of Haemin crystal from blood
9. Study of cardiac cycle in Frog/Rat using Kymograph.
10. Normal and abnormal constituents of urine (Glucose and albumin)

Practical Note Book	4
Viva Voce	6

TDC V SEMESTER (MAJOR)

PAPER M- 506 (PRACTICAL) **Total Marks- 40+10=50**

Total Credits : 4

BIOCHEMISTRY AND ENDOCRINOLOGY

BIOCHEMISTRY **15**

1. Biochemical estimation of Glucose, total soluble proteins and total lipids.
2. Detection of enzyme activity-Salivary amylase, pepsin
3. Separation of amino acids by paper/thin layer chromatograph.
7. Estimation of ascorbic acid in lemon
8. Detection of presence of Vitamin A
9. Detection of mono-, di- and polysaccharides.

ENDOCRINOLOGY **15**

1. Dissection and localization of selected endocrine glands : Throid, Pituitary, Pancreas,
   Adrenal, Testis and Ovary of Frog / Rat/Rabbit/Squirrel.
2. Histological study of endocrine glands- Thyroid, Adrenal, Pancreas, Testis and Ovary (Through prepared slides)

Practical Record 4
Viva Voce 6

TDC VI SEMESTER (MAJOR)

Paper M-601 **Total mark : 60+15=75**
Total Credits : 6

ANIMAL BEHAVIOUR

1. Introduction to Ethology
2. Scope and methods of ethology
3. Behaviour equipment-Sign, stimuli, stimulus filtering
4. Patterns of Behaviour
5. Individual behavioural Pattern
6. Homeing behaviour
7. Genetic basic of behaviour
8. Neural and hormonal control of behaviour
9. Circadian rhythm
10. Motivation : Models of motivation of motivation, feeding and drinking.
11. Learning behaviour : Types of learning , Habituation Conditional reflex, Insight learning , Association learning, Reasoning and Imprinting
12. Socio Biology : Social organization, Individual Social interactions, Animal communications, Dance language of honey bees, Aggregation, Social behaviour of bee, ant and monkey, Role of pheromones
13. Communication ; Chemical, Visual, Audio, Language of behaviour, Habittal Selection, Aggression,Territoriality, Dispersal

TDC VI SEMESTER (MAJOR)

Paper M-602 **Total mark 60+15=75**
Total Credits : 6

EVOLUTION AND ADAPTATION

EVOLUTION 50

1. Evolution- Origin of life
2. Spontaneous generation, formation of organic compound.
3. Evidences of organic evolution : Embryological and biochemical
4. Theories of organic evolution
5. Darwinism and Neo-Darwinism
6. Lamarckism and Neo-Lamarckism
7. Germplasm theory, Mutation theory
8. Modern synthetic theory
9. Concept of micro, macro and mega evolution.
10. Phylogeny of Horse
11. Evolution of Man.
12. Origin of Bird.
13. Speciation- Genetic and Geographical
14. Zoo-geography
15. Factor influencing animal distribution.
16. Geological time scale.
17. Fossils- Definition, fossilization and significance, dating of fossils

ADAPTATION 10

1. Principles of adaptation.
2. Types of adaptation- Aquatic, terrestrial and Volant adaptation.
3. Adaptive Radiation in mammal
4. Cryptic and warning coloration, Mimicry

TDC VI SEMESTER (MAJOR)

Paper M-603 **Total mark 60+15=75**
Total Credits : 6

ECONOMIC ZOOLOGY

1. Sericulture

Nature of silk
Concise account of four varieties of silk products and economics in India (Eri, Muga, Pat, Tasar), life cycle of silkworm - Muga and Eri
Diseases, prevention and control measures of silkworm pest
Rearing of silkworm- Muga and Eri.
Environmental conditions for silkworm rearing-temperature
Humidity, light and air.
Storage, spinning and reeling of silk.

2. Apiculture

External morphology of honey bee
Bee colony-cast/members-the queen, worker and drone life histoy of honey bee
Colony nests
Caste distinction during development of honeybee.
Economics of bee keeping

3. Aquaculture

Aquaculture-Definition, Important groups of aquaculture.
Fresh water fish groups in India
Captive and culture fisheries.
Fresh water prawn culture
Pond fisheries- Construction and lay out of ponds of a fish farm.
Composite fish culture
Induced breeding
Integrated fish farming

4. Lac Culture, enemies of lac, uses of lac

5. Pest and pest Management

Definition of term pest. Types of pest
Importance of pest control
Principles of pest control- Cultural, Physical, Mechanical and Biological control of pest.
Pesticides and their hazards
Role of natural products in pest control
Integrated pest management

TDC VI SEMESTER (MAJOR)

Paper M-604 **Total mark 60+15=75**
Total Credits : 6

BIOTECHNOLOGY, BIOINFORMATICS AND COMPUTER APPLICATION

BIOTECHNOLOGY 45

1. Basic concepts in genetic engineering
2. Enzymology of genetic engineering –Restriction enzymes, DNA Ligases,
3. Tissue culture
4. Media preparation and sterilization
5. Cell culture media preparation and cell harvesting methods
6. Cloning
7. Gene libraries- Construction of CDNA , mRNA, isolation
8. Transferring genes into animal oocytes, eggs, embryos and specific animal tissues.

BIONFORMATICS AND COMPUTER APPLICATION FOR BIOLOGISTS 15

1. Operating system DOS, WINDOWS, UNIX
2. Programming using C++
3. Computer aided techniques for data presentation, data analysis, statistical Techniques.

TDC VI SEMESTER (MAJOR)

PAPER M- 605 (PRACTICAL) **Total Marks- 60+15=75**
Total Credits : 6

ECONOMIC ZOOLOGY

1. Identification of different varieties of silkworms (Eri, Muga and Mulberry) Larval and adult stages.
2. Study of life history of Honey bee
3. Study of important pest of paddy, jute, tea, stored grain, cane sugar and vegetables.
4. Identification of commercially important fishes- *Labeo gonius, Cirrhinus reba, Puntius sophore, Wallago attu, A seenghala, Labeo bata, Mystus vittatus Clarias batrachus, Heteropneustes fossilis, Channa marulius, Channa striatus. Notopterus notopterus. Hilsa ilisha, Anabas testudineus. Puntius javanica Cyprinus carpio, Hypophthalmichthys molitrise*.
5. Slide preparation : Pollen basket of honey bee, Different types of antenna, mouth parts, legs of insects
6. Dissection of Pituitary from any locally available fish.

Practical Record	4
Viva Voce	6

TDC VI SEMESTER (MAJOR)

PAPER M- 605 (PROJECT) **Total Marks : 75**
Total Credits : 6

PROJECT (Project work should be submitted in a bound paper form and shall be evaluated by External Examiner)
Content and Presentation : 50 Marks
Viva on Project : 25 Marks