ZOOLOGY

SYLLABUS

FOR

2020-2021

DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR I SEMESTER
ZOOLOGY - PAPER - I

ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES

Hours: 60 Max. Marks: 75

UNIT – I

1.1 Principles of Taxonomy – Binomial nomenclature – Rules of nomenclature
1.2 Whittaker's five kingdom concept and classification of Animal Kingdom.

UNIT - II

PHYLUM CTENOPHORA

2.8 General characters and Evolutionary significance (Affinities)

UNIT - III

3.3 Parasitic adaptations in Helminthes

3.5 Life cycle and pathogenicity of *Ascaris lumbricoides*

UNIT - IV

4.8 Social life in Bees and Termites

UNIT – V

5.3 Sense organs in Mollusca

5.6 Larval forms of Echinodermata

DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR II SEMESTER
ZOOLOGY - PAPER – II

ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

Periods: 60 Max. Marks: 75

UNIT - I

1.1 General characters and classification of Chordata up to classes
1.2 Protochordata – Salient features of Cephalochordata, Affinities of Cephalochordata.
1.3 Salient features of Urochordata
1.4 Structure and life history of Herdmania
1.5 Retrogressive metamorphosis – Process and Significance

UNIT - II

2.1 Cyclostomata, General characters, Comparison of *Petromyzon* and *Myxine*
2.2 Pisces - General characters of Fishes
2.3 *Scoliodon*: External features, Digestive system, Respiratory system, structure and functions of Heart, Structure and functions of the Brain.
2.4 Migration in Fishes
2.5 Types of Scales
2.6 Dipnoi

UNIT - III

3.1 General characters of Amphibia
3.2 Classification of Amphibia up to orders with examples.
3.3 *Rana hexadactyla*: External features, Digestive system, Respiratory system, Structure and functions of Heart.
3.4 Reptilia: General characters of Reptilia, Classification of Reptilia up to orders with examples.
3.5 Classification of Reptilia up to orders with examples
3.5 *Calotes*: External features, Digestive system, Respiratory system, Structure and function of Heart, Structure and function of Brain
3.6 Identification of Poisonous snakes and skull in reptiles.

UNIT – IV

AVES:

4.1 General characters of Aves

4.2 *Columba livia*: External features, Digestive system, Respiratory system. Structure and function of Heart, Structure and function of Brain

4.3 Migration in Birds

4.4 Flight adaptation in birds

UNIT – V

5.1 General characters of Mammalia

5.2 Classification of Mammalia up to sub - classes with examples

5.3 Comparison of Prototherians, Metatheria's and Eutherians

5.4 Dentition in mammals

Co-curricular activities (suggested)

Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis.

Thermocol or Clay models of Herdmania and Amphioxus.

Visit to a local fish market and identification of local cartilaginous and bony fishes.

Thermocol models of fish heart and brain.

Collecting and preparation of Museum specimens with dead frogs/snakes/lizards etc.

Chart preparation for Dentition in mammals.

DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR III SEMESTER
ZOOLOGY - PAPER – III

CYTOLOGY, GENETICS AND EVOLUTION

Periods: 60 Max. Marks: 75

UNIT - I

1. CYTOLOGY

1.1 Definition, history, prokaryotic and eukaryotic cells.
1.2 Electron microscopic structure of eukaryotic cell.
1.3 Plasma membrane –Fluid Mosaic model of plasma membrane.

UNIT – II

2. CELL ORGANELLES

2.1 Structure and functions of Endoplasmic Reticulum
2.2 Structure and functions of Golgi apparatus
2.3 Structure and functions of Lysosomes
2.4 Structure and functions of Ribosomes
2.5 Structure and functions of Mitochondria
2.6 Nucleus
2.7 Chromosomes - Structure, types, functions

UNIT - III

3.1GENETICS – I

3.1.1 Mendel’s work on transmission on traits
3.1.2 Principles of inheritance
3.1.3 Incomplete dominance and co-dominance
3.1.4 Epistasis, Pleiotropy

UNIT - IV

4.1GENETICS – II

4.1.1 Sex determination
4.1.2 Sex linked inheritance
4.1.3 Extra chromosomal inheritance
4.1.4 Human Karyotyping

UNIT – V

5.1EVOLUTION

5.1.1 Lamarckism, Darwinism, Neo – Darwinism, Hardy-Weinberg Equilibrium.
5.1.2 Variations, isolating mechanisms, natural selection
5.1.3 Types of natural selection (directional, stabilizing, disruptive)
5.1.4 Speciation (Allopatric and Sympatric)
5.1.5 Macro evolutionary principles (Example: Darwin's finches)

DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR IV SEMESTER
ZOOLOGY - PAPER – IV

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Periods: 60 Max. Marks: 75

UNIT - I

1.1DEVELOPMENTAL BIOLOGY AND EMBRYOLOGY

1.1.1 Gametogenesis
1.1.2 Fertilization
1.1.3 Types of eggs
1.1.4 Types of cleavages
1.2. Formation and functions of Foetal membrane in chick embryo
1.3.Types and functions of Placenta in mammals

UNIT - II

2.1PHYSIOLOGY – I

2.1.1 Elementary study of process of digestion
2.1.2 Absorption of digested food
2.1.3 Respiration - Transport of oxygen and carbon dioxide
2.1.4 Circulation - Structure and functioning of heart, Cardiac cycle
2.1.5 Excretion - Structure of nephron, urine formation, counter current mechanism

UNIT - III

3.1PHYSIOLOGY - II

3.1.1 Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers.
3.1.2 Muscle contraction - Ultra structure of muscle fibre, molecular and chemical basis of muscle contraction.
3.1.3 Endocrine glands - Structure, secretions and the functions (of hormones) of pituitary, thyroid, parathyroid, adrenal glands and pancreas
3.1.4 Hormonal control of reproduction in a mammal

UNIT - IV

4.1ECOLOGY – I

- 4.1.1 Meaning and scope of Ecology
- 4.1.2 Important abiotic factors of Ecosystem - Temperature, light, water, oxygen and Carbon dioxyde.
- 4.1.3 Nutrient cycles - Nitrogen, Carbon and phosphores
- 4.1.4Components of Ecosystem (lake), food chains and food web, energy flow in Ecosystem.

UNIT - V

5.1ECOLOGY – II

- 5.1.1 Habitat and ecological niche
- 5.1.2 Community interactions - Mutualism, commensalism, parasitism, competition, predation.
- 5.1.3 Ecological succession
- 5.1.4 Population studies

6.1ZOOGEOGRAPHY

- 6.1.1 Zoogeographical regions
- 6.1.1 Study of physical and faunal peculiarities of Oriental, Australian and Ethiopian regions.

DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR V SEMESTER
ZOOLOGY - PAPER – V

ANIMAL BIOTECHNOLOGY

Periods: 60 Max. Marks: 75

UNIT - I

Tools of Recombinant DNA technology - Enzymes and Vectors
Restriction modification systems: Types I, II and III.
Application of Type II restriction enzymes in Genetic Engineering.
Cloning Vectors - Plasmid vectors, pBR and pUC series.

UNIT - II

Techniques of Recombinant DNA technology
Gene delivery: Microinjection, Electroporation, Biolistic method (gene gun), liposome and viral-mediated delivery
PCR: Basics of PCR.
Hybridization techniques - Southern and Northern.
Genomic and cDNA libraries - Preparation and Uses

UNIT – III

Animal Cell Technology
Cell culture media: Natural and Synthetic
Cell cultures: primary culture, secondary culture, continuous cell lines, Protocols for Primary Cell Culture - Organ culture and Cryopreservation.
Hybridoma Technology-Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb
Stem cells: Types of stem cells, applications

UNIT - IV

Reproductive Technologies & Transgenic Animals

Manipulation of reproduction in animals - Artificial Insemination, *In vitro* fertilization, super ovulation, Embryo transfer, Embryo Cloning

Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish and applications

UNIT - V

Agriculture: fisheries – monoculture in fishes, polyploidy in fishes. DNA finger .printing.

DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR V SEMESTER
ZOOLOGY - PAPER – VI

ANIMAL HUSBANDRY

Periods: 60 Max. Marks: 75

UNIT – I

General introduction to Principles of poultry housing.
Poultry houses.
Management of chicks, growers and layers.
Management of Broilers. poultry farming.

UNIT – II

Poultry feed management – Principles of feeding.
Nutrient requirements for different stages of layers and broilers. Methods of feeding.
Poultry diseases – viral, bacterial, fungal and parasitic (two each) symptoms, control and management.

UNIT – III

Selection, care and handling of hatching eggs. Egg testing.
Methods of hatching. Brooding and rearing.
Sexing of chicks.

UNIT- IV

Breeds of Dairy Cattle and Buffaloes – Definition of breed, Classification of Indian Cattle breeds, Exotic breeds and Indian buffalo breeds.
Systems of inbreeding and crossbreeding.
Housing of dairy animals – Selection of site for dairy farm systems of housing.
Conventional dairy barn. Cleaning and sanitation of dairy farm.
Weaning of calf. Deworming and Vaccination programme.
Records to be maintained in a dairy farm.

UNIT - V

Care and management of dairy animals.
Care and management of calf, heifer, milk animal, dry and pregnant animal, bulls and bullocks.

DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR VI SEMESTER
ZOOLOGY – ELECTIVE PAPER - VII

IMMUNOLOGY

Periods: 60 Max. Marks: 75

UNIT – I

1. OVERVIEW OF IMMUNE SYSTEM
    - 1.1 Introduction to basic concepts in Immunology
    - 1.2 Innate and adaptive immunity
    - 1.3 Cells and organs of Immune system
    - 1.4 Cells of immune system
    - 1.5 Organs of immune system

UNIT – II

2. ANTIGENS
    - 2.1 Basic properties of antigens
    - 2.2 B and T cell epitopes, haptens and adjuvants
    - 2.3 Factors influencing immunogenicity

UNIT – III

3. ANTIBODIES
    - 3.1 Structure of antibody
    - 3.2 Classes and functions of antibodies
    - 3.3Monoclonal antibodies

UNIT – IV

4. WORKING OF IMMUNE SYSTEM
    - 4.1 Structure and functions of major histocompatibility complexes
    - 4.2 Exogenes and Endogenes pathways of antigen presentation and processing
    - 4.3 Basic properties and functions of cytokines

UNIT – V

5. IMMUNE SYSTEM IN HEALTH AND DISEASE
    - 5.1 Classification and brief description of various types of hyper sensitivities
    - 5.2 Introduction to concepts of autoimmunity and immunodeficiency

VACCINES

5.3 General introduction to vaccines

5.4 Types of vaccines

DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR VI SEMESTER
ZOOLOGY – CLUSTER ELECTIVE PAPER: VIII - (A)

PRINCIPLES OF AQUACULTURE

Periods: 60 Max. Marks: 75

UNIT – I

1.1 INTRODUCTION / BASICS OF AQUACULTURE

1.1.1 Definition, Significance and History of Aquaculture
1.1.2 Present status of Aquaculture – Global and National scenario
1.1.3 Major cultivable species for aquaculture: freshwater, brackish water and marine.
1.1.4 Criteria for the selection of species for culture

UNIT – II

1.1 TYPES OF AQUACULTURE

2.1.1Concept of Monoculture, Poly culture, Composite culture, Mono sex culture and Integrated fish farming
2.2 Ponds, Raceways, Cages, Pens, Rafts and water re-circulating systems
2.3 Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.

UNIT – III

3.1 DESIGN AND CONSTRUCTION OF AQUA FARMS

3.1.1Criteria for the selection of site for freshwater and brackish water pond farms
3.1.2 Design and construction of fish and shrimp farms
3.2 Seed resources
3.2.1 Natural seed resources and Procurement of seed for stocking: Carp and shrimp
3.3 Nutrition and feeds

3.3.1 Nutritional requirements of a cultivable fish and shellfish
3.3.2 Natural food and Artificial feeds and their importance in fish and shrimp culture

UNIT – IV

4.1MANAGEMENT OF CARP CULTURE PONDS

4.1.1 Culture of Indian major carps: Pre-stocking management – Dewatering, drying, ploughing / de silting Predators, weeds and algal blooms and their control, Liming and fertilization, Stocking management – Stocking density and stocking; Post-stocking management – Feeding, water quality, growth and health care and Harvesting of ponds.
4.2 Culture of giant freshwater prawn, *Macro brachium rosenbergii*

UNIT – V

5.1Culture of shrimp (*Penaeus monodon* or *Litopenaeus vannamei*)
5.2 Culture of pearl oysters
5.3 Culture of seaweeds-species cultured, culture techniques, important by-products, prospects
5.4 Culture of ornamental fishes – Setting up and maintenance of aquarium; and breeding.

DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR VI SEMESTER
ZOOLOGY – CLUSTER ELECTIVE PAPER: VIII - (A)

AQUACULTURE MANAGEMENT

Periods: 60 Max. Marks: 75

UNIT – I

BREEDING AND HATCHERY MANAGEMENT:

1.1 Bundh Breeding and Induced breeding of carp by Hypophysation and use of synthetic hormones
1.2 Types of fish hatcheries; Hatchery management of Indian major carps
1.3 Breeding and Hatchery management of *Penaeus monodon*/ *Litopenaeus vannamei*
1.4 Breeding and Hatchery management of giant freshwater prawn.

UNIT – II

WATER QUALITY MANAGEMENT:

2.1Water quality and soil characteristics suitable for fish and shrimp culture
2.2 Identification of oxygen depletion problems and control mechanisms in culture ponds
2.3 Aeration: Principles of aeration and Emergency aeration
2.4 Liming materials, Organic manures and Inorganic fertilizers commonly used and their implications in fish ponds

UNIT – III

FEED MANAGEMENT:

3.1 Live Foods and their role in shrimp larval nutrition.
3.2 Supplementary feeds, Principal foods in artificial diets, Types of feeds, feed additives and Preservatives, role of probiotics.
3.3 Feed formulation and manufacturing, Feed storage, feeding strategies. Feeding devices, feeding schedules and ration size, Feed Evaluation - feed conversion efficiencies and

ratios

UNIT – IV

DISEASE MANAGEMENT:

4.1 Principles of disease diagnosis and health management
4.2 Prophylaxis, Hygiene and Therapy of fish diseases
4.3 Specific and non-specific defense systems in fish, Fish immunization and vaccination
4.4 Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds and common shrimp diseases in shrimp ponds

UNIT – V

ECONOMICS AND MARKETING:

5.1Principles of aquaculture economics – Capital costs, variable costs, cost-benefit analysis
5.2 Fish marketing methods in India. Basic concepts in demand and price analysis. Fisheries Extension
5.3Fisheries training and education in India. Role of extension in community development.
5.4 Genetic improvement of fish stocks – Hybridization of fish.
5.5 Gynogenesis, Androgenesis, Polyploidy, Transgenic fish, Cryopreservation of gametes, Production of monosex and sterile fishes and their significance in aquaculture.

DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR VI SEMESTER
ZOOLOGY – CLUSTER ELECTIVE PAPER: VIII - (A)

POST HARVEST TECHNOLOGY

Time: 3 Hrs. Max. Marks: 75

UNIT – I

HANDLING AND PRINCIPLES OF FISH PRESERVATION:

1.1 Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.
1.2 Principles of preservation– cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to low radiation of gamma rays.

UNIT – II

2. Methods of fish Preservation:

2.1 Traditional methods - sun drying, salt curing, pickling and smoking.
2.2 Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, Irradiation and Accelerated Freeze drying (AFD).

UNIT – III

PROCESSING AND PRESERVATION OF FISH AND FISH BY-PRODUCTS:

3.1 Fish products – fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.
3.2 Fish by-products – fish glue, isinglass, chitosan, pearl essence, shark fins, fish leather and fish maws.
3.3 Seaweed Products: Preparation of agar, algin and carrageen. Use of seaweeds as food for human consumption, in disease treatment and preparation of therapeutic drugs.

UNIT – IV

SANITATION AND QUALITY CONTROL:

4.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing

plants.

4.2 Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

UNIT – V

QUALITY ASSURANCE, MANAGEMENT AND CERTIFICATION:

5.1 Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.

5.2 National and International standards – ISO 9000: 2000 Series of Quality Assurance System, *Codex Alimentarius*.