

UG SYLLABUS

ZOOLOGY – SEMESTER I

PAPER – I: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES

UNIT I 1.1 Principles of Taxonomy – Binomial nomenclature – Rules of nomenclature

- 1.2 Whittaker's five kingdom concept and classification of Animal Kingdom. Phylum Protozoa
- 1.3 General Characters and classification of protozoa up to classes with suitable examples
- 1.4 Locomotion, nutrition and reproduction in Protozoans
- 1.5 Elphidium (type study)

UNIT –II Phylum Porifera

- 2.1 General characters and classification up to classes with suitable examples
- 2.2 Skelton in Sponges
- 2.3 Canal system in sponges

Phylum Coelenterata

- 2.4 General characters and classification up to classes with suitable examples
- 2.5 Metagenesis in Obelia
- 2.6 Polymorphism in coelenterates
- 2.7 Corals and coral reefs

Phylum Ctenophora :

- 2.8 General Characters and Evolutionary significance (affinities)

Unit – III Phylum Platyhelminthes

- 3.1 General characters and classification up to classes with suitable examples
- 3.2 Life cycle and pathogenicity of Fasciola hepatica
- 3.3 Parasitic Adaptations in helminthes Phylum Nematelminthes
- 3.4 General characters and classification up to classes with suitable examples
- 3.5. Life cycle and pathogenicity of Ascaris lumbricoides

Unit – IV Phylum Annelida

- 4.1 General characters and classification up to classes with suitable examples
- 4.2 Evolution of Coelom and Coelomoducts

4.3 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost Phylum Arthropoda

4.4 General characters and classification up to classes with suitable examples

4.5 Vision and respiration in Arthropoda

4.6 Metamorphosis in Insects

4.7 Peripatus - Structure and affinities 4.8 Social Life in Bees and Termites

Unit – V Phylum Mollusca

5.1 General characters and classification up to classes with suitable examples

5.2 Pearl formation in Pelecypoda

5.3 Sense organs in Mollusca Phylum Echinodermata

5.4 General characters and classification up to classes with suitable examples

5.5 Water vascular system in star fish

5.6 Larval forms of Echinodermata Phylum Hemichordata

5.7 General characters and classification up to classes with suitable examples

5.8 Balanoglossus - Structure and affinities

ZOOLOGY PRACTICAL SYLLABUS FOR I SEMESTER

ZOOLOGY - PAPER - I ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

1. Study of museum slides / specimens / models (Classification of animals up to orders

Protozoa: Amoeba, Paramecium, Paramecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax

Porifera: Sycon, Spongilla, Euspongia, Sycon- T.S & L.S, Spicules, Gemmule

Coelenterata: Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatulav.

Platyhelminthes: Planaria, Fasciola hepatica, Fasciolalarval forms – Miracidium, Redia, Cercaria, Echinococcus granulosus, Taenia solium, Schistosoma haematobium

Nemathelminthes: Ascaris (Male & Female), Dracunculus, Ancylostoma, Wuchereria

Annelida: Nereis, Aphrodite, Chaetopterus, Hirudinaria, Trochophore larva

Arthropoda: Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female Anopheles and Culex, Mouthparts of Housefly and Butterfly.

Mollusca: Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva

Echinodermata: Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Bipinnaria larva

Hemichordata: Balanoglossus, Tornaria larva

2. Dissections: 1. Prawn: Appendages, Digestive system, Nervous system, Mounting of Statocyst

2. Insect Mouth Parts

3. Laboratory Record work shall be submitted at the time of practical examination

4. An "Animal album" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose

5. Computer - aided techniques should be adopted or show virtual dissections

ZOOLOGY –SEMESTER II PAPER – II: ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

Unit – I

- 1.1 General characters and classification of Chordata upto 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 function 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 function of Heart, structure and functions of the Brain
- 3.4 Reptilia: General characters of Reptilia, Classification of Reptilia upto 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

- 4.1 Aves 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 upto sub - classes with examples
- 5.3 Comparision of Prototherians, Metatherians and Eutherians
- 5.4 Dentition in mammals

ZOOLOGY PRACTICAL SYLLABUS FOR II SEMESTER

ZOOLOGY - PAPER - II ANIMAL DIVERSITY - BIOLOGY OF CHORDATES

1. Protochordata :Herdmania, Amphioxus, Amphioxus T.S through pharynx.
2. Cyclostomata :Petromyzon and Myxine.
3. Pisces : Pristis, Torpedo, Hippocoampus ,Exocoetus, Echeneis, Labeo, Catla, Clarius,Channa, Anguilla.
4. Amphibia :Ichthyophis, Amblystoma, Axolotl larva, Hyla,
5. Reptilia: Draco, Chamaeleon, Uromastix,,Testudo, Trionyx, Russels viper, Naja, Krait, Hydrophis, Crocodile.
6. Aves : Psittacula, Eudynamis, Bubo, Alcedo.
7. Mammalia: Ornithorhynchus,Pteropus,Funambulus.

Dissections1. Scoliodon IX and X, Cranial nerves

2. Scoliodon Brain

3. Mounting of fish scales

ZOOLOGY – SEMESTER III PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

Unit – I Cell Biology

- 1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma
- 1.2 Electron microscopic structure of animal cell.
- 1.3 Plasma membrane – Models and transport functions of plasma membrane.
- 1.4 Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes

- 1.5 Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes (Note: 1. General pattern of study of each cell organelle – Discovery, Occurrence, Number, Origin, Structure and Functions with suitable diagrams) 2. Need not study cellular respiration under mitochondrial functions)

Unit – II Genetics

2. 1 Mendel's work on transmission of traits
2. 2 Gene Interaction – Incomplete Dominance, Codominance, Lethal Genes
2. 3 Polygenes (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance
2. 4 Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy) types of sex determination
2. 5 Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

Unit – III Genetics – II

- 3.1 Mutations & Mutagenesis
- 3.2 Chromosomal Disorders (Autosomal and Allosomal)
- 3.3 Human Genetics – Karyotyping, Pedigree Analysis (basics)
- 3.4 Basics on Genomics and Proteomics

UNIT IV: Molecular Biology

- 4.1 Central Dogma of Molecular Biology
- 4.2 Basic concepts of - a. DNA replication – Overview (Semi-conservative mechanism, Semi discontinuous mode, Origin & Propagation of replication fork) b. Transcription in prokaryotes – Initiation, Elongation and Termination, Posttranscriptional modifications (basics) c. Translation – Initiation, Elongation and Termination
- 4.3 Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes

Unit - V

- 5.1 Origin of life
- 5.2 Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, Mutation Theory
- 5.3 Neo-Darwinism: Modern Synthetic Theory of Evolution, Hardy-Weinberg Equilibrium
- 5.4 Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation

ZOOLOGY PRACTICAL SYLLABUS FOR III SEMESTER

ZOOLOGY - PAPER - III CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

I. Cell Biology

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis and Meiosis with prepared slides
3. Mounting of salivary gland chromosomes of Chironomous

II. Genetics

1. Study of Mendelian inheritance using suitable examples and problems
2. Problems on blood group inheritance and sex linked inheritance
3. Study of human karyotypes (Down's syndrome, Edwards, syndrome, Patau syndrome, Turner's syndrome and Klinefelter syndrome)

III. Evolution

1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Phylogeny of horse with pictures
4. Study of Genetic Drift by using examples of Darwin's finches (pictures)
5. Visit to Natural History Museum and submission of report

ZOOLOGY – SEMESTER IV PAPER – IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY

UNIT I Animal Physiology

- 1.1 Process of digestion and assimilation
- 1.2 Respiration - Pulmonary ventilation, transport of oxygen and CO₂ (Note: Need not study cellular respiration here)
- 1.3 Circulation - Structure and functioning of heart, Cardiac cycle
- 1.4 Excretion - Structure and functions of kidney urine formation, counter current Mechanism

UNIT II Animal Physiology – II

- 2.1 Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers
- 2.2 Muscle contraction - Ultra structure of muscle, molecular and chemical basis of muscle contraction
- 2.3 Endocrine glands - Structure, functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas
- 2.4 Hormonal control of reproduction in a mammal

UNIT III Cellular Metabolism – I (Biomolecules)

- 3.1 Carbohydrates - Classification of carbohydrates. Structure of glucose
- 3.2 Proteins - Classification of proteins. General properties of amino acids
- 3.3 Lipids - Classification of lipids
- 3.4 Enzymes: Classification and Mechanism of Action

UNIT IV Cellular Metabolism – II

- 4.1 Carbohydrate Metabolism - Glycolysis, Krebs cycle, Electron Transport Chain, Glycogen metabolism, Gluconeogenesis
- 4.2 Lipid Metabolism – β -oxidation of palmitic acid
- 4.3 Protein metabolism - Transamination, Deamination and Urea Cycle

Unit – V Embryology

- 5.1 Gametogenesis
- 5.2 Fertilization
- 5.3 Types of eggs
- 5.4 Types of cleavage
- 5.5 Development of Frog up to formation of primary germ layers

ZOOLOGY PRACTICAL SYLLABUS FOR IV SEMESTER
ZOOLOGY - PAPER - IV ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND
EMBRYOLOGY

I. ANIMAL PHYSIOLOGY

1. Qualitative tests for identification of carbohydrates, proteins and fats
2. Study of activity of salivary amylase under optimum conditions
3. T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage
4. Differential count of human blood

II. CELLULAR METABOLISM

1. Estimation of total proteins in given solutions by Lowry's method
2. Estimation of total carbohydrate by Anthrone method.
3. Qualitative tests for identification of ammonia, urea and uric acid
4. Protocol for Isolation of DNA in animal cells

III. EMBRYOLOGY

1. Study of T.S. of testis, ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8 cell stages)
3. Construction of fate map of frog blastula

COURSE – 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

Unit – I Immunology – I (Overview of Immune system)

- 1.1 Introduction to basic concepts in Immunology
- 1.2 Innate and adaptive immunity, Vaccines and Immunization programme
- 1.3 Cells of immune system
- 1.4 Organs of immune system

Unit – II Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity)

- 2.1 Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants; Factors influencing immunogenicity
- 2.2 Antibodies: Structure of antibody, Classes and functions of antibodies
- 2.3 Structure and functions of major histocompatibility complexes
- 2.4 Exogenous and Endogenous pathways of antigen presentation and processing
- 2.5 Hypersensitivity – Classification and Type

s Unit – III Techniques

- 2.1 Animal Cell, Tissue and Organ culture media: Natural and Synthetic media,
- 2.2 Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Protocols for Primary Cell Culture); Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures
- 2.3 Stem cells: Types of stem cells and applications
- 2.4 Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)

Unit – IV Applications of Animal Biotechnology

- 3.1 Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases and Recombinant DNA technology
- 3.2 Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated gene delivery
- 3.3 Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications
- 3.4 Manipulation of reproduction in animals: Artificial Insemination, In vitro fertilization, super ovulation, Embryo transfer, Embryo cloning

Unit – V

- 4.1. PCR: Basics of PCR
- 4.2 DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing (2 hrs)
- 4.3 Hybridization techniques: Southern, Northern and Western blotting
- 4.4 DNA fingerprinting: Procedure and applications
- 4.5 Applications in Industry and Agriculture: Fermentation: Different types of Fermentation and Downstream processing; Agriculture: Monoculture in fishes, polyploidy in fishes

ZOOLOGY PRACTICAL SYLLABUS FOR V SEMESTER COURSE – 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

I. IMMUNOLOGY

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination
4. Demonstration of a. ELISA
- b. Immuno electrophoresis

II. Animal biotechnology

1. DNA quantification using DPA Method
2. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
3. Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography
4. Cleaning and sterilization of glass and plastic wares for cell culture
5. Preparation of culture media

ANDHRAPRADESH STATE COUNCIL OF HIGHER EDUCATION

(A Statutory body of the Government of Andhra Pradesh)

REVISED UG SYLLABUS UNDER CBCS

(Implemented from Academic Year - 2020-21)

PROGRAMME: FOUR YEAR B.Sc. (Hons)

Domain Subject: ZOOLOGY

Skill Enhancement Courses (SECs) for Semester V, from 2022-23

(Syllabus with Learning Outcomes, References, Co-curricular Activities & Model Q.P. Pattern)

Structure of SECs for Semester-V

(To choose one pair from the four alternate pairs of SECs)

Univ Code	Course Number	Name of Course	Hours/Week Theory +Practical	Credits Theory+ Practical	Marks	
					IA-20 FW-05	Sem End T+P
	6&7					
	6A	SUSTAINABLE AQUACULTURE MANAGEMENT	3+3	3+2	25	75+50
	7A	POST HARVEST TECHNOLOGY OF FISH AND FISHERIES	3+3	3+2	25	75+50
OR						
	6B	LIVE STOCK MANAGEMENT-I (BIOLOGY OF DAIRY ANIMALS)	3+3	3+2	25	75+50
	7B	LIVE STOCK MANAGEMENT -II (DAIRY PRODUCTION AND MANAGEMENT)	3+3	3+2	25	75+50
OR						
	6C	POULTRY MANAGEMENT- I (POULTRY FARMING)	3+3	3+2	25	75+50
	7C	POULTRY MANAGEMENT- II (POULTRY PRODUCTION AND MANGEMENT)	3+3	3+2	25	75+50
OR						
	6D	SERI CULTURE -I***	3+3	3+2	25	75+50
	7D	SERI CULTURE -II	3+3	3+2	25	75+50

*** To be taught by Zoology Teachers

Note: For Semester-V, for the domain subject Zoology, any one of the four pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C or 6D & 7D. The pair shall not be broken (ABCD allotment is random, not on any priority basis).

Note-2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the skills embedded in syllabus citing related real field situations.

ZOOLOGY IV Year B.Sc. Semester –V

Course6 A: SUSTAINABLE AQUACULTURE MANAGEMENT

Unit: 1

- 1.1 Present status of Aquaculture – Global and National scenario
- 1.2 Major cultivable species for aquaculture: freshwater, brackish water and marine
- 1.3 Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.
- 1.4 Design and construction of fish and shrimp farms

Unit: 2

- 2.1 Functional classification of ponds – head pond, hatchery, nursery ponds
- 2.2 Functional classification of ponds -rearing, production, stocking and quarantine ponds
- 2.3 Need of fertilizer and manure application in culture ponds
- 2.4 Physio-chemical conditions of soil and water optimum for culture (Temperature, depth, turbidity, light, water, PH, BOD, CO₂ and nutrients)

Unit: 3

- 3.1. Induced breeding in fishes
- 3.2. Culture of Indian major carps: Pre-stocking management (Dewatering, drying, ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization)
- 3.3. Culture of Indian major carps - Stocking management
- 3.4. Culture of Indian major carps - post-stocking management

Unit: 4

- 4.1 Commercial importance of shrimp & prawn
- 4.2 Macrobrachium rosenbergii- biology, seed production.
- 4.3 Culture of L. vannamei – hatchery technology and culture practices
- 4.4 Mixed culture of fish and prawns

Unit: 5

- 5.1 Viral diseases of Fin Fish & shell fish
- 5.2 Fungal diseases of Fin & Shell fish
- 5.3 Bacterial diseases of Finfish & Shell fish
- 5.4 Prophylaxis in aquaculture

Course6 A: SUSTAINABLE AQUACULTURE MANAGEMENT PRACTICAL SYLLABUS

1. Fresh water Cultivable species any (Fin & Shell Fish Specimens – Observation of morphological characters by observation and drawings)-5
2. Brackish water cultivable species (Fin & Shell fish- Specimens- Observation of Morphological Character by observing drawing) -5
3. Hands on training on the use of kits for determination of water quality in aquaculture (DO, Salinity, pH, Turbidity- Testing kits to be used for the estimation of various parameters/ Standard) procedure can be demonstrated for the same
4. Demonstration of Hypophysation (Procedure of hypophysation to be demonstrated in the practical lab with any edible fish as model)
5. Viral diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of viral pathogens in fin/ shell fish – one edible specimen can be used for observation of same in the laboratory)
6. Bacterial diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)
7. Fungal diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)

Course 7 A: POST HARVEST TECHNOLOGY OF FISH AND FISHERIES

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 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, Using glass, chitosan, pearl essence, shark fins, fish Leather and fish maws

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.

Course 7 A: POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES PRACTICAL SYLLABUS

1. Evaluation of fish/ fishery products for organoleptic, chemical and microbial quality.
2. Preparation of dried, cured and fermented fish products For detailed procedure method visit sites:
3. Examination of salt, protein, moisture in dried / cured products
4. Examination of spoilage of dried / cured fish products, marinades, pickles, sauce.
5. Preparation of isinglass, collagen and chitosan from shrimp and crab shell.
6. Developing flow charts and exercises in identification of hazards – preparation of hazard analysis worksheet
7. Corrective action procedures in processing of fish- flow chart- work sheet preparation