

**DEPARTMENT OF
ZOOLOGY**
TeachingPlan2022-2023

TEACHING-LEARNING PEDAGOGY

Pedagogy	P₁	General Lecture Using Blackboard and Chalk
	P₂	Demonstration
	P₃	Question and Answer
	P₄	Slide Share/PPT
	P₅	Group Discussion
	P₆	ICT (Virtual and online learning)
	P₇	Assignment (Written)
	P₈	Discovery-Storytelling
	P₉	Seminar
	P₁₀	Guest Lecture
	P_X	Problem solving
	P_Q	Quiz
	P_T	Written Test
External & Internal Evaluation	75:25	

Course:B.Sc.,BZC	Year:I	Semester:I			
Subject	ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES				
Units	1. General Characters Of Protozoa 2. General Characters Of Porifera, Coelenterata, Ctenophora, 3. General Characters And Classification of Platyhelminthes, Nematyhelminthes 4. General Characters And Classification of Annelida,Arthropoda 5. General Characters And Classification of Mollusca,Echinodermata,Hemichordata				
Duration	60hours				
LearningObjectives	1. .To understand the taxonomic position of protozoa to helminthes. 2. To understand the general characteristics of animals belonging to protozoa to hemichordata. 3. To understand the structural organization of animals phylum from protozoa to hemichordata. 4. To understand the origin and evolutionary relationship of different phyla from protozoa to hemichordata. 5. To understand the origin and evolutionary relationship of different phylum from annelids to hemichordates				
Units	U1	U2	U3	U4	U5
HoursSplit:Total:60	12	12	12	12	12
Internalvaluation:25marks	5	5	5	5	5

StudyMaterial(Handouts):

ReferenceBooks:

1. Bsc. First Year Zoology,
2. L.H. Hyman '*The Invertebrates*' Vol I, II and V. – M.C. Graw Hill Company Ltd.
3. Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.

YouTubeLinks:

<https://www.youtube.com/watch?v=zCByV0LBkSM>

**Resource
Material:**

Power Point Presentations: <https://www.slideshare.net/maheshthakur30/introduction-to-non-chordates>

QuestionBank: <https://uou.ac.in/sites/default/files/slm/BSCZO-101.pdf>

Academic-Pedagogical-Evaluation:Unit-wisePedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Principles of Taxonomy – Binomial nomenclature Rules of nomenclature. Whittaker’s five kingdom concept and classification of Animal Kingdom. Phylum Protozoa: General Characters and classification of protozoa up to classes with suitable Examples. Locomotion, nutrition and reproduction in Protozoans . <i>Elphidium (type study)</i>	P1,P2,P6,PQ, PT	PQ,P6,PT
II	Phylum Porifera: General characters and classification up to classes with suitable examples, Skelton in Sponges, Canal system in sponges Phylum Coelenterata: General characters and classification up to classes with suitable examples, Metagenesis in <i>Obelia</i> , Polymorphism in coelenterates, Corals and coral reefs Phylum Ctenophora : General Characters and Evolutionary significance(affinities)	P1,P2,P6,PQ, PT.	PQ,P6,PT
III	Phylum Platyhelminthes: General characters and classification up to classes with suitable examples, Life cycle and pathogenecity of <i>Fasciola hepatica</i> , Parasitic Adaptations in helminthes Phylum Nematelminthes: General characters and classification up to classes with suitable examples, Life cycle and pathogenecity of <i>Ascaris lumbricoides</i> .	P1,P2,P6,PQ, PT.	PQ, P6, PT
IV	Phylum Annelida: General characters and classification up to classes with suitable examples, Evolution of coelom and coelom ducts, Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompos. Phylum Arthropoda: General characters and classification up to classes with suitable examples, Vision and respiration in Arthropoda, Metamorphosis in Insects <i>Peripatus</i> - Structure and affinities, Social Life in Bees and Termites	P1,P2,P6,PQ,PT.	PQ, P6, PT
V	Phylum Mollusca 1 General characters and classification up to classes with suitable examples 2 Pearl formation in Pelecypoda 3 Sense organs in Mollusca Phylum Echinodermata 4 General characters and classification up to classes with suitable examples 5 Water vascular system in star fish 6 Larval forms of Echinodermata Phylum Hemichordata 7 General characters and classification up to classes with suitable examples 8 <i>Balanoglossus</i> - Structure and affinities	P1,P2,P6,PQ,PT.	PQ, P6, PT

Course:B.Sc.,BZC	Year:I	Semester:II			
Subject	Animal diversity & biology of chordates				
Units	<ol style="list-style-type: none"> 1. General character and classification of chordates. 2. General characters and classification of fishes. 3. General character & classification of Amphibia, Reptails, Calottes. 4. General characters & classification of Aves 5. General character & classification of Mammalia 				
Duration	60hours				
LearningObjectives	<ul style="list-style-type: none"> • UnderstandtheconceptofTalent Management. • Definecompetency mapping, methods and approaches of competency mapping. • Explain Performance management and ways of employee development. • Critically examine parameters to measure employee engagement, Q12 model of Gallup. • Evaluating the employee satisfaction survey. • Developing knowledge on Succession planning.. 				
Units	U1	U2	U3	U4	U5
HoursSplit:Total:60	12	12	12	12	12
Internalvaluation:25marks	5	5	5	5	5

Power point presentation:

<https://www.slideshare.net/druppani/animal-kingdom-ii-chordates>

StudyMaterial(Handouts):

ReferenceBooks:

Veena 2008 lower chordates.

J.Z Young, 2006. The life of vertebrates,
B.Sc. Zoology Text book

YouTubeLinks: <https://www.youtube.com/watch?v=9AeNGFcis2o>

**Resource
Material:**

Academic-Pedagogical-Evaluation:Unit-wisePedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	General characters and classification of Chordata up to classes Protochordate- Salient features of Cephalochordate, Affinities of Cephalochordate. Salient features of Urochordata. Structure and life history of <i>Herd mania</i> . Retrogressive metamorphosis –Process and Significance	P1,P2,P6,PQ, PT	PQ,P6,PT
II	Cyclostomata, General characters, Comparison of <i>Petromyzon</i> and <i>Myxine</i> . Pisces : General characters of Fishes <i>Scoliodon</i> : External features, Digestive system, Respiratory system, Structure and function of Heart, Structure and functions of the Brain. Migration in Fishes. Types of Scales Dipnoi.	P1, P2, P6,PQ, PT	PQ,P6,PT
III	General characters of Amphibia Classification of Amphibia up to orders with examples. <i>Rana hexadactyla</i> : External features, Digestive system, Respiratory system, Structure and function of Heart, structure and functions of the Brain Reptilia: General characters of Reptilia, Classification of Reptilia up to orders with examples <i>Calotes</i> : External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain Identification of Poisonous snakes and Skull in reptiles General characters of Amphibia	P1, P2, PQ,P6, PT	PQ,P6,PT
IV	Aves General characters of Aves. <i>Columba livia</i> : External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain Migration in Birds. Flight adaptation in birds	P1, P2, PQ,P6, PT	PQ,P6,PT
V	General characters of Mammalia. Classification of Mammalia up to sub - classes with examples. Comparison of Prototherians, Metatherians and Eutherians. Dentition in mammals	P1, P2, P6,PQ, PT	PQ,P6,PT

Course:B.Sc.,BZC	Year:II	Semester:III			
Subject	CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION				
Units	1. . Cell Biology 2. Genetics - I 3. Genetics-II 4. Molecular Biology 5. Evolution				
Duration	60hours				
LearningObjectives	<ul style="list-style-type: none"> To understand the origin of cell and distinguish between prokaryotic and eukaryotic cell To understand the role of different cell organelles in maintenance of life activities To provide the history and basic concepts of heredity, variations and gene interaction To enable the students distinguish between polygenic, sex-linked, and multiple allelic modes of inheritance. To acquaint student with basic concepts of molecular biology as to how characters are expressed with a coordinated functioning of replication, transcription and translation in all living beings To provide knowledge on origin of life, theories and forces of evolution To understand the role of variations and mutations in evolution of organisms 				
Units	U1	U2	U3	U4	U5
HoursSplit:Total:60	12	12	12	12	12
Internalvaluation:25marks	5	5	5	5	5

Powerpoint presentation:

<https://www.slideshare.net/BINTA11223344/cell-and-molecular-genetics>

StudyMaterial(Handouts):

ReferenceBooks:

1.Bsc.Second Year Zoology Textbook,

1. Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell 'Molecular Cell Biology'

W.H.Freeman and company New York.

2. Cell Biology by De Robertis

YouTubeLinks: <https://www.youtube.com/watch?v=HpH1qhcb8gQ>

**Resource
Material:**

Academic-Pedagogical-Evaluation:Unit-wisePedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma. Electron microscopic structure of animal cell. Plasma membrane –Models and transport functions of plasma membrane. Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes	P1,P2,P6,P Q,PT	PQ,P6,PT
II	Mendel's work on transmission of traits. Gene Interaction – Incomplete Dominance, Codominance, Lethal Genes. Polygenes (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy types of sex determination) Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)	P1,P2,P6,P Q,PT	PQ,P6,PT
III	Mutations & Mutagenesis Chromosomal Disorders (Autosomal and Allosomal) Human Genetics – Karyotyping, Pedigree Analysis (basics) Basics on Genomics and Proteomics	P1,P2,P6,PQ,PT	PQ,P6,PT
IV	Central Dogma of Molecular Biology Basic concepts of - DNA replication – Overview (Semi-conservative mechanism, Semi discontinuous mode, Origin & Propagation of replication fork) Transcription in prokaryotes – Initiation, Elongation and Termination, Post transcriptional modifications(BASICS) Translation – Initiation, Elongation and Termination. Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes	P1,P2,P6,P Q,PT	PQ,P6,PT
V	Origin of life. Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, Mutation Theory. Neo-Darwinism: Modern Synthetic Theory of Evolution, Hardy-Weinberg Equilibrium. Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation	P1,P2,P6,P Q,PT	PQ,PT

Course:B.Sc.,BZC	Year:II	Semester:IV			
Subject	ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY				
Units	<ol style="list-style-type: none"> 1. Animal Physiology - I 2. Animal Physiology – II 3. Cellular Metabolism – I (Biomolecules) 4. Cellular Metabolism – III 5. Embryology 				
Duration	60hours				
LearningObjectives	<ul style="list-style-type: none"> • To achieve a thorough understanding of various aspects of physiological systems and their functioning in animals. • To instill the concept of hormonal regulation of physiology, metabolism and reproduction in animals. • To understand the disorders associated with the deficiency of hormones • To demonstrate a thorough knowledge of the intersection between the disciplines of Biology and Chemistry. • To provide insightful knowledge on the structure and classification of carbohydrates, proteins, lipids and enzymes • To demonstrate an understanding of fundamental biochemical principles such as the function of biomolecules, metabolic pathways and the regulation of biochemical processes • To make students gain proficiency in laboratory techniques in biochemistry and orient them to apply the scientific method to the processes of experimentation and hypothesis testing. 				
Units	U1	U2	U3	U4	U5
HoursSplit:Total:60	12	12	12	12	12
Internalvaluation:25marks	5	5	5	5	5

StudyMaterial(Handouts):

ReferenceBooks:

1. BSc Zoology text book
2. Eckert H. Animal physiology
3. Embryology by V.B Rastogi
4. BSc Zoology text book
5. Eckert H. Animal physiology
6. Embryology by V.B Rastogi

**Resource
Material:**

YouTubeLinks:

<https://www.youtube.com/watch?v=nMzAXKK1D08>

PowerPoint Presentations:

<https://www.slideshare.net/amoldeore22/animal-cell-anatomy-and-physiology-142470236>

QuestionBank:

<https://stsngdckadiri.ac.in/admin/uploads/4088IV%20Semester%20Zoology.docx>

Academic-Pedagogical-Evaluation:Unit-wisePedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Process of digestion and assimilation. Respiration - Pulmonary ventilation, transport of oxygen and CO ₂ (Note: Need not study cellular respiration here). Circulation - Structure and functioning of heart, Cardiac cycle. Excretion - Structure and functions of kidney urine formation, counter current Mechanism	P1,P2,P6,PQ, PT	PQ,P6,PT
II	Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers Muscle contraction - Ultra structure of muscle, molecular and chemical basis of muscle contraction Endocrine glands - Structure, functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas Hormonal control of reproduction in a mammal	P1, P2, P6,PQ, PT	PQ,P6,PT
III	Carbohydrates - Classification of carbohydrates. Structure of glucose Proteins - Classification of proteins. General properties of amino acids Lipids - Classification of lipids Enzymes: Classification and Mechanism of Action	P1, P2, PQ,P6, PT	PQ,P6,PT
IV	Carbohydrate Metabolism - Glycolysis, Krebs cycle, Electron Transport Chain, Glycogen metabolism, Gluconeogenesis Lipid Metabolism – β -oxidation of palmitic acid Proteinmetabolism - Transamination, Deamination and Urea Cycle	P1, P2, PQ,P6, PT	PQ,P6,PT
V	Gametogenesis Fertilization Types of eggs Types of cleavages Development of Frog upto formation of primary germ layers.	P1, P2, P6,PQ, PT	PQ,P6,PT

Course:B.Sc.,BZC	Year:II	Semester:IV			
Subject	PAPER:V IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY				
Units	1. Overview of Immune system. 2. Antigens, Antibodies, MHC and Hypersensitivity. 3. Immunology – III (Techniques). 4. Applications of Animal Biotechnology. 5. Bio technology – Techniques				
Duration	60hours				
LearningObjectives	<ul style="list-style-type: none"> • UnderstandtheconceptofTalent Management. • Define competency mapping, methods and approaches of competency mapping. • Explain Performance management and ways of employee development. • Critically examine parameters to measure employee engagement, Q12 model of Gallup. • Evaluating the employee satisfaction survey. • Developing knowledge on Succession planning. 				
Units	U1	U2	U3	U4	U5
HoursSplit:Total:60	12	12	12	12	12
Internalvaluation:25marks	5	5	5	5	5

Power point presentation:

<https://www.slideshare.net/Pure-man/introduction-to-animal-biotechnology>

Study Material(Handouts):

ReferenceBooks:

1. Zoology text book
2. Immunology text book
3. Sreekrishna V. 2005. Biotechnology -1, cell biology and Genetics, new age international publ. new delhi, India

YouTubeLinks: <https://www.youtube.com/watch?v=tFq3pXKZDnY>

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**Resource
Material:**

Academic-Pedagogical-Evaluation:Unit-wisePedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Introduction to basic concepts in Immunology Innate and adaptive immunity, Vaccines and Immunization programmed Cells of immune system Organs of immune system	P1,P2,P6,PQ, PT	PQ,P6,PT
II	Antigens: Basic properties of antigens, B and T cell epitopes, happens and adjuvants; Factors influencing immunogenicity. Antibodies: Structure of antibody, Classes and functions of antibodies. Structure and functions of major histocompatibility complexes. Exogenous and Endogenous pathways of antigen presentation and processing. Hypersensitivity – Classification and Types	P1, P2, P6,PQ, PT	PQ,P6,PT
III	Animal Cell, Tissue and Organ culture media: Natural and Synthetic media, 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 3 Stem cells: Types of stem cells and applications 4 Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)	P1, P2, P6,PQ, PT	
IV	Genetic Engineering:Basic concept, Vectors, Restriction Endonucleases and Recombinant DNA technology Gene delivery:Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated gene delivery Transgenic Animals:Strategies of Gene transfer; Transgenic - sheep, - fish; a plications. Manipulation of reproduction in animals:Artificial Insemination, <i>In vitro</i> fertilization, super ovulation, Embryo transfer, Embryo cloning	P1,P2,P6,PQ,PT	PQ,P6,PT
V	PCR:Basics of PCR. DNA Sequencing: Sanger's method of DNA sequencing-traditional and automated sequencing (2 hrs) Hybridization techniques: Southern, Northern and Western blotting. DNA fingerprinting: Procedure and applications Applications in Industry and Agriculture: Fermentation: Different types of Fermentation and Downstream processing; Agriculture: Monoculture in fishes, polyploidy in fishes	P1,P2,P6,PQ, PT	PQ,P6,PT

Course:B.Sc.,BZC	Year:III	Semester:V			
Subject	PAPER:(6C) SUSTAINABLE AQUACULTURE MANAGEMENT				
Units	1.Present status of Aquaculture,Major cultivable species for aquaculture 2. Functional classification of ponds 3. Induced breeding in fishes,Culture of Indian major carps 4. Commercial importance of shrimp & prawn 5. Viral, Fungal,Bacterial diseases of Finfish & Shell fish				
Duration	60hours				
LearningObjectives	<ul style="list-style-type: none"> • Evaluate the present status of aquaculture at the Global level and National level • Classify different types of ponds used in aquaculture • Demonstrate induced breeding of carps • Acquire critical knowledge on commercial importance of shrimps • Identify fin and shell fish diseases 				
Units	U1	U2	U3	U4	U5
HoursSplit:Total:60	12	12	12	12	12
Internalvaluation:25marks	5	5	5	5	5

Powerpoint presentation: <https://www.slideshare.net/aakhattaby/sustainable-aquaculture>

Academic-Pedagogical-Evaluation:Unit-wisePedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Present status of Aquaculture – Global and National scenario Major cultivable species for aquaculture: freshwater, brackish water and marine. Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp. Design and construction of fish and shrimp farms	P1,P2,P6,PQ, PT	PQ,P6,PT
II	Functional classification of ponds – head pond, hatchery, nursery ponds Functional classification of ponds -rearing, production, stocking and quarantine ponds Need of fertilizer and manure application in culture ponds Physio-chemical conditions of soil and water optimum for culture (Temperature, depth, turbidity, light, water, PH, BOD, CO2 and nutrients)	P1,P2,P6,PQ, PT	PQ,P6,PT
III	Induced breeding in fishes Culture of Indian major carps: Pre-stocking management (Dewatering, drying, ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization) Culture of Indian major carps - Stocking management Culture of Indian major carps - post-stocking management.	P1,P2,P6,PQ, PT	PQ,P6,PT
IV	Commercial importance of shrimp & prawn Macrobrachiumrosenbergii- biology, seed production. Culture of L. vannamei – hatchery technology and culture practices Mixed culture of fish and prawns.	P1,P2,P6,PQ,PT	PQ,P6,PT
V	Viral diseases of Fin Fish & shell fish Fungal diseases of Fin & Shell fish Bacterial diseases of Finfish & Shell fish Prophylaxis in aquaculture	P1,P2,P6,PQ, PT	PQ,P6,PT

Course: B.Sc., BZC	Year: III	Semester: VI			
Subject	PAPER: (7C) POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES				
Units	1. Handling and Principles of fish Preservation 2. Methods of fish Preservation 3. Processing and preservation of fish and fish by-products 4. Sanitation and Quality control 5. Quality Assurance, Management and Certification				
Duration	60hours				
Learning Objectives	<ul style="list-style-type: none"> • Identify the types of preservation methods employed in aquaculture • Choose the suitable Processing methods in aquaculture • Maintain the standard quality control protocols laid down in aqua industry • Identify the best Seafood quality assurance system. 				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	12	12	12	12	12
Internal valuation: 40 marks	5	5	5	5	5

StudyMaterial(Handouts):

ReferenceBooks:

Santharam R, N
Sukumaran and P
Natarajan 1987. A manual
of aquaculture, Oxford-
IBH, NewDelhi
C. Mahalingam, P. S. S. Prasad, P. S. S. Prasad

**Resource
Material:**

Academic-Pedagogical-Evaluation:Unit-wisePedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	<p>Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.</p> <p>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</p>	P1,P2,P6,PQ ,PT	PQ,P6,PT
II	<p>Traditional methods - sun drying, salt curing, pickling and smoking.</p> <p>Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, irradiation and Accelerated Freeze drying (AFD).</p>	P1,P2,P6,PQ ,PT	PQ,P6,PT
III	<p>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.</p> <p>Fish by-products – fish glue, Using glass, chitosan, pearl essence, shark fins, fish Leather and fish maws</p>	P1,P2,P6,PQ ,PT	PQ,P6,PT

<p>IV</p>	<p>Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants</p> <p>Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.</p>	<p>P1,P2,P6,PQ,PT</p>	<p>PQ,P6,PT</p>
<p>V</p>	<p>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.</p> <p>National and International standards – ISO 9000: 2000</p> <p>Series of Quality Assurance System, Codex Alimentarius.</p>	<p>P1,P2,P6,PQ, PT</p>	<p>PQ,P6,PT</p>