ST. ALOYSIUS COLLEGE(AUTONOMOUS), JABALPUR

Reaccredited 'A++ 'Grade by NAAC(CGPA:3.58/4.00)
College with Potential for Excellence by UGC
DST-FIST Supported & STAR College Scheme by DBT

M.Sc. I Semester
SUBJECT: Zoology

Practical syllabus

Scheme A-1 (For course of science Practical Discipline having Major Practicum Component)

Part A – Introduction			
PROGRAMME: PG Diploma	Class: M.Sc.	1 Year/ 1 Semester	Session – 2025-26
Subject – Zoology			
1	Course Code	PC – 11 (Paper – I)	
2	Course Title	Biosystematics & Animal Diversity	
3	Course Type	Core Course	
4	Pre – requisite (if any)	To study this course a student must have had subject Major Zoology in 3 year Graduation course	
5	Course Learning Outcomes (CLO)	• Identify and classify representative animal specimens from all major phyla. • Demonstrate understanding of anatomical structures through slides and models. • Use taxonomic keys and digital tools for biosystematics and species identification. • Conduct field surveys and document local animal biodiversity. • Develop practical skills in microscopy, observation, and scientific recording. • Communicatebiological information effectively through reports and presentations	
6	Credit Value	04	
7	Total Marks	Max. Marks: 60 + 40	Min. Passing Marks: 40

Part B- Content of the Course

Total No. of Lectures- Tutorials- Practical (in hour per week) : 3 hour per week L-T-P

	Topics	No. of Lectures
I	• Identification & Classification (Museum/Model Specimens): • Protozoa: Amoeba, Paramecium, Trypanosoma • Porifera: Sycon, Spongilla • Cnidaria: Obelia, Aurelia, Hydra • Platyhelminthes: Fasciola, Taenia • Aschelminthes: Ascaris • Annelida: Nereis, Pheretima, Leech • Arthropoda: Palaemon, Periplaneta, Limulus • Mollusca: Pila, Unio, Sepia • Echinodermata: Starfish, Sea Urchin • Chordata: Herdmania, Amphioxus, Scoliodon, Rana, Calotes, • Columba, Oryctolagus	12
II	• Permanent Slides & Microscopy • Protozoan locomotion (e.g., cilia, pseudopodia) • Spicules (Porifera), Nematocysts (Cnidaria) • T.S, of body wall (Annelida, Ascaris) • Larval forms: trochophore, nauplius, echinoderm larvae • Chordate histological slides (e. g. muscle skin nerve)	12
III	• Virtual Dissection Models /-Simulations • Earthworm: Digestive and reproductive systems • Cockroach: Nervous and reproductive systems • Fish/Amphibian: Circulatory system (use of ICT and simulation tools as per ethical guidelines)	12
IV	• Biosystematics & Taxonomy Tools • Use of Dichotomous keys • Construction of taxonomic hierarchy • Online taxonomy databases: EOL, ITIS, ZSI, GBIF • Observation and documentation of local fauna (birds, insects, amphibians, etc.)	12

23/08/25

Part B – Content of the Course

Total No. of Lectures – Tutorials- Practical (in hour per week): 5 hours per week

Unit	Topics	No. of Lectures
I	**Principles of Systematics & Species Concept** • Indigenous Zoological Terminologies and Nomenclature: Study of Sanskrit, Pali, and Prakrit terms for animal species, Role of language in taxonomic traditions. • Definition, History and basic concepts of biosystematics Alfa, Beta, Gamma Taxonomy Newer trends in Taxonomy (Molecular taxonomic details). • Trends in biosystematics: Chemotaxonomy, cytotaxonomy and molecular taxonomy • Speciation: Types and Cause • Species concepts: Typological, Nominalistic and Biological species concepts. Subspecies and other infra-specific categories.	18
II	• Taxonomic Characters and different kinds. • Origin of reproductive isolation, biological mechanism of genetic incompatibility. • Taxonomic procedures: Taxonomic collections, preservation, curating, process of identification. • Taxonomic keys, different types of keys, their merits and demerits. • International code of Zoological Nomenclature (ICZN): Operative principles, interpretation and application of important rules: Formation of Scientific names of various Taxa.	16
III	**Basics of Animals Classification and Non-Chordates (Protozoa to Annelida)** • **Basics of taxonomy and classification** – Concepts of symmetry, body plans, coelom types, germ layers. • **Protozoa** – General characters, classification, locomotion, Nutrition and Reproduction in protozoa • **Porifera** – Canal system, types of spicules. • **Coelenterata (Cnidaria)** – Polymorphism, coral reefs, Life cycle of *Obelia*. • **Platyhelminthes** – Parasitic adaptations in *Taenia* and *Fasciola*. • **Aschelminthes (Nematoda)** – General features, parasitism in *Ascaris*. • **Annelida** – Life history of *Neries* and *Pheretima* (earthworm), Metamerism in Annelides.	20

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M.Sc. I Semester

SUBJECT: ZOOLOGY

Theory syllabus

Scheme B-1 (For course of science Discipline having Major Practicum Component)

Part A – Introduction			
PROGRAMME: PG Diploma	Class: M.Sc.	1 Year/ 1 Semester	Session – 2025-26
Subject – Zoology			
1	Course Code	CC – 11 (Paper – I)	
2	Course Title	Biosystematics & Animal Diversity	
3	Course Type	Core Course	
4	Pre – requisite (if any)	To study this course a student must have had subject Major Zoology in 3-year Graduation course	
5	Course Learning Outcomes (CLO)	• To Understand Indigenous Zoological Terminologies and Nomenclature. • Identify and classify animals across all major phyla based on structural and functional features. • Understand the evolutionary relationships and ecological roles of various animal groups. • Apply biosystematics principles in taxonomy and species identification. • Develop skills in observation, documentation, and scientific communication. • Students will become Zoologist / Taxonomist	
6	Credit Value	06	
7	Total Marks	Max. Marks: 60 + 40	Min. Passing Marks: 40

IV	**Non-Chordates and Minor Phyla (Arthropoda to Echinodermata)** • **Arthropoda** – Segmentation, respiration, and sensory structures in insects and crustaceans, Larval form of Arthropoda. • **Mollusca** – Shell diversity, radula, torsion in gastropods. • **Echinodermata** – Water vascular system, larval forms, regeneration. • **Minor Phyla** – General features and significance of Rotifera, Hemichordata, Ectoprocta, and Chaetognatha.	18
V	**Phylum Chordata (From Protochordates to Mammals)** • **Protochordates** – *Balanoglossus*, *Herdmania*, *Branchiostoma* • **Pisces** – Types of scales, accessory respiratory organs, Parental care and migration. • **Amphibia** – Neoteny, parental care. • **Reptilia** – Adaptive features in reptiles. • **Aves** – Flight adaptations, types of beaks, feathers and feet, migration. • **Mammalia** – Dentition, skin derivatives and its functions, aquatic adaptations.	18

23/08/25

A Saxena

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M.Sc. I Semester
SUBJECT: Zoology
Practical syllabus

Scheme B-I(For course of science Practical Discipline having Major Practicum Component)

Part A – Introduction			
PROGRAMME: PG Diploma	Class: M.Sc.	1 Year/ 1 Semester	Session – 2025-26
Subject – Zoology			
1	Course Code	PC – 11 (Paper – I)	
2	Course Title	Biosystematics & Animal Diversity	
3	Course Type	Core Course	
4	Pre – requisite (if any)	To study this course a student must have had subject Major Zoology in 3 year Graduation course	
5	Course Learning Outcomes (CLO)	• Identify and classify representative animal specimens from all major phyla. • Demonstrate understanding of anatomical structures through slides and models. • Use taxonomic keys and digital tools for biosystematics and species identification. • Conduct field surveys and document local animal biodiversity. • Develop practical skills in microscopy, observation, and scientific recording. • Communicatebiological information effectively through reports and presentations	
6	Credit Value	04	
7	Total Marks	Max. Marks: 60 + 40	Min. Passing Marks: 40

23/08/25

A Saxena

Part B- Content of the Course

Total No. of Lectures- Tutorials- Practical (in hour per week) : 3 hour per week L-T-P

	Topics	No. of Lectures
I	• Identification & Classification (Museum/Model Specimens): • Protozoa: Amoeba, Paramecium, Trypanosoma • Porifera: Sycon, Spongilla • Cnidaria: Obelia, Aurelia, Hydra • Platyhelminthes: Fasciola, Taenia • Aschelminthes: Ascaris • Annelida: Nereis, Pheretima, Leech • Arthropoda: Palaemon, Periplaneta, Limulus • Mollusca: Pila, Unio, Sepia • Echinodermata: Starfish, Sea Urchin • Chordata: Herdmania, Amphioxus, Scoliodon, Rana, Calotes, • Columba, Oryctolagus	12
II	• Permanent Slides & Microscopy • Protozoan locomotion (e.g., cilia, pseudopodia) • Spicules (Porifera), Nematocysts (Cnidaria) • T.S, of body wall (Annelida, Ascaris) • Larval forms: trochophore, nauplius, echinoderm larvae • Chordate histological slides (e. g. muscle skin nerve)	12
III	• Virtual Dissection Models / Simulations • Earthworm: Digestive and reproductive systems • Cockroach: Nervous and reproductive systems • Fish/Amphibian: Circulatory system (use of ICT and simulation tools as per ethical guidelines)	12
IV	• Biosystematics & Taxonomy Tools • Use of Dichotomous keys • Construction of taxonomic hierarchy • Online taxonomy databases: EOL, ITIS, ZSI, GBIF • Observation and documentation of local fauna (birds, insects, amphibians, etc.)	12

V	Field Study & Project Work • Local biodiversity survey (college campus/pond/forest/park) • Preparation of Field Note Book: common name, scientific name, features • Submission of field report with photographs/drawings • Optional mini project ' Animal diversity in My Locality	12

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M.Sc. I Semester

Subject: Zoology

Theory syllabus

Scheme B-1(For course of science Practical Discipline having Major Practicum Component)

Part A – Introduction			
PROGRAMME: PG Diploma	Class: M.Sc.	1 Year/ 1 Semester	Session – 2025-26
Subject – Zoology			
1	Course Code	CC – 12 (Paper- II)	
2	Course Title	Molecular Cell Biology & Genetics	
3	Course Type	Core Course	
4	Pre – requisite (if any)	To study this course a student must have had subject Major Zoology in 3-year Graduation course	
5	Course Learning Outcomes (CLO)	• To know about Ancient Indian Concepts of the Cell. • Understand Genetic Disorders and their Interpretation in Ancient Texts. • Understand cell structure, function, and Communication. • Explain molecular mechanisms of DNA Replication, transcription, translation. • Analyze gene regulation in prokaryotes and Eukaryotes. • Discuss genetic disorders and applications of Biotechnology. • Integrate cell and genetic knowledge to Understand diseases like cancer. • Students will become biomedical research, Genomics, biotechnology, diagnostics, Teaching and Ayurgenomics, in both academic and industrial sectors	
6	Credit Value	06	
7	Total Marks	Max. Marks: 60+40	Min. Passing Marks: 40

Part B- Content of the Course

Total No. of Lectures- Tutorials- Practical (in hour per week) : 5 hour per week L-T-P

Unit	Topics	No. of Lectures
I	Ancient Indian Concepts of the Cell. • Philosophical parallels to cellular structure, function. Membrane structure and function. • Plasma Membrane: Membrane transport mechanism; transport of macromolecules, Electrical Properties of membranes. • Protein Sorting and Intracellular transport. • Electrical properties of Membrane. Structural organization of intracellular organelles. • Structure and Function of nucleus, Cytoskeleton, Endoplasmic reticulum, Mitochondria, Golgi Apparatus, Lysosomes.	16
II	Cell signaling and Communication • Hormones and their receptors, Extracellular signal And cellular response. • Cell surface receptors , highly conserved components of intracellular signal transduction pathways. • G protein coupled receptor systems: Regulation of ion Channels; Activation or inhibition of adenyl cyclase, activation of phospholipase. • Cell signaling pathways that control gene activity: TGFβ receptors and Smad transcription factors; Cytokine receptors ; Tyrosine kinase receptor. • Cell Junctions: Types and functions; Cadherins mediated adhesion, Catenine actin mediated contraction, role of Desmosomes for mechanical strength, tight junctions and transmembrane adhesion, scaffold proteins, Gap junctions: Metabolic and Electrical activity ; Plasmodesmata. • Cancer: Oncogenes, Tumor Suppressor Genes, Cancer and cell cycle, virus induced cancer, metastasis, therapeutic intervention of uncontrolled cell growth.	20

III	The cellular and molecular basis of inheritance. • Nucleus, Human Chromosome structure, DNA and its type. • Cell divisions: chromosomes segregation during mitosis and meiosis. • Inheritance: Mendelian Law (law of segregation, law of independent assortment, law of segregation and independent assortment), Non mendelian Inheritance • Gene interaction, multiple allele, Sex linked Inheritance. • Linkage, Crossing Over.	18
IV	• Genome Replication and Replication Associated Errors: DNA replication (Bacterial and Eukaryotic chromosomal replication), Replication associated errors. • DNA Damage and Repair : DNA damages • (Oxidative damages, Depurinations, Depyrimidinations, Cytosine deamination, single and double strand breaks), Repair mechanisms (Photo reactivation, excision repair, mismatch repair, post replication repair, SOS repair). • Genetic code	18
V	Pedigree analysis: Family history, pedigree symbols, construction of pedigrees, Complications to the basic pedigree patterns. Human genetic disorders • Overview of mendelian inheritance and diseases. • Sickle cell, hemochromatosis, cystic fibrosis, Duchenne muscular dystrophy. • Huntington's disease, achondroplasia, phenylketonuria. • Turner Syndrome, Down syndrome, Patau syndrome, Klinefelter syndrome. • Structural aberration of chromosomes. • Genetic disorders and their Interpretation in Ancient Texts: Descriptions of congenital conditions (*Janma dosha)* in Ayurvedic and astrological texts.	18

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M.Sc. I Semester

SUBJECT: Zoology

Practical syllabus

Scheme B-1 (For course of science Practical Discipline having Major Practicum Component)

Part A – Introduction			
PROGRAMME: PG Diploma	Class: M.Sc.	1 Year/ 1 Semester	Session – 2025-26
Subject – Zoology			
1	Course Code	PC – 12 (Paper- II)	
2	Course Title	Molecular Cell Biology & Genetics	
3	Course Type	Molecular Cell Biology & Genetics	
4	Pre – requisite (if any)	To study this course a student must have had subject Major Zoology in 3 year Graduation course	
5	Course Learning Outcomes (CLO)	• Understand basic molecular biology techniques (e.g.-DNA extraction,PCR,Gel electrophoresis) • Use microscopy to study cell structure and identify cellular components. • Analyze and interpret experimental data in molecular and genetics studies. • Apply techniques to study inheritance patterns and genetic traits. • To know local and regional genetic disorder.	
6	Credit Value	04	
7	Total Marks	Max. Marks: 60+40	Min. Passing Marks: 40

Part B- Content of the Course

Total No. of Lectures- Tutorials- Practical (in hour per week) : 3 hour per week L-T-P

Unit	Topics	No. of Lectures
I	• Observation of Mitosis and Meiosis in plant or animal tissues (e.g. onion root tips, grasshopper testis). • Preparation and staining of human metaphase chromosomes (karyotyping). • • Identification of chromosomes structures and types of DNA sequences using prepared slides or chromosome models.	15
II	• DNA isolation from plant (e.g.-spinach) or animal cells. • Using bacterial cultures (e.g.-UV irradiation effect). • • Demonstration of DNA repair mechanisms through literature based simulations or experimental design discussions.	15
III	• Pedigree chart construction from given family data • Case studies on genetic disorders (Sickle cell anemia, cystic fibrosis, etc.) • Simulation or Analysis of mendelian and Non-mendelian ratios using seeds, beads or software.	15
IV	• Model-based demonstration of cell signaling pathways (e.g.-GPCR and tyrosine kinase pathways). • Study of hormonal effects on plant growth (e.g.-auxin and phototropism) • Cancer cell morphology through microscope observation of cell cultures or images.	15

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