



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

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 – 2026-27
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

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Part B – Content of the Course		
Total No. of Lectures – Tutorials- Practical (in hour per week): 5 hours per week		
Unit	Topics	No. of Lec
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 <i>Obelia</i>. Platyhelminthes – Parasitic adaptations in <i>Taenia</i> and <i>Fasciola</i>. Aschelminthes (Nematoda) – General features, parasitism in <i>Ascaris</i>.	20

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	• Annelida – Life history of <i>Neries</i> and <i>Pheretima</i> (earthworm), Metamerism in Annelides.	
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 – <i>Balanoglossus</i>, <i>Herdmania</i>, <i>Branchiostoma</i> • 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

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Part C- Learning Resources

Text Books, Reference Books, Other resources

Suggested Reading	1. Charaka Samhita (Translation: P.V. Sharma or Kunjalal Bhishagratna) 2. Amarakosha of Amarasimha Edited/Translated by: N. K. Gopalachandran, K.P.A. Menon 3. Vertebrates: Comparative Anatomy by Dr. Sangeeta Mashri 4. Dictionary of Pali By: T.W. Rhys Davids & William Stede. 5. A Practical Sanskrit Dictionary By: Arthur A. Macdonell 6. A Comparative Dictionary of the Indo-Aryan Languages By: R. S. Turner 7. Dictionary of Pali By: T.W. Rhys Davids & William Stede 8. Kotpal, R.L. - Modern Text Book Series (Separate volumes for each phylum) 9. Jordan, E.L. & Verma, P.S. - Invertebrate Zoology / Chordate Zoology (Comprehensive and student-friendly books with diagrams and classification.) 10. Barnes, R.D. - Invertebrate Zoology (Excellent for understanding functional morphology and systematics.) 11. Hickman, C.P., Roberts, L.S., & Larson, A. - Integrated Principles of Zoology (Covers animal diversity with evolutionary and ecological perspectives.) 12. Mayr, Ernst & Ashlock, P.D. - Principles of Systematic Zoology (A foundational book for biosystematics and taxonomy.) 13. Ruppert, E.E., Fox, R.S., & Barnes, R.D. - Invertebrate Zoology (7th Edition) (Advanced level reference for animal structure and function.) 14. Brusca, R.C. & Brusca, G.J. - Invertebrates (Detailed coverage with evolutionary context.) 15. S.N. Prasad - Life of Invertebrates (Useful Indian author reference with easy explanations.) 16. Theory and Practice of Animal Taxonomy V. C. Kapoor, 1983
Suggested equivalent online courses	1. Systematics and Biodiversity - Coursera (University of Edinburgh) 2. Animal Behaviour and Taxonomy- Swayam/NPTEL (IIT Kanpur) 3. Biodiversity and Taxonomy of Insects" - Swayam/NPTEL 4. Tree Thinking: Phylogenetic Analysis" - FutureLearn (University of Reading) 5. Zoological Taxonomy" - Udeemy 6. Zoological Survey of India (ZSI) 7. Systematics and Biodiversity on Encyclopedia of Life (EOL.org) 8. PG MOOCs 9. National digital library

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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 – 2026-27
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. • Communicate biological information effectively through reports and presentations	
6	Credit Value	04	
7	Total Marks	Max. Marks: 60 + 40	Min. Passing Marks: 40

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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

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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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Part D- Assessment and Evaluation			
Suggested continuous Evaluation Methods			
Internal Assessment	Marks	External Assessment	Marks
Class Interaction/ Quiz	15	Viva/Voce on Practical	10
Attendance	05	Practical Record File	10
Assignment(Charts/ Model/Seminar/Rural Service/Technology Dissemination/ report of the Excursion/Lab Visit/Survey/Industrial Visit	20	Table Work/Experiments • Spotting • Two Experiment	20 20
TOTAL	40	Total	60
Any Remarks/Suggestion:			

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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 – 2026-27
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

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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 adenylyl 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

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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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Part C- Learning Resources

Text Books, Reference Books, Other resources

Suggested Reading

1. Foundations of Indian Science: The Nature of Matter and the Structure of the Universe" – C.K. Raju
2. "Vaisheshika Darshana" with commentaries – Translations by Satkar Mukherjee
3. Model-Based Demonstration of Cell Signalling Pathways (e.g., GPCR and tyrosine kinase pathways).
4. Study of Hormonal Effects on Plant Growth (e.g., auxin and phototropism).
5. Cancer Cell Morphology through microscopic observation of cell cultures or images.
6. Case Study on Oncogenes and Tumor Suppressor Genes with example of therapeutic strategies.
7. Cell and Molecular Biology by Gerald Karp
8. Cell Biology by C.B. Power.
9. Cell Biology, Genetics, Molecular Biology by Book by P.S. Verma.
10. Cell & Molecular Biology by P.K. Gupta
11. *Essential Cell Biology* by Alberts et al.
12. *Molecular Biology of the Cell* – Alberts et al.
13. *Molecular Biology of the Gene* – James D. Watson et al.
14. *Genes XII* – Benjamin Lewin
15. *Genetics: From Genes to Genomes* by Hartwell et al.
16. *Human Molecular Genetics* by Tom Strachan & Andrew Read
17. *Genetics* – Daniel L. Hartl & Elizabeth W. Jones
18. *Principles of Genetics* – Snustad & Simmons

Suggested equivalent online courses

1. MIT OpenCourseWare – Fundamentals of Biology
2. Coursera – Molecular Biology: DNA Replication and Repair
3. Coursera – Introduction to Genetics and Evolution
4. edX – Cell Biology: Mitochondria.
5. NPTEL – "Cell Biology" (IIT Madras)
6. Coursera – "Cell Biology" (Yale University)
7. NPTEL – "Genetics and Human Welfare" (IIT Kharagpur)
8. Harvard Online – "Principles of Genetics"

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Part A – Introduction			
PROGRAMME: PG Diploma		Class: M.Sc.	1 Year/ 1 Semester
Session – 2026-27			
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

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Sanjay Kumar

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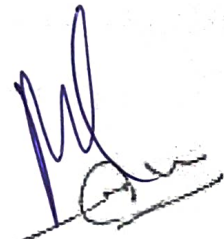
Unit	Topics	No. of Lectures
I	• Observation of Mitosis and Meiosis in plant or animal tissues (e.g. onion root tips, grasshopper testis). • Preparation and staining of human metaphase chromosomes (karyotyping). • Identification of chromosomes structures and types of DNA sequences using prepared slides 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

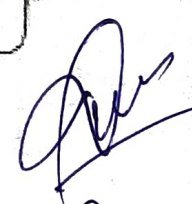
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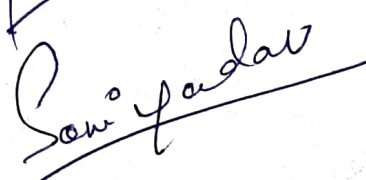
Part D- Assessment and Evaluation

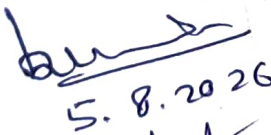
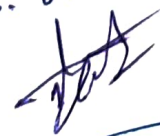
Suggested continuous Evaluation Methods

Internal Assessment	Marks	External Assessment	Marks
Class Interaction/ Quiz	15	Viva/Voce on Practical	10
Attendance	05	Practical Record File	10
Assignment(Charts/ Model/Seminar/Rural Service/Technology Dissemination/ report of the Excursion/Lab Visit/Survey/Industrial Visit	20	Table Work/Experiments • Spotting • Two Experiment	20 20
TOTAL	40	Total	60
Any Remarks/Suggestion:			

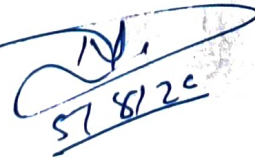











Part C- Learning Resources

Text Books, Reference Books, Other resources

Part C - Learning Resources	
Suggested Reading	Text Books, Reference Books, Other resources
	1. Molecular Biology Techniques: A Classroom Laboratory Manual by Heather Miller, D. Scott Witherow, Sue Carson 2. Experiments in Molecular Biology and Genetic Engineering by Vasudevan & Sreekumari 3. Molecular Biology of the Cell – Problems Book By John Wilson, Tim Hunt (companion to Alberts' textbook). 4. Molecular Cell Biology" (textbook with lab techniques focus) By Lodish et al. 5. Experiments in Genetics By: David Freifelder. 6. Genetics: A Laboratory Manual By Alan G. Atherly, Jack R. Gorton, John F. McDonald 7. Cell and Molecular Biology: Concepts and Experiments by Gerald Karp 8. Biological Science Lab Manual by Vodopich & Moore
Suggested equivalent online courses	1. Genetics Online – Harvard Medical School (HMX) Genetics and Genomics Program – Stanford Online 2. Cell Biology – UC Berkeley Extension 3. CDC Basic Molecular Biology eLearning Series 4. Stanford Online: Genetics and Genomics Program 5. Biotechnika: Molecular Biology Techniques Certification 6. UNE Online: Genetics Lecture & Lab (BIOL 1040)

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6. UNE Online: Genetics Lecture & Lab (BIO2 1049)

The page contains several handwritten signatures and scribbles in blue ink. At the top left, there is a signature that appears to be 'Raj'. Below it, on the left, is a signature that looks like 'Raj' with a large 'R'. In the center, there is a signature that looks like 'Raj' with a large 'R'. To the right of the center, there is a signature that looks like 'Raj' with a large 'R'. At the bottom left, there is a signature that looks like 'Raj' with a large 'R'. At the bottom center, there is a signature that looks like 'Raj' with a large 'R'. At the bottom right, there is a signature that looks like 'Raj' with a large 'R'. There are also several other scribbles and marks scattered across the page.