

ST. ALOYSIUS COLLEGE(AUTONOMOUS), JABALPUR

Reaccredited 'A++' Grade by NAAC(EGPA:3.58/4.00)

College with Potential for Excellence by UGC

DST-FIST Supported & STAR College Scheme by DBT

M.Sc. II Semester
SUBJECT: Zoology

Theory syllabus

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

Part A - Introduction			
PROGRAMME : PG Diploma		Class: M.Sc.	Session- 2025-26
		I Year/II Semester	
Subject- Zoology			
1	Course Code	CC-21 (Paper-I)	
2	Course Title	Biostatistics, Ecology & Behavioural Science	
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)	• Understand and apply basic statistical methods in biology. • Know ecological systems and population dynamics. • Understand Indigenous Data Systems and Observational Methodologies • Explain organism-environment interactions. • Describe key concepts in animal and human behaviour. • Evaluate biological data to draw scientific conclusions • Students will become ecological research, wildlife conservation, data analysis, environmental consultancy, and behavioural science in academia and NGOs.	
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

Unit	Topics	No. of Lectures
I	Basic concept of Biostatistics - Preliminary concept of development of Biostatistics (scope, statistical method and experimental problem) - Central tendency, characteristic and measures with statistical problem. - Calculation of mean median and mode by different method. - Measures of variation co-variation and analysis of variance by ANOVA technique - Test method: Z- test, F-test, T-test, standard deviation(SD), standard error(SE), and experimental problem	18
II	Graphical representation of data - Theoretical distribution monomial and binomial - Correlation, Regression. - Tabulation statistical table - Presentation of data line diagram graphs histogram per diagram pictogram cartogram - Chi square test - Probability Indigenous Data Systems and Observational Methodologies - Ancient Indian methods of systematic observation (e.g., in Ayurveda, Jyotisha). - Use of metrics in Ayurveda, e.g., Nadi pariksha, dosha quantification, and other semi-quantitative models.	18
III	Ecology - Definition: Ecology, landscape, habitat, ecozone, biosphere reserve and ecosystem. - Habitat Ecology Introduction to Habitat Ecology: Ecological concept of habitat. Ecological niche: niche overlap, niche separation. Ecology of major habitats: Grasslands (characteristics, composition, grassland ecosystem and its distribution in central India), Forests (types of forest, canopy cover, species composition in different forest types). - Wetland Ecology Wetlands: Wetland definition, characteristics and distribution in northeast India, Wetland formation, Ecological role of wetland as wildlife habitat with special reference to Central India. - Forest Ecology Forest and forest environment: Structure of forest ecosystem; Forest fragmentation, Characteristic of tropical trees; phenology of trees; forest seed dormancy and germination; regeneration of forest trees.	18
IV	Foundations and Mechanisms of Animal Behaviour. - Introduction to Ethology and Behavioural Science - Tinbergen's Four Questions	

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- Neural and Hormonal Control of Behaviour
- Genetic Basis of Behaviour: Heritability and Gene-Environment Interactions
- Learning and Cognition: Classical & Operant Conditioning, Habituation, Insight Learning
- Communication: Signals, Modalities, Evolution of Language
- Circadian Rhythms, Biological Clocks, and Navigation

V

Ethology, Evolution & Applications of Behaviour

- Behavioural Ecology: Optimal Foraging Theory, Mating Systems, Territoriality.
- Reproductive Strategies and Parental Care.
- Altruism, Cooperation, and Kin Selection.
- Social Organization in Insects, Birds, Mammals (Case Studies: Ants, Wolves, Primates).
- Human-Wildlife Conflict and Behavioural Adaptation in Urban Ecology.
- Applied Behavioural Science: Conservation, Captive Animal Welfare, and Etho-tourism.
- Ethical and Legal Aspects in Behavioural Research (Wildlife Protection Acts, IUCN guidelines).

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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

Unit	Topics	No. of Lectures
I	• Measure of Central Tendency - Collection of biological data (field/lab data) - Calculation of mean, median, mode. - Application – based problem solving. • Measurement of variation - Application of ANOVA(One-way) using example datasets. • Test of significance - Performing Z-test, F-Test using biological data. • Graphical representation - Construction and analysis of: 1. Line diagram, Bar graph, Histogram, Pie chart. 2. Pictogram, Cartogram, Frequency polygon. • Distribution and correlation - Calculation and plotting of correlation (Pearson/Spearman) using sample data. • Tabulation and Chi-square - Designing of statistical tables (Primary and secondary). - Chi-square test for goodness of fit and association.	25
II	• Basic and Habitat Ecology - Field study on niche characteristics of selected species. - Comparative study of grassland vs. forest ecosystem composition. - Mapping and identification of Habitat zones (with reference to NE India). • Wetland Ecology - Field visit to a local wetland. - Assessment of wetland flora/fauna. - Study of ecological roles in nutrient cycling, wildlife habitat. • Forest Ecology	25

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	- Identification of tree species, phenology study. - Observation of canopy cover, forest stratification, seed dormancy. - Field survey on forest fragmentation and it's impact on species diversity.	
III	• Construction of ethograms for selected species (in lab or field). • Observation and recording of foraging or social behaviour. • Design of behavioural experiments (e.g., maze learning, choice test). • Data analysis using descriptive statistics and behaviour software (e.g., BORIS).	10

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Shruti
Mishra

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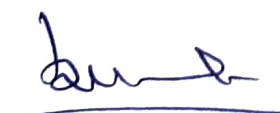
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M.Sc. II Semester

SUBJECT: Zoology

Part A – Introduction

PROGRAMME: PG Diploma	Class: M.Sc.	1 Year/ II Semester	Session – 2026-27
Subject – Zoology			
1	Course Code	CC-22	
2	Course Title	Tools and techniques of biophysics and Bioinformatics	
3	Course Type	Core	
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 the structure and function of microscope. To know the different principles of working of microscope. To understand the different cytological lab techniques. Know about Panchamahabhutas & Biophysical States of Matter according to ancient text.	
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

Unit	Topics	No. of Lectures
I	- Basic principles of microscopy: Types of microscopes and their biological applications, Bright-field, microscope, numerical aperture, limit of resolution, types of objectives, ocular and stage micrometers, Dark-field, Phase-contrast, Differential interference contrast, Fluorescence, Confocal, Atomic force, Transmission and scanning electron microscopy - Centrifugation: Basic principle, Types of rotors, Clinical, high speed and ultracentrifuge.	18
II	- Electrophoresis: Agarose- and polyacrylamide gel, Two-dimensional, Isoelectrofocussing - Spectroscopy: Beer-Lambert's law, molar extinction coefficient and calculation, Spectroscopy, Colorimeter and UV-Vis, Spectrophotometer, CD, Fluorescence, NMR, Spectrofluorometry - Chromatography: Paper and thin layer chromatography, Column chromatography, Gel filtration, Ion-exchange, HPLC, FPLC, MALDI (TOF), Affinity purification	18
III	- Panchamahabhutas & Biophysical States of Matter: Earth (solid), Water (liquid), Fire (thermal/energy), Air (gaseous), Ether (space): traditional descriptors of physical and physiological states. - Bioenergetics: Laws of thermodynamics, Concept of free energy. - Standard free energy, ATP as energy currency and its hydrolysis. Water: Hydrogen bonding and structure of water molecule, Ionization of water, Concept of pH, pK and pOH, Colligative properties. - Carbohydrates: Classification and structure, glycosaminoglycans and proteoglycans, Glycolysis, TCA cycle, Electron transport system.	16

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IV	• Amino acids: Structure, Classification, Zwitter ionic properties and titration curves. • Proteins: Various levels of structural organization of proteins, Peptide bonds, disulphide and other types of cross-links, α-helix and other helices, Helix-coil transition, parallel and anti-parallel β-pleated sheets, Ramachandran plot and its significance • Lipids: Simple and complex lipids, Glycerophospholipids, Sphingolipids, Gangliosides, Eicosanoids and prostaglandins Cholesterol: Structure and biosynthesis. Nucleic acids and Nucleotides: Biosynthesis of purines and pyrimidines, de novo and Salvage pathway, various confirmations of nucleotides.	20
V	Bioinformatics and Molecular Biology Techniques. • Introduction and scope of Bioinformatics, Data bases Nucleic acid sequences Genomes, Protein sequence and structures. • Access to molecular biology data buses Entrez Sequence retrieval system (SRS) Protein identification resource (PIR). • Sequence alignments and phylogenetic trees Southern and northern blotting, Western blotting, ELISA, POR, FACS. • In situ hybridization, FISH, RISH, Immunostaining, Microarray, FACS DNA protein Interaction methods, EMSA, South Western, Protein-protein interaction methods, Pull down assay, Far western Blot, FRET-FREM, yeast two hybrid system.	18


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M.Sc. II 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: B.Sc.	1 Year/ II Semester	Session – 2026-27
Subject – Zoology			
1	Course Code		
2	Course Title	Tools and techniques of biophysics and Bioinformatics	
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)	Instruments Identify and operate basic laboratory (e.g centrifuge, spectrophotometer, pH meter, microscope). Demonstrate aseptic techniques for microbial culture and handling. Understand nucleic acid handling techniques, including DNA extraction, PCR, and gel electrophoresis. Understand the physical principles behind biological structures and processes. Perform experiments to assess protein folding, enzyme kinetics, and diffusion processes. Know thermodynamic and kinetic data from biological systems.	
6	Credit Value	04	
7	Total Marks	Max. Marks: 60+40	Min. Passing Marks 40

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