(22) जीवविज्ञान + प्राणी विज्ञान (22)

P. H. D. Course work

Maharaja Suhel Dev State University
Azamgarh, U.P.

*SYLLABUS OF **PRE-PH.D.** COURSE WORK IN ZOOLOGY FOR UNIVERSITY AND AFFILIATED COLLEGES*

(As Per Guidelines of U.P Government in Accordance with National Education Policy-2020 with Effect from the session 2024)

(19)

PROGRAMME SPECIFIC OUTCOMES

PSO1: The Doctor of Philosophy program is designed to prepare each student to actively participate in research and teaching in the field of Zoology along with other fields of Life Sciences and in a University or a Research organization.

PSO2: Students are exposed to advanced experimental and theoretical techniques, encouraged to attend National and International conferences as well as workshops during the program.

PSO3: Several research areas of Zoology are interdisciplinary in nature and are funded by various funding agencies, giving students a flavor for both applied and basic research.

PSO4: Students in this program acquire knowledge, critical thinking skills, and experience in conducting cutting-edge research. Students would gain proficiency in research methodology and assessment techniques in animal science

PSO5: Students with a PhD degree either pursue a post-doctoral position aiming for an academic career or find employment in industrial R&D laboratories.

Duration: One Semester (Six months)
Total Credit requirement: 16 credits

Program Structure: Ph.D. in Zoology

STRUCTURE

Paper No.	Code	Paper Title	Type	Credit	Hours/Week
Paper–I	**ZOO-PhD-I**	Research Methodology and Computer Applications	Theory	4	15
Paper–II	**ZOO-PhD-II**	Applications of Techniques in Animal Sciences	Theory	4	15
Paper–III	**ZOO-PhD-III**	Cytology and Genetics	Theory	4	15
Paper–IV	**ZOO-PhD-IV**	Environmental Biology, Animal behavior & Fish biology	Theory	4	15
			Total	**16**	

Paper–I

CODE: ZOO-PhD-I

Research Methodology and Computer Applications

Unit-I
• Meaning of Research in Biological Sciences. • Purpose, Characteristics and Types of Research. • Process of Research -Formulation of objectives. • Formulation of Hypotheses - Types of Hypotheses - Methods of testing Hypotheses. • Research plan and its components-Methods of Research (Survey, Observation, case study, experimental, historical and comparative methods). • Difficulties in Biological research. Identification and formation of research problem (Hypothesis).
Unit-II
• Scientific database: Science Direct and Pubmed. • Ethical, legal, social and scientific issues in Biological Research. • A brief idea about the funding agencies such as DST, DBT, ICMR, CSIR and UGC. • Role of IPR in Research and Development. • Writing of Research Proposal, Report and Research Paper. • Meaning and types-Stages in preparation Characteristics - Structure – Documentation. • Footnotes and Bibliography- Editing the final draft-Evaluating the final draft-Checklist for a good proposal/report/research paper. • Basic knowledge of Organizing conferences, symposia, workshop, exhibition etc.
Unit-III
• Variables in Biology, Collection, classification and tabulation of data. • Frequency distribution, Diagrammatic and Graphical presentation of statistical data. • Sampling techniques. • Specific applications of measures of Central tendency, Dispersion, Standard deviation, variance, coefficient of variance, Skewness and Kurtosis in research. • Measures of Relationship: Correlation–Simple, Partial and multiple-Regression. • PROBABILITY:-Meaning, Fundamental Concepts, Approaches to measurement of Probability, Random experiments, sample space, events. Mathematical definition of probability of an event. • Hypothesis Testing and estimation: Fundamentals of hypothesis testing- Standard error. • chi-square test, t- and F tests , ANOVA- One way and two way
Unit-IV
• Computer Basics: Course introduction, MS Windows basics, File management, E-mail, File Transfer. • Office Applications: MSOffice2000/XP including MSWord, MS Excel, MS PowerPoint. • Computer and Internet: Networking, different WAN, MAN and LAN connections. • Web Browsers, Internet security, Web Search Engine.

Paper–II

CODE: ZOO-PhD-II

Applications of Techniques in Animal Sciences

Unit-I
• **Chromatographic Technique:** Paper chromatography, Thin Layer Chromatography (TLC), High Performance Liquid Chromatography (HPLC), Ion exchange Chromatography(IEC), Gas -Liquid chromatography (GLC). • **Electrophoresis:** PAGE, SDSPAGE, DIGE (Differential in Gel Electrophoresis). Separation of proteins through electrophoresis. • Southern, Northern and South-Western blotting techniques.
Unit-II
• **Microscopy**: Principles of Microscopy, Confocal microscopy, Fluorescence Microscopy, Electron Microscopy, Phase Contrast microscopy. • **Microtomy:** Microtomy/Microtome & it types. • Polymerase Chain reaction(PCR). • Principles of Centrifugation, Basic rule of sedimentation, types of Rotors, various types of centrifuge and their applications.
Unit-III
• Measures of Radioactivity, types and their importance in biological studies. • GM-counter and Scintillation counter. • Safety measures of radio-tracer techniques. • Measurement of PH, preparation of buffer and solutions.
Unit-IV
• Introduction and application of bioinformatics. • Definition and types, Nucleotide sequence database. • Brief note on EMBL, NCBI and DDBJ. Protein structure database [PDB]. • Definition, applications, BLAST and FASTA, ClustalW. • Techniques and tools for Sequences Alignment (Pairwise and multiple alignment). • Phylogenetic analysis- Methods and Tools, gene prediction, ORF finding. • Generation and analysis of whole genome data, Whole genome annotation.

Paper–III

CODE: ZOO-PhD-III

Cytology and Genetics

Unit-I
• Cell cycle and its regulation. • Apoptosis Signal transduction: intracellular signaling and cell surface receptors, via G-protein linked receptors, JAK-STAT pathway. • Cell-cell interaction: cell adhesion molecules, cellular junctions • Endomembrane system: protein targeting and sorting. • Mitochondria: Structure, oxidative phosphorylation.
Unit-II
• Structure and function of nucleus in eukaryotes • Chemical structure and base composition of DNA and RNA • DNA supercoiling, chromatin organization, structure of chromosomes • Types of DNA and RNA • Cytoskeleton: microtubules, microfilaments, intermediate filaments.
Unit-III
• Basic principles of heredity: Mendel's laws, monohybrid and dihybrid crosses • Complete and Incomplete Dominance. • Penetrance and expressivity. • Genic Sex-Determining Systems, Environmental Sex Determination, • Sex Determination in Drosophila, Sex Determination in Humans. • Sex-linked characteristics and Dosage compensation.
Unit-IV
• Extensions of Mendelism: Multiple Alleles, • Gene Interaction The Interaction Between Sex and Heredity. • Sex-Influenced and Sex Limited Characteristics. • Cytoplasmic Inheritance, Genetic Maternal Effects. • Genomic Imprinting, Anticipation. • Interaction Between Genes and Environment: Environmental Effects on Gene Expression, • Inheritance of Continuous Characteristics.

Paper–IV

CODE: ZOO-PhD-IV

Environmental Biology, Animal behavior & Fish biology

Unit-I
• Levels of organization, Laws of limiting factors, • Study of physical factors, Population: Density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex ratio, dispersal and dispersion ,Exponential and logistic growth, • Types of ecosystems with one example in detail, • Food chain: Detritus and grazing food chains, , Food web, Energy flow through the ecosystem, Ecological pyramids and Ecological efficiencies, • Nutrient and biogeochemical cycle with one example of Carbon cycle.
Unit-II
• Sources of Environmental hazards • Climate changes. Greenhouse gases and global warming. • Acid rain, Ozone layer destruction. • Effect of climate change on public health • Sources of waste, types and characteristics, • Sewage disposal and its management, Solid waste disposal, Biomedical waste handling and disposal, Nuclear waste handling and disposal, Waste from thermal power plants.
Unit-III
• Origin and history of Ethology, • Instinct vs. Learnt Behavior • Associative learning, classical and operant, conditioning, Habituation, Imprinting, • Circadian rhythms; Tidal rhythms and Lunar rhythms • Parental care and Migrations
Unit-IV
• Fish ponds: construction and layout of different types of ponds. • Breeding techniques: induced breeding, spawning habits, factor affecting spawning, spawning seasons and frequency. • Hypophysation, Use of different, synthetic and natural hormones. • Fish seed collection, transport of brood fishes and fish seeds. • Fish culture system: composite culture, integrated culture, cage culture, sewage culture, etc.