

**Ph.D. COURSE SYLLABUS
2014 – 2015
DEPARTMENT OF ZOOLOGY**



**SCHOOL OF BIOLOGICAL SCIENCES
DR. H. S. GOUR UNIVERSITY SAGAR
SAGAR 470003 M.P.**

Ph.D. COURSE SYLLABUS 2014 –15
DEPARTMENT OF ZOOLOGY
SCHOOL OF BIOLOGICAL SCIENCES
DR. H. S. GOUR UNIVERSITY SAGAR, 470003 (M.P.)

I Semester

		Credits
Course I	Code – Zoo C 141: Research Methodology	04
Course II	Code – Zoo C 142: Biostatistics and Informatics	04
Course III	Code – Zoo C 143: Experimental Models and Alternatives	04
Course IV	Code – Zoo C 144: Techniques in Modern Biology	04
	Research wok	08

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I Semester

Course I Code – Zoo C 141 Course Title: Research Methodology

L	T	P	C
4	0	0	4

Unit - I

Objectives and types of research: Motivation and objectives - Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.

Unit - II

Research Formulation: Defining and formulating the research problem. Importance of literature review in defining a problem. Primary and secondary sources – reviews, treatise, monographs, patents. Development of working hypothesis.

Unit - III

Research design and methods: Basic Principles, need of research design, features of good design, important concepts relating to research design. Developing a research plan: Exploration, Description, Diagnosis, Experimentation.

Unit - IV

Reporting and thesis writing: Structure and components of scientific reports. Types of report, preparation of technical reports and thesis. Bibliography and referencing. Oral and poster presentations, use of visual aids, importance of effective communication.

Unit - V

Application of results and ethics: Environmental impacts, Ethical issues, ethical committees. Commercialization: Copy right, royalty, intellectual property rights and patent law. Plagiarism, citation and acknowledgement, reproducibility and accountability.

12 hours/month

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I Semester

Course I Code – Zoo C 142

Course Title: Biostatistics & Informatics

L	T	P	C
4	0	0	4

Unit - I

Collection, classification & diagrammatic representation of statistical data, frequency and frequency distribution, measures of central tendency: mean, median and mode.

Unit - II

Measures of dispersion: range, mean deviation, variance & standard deviation, skewness, kurtosis, regression & correlation, chi-square test, student's t-test, ANOVA and other statistical packages.

Unit - III

Definition, history, scope and applications of bioinformatics, Biological Databases: primary & secondary databases e.g. GenBank, EMBL, DDBJ, Entrez, OMIM, SWISS-Prot etc. Literature Databases: Open access and open sources, PubMed, PLoS, Biomed Central.

Unit - IV

Sequence alignment methods: pairwise and multiple sequence alignment, analyzing and retrieving databases, database similarity searches: BLAST & FASTA, Phylogenetic tree construction, Gene prediction, Protein and RNA structure prediction.

Unit - V

IPR in bioinformatics, computer science, medical research, pharma, biodiversity, genetic resources & biotechnology.

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I Semester

Course I - Code – Zoo C 143

Course Title: Experimental Models and Alternatives

L	T	P	C
4	0	0	4

Unit I

Biodiversity & Taxonomic Studies: Biodiversity, genetic diversity, molecular diversity and taxonomy, DNA bar-coding, Conservation of diversity and endangered species. Collection, Preservation and Identification of Animals.

Unit II

Assessment of biodiversity in different types of ecosystems. Sampling techniques and quantitative methods for biodiversity assessment. Modern tools of Taxonomy (alpha beta and gamma level taxonomy), Application of molecular and computational tools for Phylogenetic and Taxonomic studies.

Unit III

Environmental Impact Assessment (EIA): Definition, concepts & characteristics of EIA; participants, stages & types of EIA. Guidelines for EIA in India. Environmental Impact Statement (EIS) & Environmental Management Plan (EMP). Methods of impact identification.

Unit IV

Biosafety and Ethics: Guidelines for Bio-safety, functioning of Institutional Biosafety committee, Institutional Animal ethics committee, and Institutional ethical committee , CPCSEA guidelines for animal experimentation, ICMR guidelines for experiments involving animals and humans, DBT guidelines for Biosafety practices.

Unit V

Disease specific models: Cancer, Diabetes, Ageing, Arthritis, Experimental Autoimmune Encephalitis (EAE).

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I Semester

Course I Code – Zoo C 144 Course Title: Techniques in Modern Biology

L	T	P	C
4	0	0	4

Unit - I

Biochemical and Biophysical Techniques: Purification and characterization of biomolecules - Centrifugation, Ultrafiltration, Spectrophotometric methods, flowcytometry.

Unit - II

Histology and Histochemistry: Fixation and sectioning of tissue, embryos, and cells, Microtomy, Cryotomy. Principles and applications of Immunohistochemistry and Immunofluorescence. Histochemical staining for localization of enzymes, lipids, protein and carbohydrates.

Unit - III

Microscopic techniques: Specimen preparation for electron microscopy, freeze fracturing, freeze etching, negative staining. Principles and applications of SEM, TEM, STEM, Fluorescence microscopy, Confocal microscopy, Microphotography.

Unit - IV

Methods for protein and nucleic acid purification - chromatography. One and two dimensional electrophoresis, agarose gel electrophoresis. Blotting Techniques - Southern, Northern and Western.

Unit - V

Cell & Molecular biology and Genetic Engineering Techniques: Principles and applications of PCR, RT-PCR and ELISA, Fluorescence insitu Hybridization (FISH), DNA sequencing, Protein sequencing, Comet assay, Cell based assays.

12hours/month