

चौधरी चरण सिंह विश्वविद्यालय, मेरठ

**CHAUDHARY CHARAN SINGH UNIVERSITY,
MEERUT**



**Pre-Ph.D. COURSE- WORK PROGRAMME
CURRICULUM & REVISED SYLLABUS**

w.e.f. the session 2023-2024

DEPARTMENT OF ZOOLOGY

Name of the Programme
Pre-Ph.D. Course work in Zoology

Sem.	Paper Code	Title of the Paper	Duration (hrs.)	Credits
one		Research methodology	60	04
		Instrumentation and Bio-techniques	60	04
		Applied Animal Sciences	60	04
		Survey/ research project	60	04

Subject: Common for all faculties (Semester –I)		
Course Code: -----	Course Title: Research Methodology	Theory
<p>Course Objectives: The main objective of this paper is to</p> <ol style="list-style-type: none"> 1. Identify and discuss the role and importance of research. 2. Identify and discuss the issues and concepts salient to the research process. 3. Identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project. 4. Identify and discuss the concepts and procedures of sampling, data collection, analysis and reporting. <p>Course Outcomes: At the end of this course, the students should be able to:</p> <p>CO1. Understand some basic concepts of research and its methodologies. CO2. Explain key research concepts and issues read, comprehend, and explain research articles in their academic discipline. CO3. Select and define appropriate research problem and parameters. CO4. Organize and conduct research (advanced project) in a more appropriate manner. CO5. Write a research report and thesis. CO6. Write a research proposal (grants).</p>		
Credits: 4		Core Compulsory
Max. Marks: 100		Min. Pass Marks: 55
Total No. of Lectures-Tutorial (in hours per week): L-T: 4-1		
Unit	Topics	No. of Lectures 60
I	Perception & Definition of Research, Objectives & Motivations of Research, Importance of Research, Types of Research, Research Methods versus Methodology, Process of Research; Review of Literature, Formulation of the Research Problem, Sources and Identification of a Research Problem, Status of the Research Problem, Formulation of Hypothesis, Research Design,	12
II	Outlines of Synopsis; Project Proposal, Project Report Writing; Research Paper Writing; Components of Research Reports; Thesis Writing; Outlines of Thesis, Reference citing, Formats of Writing References, Bibliography; Plagiarism.	12
III	Intellectual Property (IP), Intellectual Property Rights (IPR), Intellectual Property Law, Different fields of Intellectual Property Rights, Patents, Publication Ethics: Definitions importance Conflicts of Interest, Publication Misconduct Definition, Concept, Problems that lead to Unethical Behavior and vice versa, Types Identification of publication misconduct, Complaints and Appeals; Violation of publication ethics, Authorship and Contributorship; Predatory Publishers and Journals.	12

IV	Web Browsers, Search Engines, MS Word: Handling Graphs, Tables and Charts, Formatting in MS-Word, MS Power Point: Creating Slide Show, Screen Layout and Views, Applying Design Template, MS Excel: Features, Formulas and Functions.	12
V	Subject Classification Index, Citation, Citation Index, Impact Factor, h-index, i-10index, INFLIBNET, Introduction to Peer Reviewed and Open Access Journals, e-Journals, e-Library, Research Databases, Institute for Scientific Information (ISI) & Journal Citation Reports, Science Citation Index (SCI), Social Sciences Citation Index (SSCI), Arts and Humanities Citation Index (AHCI), Databases: UGC care list, Web of Science (WoS), Scopus.	12
<p>Teaching Learning Process: Class discussions/ demonstrations, Power Point presentations, Class activities/ assignments, Field visits., Internship, etc.</p>		
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Creswell. W.: Research Design, Qualitative, Quantitative and Mixed Methods Approaches (3rd Edition), SAGE, Inc., 2018. 2. Gupta. S: Research Methodology: Methods and Statistical Techniques, Deep & Deep Publications, 2010. 3. Gupta. S.P.: Statistical Methods, Sultan Chand & Sons, 2014. 4. Kumar. R: Research Methodology: A Step-by-Step Guide for Beginners (3rd Edition), SAGE, Inc., 2011. 5. Melville. S. and Goddard. W.: Research Methodology: An Introduction (2nd edition), Juta Academic, 2004. 6. Shortis, T.: The Language of ICT: Information and Communication Technology, Taylor & Francis, 2016. 7. Research Methodology: Methods and Techniques by C.R. Kothari, Second revised edition 8. Research Methodology: A step by step guide for beginners by Ranjit Kumar 9. Research methodology: Methods and Statistical techniques, by Santosh Gupta 10. Statistical Methods, by S.P. Gupta 11. Research Design, Qualitative, Quantitative and mixed method approaches, by W. Creswell, 3rd edition. 12. Information Communication Technology, by Tim Shorts Handbook of Communication and Social Interaction Skills, by John O. Green, Brant Raney Burleson 13. शोध प्रविधि - डॉ० विनय मोहन शर्मा 14. 8 अनुसंधान प्रविधि, सिद्धांत और प्रक्रिया - एस०एन० गणेशन 15. 9 अनुसंधान प्रविधि - डॉ० एस०एन० राय 16. 10 अनुसंधान की प्रविधि एवं प्रक्रिया - डॉ० राजेन्द्र मिश्र 17. 11 साहित्य अनुशीलन: विभिन्न दृष्टियाँ - डॉ० दया शंकर शुक्ल 18. 12 अनुसंधान प्रविधि और प्रक्रिया - डॉ० मुध खराटे/डॉ० शिवाजी देवरे 		

Pre-Ph.D. Course Work in Zoology

Subject: ZOOLOGY		
Course Code: ----	Course Title: Instrumentation and Bio - techniques	Theory paper
<p>Course Objectives: The main objective of this paper is to</p> <ol style="list-style-type: none"> 5. To know about research perspective in life science. 6. To understand the handling of laboratory instruments. 7. To understand the various techniques used in laboratory experimentation. 8. To understand the various principles on which laboratory instruments works. <p>Course Outcomes: At the end of this course :</p> <ul style="list-style-type: none"> • CO1 Students will be able to identify a research problem stated in a study. • CO2 Students will be able to learn basic principles of instruments. • CO3 Students will be familiar and more comfortable to handle the laboratory equipment. • CO4 Students will have the broad vision about the various technologies used in biosciences. • CO5 Students will be able to select the instruments and techniques involved in particular experiment. 		
Credits: 4	Core Compulsory / Elective	
Max. Marks: 100	Min. Pass Marks:55	
Total No. of Lectures-Tutorial (in hours per week): L-T-P: 4-0-0		
Unit		No. of Lectures (Total = 60)
I	<ul style="list-style-type: none"> • Microscopy: Principles of microscopy; Phase contrast microscopy, Fluorescent microscopy, Confocal microscopy, Electron microscopy - SEM and TEM, dissecting microscope (Stereomicroscope), Brightfield microscope, polarizing microscope, Scanning probe microscope, digital microscope, inverted microscope, 	12
II	<ul style="list-style-type: none"> • Colorimetry: Principles and methodology • Centrifuge: Homogenizers and Centrifuges, High speed centrifuge, Differential and Density gradient centrifuge, Ultracentrifuge, analytical ultracentrifuge. • Electrophoresis: Principles, types, techniques and applications. • Nucleic acids: isolation, purification, Southern, Western and Northern hybridization techniques. 	12
III	<ul style="list-style-type: none"> • Spectroscopic techniques: Introduction to spectroscopy, basic principles, instrumentation and applications of UV- VIS absorption, infrared, Raman, atomic absorption, fluorescence, circular dichroism, Laser spectroscopy, ; Nuclear Magnetic Resonance Spectroscopy (NMR), electron spin resonance, acoustic spectroscopy; applications of Laser; mass spectroscopy. 	12

IV	<ul style="list-style-type: none"> • PCR and RT PCR: principle and Applications • Chromatography: Principle of chromatography, types of chromatography, Thin layer chromatography (TLC), two dimensional and column chromatography, High Performance Liquid Chromatography (HPLC), Gas liquid chromatography (GLC), Gas Chromatography (GC). Autoclave, Laminar Air flow, Lyophilizer, 	12
V	<ul style="list-style-type: none"> • Microtome: Different types of microtomes- Rocking Rotary, Freezing microtomes. • RIA, ELISA • Cryotechniques of freeze drying and freeze substitution, fresh and fixed frozen sections, Ultratome and Cryocut. • Electrophysiology: patch clamp method. • CRISPR technique 	12
<p>Teaching Learning Process: Class discussions/ demonstrations, Power point presentations, Class activities/ assignments, Field visits, Internship, etc.</p>		
<p>Suggested Reading:</p> <ol style="list-style-type: none"> 1. Keith Wilson and John Walker : Principles and Techniques of Biochemistry 2. B.D.Singh :Biotechnology, Expanding Horizons 3. Prof. Punit Puri: Practical approach to histopathological staining and Microtomy 4. Pavia and Lampman : Introduction to Spectroscopy 5. Atheena Pandian: Types of Microscope 6. Jennifer D.T. Kruschwitz: Colorimetry and Fundamental colour modelling 7. Elsa Lundanes and Leon Reubsæet: Chromatography, Basic Principles Sample preparations and related methods. 		

Pre-Ph.D. Course Work in Zoology

Subject: ZOOLOGY		
Course Code: -----	Course Title: Applied Animal Sciences	Theory paper
<p>Course Objectives: The main objective of this paper is to</p> <ol style="list-style-type: none"> 1. To inculcate the idea of origin and diversification of animal world 2. To understand the research hypothesis formulation and testing. 3. To understand about animal caring, maintenance and ethics. 4. Biostatistics will help the students in formulating the scientific questions to be answered, determine appropriate sampling techniques, coordinate data collection procedure and conduct statistical analysis to answer those scientific questions 5. Application of computer software in various biological studies. <p>Course Outcomes: At the end of this course,:</p> <p>CO1 Student will be able to correctly identify their biological model.</p> <p>CO2. Students would be able to prepare lab solutions required in lab for experimental design and know the safe laboratory practices and disposal of waste materials Students would gain knowledge about office applications of computers in research.</p> <p>CO3. Students will be able to understand the primary characteristics of quantitative and qualitative research.</p> <p>CO4. Students will be able to develop and test research ideas and apply the knowledge of research designs in planning and analyzing research.</p> <p>CO5. Students would gain knowledge of DNA Sequencing and genome and application of other tool in the field of molecular biology.</p>		
Credits: 4	Core Compulsory / Elective	
Max. Marks: 100	Min. Pass Marks: 55	
Total No. of Lectures-Tutorial (in hours per week): L-T-P: 4-0-0		
Unit	Topics	No. of Lectures (Total sum = 60)
I	Taxonomy and Biodiversity: Principles of Taxonomy & its importance, Binomial nomenclature, Taxonomic hierarchy, Concept of Species, Taxonomic Publications, Newer trends in Taxonomy – Numerical, Phenetic, Cladistic and Molecular. Levels of biodiversity, importance of biodiversity; threats to biodiversity, conservation and management of biodiversity, biodiversity act and related international conventions, bio-geographical classification of India. Impact of environment pollution(air and water), wetland conservation, EIA	12
II	Lab management: Biochemical calculation, General idea of buffer system, Preparation of buffers such as (phosphate buffer, Tris-cl etc.), General idea of concentration measurement of solution viz. molarity normality, molality etc.) Management of laboratories chemicals, glassware and working with equipments, Preparation of specimen, Reagents in aquatic ecology, Animal house management	12
III	CPCSEA and research funding agencies: Guidelines for Bio-safety, Functioning of Institutional Bio-safety committee, Institutional Animal Ethics Committee and Institutional Ethical Committee, CPCSEA guidelines for Animal experimentation. A brief idea of funding agencies such DST, DBT, ICMR, CSIR, ICAR, UPCAR, UPCST, BNHS, European Commission, DFID and UGC. Role of Intellectual Property Rights (IPR), Patenting, Copyright.	12

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IV	Biostatistics: Sampling – Random and non-random sampling methods, Data analyses – measures of averages and dispersion, Data Presentation techniques – Graphical and tabular, Normal distribution – properties and applications, Standard error, Confidence interval and sampling distribution – definition, computation, interpretation and applications; Basic principles of testing of hypothesis, Test of significance - t-test, Chi square and Non parametric methods; anova, Correlation and Regression	12
V	Bioinformatics: Background and major developments in Bioinformatics; different biological databases and their usage; Analysis of Nucleic acid sequences and protein sequences; alignment, similarity and pattern searches; secondary structure; motifs; functional homologs & orthologs; meta-analysis and functional assignment of unknown open reading frames particularly for pathogens; RNA sequence analysis, secondary structure, different methods of tree construction for evolutionary analysis.	12

Teaching Learning Process: Class discussions/ demonstrations, Power point presentations, Class activities/ assignments, Field visits., Internship, etc.

Suggested Readings:

1. Khan and Khanna : Fundamentals of biostatistics
2. G.R. Basotia and K.K.Sharma : Research Methodology
3. WHO (2003) :Laboratory Biosafety Manual
4. Arthur M. Lesk: Introduction to Bioinformatics, 5th ed.
5. Jin Xiong: Essential Bioinformatics
6. DBT (2011):Guidelines and Handbook for Institutional Biosafety Committee (IBSC) Manual of Patent office practice and Procedure (2011)
7. V.C. Kapoor: Animal Taxonomy and Biodiversity,8th ed.
8. Botkin and Keller: Environmental Science, 8th ed
9. P.D. Sharma: Ecology and Environment,13th ed.