SYLLABI AND SCHEME OF EXAMINATION FOR Ph.D. COURSE WORK

In accordance to IGU Ph.D. Ordinance 2025-26 on dated 09.10.2025

(W.E.F. SESSION 2025-26)

DEPARTMENT OF ZOOLOGY

Indira Gandhi University, Meerpur- Rewari, HARYANA
(Established under State legislature Haryana Act 29 of 2013)
Recognized u/s 12-B & 2(f) of UGC Act, 1956

Ph.D. Course Work (Zoology)
Scheme of Examination
(Under Credit System w.e.f. 2025-26)

Total Credits: 12

Programme Objective:

The objective of the course is to familiarize the Ph.D. scholars with research and its various methods. The focus of the course is applied and decisional. It aims at providing the relevant inputs to the research scholars so that they could study systematically various complex problems and provide information and solutions for the same

## The coursework will have a total of 12 credits distributed as follows:

Course Code	Title of the Course	Theory Marks	Internal Marks	Practical Marks	Max Marks	Credits
25L8.0-ZOO-101	Research Methodology	70	30	-	100	4
25L8.0-ZOO-102 (A)*	Tools and Techniques in Animal Sciences	70	30	-	100	4
25L8.0-ZOO-102 (B)*	Biostatistics					
25L8.0-RPE-103**	Research and Publication Ethics	40	10	-	50	2
25L8.0-ZOO-104	Review of Literature and Seminar	50	-	-	50	2
Total		230	70		300	12

*Subject specific paper (Opt any one)
**Common paper across all the departments provided by the University

Note: 1. The internal assessment of 30 marks in the paper shall be based on one written test (10 marks), one written assignment (10 marks) and one presentation (10 marks). The internal assessment of Research and Publication Ethics will comprise of one written assignment of 10 marks.
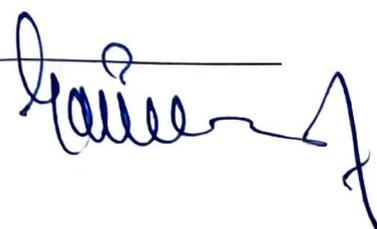
Programme Outcomes

PO1: The Doctor of Philosophy programme 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.

PO2: 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.

PO3: Students in this programme 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.

PO4: Students with a Ph.D. degree either pursue a post-doctoral position aiming for an academic career or find employment in industrial R & D laboratories.

PO5: The course will equip the students to highest level of research integrity and train them to follow research and publication ethics while practicing science.
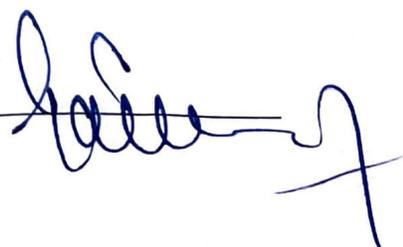
Indira Gandhi University, Meerpur– Rewari
DEPARTMENT OF ZOOLOGY
(Ph.D. Course Work)

PAPER-1: RESEARCH METHODOLOGY
COURSE CODE: 25L8.0-ZOO-101

Time:3 Hrs.

Contact Hours/ Week: 4 hrs

Credit-04

Maximum Marks:100

Theory Marks:70

Internal Assessment:30

Course Objective:
1. To know about the research perspective in life sciences
2. To understand the research hypothesis formulation and testing
3. To understand the significance of scientific programs in Life Sciences
4. To develop skills in writing research article/papers

Course Outcomes

CO1: Students should be able to identify the overall process of designing a research study from its inception to its report.

CO2: Students should know the primary characteristics of quantitative research and qualitative research.

CO3: Students should be able to identify a research problem stated in a study.

CO4: Students should be familiar with ethical issues in educational research, including those issues that arise in using quantitative and qualitative research.

Note: The question paper will contain total of nine questions in all from four units of syllabus. The candidates are required to attempt five questions in all selecting one from each unit, the 1st question will be compulsory and covered from all units. All questions carry equal marks.

Course Contents:

Unit- I

Meaning of research, objectives of research, types of research, significance of research, research methods vs methodology, Familiarization of research area; Reading and interpretation of research papers, Critical analysis of research problems, Use of tools for searching literature through electronic databases; Research design and related concept, Sampling, Patent search, related topics.

Unit- II

Definition, necessity and techniques of defining research problem, formulation of research problem, Objectives of research problem, features of good research design, Types of research design, Research process and its components, Basic Principles of Experimental Design, Design of experiments, Census and Sample surveys, Different types of sample designs, Characteristics of good sample design, Techniques of selecting a random sample.

Unit- III

Guidelines for Biosafety and Bioethics; Institutional Biosafety Committee-Handling of Genetically modified organisms, Institutional Human and Animal Ethics Committee- compliance, concerns and approval; Safety practices and disposal of Bio-waste in the laboratory; Radioactivity and safety precautions; Handling and disposal of

flammable and hazardous chemicals. Ethics in Science- Copyright, Royalty, Intellectual property rights and patent laws, Reproduction of published material, Plagirism, Citation and acknowledgements, Reproducibility and accountability, Conflict of Interest, related topics.

Unit- IV

Skills for scientific writing and research presentation- Term paper, Research project, Research report, Thesis, Research article and Review; Use of electronic tools for bibliographic formatting and checking Plagiarism; Oral presentation skills.

Suggested Reading:
1. Research Methodology-G. R. Basotia and K. K. Sharma.
2. Research Methodology-C.H. Chaudhary, RBSA Publication
3. Research Methodology- C.R. Kothari

Examination Scheme

Components	Written Test	Assignment	Presentation	End Semester
Weightage (%)	10	10	10	70

Student Learning Outcomes:
- ✓ The students become well versed with skills of writing research papers and conclusion of the research problems.
- ✓ Exposure to MS office and other scientific software's enable the scholars in analyzing the data as well as in preparing manuscript and presentation.

Indira Gandhi University, Meerpur– Rewari
Department of Zoology
(Ph.D. Course Work)
PAPER-4: Tools and Techniques in Animal Sciences
COURSE CODE: 25L8.0-ZOO-102 (A)

Time:3 Hrs.

Credit-04
Maximum Marks:100
Theory Marks:70
Internal Assessment:30

Course Objective:
1. This course will impart the advanced knowledge of fundamental research techniques which are essential for performing the research in Zoology.
2. On completion of course, students will be able to understand the use of basic methods, which are extensively used in biological experiments.
3. To study various techniques for analysis of biomolecules.
4. To study the sequencing techniques for nucleic acids.

Course Outcomes:

CO1 Students would be able to develop basic appreciation of the underlying principles and practical strategy of the analytical and preparative techniques that are fundamental to study and understanding of life processes

CO2 Students would be able to develop basic concepts and practical aspects of various kinds of Microscopy, spectroscopy and separation techniques.

CO3 Students would be able to understand the concept of sequencing of nucleic acid techniques and their applications in research.

CO4 Students would be able to understand the concept of bioinformatics and their applications.

Note: The question paper will contain total of nine questions in all from four units of syllabus. The candidates are required to attempt five questions in all selecting one from each unit, the 1st question will be compulsory and covered from all units. All questions carry equal marks.

Course Contents:

UNIT-I

Compound Microscope, Fluorescence Microscope, Dark Field Microscopy, Phase Contrast Microscope, Electron Microscope (TEM/SEM), Confocal Microscope, and Analysis of biomolecules using UV /visible spectroscopy and FTIR, Atomic Absorption Spectroscopy, X-Ray Diffraction.

UNIT-II

Paper chromatography, Thin layer chromatography, Gel filtration, ion exchange & affinity chromatography; High pressure liquid chromatography (HPLC), Electrophoresis (Agarose, PAGE), Polymerase Chain Reaction, Sequencing of Nucleic Acids, Designing of Primers.
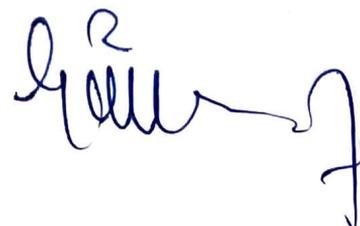
UNIT-III

Centrifugation: centrifugation in biological research, Microcentrifuge, High Speed Centrifuge, Ultracentrifugation, Differential Centrifuge, Density Gradient Centrifuge, Southern, Northern and Western blotting techniques.

UNIT-IV

Flow Cytometry: definition, principle, instrumentation, Types of Flow Cytometry, Applications; Introduction to Bioinformatics, components of bioinformatics; Introduction to CRISPR, Molecular Phylogeny.

Suggested Reading:

1. Animal Cell Culture - A practical approach, Ed. John R.W. Masters, IRL Press.
2. Introduction to Instrumental analysis, Robert Braun. McGraw Hill International Editions.

Examination scheme

Components	Written Test	Assignment	Presentation	End Semester
Weightage (%)	10	10	10	70

Indira Gandhi University, Meerpur– Rewari
Department of Zoology
(Ph.D. Course Work)
PAPER-4: Biostatistics
COURSE CODE: 25L8.0-ZOO-102 (B)

Time:3 Hrs.

Credit-04
Maximum Marks:100
Theory Marks:70
Internal Assessment:30

Course Objective:

1. This course will impart the advanced knowledge of software for detection of Plagiarism.
2. On completion of course, students will be able to understand the methods for collection, classification, tabulation, and graphical representation of biological data.
3. To develop skills in measures of correlation and hypothesis testing.
4. To train students to assess variability, chance and reliability in research outcomes.

Course Outcomes:

CO1 Students will be able to identify and apply probability distributions to biological and medical data.

CO2 Learners will gain skills in designing surveys and choosing appropriate sampling methods.

CO3 Students will gain ability to classify, tabulate and represent data using diagrams, histograms, frequency curves and polygons.

CO4 Students would interpret results, assess reliability and communicate findings in scientific formats.

Note: The question paper will contain total of nine questions in all from four units of syllabus. The candidates are required to attempt five questions in all selecting one from each unit, the 1st question will be compulsory and covered from all units. All questions carry equal marks.

Course Contents:

UNIT-I

Data collection, documentation and presentation of data, classification and tabulation of data. Diagrammatic and Graphical presentation of statistical data, Frequency distribution, Analysis and Interpretation of Data.

UNIT-II

Central tendency: Mean, Median and Mode. Standard Deviation and error. Concepts of population and sample, need for sampling, census and sample, surveys, sampling and non-sampling errors, sample size de termination, finite population, sampling techniques-. Systematic sampling, stratified sampling etc.

Probability.

UNIT-III

Level of significance, Simple Correlation, correlation coefficient, simple linear regression. Poisson Distribution. Student 't' test, Chi-square test, Fisher test, Z-test. Analysis of variance: One way ANOVA and Two way ANOVA. Statistical Packages and analysis: SPSS etc.

UNIT-IV

Basic Computers: MS office including Word, Excel, Power Point ad Internet. Use of tools/ techniques for Research: methods to search required information effectively. E-learning, Software for paper formatting like LaTex/MS office, Software for detection of Plagiarism: Urkund, Turnitin/Ithenticate

Suggested Reading:

1. QuantitativeTechniques1st Edition by S.K. Khandelwal, 2012
2. Quantitative Techniques: Theory and Problems by P.C. Tulsianand Vishal Pandey, 2002.
3. Mann, P.S. (2007). Introductory statistics. John Wiley & Sons.
4. Rice, J.A. (2006). Mathematical statistics and data analysis. Cengage Learning. Campbell, A. M., & Heyer,

Examination scheme

Components	Written Test	Assignment	Presentation	End Semester
Weightage (%)	10	10	10	70

Indira Gandhi University, Meerpur– Rewari
DEPARTMENT OF ZOOLOGY
(Ph.D. Course Work)

PAPER-4: RESEARCH AND PUBLICATION ETHICS
COURSE CODE: 25L8.0-RPE-103

Time:3 Hrs.

Credit-02
Maximum Marks: 50
Theory Marks: 40
Internal Assessment: 10

Note: The question paper shall have total eight questions of eight marks each covering whole syllabus. The students shall be asked to attempt total five questions in all.

Course Objective:
1. To understand the philosophy of science and ethics, research integrity and publication ethics.
2. To identify research misconduct and predatory publications.
3. To understand indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.)
4. To understand the usage of various plagiarism tools.

Course Outcomes:
At the end of the course, the students will have awareness about-
CO1: Understanding the philosophy of science and ethics, research integrity and publication Ethics.
CO2: To identify research misconduct and predatory publications.
CO3: To understand indexing and citation databases., open access publications, research metrics (Citations, h-index, Impact Factor, etc.)
CO4: To understand the usage of various plagiarism tools.

OVERVIEW
This course has total 6 units focusing on basics of Philosophy of science and ethics, research integrity, publication ethics. Hands on sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:
Classroom teaching, Guest Lectures, group discussions and practical sessions. Total teaching hours shall be 30 hours.

Evaluation
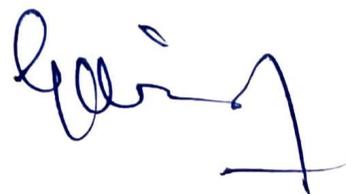
Continuous assessment will be done through assignments. Weightage will be given for active participation. Final written examination will be conducted at the end of the course.

SYLLABUS IN DETAIL

Theory

RPE01: PHILOSOPHY AND ETHICS (3hrs.)
1. Introduction to Philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgment and reactions

RPE02: SCIENTIFIC CONDUCT (5hrs.)
1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FPP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

RPE03: PUBLICATIUON ETHICS (7hrs.)
1. Publication ethics: definition, introduction and importance
2. Best practices/ standard setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation and publication ethics, authorship and contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals Practice

RPE04: OPEN ACCESS PUBLISHING (4hrs.)
1. Open access publications and initiatives
2. SHERPA/RoMEO online recourse to check publisher copyright & self-archiving policies
3. Software tool of identify predatory publications developed by SPPU
4. Journals finder/ journals suggestion tools viz. JANE, Elsevier Journals Finder, Springer Journals Suggester, etc.

RPE05: PUBLICATION MISCONDUCT (4hrs.)
A. Group Discussions (2hrs.)
1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad
B. Software tools (1hrs.)

1. Use of plagiarisms of tware likeTurnitin, Urkund and other open source software tools

RPE06: DATA BASE AND RESEARCH METRICS (7hrs.)

A. Database (4hrs.)

1. Indexing databases
2. Citation databases: Web of Sciences, Scopus, etc.

B. Research Metrics (3hrs.)

1. Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, gindex, i10index, altmetrics

Suggested Reading

- Nicolas H. Steneck. Introduction to the Responsible Conduct of Research. Office of Research Integrity, 2007. Available at: http://ori.hhs.gov/sites/default/files/rcrintro.pdf
- The student's Guide to Research Ethics By Paul Oliver Open University Press, 2003.
- Responsible Conduct of Research By Adil E. Shamoo; David B. Resnik Oxford University Press, 2003.
- Ethics in Science Education, Research and Governance Edited by Kambadur Muralidhar, Amit Ghosh, Ashok Kumar Singh vi. Indian National Science Academy, 2019. ISBN: 978-81- 939482-1-7. http:www.insaindia.res.in/pdf/Ethics_Book.pdf
- Anderson B.H., Dursaton, and Poole M.: Thesis and assignment writing,Wiley Eastern 1997.
- Bijorn Gustavii: How to write and illustrate scientific papers? Cambridge University Press.
- Bordens K.S. and Abbott, B.b.: Research Design and Methods, McGraw Hill, 2008.
- Graziano, A., M., and Raulin, M., L: ResearchMethods–A process of Inquiry, Sixth Edition, Pearson, 2007.
- Bird,A.(2006). Philosophy of Science. Routledge.
- P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865.
- National Academy of Sciences, National Academy of Engineering and Institute of Medicine (2009). On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academies Press.
- Resnik, D.B. (2011). What is ethics in research & why is it important. National Institute of Environmental Health Sciences, 1-10. Retrieved from https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm
- Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489 (7415),179-179. https://doi.org/10.1038/489179a

Examination Scheme

Components	Written Assignment	End Semester
Weightage (%)	10	40

Indira Gandhi University, Meerpur– Rewari
DEPARTMENT OF ZOOLOGY
(Ph.D. Course Work)
PAPER-3: REVIEW OF LITERATURE AND SEMINAR
COURSE CODE: 25L8.0-ZOO-104

Contact Hours: 2 hrs /week
Time of Presentation: 1 hr

Credit-02
Maximum Marks:50
Presentation:25
Viva Voce: 25

Course Objective:
1. The course will help the student to learn about the basic introduction and literature related to the area of research.
2. Students will require to prepare a power point presentation on the allotted topic.
3. Will have to make a presentation in front of advisory committee.
4. Students will be expected to update information of peer-reviewed national & international research journals.

Course Outcomes:
CO1: Students would be able to search the literature systematically.
CO2: Students would be able to formulate a research question.
CO3: Students would be able to demonstrate a scientific attitude.
CO4: Students would be able to manage your own learning process.

Course Contents: Students must review 15-20 research papers in their respective area of interest.

Databases: Pubmed/ Medline, Science Direct, Springer Link, Ingenta Connect etc.

Some Suggested Journal Publishing Groups and Suggestive Relevant Journals
Nature (npg), Cell, Science, Science Direct, Springers, Elsvier, Wiley, Taylor & Francis etc.

Examination Scheme

Components	Marks	Evaluation	Marks
Research Presentations/ Seminars	25	By Internal or/ External Examiners	25

Student Learning Outcomes:
✓ Student will be able to understand the searching documents relevant to his/her work.
✓ This will help the students to write review articles