

Department of Zoology

School of Biological Sciences



Curriculum Framework

PhD (Course Work) Zoology

Based on National Education Policy- 2020

**Doctor Harisingh Gour Vishwavidyalaya
(A Central University)**

Sagar-Madhya Pradesh-470003

**PH.D. COURSE WORK
DEPARTMENT OF ZOOLOGY
SCHOOL OF BIOLOGICAL SCIENCES
DR. HARISINGH GOUR VISHWAVIDYALAYA SAGAR, 470003 (M.P.)**

I Semester

Course code	Paper Title	Credits
ZOO-CC-141	Research Methodology	04
ZOO-CC-142	Biostatistics and Bioinformatics	04
ZOO-CC-143	Review Writing	06
ZOO-CPE-RPE	Research and Publication Ethics	02
		Total Credits 16

PH.D. COURSE WORK
COURSE TITLE: RESEARCH METHODOLOGY
COURSE CODE: ZOO-CC-141
THEORY

L	T	P	C
1	3	0	4

Objective: To learn the designing of Research problem and to analyze the obtained data.

Unit - I Research Design and Hypothesis

Types of research (descriptive, analytical, applied, fundamental, qualitative, conceptual and empirical) and research methods. Importance of literature review in defining a problem. Defining, formulating & development of research hypothesis. Testing & development of working hypothesis.

Unit - II Computer application in biological research

Basics Computer programmes (Microsoft Excel, Word & PPT) and software (SPSS etc) used in research. Networking and modelling. Data mining and interpretation by use of computer. Data repository in knowledge bank (Gene Bank, Shodh Ganga, INFLIBNET etc.).

Unit - III Scientific presentations & Writing

Structure and components of scientific reports, Types of scientific reports and their preparation. Review, report, Paper & Thesis writing. Bibliography, referencing and citation for scientific writing.

Unit - IV Sophisticated instruments used in biological research

Microscopy (Confocal, Phase contrast, TEM, SEM) Centrifuge, Chromatography, Spectroscopy, Immunochemical Techniques (ELISA), Electrophoresis (DNA, Protein), PCR (routine and Real time).

Unit - V Bio safety and Good Laboratory Practices

International standards and concept of bio safety, bio safety levels & biohazards. Chemical & radiological hazards. Removal and disposal of biohazards. Concept of good laboratory practices. Safety related with genetically modified organisms. Ethics in use of animals and their disposal

Suggested Readings:

1. Kothari, C. R., 2004. Research Methodology: Methods and Techniques, New Age International Publishers, New Delhi.
2. Day, R. A., 1998. How to Write & Publish a Scientific Paper, 5th edition, Oryx Press.
3. Bell, F. D. Brown, W. C. (1994). Basic Biostatistics: Concepts for the Health Sciences. McGraw-Hill.
4. Wilson, K. and Walker, J. M., 2000. Principles and Techniques of Biochemistry and Molecular Biology, 8th Edition, Cambridge University Press.

Learning Outcome:

After complete the course, the students will able to-

- explore different type of research and to formulate the hypothesis of the Research.
- use the different computer programs to execute the research data.

PH.D. COURSE WORK
COURSE TITLE: BIOSTATISTICS & BIOINFORMATICS
COURSE CODE: ZOO-CC-142
THEORY

L	T	P	C
1	3	0	4

Objective: To learn the commonly used software to interpret biological research data.

Unit – I Basics of Statistics

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

Unit - II Common Methods used in Biostatistics

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

Unit - III Biological Databases

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 Common Bioinformatic tools

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 Use of Biostatistics

IPR in Bioinformatics, Computer Science, Medical research, Pharma, Biodiversity, Genetic resources & Biotechnology.

Suggested Readings:

1. Marketa Z. and Baum J.,2008. Understanding Bioinformatics. Garland Science.
2. Lesk M.,2009. Introduction to Bioinformatics. Oxford University Press.
3. Ignacimuthu S., 2013. Basic Bioinformatics. Narosa, Alpha science International.
4. Claverie J. M. and Notredame C., 2006. Bioinformatics for Dummies. Wiley Publishing, Inc., New York, USA.
5. Pagano,M. and Gauvreau K., 2018. Principles of Biostatistics. Duxbury Press, USA.
6. Sharma V. Munjal A. and Shanker A., 2008. A text Book of Bioinformatics. Rastogi Publications, New Delhi.

Learning Outcome:

After complete the course, the students will able to-

- use biostatistics to understand and interpret biological data.
- use the different biological database to compare the obtained data.

PH.D. COURSE WORK
COURSE TITLE: REVIEW WRITING
COURSE CODE: ZOO-CC-143
PRACTICAL

L	T	P	C
0	2	4	6

Objective: To write a review article using the published research article.

1. Survey of Literature; Data research using various platforms.
2. Pico tool of Systematic review writing.
3. Designing of the Research Problem.
4. Formulation of Hypothesis.
5. Description of Review content in the form of various types of Research.
6. Data analysis Procedure.
7. Writing of Proposal for funding.
8. Power point Presentation of reviewed literature.
9. Submission and Presentation of review of literature with meta-analysis in Two Hard copies.

Learning outcome:

After completing the course, the students will be able to draft a review article for the possible publication in peer reviewed Journal.

PH.D. COURSE WORK
COURSE TITLE: RESEARCH AND PUBLICATION ETHICS
COURSE CODE: ZOO-CPE-RPE
THEORY

L	T	P	C
1	3	0	2

Objective: To learn ethics in publication of research data and conducting research.

Unit I. Philosophy and Ethics

- a. Introduction to philosophy: definition, nature and scope, concept, branches.
- b. Ethics: definition, moral philosophy, nature of moral judgments and resections.

Unit II. Scientific Conduct

- a. Ethics with respect to science and research.
- b. Intellectual honesty and research integrity.
- c. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP).
- d. Redundant publications: duplicate and overlapping publications, salami slicing.
- e. Selective reporting and misrepresentation of data.

Unit III. Publication Ethics

- a. Publication ethics: definition, introduction and importance.
- b. Best practices/ standards setting initiatives and guidelines: COPE, WAME. etc.
- c. Conflict of interest.
- d. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types.
- e. Violation of publication ethics, authorship and contributor ship.
- f. Identification of publication misconduct, complaints and appeals
- g. Predatory publishers and journals.

Unit IV. Practice

- a. Open access publications and initiatives.
- b. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies.
- c. Software tool to identify predatory publications developed by SPPU.
- d. Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

Unit V. Publication Misconduct

A. Group Discussions

- a. Subject specific ethical issues, FFP, authorship.
- b. Conflict of interest.
- c. Complaints and appeals: examples and fraud from India and abroad.

B. Software tools

- d. Use of plagiarism software like Turnitin, Urkund and other open source software tools.

Unit-VI Databases and Research Metrics

- a. Indexing databases.
- b. Citation databases: Web of Science, Scopus, etc.
- c. Impact Factor of Journal as per Citation Report, SNIP, SJR, IPP, Cite Score.
- d. Metrics: h-index, g-index, i10 index, altmetric.

Suggested Readings:

1. Bird, A. (2006). *Philosophy of science*. Routledge.
2. MacIntyre, Alasdair (1967) *A Short History of Ethics*. London.
3. P. Chaddah, (2018) *Ethics in Competitive Research: Do not get scooped; do not get plagiarized*, ISBN:978-9387480865
4. National Academy of Sciences. National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist*:
5. *A Guide to Responsible Conduct in Research: Third Edition*. National Academies Press.
6. 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.nieh.nih.gov/research/resouces/bioethics/whatis/index.cfm>
7. Beall, J. (2012). Predatory publishers are corrupting open access. *Nature*,489(7415), 179-179.
8. <https://doi.org/10.1038/489179a>
9. Indian National Science Academy (INSA), *Ethics in Science Education, Research and Governance* (2019),
10. ISBN:978-81-939482-1-7. https://www.insaindia.res.in/pdf/Ethics_Book.pdf.

Learning outcome:

After completing the course, the students will be able to learn-

- understand scientific conduct in publication of data.
- learn use of various available data base before the publication of research data.