



# **VIVEK UNIVERSITY**

[Estd. by Govt. of Uttar Pradesh, as per Uttar Pradesh Private Universities Act, 2019, no.21 of 2024.]  
MORADABAD ROAD, POST AGRI, BIJNOR, UTTAR PRADESH-246701, INDIA

## **Syllabus**

### **Pre-Ph.D. Course Work**

#### **Zoology**

**Effective from Academic Session (2024-2025)**

## Course Structure and the Assessment Scheme of Pre Ph.D. Course Work Syllabus

| SN    | Paper Code | Subject   | Credits<br>L:T:P | Total<br>credit | Total<br>marks<br>(External<br>+<br>Internal) | Minimum<br>marks to be<br>scored for<br>successful<br>completion |
|-------|------------|---|------------------|-----------------|---|--|
| 1     |            | Research Methodology<br>(Common for All)                              | 3:1:0            | 4               | 60+40   | 50   |
| 2     |            | Research & Publication<br>Ethics (Common for All)                     | 1:1:0            | 2               | 30+20   | 25   |
| 3     |            | Quantitative Methods and<br>Computer Applications<br>(Common for All) | 3:1:0            | 4               | 60+40   | 50   |
| 4     |            | Recent Advances in<br>Zoology   | 3:1:0            | 4               | 60+40   | 50   |
| 5     |            | Field work (Seminar/<br>workshop/ conferences/<br>literature review)  | 0:0:4            | 4               | (0+100)                                       | 50   |
| Total |            |   |                  | 18              | 450   | 225  |

**Note: 1. A Ph.D. scholar must attain a minimum of 55% marks in aggregate.**

**2. Internal marks shall be based on assignments/class activity/case study and other academic activities provided by course instructor.**

### **Programme objectives:**

1. Equip themselves with ethical issues related to Research and Publication.
2. Offer expertise, resources, and services to the community in the field of Zoology, wildlife, Entomology, Fish & fisheries etc.
3. Proficiency with fundamental knowledge in several specialized areas of research and expertise in at least one area of research related to Zoology and life sciences.
4. To contribute the advancement of knowledge and technology to enhance activities in Zoology and related core subjects.
5. To generate original research that contributes to academic knowledge.
6. Organize and conduct research (advanced project) in a more appropriate manner.

### **Programme Outcomes:**

1. Provide students with knowledge, general competence, and analytical skills in Research Methodology, Research & Publication Ethics and Zoology.
2. Build their foundation for research in Zoology and their applied field.
3. Provide hands-on experience to carry out research work in Zoology as well as interdisciplinary areas.

4. Knowledge and understanding of ethical standards in proposing, executing, and communicating scientific research.
5. Ability to communicate concepts and results to a technical audience in the form of conference papers, journal papers, and/or oral presentations etc.

**Programme Specific Outcomes:**

1. Apply appropriate research methodology, tools & techniques for systematic investigation, data analysis and solving the problems.
2. Gain ability to apply knowledge of Zoology to research in real-world issues.
3. Get familiar with current research trends in various core areas of Zoology.
4. Leadership and self-reliance Impact leadership abilities to the students to lead and excel in their respective fields. Also, the training will make students self-reliant.

## **Paper-I: Research Methodology (Common)**

### **Course objectives:**

1. To understand some basic concepts of research and its methodologies & identify appropriate research topics.
2. Select and define appropriate research problem and parameters.

### **Course outcomes:**

1. To familiarize the research scholar with the fundamentals of scientific research.
2. To develop understanding of the basic framework of research process.
3. To develop an understanding of various research designs and techniques.
4. To identify various sources of information for existing research and data collection.
5. To develop an understanding of the ethical dimensions of conducting applied research.
6. Apply the theoretical and experimental knowledge into research work.

### **Unit-I**

- **Scientific Research:** Meaning, importance and characteristics of scientific research, validity in research, Selection and formulation of Research Problem, Research Design, Phases/stages in research; types of research- qualitative, quantitative, exponential, exploratory, empirical, descriptive, ex-post facto, case studies, historical studies, philosophical studies, quasi-experimental; ethical problems in research; constructs and variables- nature of construct and variables, concept of constructs, type of variables, continuous and categorical, constructs, observables and intervening variables; Review of literature- purpose of the review, sources of the review, preparation of index card for reviewing and abstracting.

### **Unit-II**

- **Methods of Research:** General Survey of various methods including Survey Method, Interdisciplinary Method, Case Study Method, Sampling Method, Observation Method, Interview Method, Schedule Method, Questionnaire Method, Documentary Method, Library Method, Historical Method and Scientific Method. Characteristic Features of Scientific Method; Empirical Verifiable, Cumulative, Self - Correcting, Deterministic, Ethical & Ideological neutrality (Value Free).

### **Unit-III**

- **Problem Identification and Hypothesis Formation:** Problem- meaning and characteristics of a problem, types of problem, generality and specific of problem; hypothesis- meaning and characteristics of a good hypothesis, types of hypotheses, formulating a hypothesis, ways of stating a hypothesis; testing experimental hypothesis- standard error, test of significance, level of significance, degrees of freedom, errors in hypothesis- type I, type II errors.

### **Unit-IV**

- **Sampling and Research Design:** Meaning and types of sampling; probability and non-probability sampling. Methods of drawing samples, requisites of a good sampling method, sample size, sampling error; meaning and purpose of research design, types of research design, criteria of a good research design, basic principles of experimental design.

## **Unit-V**

- **Report Writing:** Meaning and significance of report writing, types of report, steps in writing report, layout of the research report, precaution in writing research report, developing thesis report, formatting, inside citations, references and bibliography. Locating Information on a Topic of Interest, Acquiring Copies of Articles of Interest, The Nature of Scientific Variables, Conceptual Versus Operational Definitions of Variables, Levels of Measurement, Various Paradigms, The Basic Format for a Research Report, Identification of the Parts of a Research Report, Citation and Referencing Styles, Essentials of Report Writing, Aids for Writing Good Research Report

## **Suggested Reading:**

- Bagchi, Kanak Kanti (2007) Research Methodology in Social Sciences: A Practical Guide, Delhi, Abijeet Publications.
- Kothari, C.R (2004) Research Methodology: An Introduction, Delhi, New Age.
- Flyvbjerg, Bent (2001) Making Social Science Matter: Why Social Inquiry Fails and How it can Succeed Again, United Kingdom, Cambridge University Press.
- Goodde and Hatte (1952) Methods in Social Research, New York, McGraw – Hill.
- Cooper & Schindler, Business Research Methods, Tata McGraw Hill.
- Broota, K.D., Experimental Designs in Behavioural Research, New Age International.
- Singh A. K., Test Measurement and Research Methods in Behaviours Sciences, Bharti Bhawan.

## **Paper-II: Research & Publication Ethics (Common)**

### **Course objectives:**

1. To understand the philosophy of science and ethics, research integrity and publication ethics research misconduct.
2. To understand indexing and citation databases, open access publications, research metrics (citations, h-index, impact Factor, etc.), predatory and clone Journals.

### **Course outcomes:**

1. To develop an understanding of research ethics, publications misconduct and plagiarism.
2. To develop Intellectual honesty and research integrity as per committee of publication ethics.
3. To identify various sources of information for data bases and research matrices.
4. To develop an understanding of Open access publications and initiatives.
5. To understand the usage of similarity index tools.
6. Appreciate the components of scholarly writing and evaluate its quality

**I. Philosophy and Ethics:** Introduction to philosophy: definition, nature and scope, concept, branches. Ethics: definition moral philosophy, nature of moral judgements and reactions.

**II. Scientific Conduct:** Ethics with respect to science and research, Intellectual honesty and research integrity, Scientific misconducts: Falsification and Plagiarism (FFP), Redundant publication: duplicate and overlapping publication, salami slicing, Selective reporting and misrepresentation of data.

**III. Publication Ethics:** Publication ethics: definition, introduction and importance, Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest, Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types, violation of publication ethics, authorship and contributor ship, Identification of publication misconduct, complaints and appeals, Predatory publishers and journals Practice.

**IV. Open Access Publishing:** Open access publications and initiatives, SHERPA / RoMEO online resource to check publisher copyright and self-archiving policies, Software tools to identify predatory publications developed by SPPU, Journal finder / journal suggestion tools viz. JANE, Elsevier journal Finder, Springer, Journal Suggester, etc.

**V. Publication Misconduct:** Group Discussion, Subject specific ethical issues, FFP, authorship, Conflicts of interest, Complaints and appeals: examples and fraud from India and abroad. Software tools, Use of plagiarism software like Turnitin, Drillbit, iThenticate and other open-source software tools.

**VI. Databases and Research Metrics:** Databases, Indexing databases, Citation databases: Web of Science, scopus, etc., Research Metrics, Impact factor of journal as per journal Citation report, SNP, SJR, IPP, Cite score, Metrics: h-index, g index, i10 index, altmetrics.

### **Paper-III: Quantitative Methods and Computer Applications (Common)**

#### **Course objectives:**

1. To gain familiarity about various data collection tools and techniques, data analysis and interpretation along with the application of computer and statistical software in research.
2. Application of various statistical and computer software's in research and development.

#### **Course outcomes:**

1. Analyse qualitative and quantitative data, and explain how evidence gathered supports or refutes an initial hypothesis.
2. Describe descriptive and inferential statistics techniques.
3. To apply the statistical techniques and computer software's for data analysing.
4. Develop research skills of administering research tools and data collection.
5. Able to locate the research studies available in the Internet and use of online journals and books,
6. Use computer techniques and software's for research & data analysing.

#### **Unit-I**

- **Measurement and Scaling Techniques:** Measurement in research, measurement scales sources of errors in measurement, tests of second measurement, techniques of developing measurement tools, meaning of scaling, scale classification bases, important scaling techniques, and scale construction techniques.

#### **Unit-II**

- **Data Collection, Processing and Analysis:** Methods of data collection – primary data, secondary data; primary data collection – observation method, interview method, questionnaires, schedules, guideline for constructing questionnaires/schedules, secondary data collection of, selection of appropriate method of data collection; coding, editing and tabulation of data, charts and diagrams used in data analysis, bar and pie diagrams and their significance; measures of central tendency, measures of dispersion; correlation and regression analysis - meaning and uses, methods of calculation of coefficients and their analysis and implication. sampling distribution, sampling schemes and sample sizes, confidence interval for the mean, t-statistic, z-statistic, confidence interval for the population variances, hypothesis testing, test of hypothesis for the population mean, population variance and ratio of two population variances; applications of z-test, t-test, f-test and chi-square test, association of attributes and techniques of testing, ANOVA.

#### **Unit-III**

- Fundamental knowledge of computer, statistical software and their application, application of statistical tests/techniques through the use of statistical software like SPSS, scientific packages like LISREL, AMOS, and SYSTAT for documentation and report generation.

#### **Unit-IV**

- **Introduction to MS-Office:** MS-WORD, MS-EXCEL, MATLAB, LATEX, MINITAB, R- programming. Applications of AI & ML in research.

**Suggested Reading:**

- Power Analysis for Experimental Research: A Practical Guide for the Biological, Medical and Social Sciences by R. Barker Baushell, Yu-Fang Li, Cambridge University Press.
- Chandan J. S., Statistics for Business and Economics, Vikas Publications.
- Broota, K.D., Experimental Designs in Behavioral Research, New Age International.
- Singh A. K., Test Measurement and Research Methods in Behavioral Sciences, Bharti Bhawan.
- Joyce Cox & Polly Urban, Microsoft Office, Galgotia Publishing.
- Sinha P.K., Computer Fundamentals, BPB Publishing.
- LaTeX: A Document Preparation System, 2/E Pearson Low Price Edition by Lamport.
- MATLAB: An Introduction with Applications by Gilat, Wiley India Pvt. Ltd.
- Getting Started with MATLAB by Rudra Pratap, Oxford University Press.



## Paper-IV: Recent Advances in Zoology

### Course Outcomes (COs)

1. Understand the complexity and significance of biodiversity at various levels.
2. Analyze genetic mechanisms and molecular biology tools, including DNA repair and cloning.
3. Describe environmental stresses and global phenomena like ozone depletion and global warming.
4. Evaluate the social behavior and adaptive strategies in animal societies.
5. Apply laboratory techniques such as PCR, ELISA, spectrometry, and electrophoresis for biological research.

### Unit-I

- **Biodiversity:** levels of biodiversity, value of biodiversity, regional, national and global status of biodiversity, threats to biodiversity, conservation and management of biodiversity, biodiversity act and related international conventions, bio-geographical classification of India. Environmental stresses and their management, global warming. Atmospheric ozone, Biodegradation and bioremediation of chemicals.

### Unit-II

- **Chemistry of gene:** structure of nucleic acids (A,B,C & Z DNAs RL model of Sasisepharan, super coiling, genetic & Non-genetic RNA, DNA replication, DNA repair (excision repair, mismatch repair and SOS repair) and genetic diseases in humans. restriction enzymes in cloning, techniques used in recombinant DNA technology and its application, DNA fingerprinting.

### Unit-III

- **Social behavior of animals:** costs and benefits of group-living, types of social acts, individual adjustments of group-living, parental care and socio functional organization in apes & monkeys.
- **Special features of selected micro-organisms:** animal viruses, plant viruses, bacteriophages, rickettsiae, mycobacterium, mycoplasma, actinomycetes, fungi and slime-moulds.
- A brief knowledge of environmental endocrinology.

### Unit-IV

- **Cells in culture:** requirements for cell culture, aseptic technique, primary culture, organotypic culture

- **Pesticides:** brief history, pesticide industries and markets. Dose-response relationship, insecticide, carcinogenic, teratogenic effects.

## Unit-V

- **Techniques:**
  1. **Spectroscopic methods:** UV/Vis, fluorescence spectrometry.
  2. Electrophoretic techniques: Vertical, Horizontal, 2-Dimensional, Denaturing gradient gel electrophoresis, Thermal gradient gel electrophoresis etc.
  3. **Variants of PCR and Amplification of gene:** Semi-quantitative RT PCR Nested PCR, Multiplex PCR, DOP-PCR etc. Immunological techniques:
  4. **Radial Immuno diffusion test.** ELISA, RIA, Surface Plasmon Resonance etc.

## Suggested Reading:

1. **Principles of Ecology and Environmental Science** *Author:* P.D. Sharma  
*Publisher:* Rastogi Publications
2. **Fundamentals of Molecular Biology** *Author:* G. Pathak *Publisher:* Oxford University Press
3. **Cell and Molecular Biology** *Author:* De Robertis and De Roberti *Publisher:* Lippincott
4. **Molecular Biology of the Gene** *Author:* James D. Watson  
*Publisher:* Pearson Education
5. **Introduction to Biodiversity** *Author:* S.K. Agarwal *Publisher:* APH Publishing
6. **Principles and Techniques of Biochemistry and Molecular Biology** *Author:* Keith Wilson & John Walker *Publisher:* Cambridge University Press
7. **Genetics: A Conceptual Approach** *Author:* Benjamin A. Pierce  
*Publisher:* Macmillan
8. **Environmental Endocrinology** *Author:* Sumpter J.P. *Publisher:* Springer
9. **Pesticide Toxicology and International Regulation** *Author:* Timothy Marrs & Bryan Ballantyne *Publisher:* John Wiley & Sons