

**COURSES OF STUDIES**  
**FOR**  
**Pre-Ph.D. EXAMINATION**  
**(With effective from 2019-2020)**

**ZOOLOGY**

**(Semester System)**



**DEPARTMENT OF ZOOLOGY**

North Orissa University  
Sriram Chandra Vihar  
Takatpur, Baripada-757003

# Curriculum Structure

## Semester-1

Course Code & Paper Code	Paper Name	Credit	Marks
ZO-801	Research Methodology-I	5	50
ZO-802	Research Methodology- II	5	50
ZO-803	Review (to be evaluated through seminar presentation)	10	100
	Total	20	200

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

### **Objectives of Pre-Ph.D. Course Work Program:**

To endow the student with adequate knowledge to understand and appreciate the nature, complexities and challenges in research related to Zoology.

Enable the students to learn the principles and theories of research methodology, data collection, presentation and interpretation.

To make them efficient in project proposal writing, review and scientific research paper writing and report writing.

### **Outcomes of Pre-Ph. D Course Work Program:**

Recognize and think critically to develop a scientific project proposal.

Capacities build up in developing in planning and implementation of research work.

Handle equipments needed for material preparation, characterization and to analyze and interpret the data with theoretical background and software.

Apply the scientific context to develop innovative ideas, products and methods for the benefits of biosphere.

Communicate research results in Written and Oral Format.

Recognize the need for the preparation and ability to carry out an independence research in broadest context of subject relevance.

Publication of their results from the research work in the peer reviewed journals to benefit the society and carrier in research.

## DETAILED SYLLABUS

### SEMESTER-1

#### Paper: ZO-801 (Research Methodology - I)

50 Marks

**Course Objective:** To enable the students to know about different tools and techniques to carry out research as well as to learn more about statistical validation of research data. The course also focuses on developing scientific writing skill and importance of research ethics

#### UNIT-I

- Principle and application of Chromatography. Electrophoresis. Spectrophotometry and Atomic Absorption Spectrophotometry. Blotting techniques and PCR.
- Sequencing of gene or DNA segment (Maxam and Gilbert's chemical deprecation method. Sanger's dideoxy method and automatic sequencers).

#### UNIT-II

- Morphometry of animals.
- Wildlife census of birds, Lion, Elephant and crocodiles.
- Wildlife forensics: Scat analysis techniques for lion and tiger.

#### UNIT-III

- Nucleic acid sequence databases-Gene Bank/EMBL/DDB1.
- Protein sequence databases-NBRF-PIR, PDB, Swissport.
- The internet and its resources, World Wide Web associated tools.
- An overview of computer viruses.

#### UNIT-IV

- Computer applications (SPSS).
- Correlation and Regression analyses.
- Testing of hypothesis (Z, chi square, T and F- tests).
- ANOVA (one-way, two-way and multi-way).
- Sampling and experimental design.
- Principal component analysis.

#### UNIT-V

- Writing of Scientific paper, Review paper and Report writing.
- Developing a research project.
- Thesis and Dissertation writing.
- Publication Ethics, Violation of publication ethics
- Avoiding Plagiarism, Preparing documents for MoUs

#### Course Outcomes

1. The student will be enabled to know the fundamentals tools and techniques needed for research related to classical and applied zoology.
2. To know and accept the new challenges and perspectives pertaining to different area chosen for research in classical and applied Zoology.
3. To enable them to write a project proposal, review and scientific research papers, pattern of report writing.
4. The course enables the student to get employed in various government and non-government offices as well as in industries and academics

#### **Recommended books:**

1. Biophysics by M.P. Arora, Himalaya Publishing House, Mumbai
2. Environmental Analysis: Water, Soil and Air by M.M. Saxena, Agro Botanical Publication (India), Bikaner.
3. Laboratory Experiments in microbiology by M.G. Reddy et al., Himalaya Publ., House, Mumbai.

4. An Introduction to Practical Biochemistry by D.T. Plummer, Tata McGraw Hill Publ. Co, New Delhi.
5. Bask: Biostatistics by G.B.N. Chainy et al., kalyani Publishers, Cuttack.
6. How to write & publish a Scientific Paper by R.A. Day Cambridge University Press, Cambridge.
7. Molecular Cell Biology by H. Lodish. Et al., W.H. Freeman and Company, New York.

**Course Objective:** To enable the students to learn more about modern biology by learning the tools and techniques involved in proteomics, genomics and transcriptomics.

**UNIT-I**

- Biodiversity conservation.
- Biodiversity Hot spots of the World and India.
- Biological Rhythms (Circannual).
- Productivity concept in ecosystems and ecological energetics.

**UNIT-II**

- Molecular evolution: concept of neutral evolution, Molecular divergence and-molecular clocks.
- Molecular tools in phylogeny, Classification and identification protein and nucleotide sequence analyses.
- Origin of new genes and proteins, Gene duplication and divergence. • Gene splicing, RNA interference.

**UNIT-III**

- Organization of Human Genome: Size and banding of Human Chromosomes. Distribution of tandems and interspersed repetitive DNA, Gene distribution and density in human nuclear genome, overlapping genes, genes within genes, Gene families pseudo genes, translated genes and gene fragments.
- Recombinant DNA technology.

**UNIT- IV**

- Proteomics: Expression analysis and characterization of proteins, Analysis of protein structure, Protein interaction.
- Molecular markers in Genome analyses: RFLP, RAPD, Mapping by using somatic cell by birds.

**UNIT-V**

- Control of Gene Expression: DNA-binding motifs in gene regulatory proteins, working of genetic switches, Molecular genetics mechanisms that create specialized cell types, post-transcriptional controls.
- Homologous DNA recombination: Holliday junction, Meselson-Radding model and Double-strand break model:

**Course Outcomes**

- 1.The students will develop innovative methodologies to handle issues identified and contributing to the development of theoretical, molecular knowledge pertaining to biodiversity and evolution.
- 2.To get skilled and employed in various industries, research institutes and academics.

**Recommended books:**

1. Biodiversity by E.O. Wilson, Academic Press, New York.
2. Concepts of Wildlife Management by B.B. Hosentti, Daya Publishing House, New Delhi.
3. Fundamentals of ecology by E.P. Odum, W.B. Saunders.
4. Fundamentals of Ecology by M.C. Dash, Tata McGraw Hill, New Delhi.
5. Molecular biology of Cell by B. Albert et al. Garland Sc., Taylor and Francis Group, New York
6. Principle of Genetics by E.W. Sinnott et al., Tata McGraw Hill, New Delhi.
7. Cell signaling by C.B. Power, Himalaya Publishing House, Mumbai.
8. Molecular Biology of cell by B. Albert et al., Garland Sc., Taylor and Francis Group, New York.
9. A textbook of Microbiology by R.C. Dubey & D.K. Maheswari, S. Chand & Co. Ltd., New Delhi.

**Paper: ZO-803**

**Review**

**100 Marks**

**Course Objective:** To enable the student to write research papers, articles, review papers and project proposal on various topics related to Zoology.

Review (to be evaluated through seminar presentation)

**Course Outcome:**

1. To enable students to identify a problem related to Zoology and put relevant questions.
2. To enable students to survey relevant literature for a given problem.
3. To prepare students to design an experiment and execute it and write review papers, research articles, project proposal etc.