

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

**LIFE SCIENCES**  
**(Semester System)**



North Orissa University  
Sriram Chandra Vihar Takatpur, Baripada-757003

# Curriculum Structure

## Semester-1

| <b>Course Code &amp; Paper Code</b> | <b>Paper Name</b>  | <b>Credit</b> | <b>Marks</b> |
|-------------------------------------|--|---------------|--------------|
| LS - 801                            | Research Methodology-I   | 5             | 50           |
| LS -802                             | Research Methodology- II   | 5             | 50           |
| LS -803                             | Dissertation of a Review Work 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 L. Sc. ology.

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 equipment 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 independent 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

LS 801

Research Methodology – I Marks: 50

**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

Scientific Paper Writing, Review Paper Writing & Scientific Report Writing.

Thesis and Dissertation Writing

Developing a Research Project

Publication Ethics, Violation of publication ethics

Avoiding Plagiarism, Preparing documents for MoUs

### Unit - II

Sample and Sampling Techniques

Collection and preservation of Data, Experimental Design

Correlation and Regression Analysis

Testing of Hypothesis (Z,  $X^2$ , T-test, F-test, Kolmogorov-Smirnov Tests)

ANOVA (One-way, Two-way, Multi-ways)

### Unit - III

Computer Operating Systems (MS Word, MS Excel, MS Power Point)

An overview of Computer Virus

Internet and its resources, World Wide Web Associated Tools

### Unit – IV

Herbarium techniques, Methodology, Functions of Herbarium and Management

Principles of Plant Nomenclature, Major rules of ICN (International Code of Nomenclature for Algae, Fungi and Plants).

Wild life Census (Plants and Animals)

Biogeographic realms of the World, Biodiversity hot spots of the World

Morphometry of animals

### Unit - V

Productivity concept in ecosystems and ecological energetics

Biogeochemical cycles

Endangered Species Concept. International and National Environment Organizations (CITES IUCN, WWF, SSC, UNEP, CBD, CAMP, WPSI, BNH)

EIA, EMP, Environmental Audit

IPR

### Course Outcomes

1. The student will be enabled to know the fundamentals tools and techniques needed for research related to Life Sciences.
2. To know and accept the new challenges and perspectives pertaining to different area chosen for research in Life Sciences.
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 get an insight knowledge on different techniques related to instrumentation, microbiology, plant and animal tissues culture and bioinformatics

**Unit-I**

Culture Methodology, Sterilization Techniques, Isolation and Pure Culture Preservation Techniques

Tissue Culture Techniques (Media Composition Selection and Preparation)

**Unit – II**

Principle and Working of Centrifuge

Chromatography

Electrophoresis

Spectrophotometry including AAS, ELISA

Immunodiffusion Techniques

**Unit – III**

Microscopy, Principles and Working of Light and Compound Microscopes

Phase Contrast Microscope, Fluorescent Microscope, Electron Microscope (SEM & TEM)

Immunocytochemistry

Autoradiography

**Unit – IV**

Methods of water, air and soil analysis, characterization of gas emission from major industries (Thermal power plants, Steel & Oil Refineries)

Ecological methods on Community Analysis (Quadrat Methods, SPS Area Curve, Frequency Density, Abundance, Important Value Indices)

**Unit - V**

Methods of Nucleic Acid and Amino Acid Sequencing

Nucleic Acid Sequence Databases (GenBank, EMBL & DDBJ)

Protein Sequence databases (NBRF, PIR, RCSB-PDB, Swiss Port)

Tools in Phylogenetic Studies (Phylogeny software, Construction of Phylogenetic Trees and Interpretation)

**Course Outcomes**

The students will develop innovative methodologies to handle issues identified and contributing to the development of theoretical, molecular knowledge pertaining to microbiology, plant and animal tissue culture.

The students will get a through knowledge to take up environmental issues and find out solutions to handle them.

To get skilled and employed in various industries, research institutes 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. Biodiversity by E.O. Wilson, Academic Press, New York.
6. Concepts of Wildlife Management by B.B. Hosentti, Daya Publishing House, New Delhi.
7. Fundamentals of ecology by E.P. Odum, W.B. Saunders.
8. Fundamentals of Ecology by M.C. Dash, Tata McGraw Hill, New Delhi.

**Paper: LS-803**

**Dissertation**

**100 Marks**

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

Review (to be evaluated through seminar presentation)

**Course Outcome:**

1. To enable students to identify a problem related to Life Sciences 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.