

# **Pre - Ph. D. COURSE WORK SYLLABUS**

**(2021)**



**P. G. DEPARTMENT OF LIFE SCIENCES  
RAMA DEVI WOMEN'S UNIVERSITY,  
VIDYA VIHAR, BHUBANESWAR-751022**

**PHD COURSEWORK SYLLABUS OF LIFE SCIENCES, RAMA DEVI  
WOMEN'S UNIVERSITY, 2021**

**OUTLINE OF THE SYLLABUS**

<b>Sl No.</b>	<b>Paper</b>	<b>Course Title</b>	<b>Credit</b>	<b>Total Marks</b>	<b>Minimum Pass mark</b>
1.	Paper-I (LS-01)	Research Methodology (75 marks) and Computer Application (25 marks)	04	100 marks	50%
2.	Paper-II (LS-02)	Elective Courses	04	100 marks	50%
3.	Paper-III (LS-03)	Literature Review (Evaluation through a write up and seminar presentation )	04	Report Writing and Submission: 50 marks Presentation: 30 marks Viva Voce: 20 marks	50%
4.	Paper- IV (LS-04)	Research and Publication ethics	04	100 marks	50%

## Paper-I

### RESEARCH METHODOLOGY

Course Code: LS-01

Credit 4

FM: 100

#### Unit- I

Research : Introduction to Meaning, Objective, Motivation of Research, Types of Research, Approaches Used in Research, Importance of Research, Research methods, methodology and the Scientific method, Criteria of Good Research, Selecting, Defining and Assessing Research Problem, Meaning, Features and Requirements in Research Design.

#### Unit- II

Chromatography: Paper Chromatography, Thin Layer Chromatography (TLC), Gas Liquid Chromatography (GLC), High Performance Liquid Chromatography (HPLC), Electrophoresis: Agarose Gel Electrophoresis, SDS-PAGE, Microscopy: Phase-Contrast Microscopy, Fluorescence Microscopy, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM).

#### Unit- III

Biostatistics: Measures of central tendency (mean, median and mode), Standard deviation, Type I and Type II Error, Coefficient of variation, Level of significance, Student's t- test, Chi-square ( $\chi^2$ ) test, Normal Distribution, Binomial Distribution, Analysis of variance: One way ANOVA and Two way ANOVA, Simple Correlation, Coefficient of correlation, Linear Regression

#### Unit- IV

Approaches to Computer Application: MS Word: Working with Text, Working with Tables, Graphics and Pages, Document Views and Formatting, and Mail-merge, and Referencing Style. MS-Office and its application, File handling in window, various versions of MSOffice, Research publishing tool- MS-Word, Adobe Acrobat, Graphics tool- MS Excel, MS-Power Point: Creating presentations and adding effects, Subject/field specific tools on [www.freeware.com](http://www.freeware.com) Use of Internet: Fundamentals and Services – E-mail, FTP, Telnet, WWW

#### Reference Books:

- 1) Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
- 2) Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
- 3) Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, EssEss Publications. 2 volumes.
- 4) Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.

**Paper-II**  
**ELECTIVE COURSE**

**Course Code: LS-02**  
**FM:100**

**Credit-4**

**Unit-I**

Methods for isolation, purification, preservation of microbes, Sterilization techniques, Media preparation, Microbial staining techniques for bacteria and fungi, Microbial Growth, Factors affecting growth of microbes of microbes, Introduction of immune system, Haematopoiesis, antigen, antibody, Production of polyclonal & monoclonal antibody and its applications.

**Unit-II**

Plant tissue culture techniques, Protoplast culture and somatic hybridization, somaclonal variations, production of haploids, transgenic plants, hybridization techniques, Molecular markers: RFLP, RAPD, AFLP, SNP and SSR.

Animal cell culture, Primary and established cell line cultures techniques. Equipment and materials for animal cell culture technology. Biology and characterization of the cultured cells. Stem cells, types of stem cells and its applications.

**UNIT-III**

Principles and application of spectroscopy in biological systems: Absorption Spectroscopy (UV-visible), Infrared spectroscopy (IR), Fourier-transform infrared spectroscopy (FTIR), Resonance Raman spectroscopy, X-Ray Diffraction (XRD) analysis, Energy Dispersive X-Ray (EDX), pH meter; Centrifugation and Ultracentrifugation, Filtration systems. Fermentative Systems, Fermenter design and types, bio-reactor variables and their control, downstream processing.

**UNIT-IV**

Introduction to biodiversity, levels of biodiversity (alpha beta gamma diversity), biodiversity Hotspot, threats to biodiversity. Biodiversity conservation: *in situ*, *ex situ* and *in vitro* conservation. Concepts of gene pool, bio-piracy and bio-prospecting. Concept of restoration ecology. Natural resources, types of natural resources, conservation of natural resources. Bioremediation – definition, types and role of plants and microbes for remediation

**Reference Books:**

1. General Microbiology- R.Y.Stainer, J.H.Ingraham
2. Physical Biochemistry- Friefelder, Publ.D.W.H. Freeman Press
3. Odum, E.P. (2007) Fundamental of Ecology. 5<sup>th</sup> Edn. Thomson books
4. Molecular Biology of Genes- Watson, baker, Bell, Gann, Levine and Losick

**Paper-III**  
**REVIEW OF RELATED LITERATURE**

**Course Code: LS 03****Credit 4****FM: 100**

Each student is required a select a problem on which she has to do intensive review of related studies under the supervision of a faculty member or supervisor. She has to review adequate research studies related to the problem and prepare a report. Each student is required to present the review of the related studies through power point. There will be an open Viva voce test after the presentation.

**Paper-IV**  
**RESEARCH AND PUBLICATION ETHICS**

**Common to all subjects**

**FM-100****Credit 4**

A: THEORY

Unit-I: Philosophy and Ethics

- Introduction to Philosophy: mdefinition, nature and scope, concept, branches.
- Ethics: definition, moral philosophy, nature of moral judemnet and reactions.

Unit-II: Scientific Conduct

- Ethics with respect to science and research
- Intellectual honesty and research integrity
- Scientific misconduct: Falsification, Fabrication, and Plagiarism (FFP)
- Redundant Publications: duplicate and overlapping publications.
- Selective reporting and misrepresentation of data.

Unit-III: Publication Ethics

- Publication ethics: definition, introduction and importance
- Best practices/standards setting initiatives and guidelines: COPE, WAME etc.
- Conflict interest
- Publication misconduct: definition, concept, problems that lead to unethical behaviour, types.
- Violation of publication ethics, authorship and contributorship
- Identification of publication misconduct, complaints and appeals
- Predatory publishers and journals

## B: PRACTICE

### Unit-IV: Open Access Publishing

- Open Access Publications and initiatives
- Online resource to check publisher copyright and self-achieving policies (SHERPA/RoMEO)
- Software tool to identify predatory publications developed by SPPU
- Journal finder/journal suggestion tools viz. Elsevier finder, Springer, Journal suggerster etc.

### Unit-V: Publication Misconduct

#### A. Group Discussion

- Subject Specific ethical issues, FFP, authorship
- Conflict of interest
- Complaints and appeals: examples and fraud from India and abroad

#### B. Software tools

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

### Unit-VI: Database and Research Metrics

#### A. Databases

- Indexing databases
- Citation databases: Web of Science, Scopus. etc.

#### B. Research Metrics

- Impact Factor of journal as per Journal Citation Report.
- Metrics: h-index, g-index, i10 index, altmetrics

## REFERENCES

Bird, A. (2006). *Philosophy of science*. Rutledge.

MacIntyre, A. (1967). *A short history of ethics*. London.

P.Chaddah (2018). *Ethics in competitive Research: Do not get scooped; do not get plagiarised*.

National Academy of Sciences (2009). *On being a scientist: A guide to responsible conduct in Research* (3<sup>rd</sup> Ed.), National Academics Press.

Resnik, D.B. (2011). What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1-10.

Beall, J. (2102). Predatory publishers are corrupting open access. *Nature*,489 (7415), 179-179.

Indian National Science Academy (INSA). *Ethics in science education, research and governance* (2019).