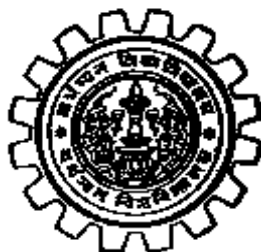


**Proposed curriculum and syllabus for Ph. D.
Coursework in BOTANY**



THE UNIVERSITY OF BURDWAN

(2020 on ward)

The University of Burdwan

Ph. D. Course Work Syllabus of Botany

Year	Semester	Course Code	Course Title	Credit Value	Marks Distribution
6 Months	Semester-I	PHDCW101	Research Methodology	4	50
		PHDCW 102	Research and Publication Ethics (RPE)	2	25
		PHDCW 103	Advanced Instrumentation for Research	4	50
		PHDCW 104	Term Paper(s) & Related Seminar Presentation(s)	4	50(25+25)
		Sub Total		14	175

Semester I

Ph. D. Coursework syllabus for Botany, BU

PHDCW 101: Research Methodology

Credit -4

Total Marks-50

- 1. Research Methodology:** Meaning of Research in Biological Sciences; Characteristics of Research, Research student and research supervisor; Process of research; Identification and criteria of selecting a research problem (Hypothesis); Formulation of objectives; Research plan and its components; Methods of Research and Difficulties in Biological research;
- 2. Research Proposal and experimental design:** Key elements- Objective, Introduction, Design or Rationale of work, Guidelines for design of experiments, Material and methods, Designing biological experiments, Compilation and documentation of data; Major research institutes related to plant sciences in India. A brief idea about government research agencies such as DBT, DST, ICMR, CSIR and UGC.
- 3. Writing and presentation:** Format of research paper and report writing, Procedure of Reference Citation; Significance of writing research papers and review articles; Major scientific publishers; Impact factor and citation index; Ethical issues in research; Intellectual Property right and Plagiarism; Effective presentation of research findings.
- 4. Statistical applications:** Standard deviation, Standard error, Co-efficient of variation, probability distributions: Binomial, Poisson and Normal Distributions (areas method only) including problems. Sample statistics and parameters, population null hypothesis, level of significance. Definitions and applications of Chi-square test, 't' and 'f' test. Analysis of variance with linear models. Analysis of variance for one-way and two way classified data.
- 5. Computer application** – Exercise in MS word, MS excel, MS PowerPoint, Adobe photoshop, Introduction to SPSS, bioinformatics, databases and their application

Books Recommended

1. Research Methodology- G.R. Basotia and K.K. Sharma.
2. Research Methodology- C.H. Chaudhary, RBSA Publication
3. Research Methodology: An Introduction - Wayne Goddard & Stuart Melville
4. Research Methodology - Ranjit Kumar
5. Research Methodology: Methods & Techniques - Kothari, C.R.
6. Molecular cloning Laboratory Manuals: Sambrook, Russel and Maniatis
7. Principle Practices in Plant Biotechnology – Wilson and Walker

PHDCW 102: Research and Publication Ethics (RPE)

Credit -2

Total Marks-25

THEORY

RPE 01: PHILOSOPHY OF ETHICS (3hr)

1. Introduction of philosophy: Definition, Nature and scope, concept, branches.
2. Ethics: Definition, moral philosophy, nature of moral judgements and reactions.

RPE 02: SCIENTIFIC CONDUCT (5hr)

1. Ethics with respect to science and research
2. Intellectual honesty and Research integrity
3. Scientific misconducts: falsification, fabrication and plagiarism
4. Redundant Publications: duplicate and overlapping Publications, Salami Slicing
5. Selective reporting and mispresentation of data

RPE 03: PUBLICATIONS ETHICS (7hr)

1. Publication ethics: definition, introduction and importance
2. Best practices/ standard settings initiatives and guidelines: COPE, WAME etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice-versa, types
5. Violation of Publication ethics, authorship and contributor ship
6. Identifications of Publication misconduct, complaints and appeals
7. Predatory publishers and journals

PRACTICAL

RPE 04: OPEN ACCESS PUBLISHING (4hr)

1. Open access Publication and initiatives
2. SHERPA/ RoMEO online resource to check publisher copyright and self-achieving policies
3. Software tool identify predatory Publications developed by SPPU
4. Journal finder/ journal suggestion tool viz., ZAME, Elsevier journal Finder, Springer journal suggester, etc

RPE 05: PUBLICATION MISCONDUCT (4hr)

A. Group discussion (2hr)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools (2 hr)

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

RPE 06: DATABASES AND RESEARCH METRICS (7hr)

A. Databases (4hr)

1. Indexing databases

2. Citation databases: Web of science, Scopus, etc.

B. Research Metric (3hr)

1. Impact factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score
2. Metrics: h- index, g-index, i10-index, altmetrics

PHDCW 103: Advanced Instrumentation for Research

Credit -4

Total Marks-50

1. Microscopy Light and Phase Contrast microscopy – working principle and applications.

Fluorescence microscopy – principle and application. Knowledge on different staining techniques; including fluorescent stains like – Acridine Orange; Hoechst-261; DAPI; FDA; etc. Scanning and Transmission Electron Microscopy, Confocal, Scanning Tunneling Microscopy

2. Centrifugation - principles - instrumentation for centrifuges - bench top - high speed- ultracentrifuges- applications, dialysis and Lyophilization

3. Colorimetry and Spectrophotometry: Colorimetry, ultraviolet - visible spectrophotometry - principles, instrumentation - applications, Principles and methodology of spectrophotometer, Fluorescence spectrophotometry.

4. Chromatography – Thin layer chromatography - Gas chromatography – Column chromatography- Ion exchange chromatography - Gel exclusion chromatography - HPLC Affinity chromatography and Immunoabsorption.

5. Electrophoresis: Polyacrylamide gel electrophoresis (PAGE) – Nucleic acid and sequencing gels - Agarose gel electrophoresis Two dimensional electrophoresis -Pulse Field Gel Electrophoresis (PFGE), isoelectric focusing – Gel documentation. Blotting - Western, Southern and Northern blots.

6. Nucleic Acids (Isolation; purification) and molecular marker (RFLP; RAPD; ISSR)

:Isolation of Plant genomic DNA and estimation of yield and quality; Estimation of melting temperature of DNA; restriction digestion of plasmid DNA; electrophoresis and molecular weight determination of DNA fragments; Polymerase chain reaction; analysis of genetic diversity (Jaccard's coefficient) using RAPD & ISSR. BLAST analysis.

7. PCR Techniques: Types, Conventional PCR, real Time PCR, qPCR

8. Immunotechniques- ELISA, RIA, RUST, RIST

9. Nanotechnology – Principles and applications of Nanotechnology in Biological Sciences.

**PHDCW 104: Term paper and related seminar presentation
(Under assigned Faculty- compulsory)**

Credit -4

Total Marks-50(25+25)



Dr. Sikha Dutta
Professor and Head
Department of Botany
The University of Burdwan
Purba Bardhaman-713104
West Bengal