

Ph.D. Course Work in Applied Botany
Paper I – Research Methodology

Duration: 54 Hours

Course outcome:

- Basic requirements like methods of literature review, citation methods are given and they are trained in writing research paper
- Basic techniques useful in laboratory and in the field are given. Also, designing a sample and determining size of the sample etc are included. These are the essential prerequisites for research planning
- A detailed study of the theory and practice of microscopy of various types helps them in their research career
- Most of the analytical techniques listed in the syllabus are a prerequisite for research
- There is a unit on biosafety measures. This will include also the safety measures to be followed in laboratories
- A detailed knowledge on intellectual property right will help them in orienting their research towards getting patents and other related issues
- Statistics and computer applications are an integral component of any research career. Only basic methods are listed here. This needs to be expanded depending on the need

UNIT I: (10 Hours)

Research prerequisites:

- a) Testing of hypothesis – refinement of experiment
- b) Field/Lab. techniques. design, sample size
- c) Collection, compilation, analysis, interpretation of data and drawing conclusions.
- d) Literature retrieval, citation methods.
- e) Format in writing research paper/dissertation.

UNIT II: (10 Hours)

Principles of Instrumental Analysis:

Microscopy and Photomicrography:

- a) Tissue preparation
- b) Light Microscopy
- c) Fluorescent Microscopy
- d) EM-Transmission & Scanning
- e) Auto –radiography

UNIT III: (12 Hours)

Analytical Techniques:

- a) Ultracentrifugation (Tissue fractionation)
- b) Chromatography techniques (HPLC, TLC, GC, Paper)
- c) Electrophoresis
- d) Spectrophotometry

UNIT IV: (12 Hours)

Safety and Toxicology (Occupation)

- a) Inhalation safety
- b) Permissible limits
- c) Safety appliances
- d) Biosafety
- e) Ethical Issues - GM crops, Ethical procedures on animal experiments

Intellectual Property Rights:

- a) Concepts and procedures for patents, designs, copyrights, trade marks
- b) Geographical indications
- c) Protection of new plant varieties
- d) Plagiarism

Future prospectives in the relevant branch.

UNIT V: (10 Hours)

Biostatistics and computer applications:

- a) Standard deviation
- b) Theory of probability
- c) Student-t-test
- d) Analysis of variance
- e) Graphical representation
- f) Principles of computing
- g) Computer application in biological research



References:

J.E. Celis, (1994): Cell Biology – a laboratory hand book, Vol. I, II and III, Academic press.

C. Hawkins and M. Sorgi (Eds) (1985) Research how to plan, speak and write about it, Springes- Verlag; Hiedelberg.

T.H. Hassard (1991) Understanding Biostat. Mosby year book, London

Norman T.J. Bailey (1994) Statistical methods in biology, 3rd edition, Cambridge University Press.

Philip Sheeler (1987) Cell and Molecular Biology, III edition, John Wiley New York.

Sadasivam S. and Manickam (1996) Biochemical Methods, New Age International Publishers, New Delhi.

Wilson, K. and Kenneth H. Goulding, 1987. A Biologist's Guide to principles and Techniques of Practical Biochemistry, 3rd Edition, English Language Book Society.

Paper II - Review of Literature

Course outcome:

- Review helps in a better understanding of the research problem
- They will be familiar with the sources of literature and the methods to access them
- This helps them to have an in-depth evaluation of the earlier research in the given topic
- They will also know the methods used so far and the limitations if any, of the earlier methods
- It helps them to mainly identify the gaps in a given topic which is essential to plan further research in the topics
- This will help in critically evaluating a given problem, understand the dynamics of writing a review including literature citation etc.



Ph.D. Course Work in Applied Botany
Course 2: Research and Publication Ethics (RPE)

THEORY

UNIT I: (3 Hours)

PHILOSOPHY AND ETHICS

- a) Introduction to philosophy: definition, nature and scope, concept, branches
- b) Ethics: definition, moral philosophy, nature of moral judgments and reactions

UNIT II: (5 Hours)

SCIENTIFIC CONDUCT

- a) Ethics with respect to science and research
- b) Intellectual honesty and research integrity
- c) Scientific *misconducts*. Falsification, Fabrication, and Plagiarism (FFP)
- d) Redundant publications: duplicate and overlapping publications, salami slicing
- e) Selective reporting and misrepresentation of data

UNIT III: (7 Hours)

PUBLICATION ETHICS

- a) Publication ethics: definition, introduction and importance
- b) Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
- c) Conflicts of interest
- d) Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
- e) Violation of publication ethics, authorship and contributorship
- f) Identification of publication misconduct, complaints and appeals
- g) Predatory publishers and journals

PRACTICE

UNIT IV: (4 Hours)

OPEN ACCESS PUBLISHING

- a) Open access publications and initiatives
- b) SHERPA/RomEO online resource to check publisher copyright & self-archiving policies
- c) Software tool to identify predatory publications developed by SPPU
- d) Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

UNIT V: (4 Hours)

PUBLICATION MISCONDUCT

A. Group Discussions (2 hrs.)

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 hrs.)

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

UNIT VI: (7 Hours)

DATABASES AND RESEARCH METRICS

A. Databases (4 hrs.)

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics (3 hrs.)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, CiteScore
2. Metrics: h-index; g index, i10 index, altmetrics

References.

- Bird, A. (2006). *Philosophy of Science*. Routledge..
- MacIntyre, Alasdair (1967) *A Short History of Ethics*. London.
- P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978- 9387480865
- National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist. A Guide to Responsible Conduct in Research.: Third Edition*. National Academies Press.
- Resnik, D. B. (2011)..What is ethics in Research & why is it important. *National Institute of Environmental Health Sciences*, 1 —10. Retrieved from <https://www.niehs.nih.gov/research/resources/tbioethics/whatis/index.cfm>
- Beall, J. (2012). Predatory publishers are corrupting open access. *Nature*, 489(7415), 179-179. <https://doi.org/10.1038/489179a>
- Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance(2019), ISBN:978-81 -939482-1 -7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf

