



Ph.D. Course Work Syllabus

Department of Botany
Tripura University
Suryamaninagar-799 022
Tripura

COURSE STRUCTURE (ONE SEMESTER COURSE)

Course Code	Course Name	Marks	Credit
PRM1-3011	Research Methodology-1	100	4
PRPE-3012	Research and Publication Ethics	100	2
PBOT-3013	Advanced Areas of Plant Research	100	4
PBOT-3014	Analytical Skill in Plant Research	100	4

Syllabus for Coursework Ph. D. Programme Research Methodology-I

Course Code: PHD9001

Course Title: Research Methodology - I

Credits: 4

Duration: 1 Semester

Total Marks: 100

Program Outcome (PO):

- Equip students with advanced research techniques, methodologies, and practices.
- Develop analytical skills to critically evaluate existing literature and data.
- Provide tools for formulating research questions, hypotheses, and designing research studies.
- Enhance the ability to conduct independent research that contributes to knowledge in the respective field.

Learning Outcomes (LO):

Upon successful completion of the course, the students will be able to:

1. Understand the foundational concepts and principles of research.
2. Demonstrate knowledge of various research methodologies and techniques.
3. Identify the appropriate research methodology for different types of research problems.
4. Formulate clear research questions, objectives, and hypotheses.
5. Apply statistical tools and techniques for data analysis.
6. Communicate research findings effectively through reports, papers, and presentations.

Course Structure:

Unit 1: Introduction to Research and Research Process

- **Concept of Research:** Definition, types of research, significance in academia and industry.
- **Research Process:** Steps in the research process, formulation of research questions and hypotheses.
- **Research Design:** Concept, importance, and types (descriptive, exploratory, experimental, etc.).

Unit 2: Research Methods and Methodology

- **Qualitative and Quantitative Research:** Definitions, methods, and approaches.
- **Sampling Techniques:** Types of sampling methods – probability vs. non-probability sampling.
- **Data Collection Methods:** Surveys, interviews, questionnaires, case studies, focus groups, observation, Laboratory, ethnographic, etc.
- **Data Analysis and Interpretation:** Overview of statistical tools and methods.

Unit 3: Literature Review and Research Question Formulation

- **Literature Review:** Purpose, techniques for conducting a literature review, evaluating sources.
- **Developing a Research Question:** From literature, identifying gaps, formulating clear, researchable questions.
- **Theoretical Framework:** Understanding and formulating theoretical perspectives and models.

Unit 4: Writing and Presentation of Research

- **Research Paper Writing:** Structure, components (Abstract, Introduction, Literature Review, Methodology, Results, Discussion).
- **Citations and References:** Importance of proper citation styles (APA, MLA, Chicago).
- **Thesis Writing:** Organizing and presenting a doctoral thesis.
- **Oral Presentation Skills:** Preparing for research defense, presenting research results effectively.

Unit 5: Future Trends

- **Emerging Research Tools:** Artificial Intelligence generative tools, Digital resources
- **Role of Inter-disciplinary/ Multidisciplinary/ Trans-disciplinary research.**

Recommended Books/References:

Bell, J. (2010). *Doing Your Research Project*.

Berg, Bruce L. *Qualitative Research Methods for the Social Sciences*.

Bernard, H.R. (2017). *Research Methods in Anthropology: Qualitative and Quantitative Approaches*.

Booth, W.C., Colomb, G.G., & Williams, J. M. (2008). *The Craft of Research*.

Braun, V., & Clarke, V. (2006). *Using Thematic Analysis in Psychology*.

Bryman, A. (2016). *Social Research Methods*. New York: OUP.

Burns, R.B. (2000). *Introduction to Research Methods*.

Cooper, H., & Hedges, L. V. (Eds.). (2009). *Handbook of Research Synthesis and Meta-Analysis*.

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*.

Creswell, J.W., & Poth, C.N. (2018). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*.

Davis, Gordon B. *Writing the Doctoral Dissertation: A Systematic Approach*.

Denscombe, M. (2014). *The Good Research Guide: For Small-Scale Social Research Projects*.

Field, A. (2017). *Discovering Statistics Using IBM SPSS Statistics*.

Flick, U. (2018). *An Introduction to Qualitative Research*.

Gerring, J. (2012). *Social Science Methodology: A Unified Framework*.

Gravetter, F.J., & Wallnau, L.B. (2017). *Essentials of Statistics for the Behavioral Sciences*.

Gupta, S. C. *Fundamental of Statics*, Himalaya Publishing.

Gupta, S. P. *Statistical Methods*, Sital Chand & Sons

Jupp, V. (2006). *The Sage Dictionary of Social Research Methods*.

Kothari, C. R. (2004). *Research Methodology: Methods and Techniques*. New Delhi: New Age International,



- Kumar, R. (2011). *Research Methodology: A Step-by-Step Guide for Beginners*.
- Marcoulides, G. A. (Ed.) *Modern methods for Business Research*. Psychology Press.
- Machi, Lawrence & McEvoy, Deborah A. *The Literature Review: Six Steps to Success*.
- McKinney, K., & Hargrove, T. (2018). *The Interdisciplinary Handbook of Research Design*.
- Melville, Stuart & Wayne, Goddard. *Research methodology : an introduction for science & engineering students*.
- Neuman, W.L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches*.
- Pallant, J. (2013). *SPSS Survival Manual*.
- Patton, M.Q. (2002). *Qualitative Research & Evaluation Methods*.
- Ranjit Kumar. *Research Methodology: A Step-by-Step Guide for Beginners*.
- Saunders, Mark, et al. *Research Methods for Business Students*.
- Schutt, R. K. (2019). *Investigating the Social World: The Process and Practice of Research*.
- Sekaran, U., & Bougie, R. (2016). *Research Methods for Business: A Skill-Building Approach*.
- Silverman, D. (2016). *Qualitative Research*.
- Silvia, Paul J. *How to Write a Lot: A Practical Guide to Productive Academic Writing*.
- Strunk, William Jr. & White, E. B. *The Elements of Style*.
- Tabachnick, B.G., & Fidell, L.S. (2013). *Using Multivariate Statistics*.
- Turabian, K. L. (2018). *A Manual for Writers of Research Papers, Theses, and Dissertations*.
- Walliman, N. (2017). *Your Research Project: Designing and Planning Your Work*.
- Wayne, Goddard & Melville, Stuart. *Research Methodology: An introduction*
- Zikmund, W. G. Babin, Carr, J.C. & Gri, M. *Business Research methods*. Mason: Cengage Learning.

Suggested Tools/Software:

- SPSS, R, Excel for data analysis.
- Zotero, Mendeley, RefWorks, EndNote for reference management.

Syllabus for Research and Publication Ethics

Course Code: RPE-3012 (Research & Publication Ethics)

Credits: 02

Marks: 50

(a) Philosophy and Ethics: 3hrs

Introduction to philosophy: definition, nature and scope, concept, branches;

Ethics: definition, moral philosophy, nature of moral judgements and reactions

(b) Scientific Conduct: 5hrs

Ethics with respect to science and research; Intellectual honesty and research integrity; Scientific misconducts: falsification, fabrication and plagiarism (FFP); Redundant publications: duplicate and overlapping publications, salami slicing; Selective reporting and misrepresentation of data, falsification of images

(c) Publication Ethics: 7hrs

Definition, introduction and importance of publication ethics; Best practices/standards setting initiatives and guidelines: COPE, WAME, etc.; Publication misconduct: Unethical behavior and vice versa; Violation of publication ethics, authorship and contributorship; Identification of publication misconduct, complaints and appeals; Predatory publishers and journals

(d) Open Access Publishing: 4hrs

Open access publications and initiatives; SHERPA/RoMEO online resource to check publisher copyright and self-archiving policies; Software tool to identify predatory publications developed by SPPU; (Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester)

(e) Publication Misconduct: 4hrs

Group discussions on - (i) Subject specific ethical issues, FFP, authorship; (ii) Conflicts of interest;

(iii) Complaints and appeals: examples and fraud from India and abroad; Using Software tools –

(iv) Anti-plagiarism tools like Turnitin, Urkund, Drill Bit and i-Thenticate and other open sources software tools

(f) Databases and Research Metrics: 7hrs

(i) Databases - Indexing databases, Citation databases: Web of Science, Scopus etc.;

(ii) Research Metrics - Impact factor of journal as per Journal Citation Report,

SNIP, SJR, IPP, Cite Score, h-index, g index, i10 index, altmetrics;

(iii) Citation of bibliography using Mendeley

Recommended Books/Journals

1. A. Bird. (2006), Philosophy of Science, Routledge
2. P. Chaddah. (2018) Ethics in Competitive Research: Do not get scooped: do not get plagiarized: ISBN: 9789387480865
3. National Academy of Science, National Academy of Engineering and Institute of Medicine. (2009). On Being a Scientist: A Guide to Responsible Conduct in Research, 3rd Edition, National Academies Press.
4. D. B Resnik. (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/bioethics/whatis/index.cfm>
5. J. Beall, (2012). Predatory publishers are corrupting open access. Nature 489 (7415), 179-179 <https://doi.org/10.1038/489179a>
6. 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.p

Syllabus For Advanced Areas of Plant Research

Course Code:PBOT-3013

4 Credits

Total Marks: 100

I. Gene in reproductive development in plant: MADs box genes and flower development –revised ABC model; Reporter Gene and GUS activity in molecular embryogeny; Cell cycle and role of Cyclins; Programmed Cell Death; micro RNA, RNA interference. Genomic imprinting. Metagenomics, DNA chips, DNA microarray; Signal transduction: receptors and G-protein, two component sensor- regulator system in bacteria and plants. Mechanism of action of phytohormone in photomorphogenetic responses. Mechanism of biotic and abiotic stress tolerance. Techniques of plant transformation principle, theory and characterization of transgenic and applications. Safety aspects of genetically modified crops.

II. Recent trends in plant taxonomy. Population dynamics. Molecular evolution, molecular clock and molecular phylogeny; Use of conserve sequences and DNA barcoding in molecular phylogeny; RNA world. DNA Recombinant technology. Niche modeling. Remote sensing methods. Phytoremediation. Immobilization of microbial enzymes. Microbial degradation of hydrocarbons. Allelopathy and allelochemicals; Phytoalexins; Systemic acquired resistance (SAR), Resistance (R) Proteins, self-incompatibility and role of systemin.

Course Code: PBOT-3014 (Analytical Skill in Plant Research)

Credit-4

Total Marks: 100

(A) Review and critics of Published works:

Review of published research papers in different fields of plant sciences; submission

(1 credit) 25 marks

(B) Power point presentation of review work

(1 credit) 25 marks

(C) Field work:

(1 credit) 25 marks

Biodiversity assessment of phytoresources of Tripura: at least two field tour in two altitudinal gradients/ Industry visit/ Research Institute visit and submission of report.

(Survey: 15 marks; submission: 10 marks)

(D) Hands on training:

(1 credit) 25 marks

- i. Techniques of novel indigenous mushroom spawn preparation
- ii. Sequence alignment and database searching
- iii. *In silico* primer designing
- iv. Sequence submission in Gene Bank
- v. Construction of phylogenetic trees.
