

Ph.D. PHYSICS

SYLLABUS

(For the batches joining in 2024–2025 and afterwards)



DEPARTMENT OF PHYSICS

The Gandhigram Rural Institute–Deemed to be University

Gandhigram - 624 302

Dindigul District - Tamil Nadu, India.

Ph.D., COURSE WORK

| Semester | Course Code | Items | Credits |
|-----------------|----------------------------------|---|----------------|
| I | Paper - I 24PHYH0101 | Research Methodology | 4 |
| | Paper - II 24PHYH0102 | Basic concepts and Theory in the Subject area (Designed by Doctoral Committee) | 4 |
| | Paper - III 24PHYH0103 | Specific area of Research / Area of Specialization (Designed by Doctoral Committee) | 4 |
| | Paper - IV 24PHYH0104 | Research and Publication Ethics | 2 |
| | | | Total |

24PHYH0101 - Research Methodology

Credit: 4

Max. Marks: 100

Contact hours: 62

Objectives:

- To develop scientific skills and expertise in formulating problem for research
- To evolve research methods and techniques in conducting research and
- To develop professional skill in writing a research report.

Learning outcomes:

Upon completion of the course, the scholars will be able to:

- Identify and formula a problem for research
- Prepare a suitable research design for carrying out the research
- Choose appropriate tools and techniques for data collection
- Prepare research report and disseminate research findings.

UNIT I: Scientific Research: Methods of acquiring knowledge – Objectivity and Subjectivity in Research – Epistemology – Phenomenology – Positivism – Constructivism – Pragmatism – Inductive and deductive reasoning – Scientific method and its application – Research paradigms and Ethics in Research.

UNIT II: Research Process: Identification – Selection and formulation of problem – Sources and criterion for selection – Review of literature and summarizing
– Conceptual model – Objectives – Hypothesis formulation – Variables and its types.

UNIT III: Research design and methods: Experimental, explorative, descriptive and historical research – Qualitative and Quantitative studies – Trend and futuristic studies – Purpose and preparation of research design – Types of research design – Historical – descriptive and Experimental – Field survey – diagnostic and evaluation research – Qualitative and Quantitative methods – problem solving – development and interdisciplinary research.

UNIT IV: Numerical differentiation: Numerical differentiation – Numerical integration – General quadrature formula – Trapezoidal rule – Simpson's rule – Weddle's rule – Curve fitting – principles of least squares – fitting a straight line – parabola and exponential curve.

UNIT V: Report writing: Significance of report writing – Layout of the Research report – types of reports – Steps in writing Research report –Bibliography – Reference management system (Mendeley) – Webliography – Style of writing – Evaluation of a Research report – Dissemination of Research findings – Presentation and publication – Ethics of publication and plagiarism.

BOOKS FOR STUDY:

UNIT I:

1. Earl Babbie, “The practice of Social research”, Tenth edition, Pg.no:5-82.
2. John Best, “Research methodology in education”.

UNIT II:

1. Ranjit Kumar, “Research methodology”, Pg.no:31-89, Sage publication,2010.
2. John W. Creswell, “Research design-Quantitative and qualitative approaches”,Pg.no:69-114,Fourth edition.Thousand Oaks,CA:Sage, 2014.

UNIT III:

1. Deepak Chawla, Neena Sondhi, “Research methodology (concepts and cases)” Pg.no:607-629, Vikas publication House Pvt ltd, 2011.
2. Kerlinger, “Foundations of Behavioral Research”, Surjeet publications, 1983.

UNIT IV & V:

1. C. R. Kothari, “Research methodology methods and techniques”, New ageInternational publishers, New Delhi.

BOOKS FOR REFERENCES:

- Bridget Somekh and Cathy Lewin, Theory and methods in social science Research, New Delhi, Sage publication,2012.
- DebasisChakroborthy, Research methodology, New Delhi:Sourath publishingHouse, 2012.
- Kenneth’s Barden and Bruce B.Abbott, Research design: Qualitative andQuantitative approaches, Tata McGraw Hill Education Pvt, New Delhi, 2011.
- Kundra S, Reporting methods, Anmal publications Pvt Ltd, 2005.
- Vijayalakshmi G and Sivapragasam C, Research methods: Tips and techniques, Chennai, MJP publishers, 2009.

24PHYH0104 – RESEARCH AND PUBLICATION ETHICS

Credit: 2
Contact hours: 32

Max. Marks: 100

Objectives:

- Provide students with the fundamental knowledge of research methods and designs used.
- Facilitate students understanding on how using valid scientific methods of measurement and scaling can improve knowledge.
- Analyze and interpret methods of quantitative and qualitative data.
- Guide and mentor students in developing, completing, writing and presenting a valid and ethical research report.
- To know about the University Grants Commission (UGC), this has launched a Consortium of Academic Research Ethics (CARE) to “identify, continuously monitor and maintain” UGC-CARE reference list of quality journals across disciplines.

Learning outcomes:

- Students will be familiar with the fundamental knowledge of basics of philosophy of science and ethics, research integrity, publication ethics.
- Students will know about predatory journals/pseudo journals and fabrication of data.
- Understand the subject specific ethical issues, FFP, authorship, conflicts of interest, complaints and appeals; examples and fraud from India and abroad.
- Understand the major and authentic databases of reputed journals like Web of Science, Scopus, PubMed, ICI.
- Understand the importance of SCI impact factor, SNP, SJR, IPP, h-index, g index, i10 index.

UNIT I: Introduction to philosophy: Definition, nature – scope – concept
– branches – Ethics definition – moral philosophy – nature of moral judgements and reactions – Ethics with respect to science and research –Intellectual honesty and research integrity–Science misconducts –Falsification, fabrication and Plagiarism (FFP) – Redundant publications –duplicate and overlapping publications – salami slicing –Selective reporting and misrepresentation of data.

UNIT II: Publications ethics: Definition, introduction and importance – Best practices / standard setting initiatives and guidelines – COPE. WAME. etc., - Conflicts of interest – Publication of misconduct definition – concept – problems that leads to unethical behavior and vice versa – type – Violation of publication ethics – authorship and contributor ship – Identification of publication misconduct complaints and appeals – Predatory publishers and journals.

UNIT III: Journals: Open access publications and initiatives – SHERPA/ROMEIO 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 etc.,

UNIT IV: Ethical issues: Subject specific ethical issues, FFP, authorship – Conflict of interest – complaints and appeals: examples and fraud from India and abroad
– Use of plagiarism software like Turnitin, Urkund and other open source software tools.

UNIT V: Databases: Indexing databases – Citation databases: Web of Science, Scopus etc., - Impact of factor of Journal as per Journal citation report, SNIP, SJR, IPP, Cite score – Metrics: h-index, g index, i10 index, altmetrics, IPR.

Books for study and references:

1. Bird, A. (2006). Philosophy of Science. Rutledge.
2. Macintyre, Alasdair (1967) A Short History of Ethics, London
3. P.Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865.
4. 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 Academic Press.
5. 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/bioethics/whatis/intex.cfm>
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 543 (7415), 481-483 <http://doi.org/10.1038/489179a>
7. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7. https://www.insaindia.res.in/pdf/Ethics_Books.pdf