

**School of Physical Sciences**  
**Syllabus for Pre-PhD Entrance Exam**

**Paper: Research Methodology**

**Unit-I** - Objectives and types of research: Motivation and objectives –Types of research – Research Formulation – Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – Critical literature review – Identifying gap areas from literature review - Development of working hypothesis.

**Unit-II** - Research design and methods – Research design – Basic Principles- Need of research design — Features of good design – Important concepts relating to research design – Developing a research plan - Exploration, Description, Diagnosis, Experimentation. Determining experimental and sample designs. Data Collection and analysis: Execution of the research - Observation and Collection of data.

**Unit-III** - Reporting and thesis writing – Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes - Oral presentation – Planning – Preparation – Practice – Making presentation – Use of visual aids - Importance of effective communication.

**Unit-IV** - Application of results and ethics - Environmental impacts - Ethical issues - ethical committees - Commercialisation – Intellectual property rights and patent law – Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

**Unit V:** Computational Methods - Computer and its role in research, Use of GUI software: Origin, Igor Pro, ChemDraw, Simulation software, ZsimpWin, Image J.

**REFERENCES**

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, Ess Ess Publications. 2 volumes.
4. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
5. Wadehra, B.L. 2000. Law relating to patents, trademarks, copyright designs and geographical indications. Universal Law Publishing.