



Research
Methodology:
4 Credits

Course outcomes for Ph.D courses including Research Methodologies, Research Ethics and Subject specific courses

1. Students after completing the six month course will have in depth knowledge of disciplines related to the topic of research-
2. Students will be able to apply mathematical skills to formulate problems in the field of research
3. Students will have knowledge of various simulation and hardware tools and utilize their knowledge of using instruments and simulation techniques in their research pursuit.
4. Students will develop the skills of critical judgment of previous works and identification of research gaps
5. Students will develop skills to access information/data from vast sources and present the information in scientific manner
6. Students will abstain from plagiarism and be aware of standard protocols of conducting quality research
7. Students will be able to write articles as per the standard format.

B. Pivale
6/6/2020



Annexure -3 – Syllabus of Research methodologies

COURSE-1: Advanced Research Methodology for Engineering, Science & Technology streams

Course objective:

To prepare scholars for research work and equip them to carry out individual or team research work according to scientific/technology requirements.

Learning Outcomes:

At the end of the course the scholar should be able to:

- i) Identify and describe researchable ideas, projects and themes;
- ii) design and specify methods for carrying out a scientific research and demonstrate possession of skills and attitudes to conduct such research ;
- iii) be able to analyze data using scientific methodologies; and
- iv) present research results in a systematic and objective way

Course Content:

Unit- 1: Research and Types of research: Meaning of Research- Objectives of Research- Motivation in Research. Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Research Process. Criteria of good Research. 2 hours

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 – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis. 6 hours

Research design and methods – Research design – Basic Principles- Need of research design — Features of good design – Important concepts relating to research design – Observation and Facts, Laws and Theories, Prediction and explanation, Induction, Deduction, Development of Models. Developing a research plan - Exploration, Description, Diagnosis, Experimentation. Determining experimental and sample designs. 7 hours

Unit-2: Data Collection and analysis - I: Execution of the research - Observation and Collection of data - Methods of data collection – Modeling, Mathematical Models for research, Sampling Methods- Data Processing and Analysis strategies. Data Analysis with Statistical Packages – Hypothesis-testing, Generalization-and-Interpretation. 8 hours

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. 4 hours

Application of results and ethics - Environmental impacts - Ethical issues - ethical committees - Commercialization – Copy right – royalty - Intellectual property rights and patent law – Trade Related aspects of Intellectual Property Rights – Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability. 3 hours

Post Midterm Test:

Session on :

LATEX: Introduction to LATEX and it's usage in documentation, preparation of thesis, technical papers and articles 9 hours

Literature Review : Visit to the Library and do necessary preparation to come up with Literature Review Report and submit the same

21 hrs

Reference Books:



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, trade marks, copyright designs and geographical indications*. Universal Law Publishing.
6. Leedy, P.D. and Ormrod, J.E., 2004 *Practical Research: Planning and Design*, Prentice Hall.
7. Satarkar, S.V., 2000. *Intellectual property rights and Copy right*. Ess Ess Publications

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