

## Course Outcome of PhD Courses

### Paper-I: Research Methodology

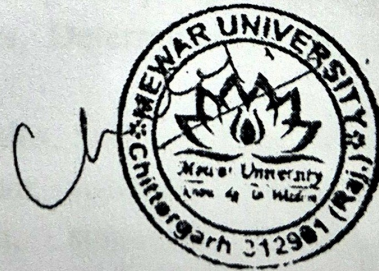
#### Course Outcome

1. To understand and comprehend Research Paradigms and Philosophies.
2. To enable them appropriate Tools and Methods for Research Data analysis.
3. To understand the Inferential and Non parametric statistics.
4. To develop Research Ethical Considerations.
5. To enable the skill of Logical form and Writing Research Report.

### Paper-II: Information and Communication Technology (ICT)

#### Course Outcome

1. To imbibe Advanced Technical Knowledge and Research Skills.
2. To encompass Problem-Solving approach and Innovation.
3. To embrace Teaching and Mentorship with better Communication.
4. To assimilate the Publication and Presentation Skills.
5. To augment the Interdisciplinary Collaboration.



## Detailed Syllabus

### **Paper-I: Research Methodology**

1. Introduction to Research Methodology: Meaning of Research, Objectives of Research, Motivations in Research, types of Research, Research Approaches, Significance of Research, Research Methods v.s Methodology, Research and Scientific Methods, Research Process, Criteria of good research and ethics in research.
2. Defining the Research Problem: Concept and need, Identification of Research problem, defining and delimiting Research problem.
3. Research Questions and Hypothesis: Variables and their linkages, characteristics of good Hypothesis. Research question and formulation of hypotheses-directional and non-directional hypotheses, Basis for hypotheses, Design of hypothesis based on deeper ROL by focusing on the citation of relevant researches.
4. Research design: Meaning, Need, Features of Good Design, Concepts, Types. Basic principles of Experimental Design, various methods of Research. Survey, Philosophical, Historical, Experimental, Causal Comparative, Genetic, Case Studies.
5. Tools for Data Collection: Collections of Primary Data, Collection of Data through questionnaire and Schedules, other Observation Interview Methods, Collection of Secondary Data, Selection of appropriate method for data collection, Case Study, Focus Group Discussion, Techniques of developing research tools, viz. Questionnaire and rating scales etc.  
Reliability and validity of Research tools.  
Sampling: Probability and Non Probability sampling- types and criteria for selection. Developing sampling Frames, Determination of sample size by using statistical formula.  
Descriptive Statistics: Measurement Scales, Sources of error in measurement. Measures of central Tendency (Mean, median, Mode), Measures of dispersion (range, mean deviation, standard deviation) Graphical representation of Data.
6. Inferential statistics: Normal Probability Curve- Meaning, characteristics and applications. Standard error. Confidence Intervals and Fiduciary limits. Type I and Type II errors. Estimating Population Means.



- Paper-II, ICT
- a. Correlations: Rank Difference Method Pearson's Product Moments Correlation Significance of correlation. Concept of Variance. Other methods of Correlation (Concept and application only)- Partial and Multiple correlation Biserial, Point Biserial, tetra choric and Phi correlation. Regression and Multiple Regression equations (concept and applications)
  - b. Sampling Distribution, Null Hypothesis- Alternative Hypothesis. Testing the Significance of difference between means (z and 't' test)
  - c. Analysis of Variance (ANOVA) and Analysis of covariance (ANCOVA) concept and applications only.
  - d. Factor Analysis and Path Analysis (concept and applications).
7. Non Parametric Statistics: Wilcoxon Test- steps, characteristics and application, Sign Test, man- Whitney u Test, Chi Square test- steps, Characteristics and applications. Relationship between chi square and phi correlation.
8. Logic: Logical form, deductive and inductive reasoning, consistency, validity, soundness and completeness, western and oriental conception of logic.
9. Writing Research Report: Format and style. Review of related literature its implications at various stages of research. (Formulation of research problem, hypothesis, interpretation and discussion of results). Major findings. Conclusions and suggestions. Citation of references and Bibliography.

#### Reference Books:

- a) Best and Kahn, Research Methodology, PHI Limited.
- b) Kothari, C.R. Research Methodology (Methods and Techniques), New Age Publisher.
- c) Kerlinger, Foundation of Research.
- d) Fundamentals of modern statistical methods by Rand R. Wilcox.
- e) Power Analysis for Experimental research A Practical Guide for the Biological, Medical and social Sciences by R. Barker Bausell, Yi-Fang Li Cambridge University Press.
- f) Design of Experience: Statistical Principles of Research Design and Analysis, by Robert O. Kuehl Brooks/cole.



## Paper-II: ICT

Word Processing: Word features, Creating, Saving and Opening Documents in Word, Interface, Toolbars, Ruler, Menus, Keyboard shortcut, Editing, Previewing, Printing and Formatting a Document, Advanced Features of MS Word, Find and replace, using thesaurus, using Auto-Multiple Functions, Mail Merge, Handling Graphics, tables and Charts, Covering a word Document into various Formats like- text ,Rich Text format, WordPerfect, HTML,PDF etc.

Worksheet: Excel: Worksheet Basics, Working with single and multiple workbook, working with formula & cell referencing, Auto sum, Copying formulae, Absolute & relative addressing, Worksheet with ranges, Formatting of worksheet, Previewing and printing Worksheet, Graphs and charts, Database, Creating and using Macros, Multiple Worksheets-concepts, Creating and using, data analysis and display.

Presentation: PowerPoint: Creating Slide show with animations. Auto Wizard, Creating a Blank presentation, auto layout, Screen layout and views, insert a new slide, applying design template, changing slide layout, recording and hiding a slide4s, slide show and editing custom slide, resizing a text box, Text Box Properties, Delete a text Box, Bulleted Lists, numbered lists, adding notes, video and audio, Adding text editing options, Formatting text, Replace fonts. Line spacing, change case spelling check, color schemes, Adding clip art, Adding an image form a file, Editing graphic, Auto Shapes, Word Art, backgrounds, Action Buttons, Slide Animation, Preview Slide transactions, Slide Show options, Slide Master, Header and Footer, Slide Numbers, Date and Time. Education and Research Resource son Net: Encyclopedia, Wikipedia, On-Line Tutorials and lectures, Virtual labs, Open Course-wares, Electronic Journals, E-Books, Digital Libraries, Searching research Information.

Professional Written Communication: Students prepare E-mails, Letters, memos, proposals, formal and informal reports.

Oral Communication: Impromptu and Extemporaneous methods of delivery.

Oral Presentations using usual aids such as handouts, overhead transparencies and presentation software such as PowerPoint.



## Information and Communication Technology (ICT)

### Course Outcomes

1. **Advanced Research Skills:** Develop advanced research skills, including the ability to formulate research questions, design experiments, gather and analyse data, and draw meaningful conclusions.
2. **Specialized Knowledge:** Gain an in-depth understanding of specific areas within ICT, such as networking, cyber security, artificial intelligence, data science, or any other relevant subfield based on your research focus.
3. **Contribution to Knowledge:** Make an original and significant contribution to the field of ICT through your research. This could involve developing new theories, algorithms, technologies, or methodologies.
4. **Research Publications:** Publish your research findings in reputable journals and present them at conferences to disseminate knowledge within the academic and professional communities.
5. **Critical Thinking and Problem-Solving:** Enhance your critical thinking and problem-solving skills, which are essential for addressing complex issues in ICT.
6. **Interdisciplinary Skills:** Develop the ability to work across disciplines, as ICT often intersects with fields like computer science, engineering, mathematics, and social sciences.
7. **Teaching and Mentorship:** Gain experience in teaching and mentoring undergraduate or graduate students in ICT-related subjects, preparing you for potential academic positions.
8. **Effective Communication:** Improve your oral and written communication skills to convey complex technical concepts to both expert and non-expert audiences.
9. **Ethical Considerations:** Understand and adhere to ethical principles in research and development, particularly concerning data privacy, cybersecurity, and responsible innovation.
10. **Project Management:** Acquire project management skills to effectively plan, execute, and complete research projects on time and within budget.
11. **International Collaboration:** Foster collaboration with researchers and institutions on a national and international scale to broaden the scope and impact of your research.
12. **Problem Identification:** Identify real-world problems in ICT and propose innovative solutions that can have practical applications.
13. **Adaptability:** Stay current with emerging technologies and trends in ICT and adapt your research accordingly.
14. **Professional Networking:** Build a strong professional network within academia, industry, and relevant professional organizations.
15. **Thesis/Dissertation:** Successfully complete and defend your Ph.D. dissertation, which should demonstrate your expertise, research contributions, and ability to conduct independent research.



## Research Methodology

### Course Outcomes

1. **Research Design:** Develop the ability to design research projects effectively, including formulating research questions, hypotheses, and objectives.
2. **Data Collection Methods:** Gain proficiency in various data collection methods such as surveys, interviews, observations, experiments, and archival research.
3. **Data Analysis Techniques:** Learn and apply appropriate statistical and qualitative data analysis techniques, depending on the research questions and data type.
4. **Literature Review:** Conduct comprehensive literature reviews to identify gaps in existing research and situate your work within the broader academic context.
5. **Research Proposal:** Prepare and present a well-structured research proposal, demonstrating the feasibility and significance of your research.
6. **Data Management:** Understand best practices for data management, storage, and security to ensure the integrity and confidentiality of research data.
7. **Ethical Considerations:** Explore and discuss ethical issues related to research, including informed consent, privacy, confidentiality, and the responsible conduct of research.
8. **Research Integrity:** Develop an understanding of research integrity and the importance of avoiding plagiarism and other forms of academic misconduct.
9. **Research Collaboration:** Enhance your skills in collaboration and teamwork, as research often involves working with other researchers and experts.
10. **Communication Skills:** Improve your ability to communicate research findings effectively through academic writing, presentations, and visualizations.
11. **Critical Thinking:** Foster critical thinking skills necessary for evaluating research methodologies, data, and results critically.
12. **Research Project Management:** Learn project management skills to plan and execute research projects efficiently and meet deadlines.
13. **Research Funding:** Understand the process of applying for research grants and funding opportunities, including proposal writing and budgeting.
14. **Publication and Dissemination:** Prepare and submit research papers to peer-reviewed journals and conferences, and understand the peer-review process.
15. **Research Ethics Committee (REC) Procedures:** Gain insight into the procedures and protocols for seeking ethical approval for research involving human subjects or sensitive data.
16. **International and Cross-Cultural Research:** Develop an awareness of cross-cultural and international research considerations, particularly when conducting research in diverse settings.
17. **Responsible Conduct:** Learn about responsible research conduct, including how to handle conflicts of interest and adhere to professional and ethical standards.
18. **Feedback Incorporation:** Develop the ability to incorporate feedback and criticism constructively into your research work.
19. **Research Presentation Skills:** Hone your skills in presenting your research findings to diverse audiences, including fellow researchers, stakeholders, and the general public.
20. **Researcher's Toolkit:** Familiarize yourself with various research software, tools, and resources that can aid in data collection, analysis, and visualization.

