Research Methdology in CSE, MTech-I (1st semester)

Syllabus, Texts, Evaluation Plan

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Topics of Study

Ch1: Introduction: What Is Research? Definition, Characteristics, Motivation and Objectives, Research Methods vs Methodology. Research as an integral part of professional practice. A way to gather evidence for practice. Evidence-based practice. Applications of research in practice. Development and policy formulation.

Overview of the research process: its characteristics and requirements Types of research: Descriptive vs Analytical, Applied vs Fundamental.

Overview of Research Designs: Quantitative vs Qualitative vs Mixed Methods Designs. Conceptual vs Empirical.

Research Process & Methodology: The research process as an eight step model. Deciding what to research. Planning how to conduct the study. Conducting the research study. [DCJ: 4 hours]

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Topics of Study...

Ch2: Formulating a research problem & Literature Review: Reviewing the literature. The place of the literature review in research Bringing clarity and focus to research problem. Improving research methodology. Broadening knowledge base in research area. Contextualising findings.

Difference between a literature review and a summary of the literature. How to review the literature Searching for the existing literature. Reviewing the selected literature. Developing a theoretical framework. Developing a conceptual framework Writing about the literature reviewed. Abstracting Studies. Examples.

What makes a good research question? The research problem. The importance of formulating a research problem. Sources of research problems. Considerations in selecting a research problem. Steps in formulating a research problem. The formulation of research objectives. The study population. Establishing operational definitions. Formulating a research problem in qualitative research. [DRP: 8 hours]

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Topics of Study...

Ch3: InRedApproaches for problem solving. Problem Solving strategies: Representation, Logical Thinking. Division into subproblems. Stretch to the extreme. Discussion of each using case studies. Techniques of representation viz. reformulation, symbolic, Table(list, matrix), Graph, Trees, Venn Diagram, Other diagrams, UML diagrams.

Problem finding. Problem solving vs problem finding. Attributes of a good research problem viz. difficulty, value/utility, originality, interesting, significance, cost/equipment/cooperation. Intuitive vs Algorithmic approach to solve problems.

The importance of hypothesis and simulation/experimentation. Identifying variables. What is a variable? The difference between a concept and a variable. Constructing hypotheses. The definition of a hypothesis. The functions of a hypothesis. The testing of a hypothesis. The characteristics of a hypothesis. Types of hypothesis. [DCJ: 8 hours]

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Topics of Study...

Ch4: Research Designs: Conceptualizing Research Designs: The research design: What is a research design? The functions of a research design. The theory of causality and the research design.

Study designs in quantitative research. Study designs based on the number of contacts, based on the reference period, based on the nature of the investigation. Variables in Quantitative Research. Definition of a Theory in Quantitative Research. Forms of Theories in Quantitative Research. Placement of Quantitative Theories. Writing a Quantitative Theoretical Perspective. Other designs commonly used in quantitative research. Case studies.

Study designs in qualitative research. Qualitative Theory Use. Variation in Theory. Use in Qualitative Research. Locating the Theory in Qualitative Research. Case studies.

Mixed mode approaches. Other commonly used philosophy-guided designs. Action research. Feminist research. Participatory research and collaborative enquiry [DCJ: 12 hours]

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Topics of Study...

Ch5: Data Modeling and Simulations: Constructing an instrument for Data Collection and Selecting Samples. Differences in the methods of data collection in quantitative, qualitative and mixed methods research. Major approaches to information gathering. Methods of data collection in qualitative research. Methods of data collection in quantitative research. Collecting data using attitudinal scales. Establishing the validity and reliability of a research instrument.

Sampling: Sampling in quantitative research: The concept of sampling Sampling terminology. Principles of sampling. Factors affecting the inferences drawn from a sample. Aims in selecting a sample. Types of sampling. The calculation of sample size. Sampling in qualitative research. The concept of saturation point in qualitative research.

Mathematical Modeling. Experimental Skills, Simulation Skills, Data Analysis and Interpretation. Linear and nonlinear modeling, Classical statistical tests, Time-series analysis, Classification, Clustering. Using tools (MATLAB, R) for statistical modeling and simulation. [MAZ: 12 hours]

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Topics of Study...

Ch6: Software Tools and Techniques for Research. Software Tools to search required information effectively. Reference Management Software. Academic Writing Tool. Using Google Scholar, ResearchGate and other such gateways. Statistical Testing Tools. Software for Paper Formatting. Software for Detection of Plagiarism. Project management tools. [DCJ: 4 hours]

Ch7: Writing Research Proposals and Papers & Mistakes to avoid. The research proposal in quantitative and qualitative research. Contents of a research proposal: Preamble/introduction, The research problem, Objectives of the study, Hypotheses to be tested, Study design. Structure of the report, Problems and limitations. Writing Research papers. Steps. The importance of outline. Writing Abstracts and Introduction sections. Writing Conclusions. The body of the research papers. Writing style. Mistakes to avoid. Understanding the review process and the fact that the reviewer is always right. Mistakes to avoid interpreting reviews. [DRP: 4 hours, DCJ: 4 hours]

Texts and References

1. John W. Creswell, J. David Creswell. “Research Design: Qualitative, Quantitative, and Mixed Methods Approaches”, SAGE Publications Ltd.
2. Ranjit Kumar. ”Research Methodology: A step-by-step guide for the beginners.” SAGE Publications Ltd.
3. C.R. Kothari,and Garg ”Research Methodology: Methods and Techniques”, New Age International Publishers.
4. David Silverman,”Qualitative Research”, SAGE Publications Ltd.
5. Norman K. Denzin and Yvonna Sessions Lincoln,” Handbook of Qualitative Research”, SAGE Publications Ltd.
6. Michael Quinn Patton,” Qualitative Research and Evaluation Methods”, SAGE Publications Ltd.

Evaluation

- Midsemester Exam - 30 marks
- Continuous evaluation: Assignments, Class activities and Quiz Tests - 20 marks
- EndSemester Exam - 50 marks

Attendance

- No specific requirement for this course, but.....

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- the attendance policy aligns with that of the institute.