24RM801 Research Methodology for Engineering 4 0 0 4

Course objectives:

CO1: To familiarize with basics of research, literature survey, formulate research problem and develop skills for meaningful interpretation to the data and the research process.

CO2: To develop understanding on various kinds of research, objectives of doing research, and research designs.

CO3: To understand ethical issues while conducting research.

CO4: To understand various stages of preparing publishing research articles.

Syllabus

Unit 1: Research process, Research questions, Research design, Approaches to research: Quantitative vs. Qualitative approach, Building and validating theoretical models, Exploratory vs. Confirmatory Research, Experimental vs Theoretical Research, Importance of reasoning in research.

Unit 2: Importance of literature survey, planning a literature search, Identifying key concepts and key words, locating relevant literature, Reliability of a source.

Unit 3: Problem formulation, Understanding modelling & simulation, Experimental research: Cause effect relationship, Development of hypothesis, Measurement systems analysis, Error propagation, Validity of experiments, Statistical design of experiments, Field experiments, Data/Variable types & classification, Data collection, Numerical and graphical data analysis: Sampling, Observation, Surveys, Inferential Statistics, and Interpretation of Results; Hands-on training on R-software for statistical analysis.

Unit 4: Philosophy and ethics: Introduction to philosophy: definition, nature and scope, concept, branches. Ethics: definition, moral philosophy, nature of moral judgements and reactions. Scientific conduct, ethics with respect to science and research, Intellectual honesty and research integrity, Scientific misconducts: falsification, fabrication and plagiarism Redundant publications: duplicate and overlapping publications, salami slicing. Selective reporting and misrepresentation of data. Publication ethics and importance. Best practices/standards setting initiatives and guidance, Conflicts of interest. Publication misconduct, Problems that lead to unethical behaviour and vice versa, Violation of publication ethics, authorship and contributor ship. Identification of publication misconduct, complaints, and appeals.

REFERENCES:

1. Alex Rosenberg, "*Philosophy of Science: A contemporary introduction*" Second Edition, Routledge, 2005.
2. Praveen Chaddah, "Ethics in Competitive Research: Do not get scooped; do not get plagiarized" 2018.
3. Bordens, K. S. and Abbott, B. B., "Research Design and Methods – A Process Approach", 8th Edition, McGraw-Hill, 2011.
4. C. R. Kothari, "Research Methodology – Methods and Techniques", 2nd Edition, New Age International Publishers.
5. C. George Thomas: "Research Methodology and Scientific Writing", Springer Nature, 2015.
6. Davis, M., Davis K., and Dunagan M., "Scientific Papers and Presentations", 3rd Edition, Academic Press, Elsevier Inc.
7. Michael P. Marder, "Research Methods for Science", Cambridge University Press, 2015

Modes of Evaluation:

Components	Weightage	Maximum Marks	Internal/ External
Assignment 1: Research Design and Methodology	10	20	Internal
Assignment 2: Literature Review and Source Reliability	10	20	
Assignment 3: Experimental Design and Hypothesis Testing	10	20	
Assignment 4: Research Ethics and Scientific Misconduct	10	20	
Presentation 1: Research Questions and Model Building	15	30	
Presentation 2: Ethics in Research and Publication	15	30	
End Semester examination (Written Examination)	30	100	External