Solapur University, Solapur

Ph.D. Course Work Syllabus

Paper I- Research Methodology and Information



(Common Paper for Faculty of Engineering & Technology)



Examination scheme: Theory paper: 100 marks (3 hrs duration)

Unit 1 - Basics of Research

Definition, objectives, motivation, types of research and approaches: descriptive research, conceptual, theoretical, applied and experimental.

Unit 2 - Formation of Research Problem

Research Process: To determine what type of research to be done, plan of research work, Selection of research area, prioritization of research.

Literature review: importance and methods, sources.

Objectives and scope of work, Developing Research Plan and Schedule: Scheduling Constraints, steps, problems in scheduling, limitations.

Unit 3 - Mathematical Modeling and Simulation

- a) Modeling: Concept of modeling, classification of mathematical models, modeling with ordinary differential equations, difference equations, partial differential equations, graphs.
- b) Simulation: Concept, types (quantitative, experimental, computer, fuzzy theory, statistical) processes of formulation of model based on simulation. Variables and measurement.

Unit 4 - Experimental Modeling

- a) Definition of experimental design, examples, single factor experiments blocking and nuisance factors, guidelines for designing experiments.
- b) General model of process: Input factors/ variables, Output parameters / variables controllable / uncontrollable variables, dependent / independent variables, experimental validity.
- c) Introduction to Risk assessment, reliability, sustainability, and uncertainty

Unit 5 - Analysis of data

Types of data: parametric and nonparametric, descriptive and inferential data, collection of data: normal distribution, calculation of co-relation coefficient.

Data processing: Analysis, error analysis, meaning, different methods. Analysis of variance, significance of variance, analysis of covariance, multiple regressions, testing linearity / nonlinearity of model, testing adequacy of model. Introduction to data handling using software.

Unit 6 - Research Deliverables

Various forms of publications: Thesis, paper, research proposal.

Thesis writing: Introduction, Literature Review or State-of-the-art, Research approach (methodology), Results or findings, discussions, conclusions, scope for future work, references and appendices.

Presentation: Poster, thesis, proposal, and paper.

Unit 7 - Components of Information Communication Technology (ICT)

Impact factor, e-information

Patents: Agencies, National /International, procedure for filing, e-submission.

International publications: notes, letters/communications, full papers Review, h-index, Citation index.

Reference Books

- 1. C. R. Kothari, "Research Methodology", Willy Estern Ltd. ND.
- 2. Wayne Goddard and Stuart Melville, "Research Methodology-An Introduction", Juta & Co, Ltd, 2006
- 3. Lucienne T.M. Blessing, Amaresh Chakrabarti, "DRM, a Design Research Methodology," Springer-Verlag London Limited 2009
- 4. Yogesh Kumar Singh, "Fundamentals of Research Methodology and Statistics," NEW AGE INTERNATIONAL (P) LIMITED, PUBLISHERS
- 5. Douglas Montgomary, "Design of Experiments"
- 6. Willkinsion K.P. L., Bhandarkar, "Formulation of Hypothesis", Himalaya publishing, Mumbai.
- 7. Schank Fr, "Theories of Engineering Experiments", Tata McGraw Hill
- 8. Role of ICT in Doctoral Research- Capt. Dr. Nitin Sonaje, Aurther Press- New Delhi