

# CS601 : Research Methodology Syllabus

Subhankar Mishra  
School of Computer Sciences - CSS, NISER

Last updated - July, 2020

## 1 Course Objective

- To inform the students about the basics of how research problems are defined, research methods are adopted and/or developed, research is undertaken, and how research results are communicated to the peers.
- The lectures will cover research methods, some of which are general in nature and the remaining specific to the field of computer science.

## 2 Syllabus

### 2.1 Philosophical Underpinnings of Research

- Introduction to Research: Novelty, Originality, Organized Method of Investigation, and Communication of Problem, Data, Method, and Results for Peer Group Verification; Paradigm and paradigm shift.
- Types of Research: Theoretical, Empirical, Experimental, and Design and Characterization of New Materials, Components, Processes, and Systems.
- Broad Objectives of Research: Problem-oriented—Defining Problems and Problem Issues, Analysing Data, Predicting, and Designing; Technique-oriented—Improving Performance and Expanding Scope.
- Modes of Inquiry and Inquiring Systems: Hypothetico-deductive and Empirical-inductive modes; Scientific Method; and Inquiring Systems of Locke, Kant, Leibnitz, Hegel, and Singer.
- Continuum of Connections among Facts, Data, Laws, Hypotheses, Theory, Models, and Experiments; Criteria of a Theory
- Research Topic, Problem, Questions, Objectives, and Scope
- Methodology, Methods, Tools, and Techniques
- Research Ethics, Plagiarism, and Their Prevention

## 2.2 Measurement, Data, and Analytics

- Structured and Unstructured Data, Scales of Measurement, Population and Sample, Descriptive Statistics, Data Visualization.
- Probability and Random Variables, Sampling and Estimation, Hypothesis Testing, ANOVA, Correlation, and Regression.
- Data Analytics: Elements of Association, Clustering, and Classification.

## 2.3 Elements of Theoretical Research

- Model and Model Building: Classification of Models, Exogenous and Endogenous Variables, Variable Relationships, Model Boundary, and Predictive and Prescriptive Models.

## 2.4 Research Methods for Computer Science

- Formal Methods: Formal Specification, Algorithm, and Complexity; Building Artefacts: Proof of Performance, Proof of Concept, and Proof of Existence; Process Methodology: Methods for Software Engineering and Human-Computer Interaction, Cognitive Processes, Interactive Games, Social Networks, and Web Analytics.

## 2.5 Research Documentation

- Elements of Preparing a Paper and a Thesis: Title, Abstract, Keywords, Acknowledgements, Symbols and Abbreviations, Introduction, Literature Review, Materials and Methods, SI Units, Mathematical Materials, Graphical and Tabular Presentation, Results and Discussion, Conclusion, Interpretation, Generalization, Scope for Future Work, Citations and List of References, and Appendixes.
- Elements of Good English Writing: Signposts, Paraphrasing—Unity, Coherence, and , and Topic Sentence, and Transitions.

## 3 References

Kothari, C. R. and G. Garg (2019), Research Methodology: Methods and Techniques, Fourth Multi-Colour Edition, New Age International Publishers.

## 4 Grading Policy

Utkal University

- MidTerm / Assignments - 30 points
- EndTerm - 70 points