

Course Outcomes:

CO1: To understand the fundamentals of logical reasoning in pure mathematics and modelling aspects of applied mathematics

CO2: To impart knowledge to develop skills for meaningful interpretation to the data sets so as to solve the Research problems in Applied Statistics and Data Science.

CO3: To have basic awareness of data analysis-and hypothesis testing procedures.

CO4: To understand various stages of preparing publishing a research articles and ethical issues

Syllabus

Unit 1: Mathematical Statement, Meaning of “If P then Q”, Sufficient and Necessary Conditions, Contrapositive, Converse, Negation, Direct Proof & Indirect Proof, Principle of Induction, Axiom of Choice, Zorn’s Lemma, Inductive reasoning, Deductive reasoning Proof by Contradiction, Counter examples. Mathematical modelling, Problem Formulation, Approximations, Solution, Analytical, Numerical, Error Analysis, Interpretation, Remodeling.

Development of Hypothesis and Testing, Sampling - Field Experiments, Data/Variable Types & Classification, Data collection, Numerical and Graphical Data Analysis.

Unit 2: Databases and research metrics: Databases – Indexing databases, Citation databases: Web of Science, Scopus, etc. Research Metrics, Impact factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score. Metrics: h-index, g-index, i10 index, altmetrics.

Unit 3: Preparation of thesis and research papers, Tables and illustrations, Guidelines for writing the abstract, introduction, methodology, results and discussion, conclusion sections of a manuscript. References (including hands-on training on End-Note/Mendeley), Citation and listing system of documents, Intellectual property rights, patents, copyrights, Trademarks, Industrial design, geographical indication.

Unit 4: Open access publishing, Online resource to check publisher copyright and self-archiving policies. Software tool to identify predatory publications. Use of plagiarism software.

REFERENCES:

1. Topology, James R Munkres, Second Edition, Prentice Hall of India, (2002).
2. Bordens, K. S. and Abbott, B. B., “Research Design and Methods – A Process Approach”, 8th Edition, McGraw-Hill, 2011
3. C. R. Kothari, “Research Methodology – Methods and Techniques”, 2nd Edition, New Age International Publishers
4. Davis, M., Davis K., and Dunagan M., “Scientific Papers and Presentations”, 3rd Edition, Elsevier Inc.
5. Michael P. Marder, “Research Methods for Science”, Cambridge University Press, 2011
6. C. George Thomas: “Research Methodology and Scientific Writing”, Springer Nature, 2015.

Modes of Evaluation:

Components	Assignment	Presentation	Written Examination at the end of the semester
Weightage %	40	30	30

Skill Development:

The PhD candidate is expected to learn various proof techniques that are useful in proving theorems in pure mathematics by acquiring knowledge in the fundamentals of logical reasoning and also understand the various aspects of modelling that are involved in applied mathematics. The candidate is expected to develop skills for interpreting the data set, data-analysis and hypothesis testing that are useful while solving research problems in Applied Statistics and Data Science. Further, the candidate is expected to understand the art of writing research articles for publication as well as thesis writing.