

Ph.D Entrance Syllabus - Research Methodology, Arithmetic and Reasoning

Part 1 – Research Methodology

Objectives and types of research: Motivation and objectives, research methods vs methodology. Types of research. Research formulation: Defining and formulating the research problem, selecting the problem, the necessity of defining the problem, Literature review – Scientometrics and Systematic- PRISMA protocol, searching through databases and registries, research gap identification and processing.

Research design and methods: Research design basic principles, need of research design, features of good design, important concepts relating to research design, observation, and facts. Execution of the research, data collection and analysis: Data collection, sources, validation, sampling, tools and software for data processing, important statistical concepts for data processing, AI applications in research.

Ethics in scientific dissemination: Ethics in science and research, Intellectual honesty and integrity, Scientific and publication misconduct: Falsification, fabrication, and plagiarism (FFP), redundant publication, salami slicing, duplication publication, selective reporting, and misrepresenting data. Authorship misrepresentation, CRediT statement, Plagiarism checking tools. Publication ethics: Importance and best practices (COPE, WAME), predatory publication, tools to identify (SPPU), unethical behaviour in publication.

Reporting and thesis writing: Structure and components of scientific reports, types of report, technical reports and thesis. Thesis writing, concept and process involved, bibliography, referencing and footnotes. Oral presentation planning, software tools, creating and making effective presentations, use of visual aids, importance of effective communication, Introduction to Intellectual property rights, Patent, Industrial design, copyright- Process involved.

Part 2 – Arithmetic and Reasoning

Numerical Ability

Number System, Fractions, LCM and HCF, Percentages, Ratios and Proportions, Partnership, Problems on Ages, Time Speed and Distance, Time and work, Averages, Profit and Loss, Simple Interest and Compound Interest, Data Interpretation (Bar-chart, Histograms, Pie - chart, Table-chart and Line-chart) and mapping of Data.

Logical Reasoning

Evaluating and distinguishing deductive and inductive reasoning, Analogy and Classification, Direction Sense Test, Data Analysis, Letter Series, Coding and Decoding, Blood Relations, Syllogisms, Statements and Assumptions, Statements and Arguments, Data Arrangements, Ranking and Ordering, Data Sufficiency.