

Ph.D. Syllabus

Paper-I (research Methodology)

1. **Scientific Process:** Meaning and Definition, a brief history of scientific process.
2. **Introduction of Research Methodology:** Meaning of research, objectives of research, types of research, significance of research, problems encountered by researchers in India.
3. **Research Problem:** Definition, necessity and techniques of defining research problem. Formulation of research problem. Objectives of research problem.
4. **Research Design:** Meaning, need and features of good research design. Types of Research Designs, Basic Principles of Experimental Designs. Design of experiments.
5. **Sampling Designs:** Census and Sample surveys, Different types of sample designs, characteristics of good sample design. Techniques of selecting a random sample.
6. **Data Collection:** Primary and secondary data. Methods of collecting primary and secondary data.
7. **Hypothesis:** Definition, testing of hypothesis, procedures of hypothesis testing, flow diagram for hypothesis testing, Parametric and non-parametric tests for testing of hypothesis, Limitations of tests of hypothesis.
8. **Paper Writing and Report Generation:** Basic concepts of paper writing and report generation, review of literature, Concepts of Bibliography and References, significance of report writing, steps of report writing, Types of Research reports, Methods of presentation of report.
9. **Computer Applications:** Fundamentals of computers- definition, types of computers, RAM, ROM, CPU, I/O devices. Number system- binary, octal and hexadecimal, base conversion. Logic gates- AND, OR, NOT. Data Structure- array, stack (push, pop), queue (insert, delete), linked list- singly, doubly. Operating system- definition, types of OS. Use of software- MS Office- Power Point, WORD and EXCEL and ACCESS.
10. **Field and Computer hazards:** viruses, misuse of internet, hacking. Field hazards.
11. **Instrumentation:** Description and principles of (i) Electrophoresis (ii) PCR Machine (iii) Laminar Flow (iv) Ultracentrifuge (v) Autoclave and (vi) Light and electron microscopy. Chromatography and HPLC. Handling of instruments and precautions.
12. **Safety Measures:**

(i).Lab safety Measures: Introduction, Code of conduct – while entering in the lab, while working with the chemicals, while disposal of chemicals. Storage and disposal of chemical wastes- aqueous wastes, organic wastes and radioactive wastes. Human contribution to reduce hazardous wastes.

(ii). Field Safety Measures: Food security during field trip/expedition, safety measures during field trip/expedition- self-care, avoid in fields, care from wild animals, hazard warnings. Safety measures during visit to library and villages, first aid in the fields.

Suggested Readings:

1. Blum, Deborah and Mary Knudson, eds. A field guide for science writers: the official guide of the National Association of Science Writers. New York: Oxford University Press, 1997.
2. Booth, Wayne, Gregory G Colomb, Joseph M. Williams. The craft of Research. Chicago: University of Chicago Press, 1995.
3. Davis, Martha. Scientific Papers and Presentations. San Diego: Academic Press, 1997.
4. Fuscaldo, AA, Erlick, BI, Hindman, B. Laboratory Safety: Theory and Practice. New York: Academic Press, 1980.
5. Bajpai, PK. Biological Instrumentation and Methodology. New Delhi: S. Chand & Co. Ltd., 2006.
6. Rajaraman, V. Fundamentals of Computers
7. Horowitz & Sahni. Data Structure
8. Manual of MS Office