Vardhman Mahaveer Open University, Kota

Syllabus for Course: Research Methodology (MSCRM)

(For M.Sc. Botany/Chemistry/Physics/Zoology)

Course Credit: 4

Unit 1: Research - An Introduction

- Definition and characteristics of scientific research.
- Steps in the scientific method.
- Importance of objectivity, reliability, and validity.

Unit 2: Types of Research (Classification, Applications, Examples)

- Definitions and characteristics.
- Basic vs. applied research.
- Quantitative vs. qualitative research
- Exploratory, descriptive, and explanatory research.
- Longitudinal and cross-sectional research.
- Correlational vs. Experimental Designs.

Unit 3: Reference Formatives Indexing, Citations, Impact Factor, H-Index

- Referencing styles: APA, MLA, Chicago, etc.
- Tools for referencing: EndNote, Zotero, Mendeley.
- Managing bibliographies effectively.
- Importance of citations.
- Metrics: Impact factor, h-index, i10-index.
- Indexing databases: Scopus, Web of Science.

Unit 4: Research Problem Identification and Formulation

- Sources of research problems.
- Techniques for defining a problem statement.
- Characteristics of a good research problem.

Unit 5: Literature Review

- Purpose and importance of literature reviews.
- Searching and organizing literature.
- Writing a literature review: Synthesis and critical analysis.

Unit 6: Data Collection Methods (Quantitative)

- Surveys, experiments, observations, and structured interviews.
- Designing and validating data collection instruments.
- Sampling techniques and sample size determination.

Unit 7: Data Collection Methods (Qualitative)

- Ethnography, interviews, focus groups, and case studies.
- Observational techniques and fieldwork.
- Ensuring trustworthiness in qualitative research.

Unit 8: Data Collection Methods (Instrumentation, Scale & Measurement Tools)

- Developing and validating scales.
- Reliability and validity of measurement tools.
- Examples: Likert scales, semantic differential scales.

Unit 9: Data Collection in Interdisciplinary Research

- Methods specific to botany, zoology, physics, chemistry, and social sciences.
- Challenges and integration of techniques across disciplines.

Unit 10: Ancient Indian Knowledge System and Research

- Contributions to mathematics, astronomy, and medicine.
- Traditional knowledge in agriculture and ecology.
- Integration of traditional and modern research methods.

Unit 11: Data Handling in Research

- Data organization and analysis.
- Functions and formulas.
- Advanced features: Pivot tables, macros.

Unit 12: Ethical Guidelines

- Guidelines from organizations (e.g., APA, UNESCO).
- Informed consent and confidentiality.
- Institutional Review Boards (IRBs).

Unit 13: Misconduct in Research

- Types: Plagiarism, falsification, fabrication.
- Consequences and detection tools.
- Case studies.

Unit 14: Scientific Writing and Communication: (Structure of a Research Paper)

- IMRaD structure: Introduction, Methods, Results, and Discussion.
- Abstracts and keywords.
- Structuring arguments and findings.

Unit 15: Scientific Writing and Communication: (Writing for Journals Formatting and Submission Guidelines)

- Choosing the right journal.
- Formatting requirements.
- Common reasons for rejection.

Unit 16: Research Presentation

- Designing posters.
- Preparing oral presentations.
- Multimedia tools for effective communication.

Unit 17: Peer Review Process

- Importance and stages of peer review.
- Responding to reviewers' comments.
- Revising and resubmitting manuscripts.

Unit 18: ICT Tools

- **Scholar**: Searching for academic papers, citation alerts research paper database.
- **Cloud Storage:** Drive File storage, sharing, and collaboration, one drive
- **Docs, Sheets, and Slides**: Collaborative writing, data analysis, and presentations, office 365 and office tools.
- **Forms**: Designing surveys and questionnaires, Monkey survey
- **Google Calendar**: Scheduling and time management for research.

Unit 19: Data Privacy & Intellectual Property Rights

- Data protection laws (e.g., GDPR).
- Patents, trademarks, and copyrights.
- Challenges in maintaining data privacy.

Unit 20: Scientific Methods

- Observation, hypothesis formulation, experimentation, and analysis.
- Role of critical thinking and skepticism.
- Case studies of scientific breakthroughs.

Unit 21: Research Objective, Hypothesis, and Research Question

- Definitions and examples of objectives, hypotheses, and questions.
- Types of hypotheses: Null, alternative, directional, non-directional.
- Aligning objectives with hypotheses.

Unit 22: Artificial Intelligence Tools in Scientific Research

- AI for literature review, data analysis.
- Tools: ChatGPT, Co-pilot, Gemini, Anuvadini, Deepseek, Bard, AI- driven statistical software.

For M.Sc. Botany/Chemistry/Physics/Zoology 3rd Semester as per Admission Prospectus (Jan 2025 & Jan 2026) presently the syllabus of paper MSCRM shall be provided to the enrolled students instead of the hard / soft copy of SLMs. For latest update visit the university website www.vmou.ac.in and also student one view on the university website time to time.