

## **CH-433 Scientific Writing & Research Methods**

**Credit Hours:** 3-0

**Pre-requisite:** Nil

### **Course Objectives**

1. This course is designed to introduce undergraduate students to the fundamentals of scientific research and academic writing. It aims to: **(a)** develop an understanding of research principles, methodologies, and ethical considerations, **(b)** equip students with practical skills in literature review, proposal development, and data handling, **(c)** build competency in scientific writing using LaTeX/Overleaf and presenting research through posters and oral presentations, **(d)** prepare students for their Final Year Project (FYP) and interactions with research supervisors, especially for postgraduate applications.

### **Course Contents**

2. Introduction to medicinal chemistry. Drug and medicine: difference and customary use. Drug discovery and development. Rational drug design and synthesis. Physicochemical properties in relation to biological action and drug transport. Pharmacodynamics (drug action) and Pharmacokinetics. Modes and sites of drug action. Routes of drug administration, absorption, distribution, metabolism and excretion. Bioavailability, toxicity, safety and therapeutic index of drugs. Drug-receptor interactions. Drug formulations. Active ingredients and excipients. Quality control and assurance. Good Manufacturing Practices (GMP).
3. Principles of Scientific Writing: Structure, clarity, and coherence in scientific communication, Components of a scientific paper: abstract, introduction, methods, results, discussion, conclusion, Common writing pitfalls and how to avoid them (b) Research Design and Methodology: Understanding the scientific method, Defining research problems and hypotheses, Study designs: exploratory, descriptive, analytical, and experimental, (c) Quantitative vs. Qualitative Research: Key differences, tools, and techniques, Applications in various disciplines, Combining methods for mixed-method research, (d) Literature Search and Review Techniques: Components of a strong research proposal, Thesis structure and formatting, Crafting objectives, methodology, and timelines, (e) Data Collection, Analysis, and Visualization: Types of data: primary vs. secondary, Tools for

analysis: statistical software, coding frameworks, Presenting results using charts, graphs, and tables, (g) Academic Integrity and Plagiarism: Plagiarism: types, detection, and prevention, Referencing and citation styles (APA, MLA, IEEE), Ethical approval and responsible research conduct, (h) Conference/Poster Presentations: Preparing oral presentations for conferences, Designing impactful research posters, Tips for presenting to academic and non-academic audiences, (i) (j) Guidelines for Final Year Projects (FYP): Choosing a viable and meaningful FYP topic, Identifying emerging research trends, Supervisory expectations and evaluation criteria, Managing timelines and milestones for project success,

### **Course Outcomes**

By the end of this course, the students will be able to:

4. Students will be able to: (a) Understand and apply key principles of scientific writing, including clarity, coherence, and structure, (b) Design, conduct, and analyze simple research studies using qualitative or quantitative approaches, (c) Conduct systematic literature reviews using credible scientific databases, (d) Write research proposals and project reports according to scientific standards, (e) Use LaTeX/Overleaf for academic writing, Demonstrate academic integrity and understand plagiarism policies, (f) Develop, present, and critically evaluate research posters and presentations,

### **Relevant Experiments**

1. Nil

### **Recommended Books**

1. C. George Thomas, Research Methodology and Scientific Writing, Springer, 2nd Ed, 2021.
2. D. Pant et al., Scientific Methods Used in Research and Writing, CRC Press (Taylor & Francis), First Edition, 2024.
3. R. Kumar, Research Methodology: A Step-by-Step Guide for Beginners, Second Edition (2005).
4. Michael Jay Katz, From Research to Manuscript: A Guide to Scientific Writing, Springer, 2nd Ed, 2009.
5. Hilary Glasman-Deal, Science Research Writing for Non-Native Speakers of English, ICP, 2009.
6. J. Blackwell & J. Martin, A Scientific Approach to Scientific Writing, Springer, 2011.

7. Andrea R. Gwosdow, *The Complete Guide to Scientific Manuscript Writing*, Aviva Publishing, 2018.