

<b>Programme</b>	BS Biotechnology	<b>Course Code</b>	<b>BCBT. 401</b>	<b>Credit Hours</b>	3-0
<b>Course Title</b>	<b>Scientific Inquiry &amp; Research Methods</b>				
<b>Course Introduction</b>					
<p>The course will introduce students to the scientific method, from finding a research question to the formulation of research hypothesis, designing and conducting experiments, collection of data, and interpretation of results using statistical methods. The course will also cover different aspects of scientific communication including research publications, thesis and project report writing and finally presenting research work by oral presentations or posters.</p>					
<b>Learning Outcomes</b>					
<p>By the end of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Develop hypotheses and design experiments to test scientific questions.</li> <li>• Apply statistical methods to analyze and interpret scientific data.</li> <li>• Communicate research findings effectively through written and oral presentations.</li> </ul>					
<b>Course Content</b>					
<ul style="list-style-type: none"> <li>• Introduction to the scientific method</li> <li>• Need of research and research types</li> <li>• Identifying a research problem and formulating a hypothesis</li> <li>• Designing a study</li> <li>• Extraction and review of literature</li> <li>• Selecting a sample, sample size, sample quality, ethical issues; informed consent etc.</li> <li>• Data collection, types of scientific data, unbiased data collection, data storage and safety</li> <li>• Interpretation and analysis, including statistical methods Use of simple descriptive statistics Standard deviation and standard error of mean, T test</li> <li>• Unethical academic practices, types of academic misconduct, falsification of data, deliberate or accidental plagiarism.</li> <li>• Unethical use of AI, consequences of academic misconduct; retractions legal actions, intellectual property and copyrights.</li> <li>• Scientific communication; writing a research article, review article.</li> <li>• Making scientific figures, use of software like Adobe Photoshop, Adobe Illustrator, online resources, image resolution vector graphics and line art.</li> <li>• Publishing research complete process; journal selection, submission review publication metrics impact factor, h factor, citations etc.</li> <li>• Thesis, research report and project writing, parts of a scientific writeup, language and style, bibliography management softwares.</li> <li>• Preparing posters, making scientific presentations</li> <li>• Critical scientific review</li> </ul>					

### Textbooks and Reading Material

#### Textbooks.

- Graduate research: A guide for students in the science (1998) 3 Rev Sub edition by Robert V. Smith University of Washington Press.
- Writing, Reading & Research Clifford (1985) by R. Veit, and J. Clifford Bobbs-Merrill Educational Publications.
- Practical Research: Planning & Design (2009) by P.D. Leedy and J.F., Ormrod Publishers: Merrill.
- Research methods: A process of Inquiry by Grazinao & Ranlin (2006)
- Conducting Research Literature Reviews: From the Internet to Paper (2004) by A. G. Fink. Saga Publications.
- At the bench: a laboratory navigator (2005) Kathy Barker Cold Spring Harbor Laboratory Press

### Teaching Learning Strategies

- Class lecture
- Class Discussions
- Class Tutorials

### Assignments: Types and Number with Calendar

- 1<sup>st</sup> Quiz in 4<sup>th</sup> Week of 5 marks
- 2<sup>nd</sup> Quiz in 12<sup>th</sup> Week of 5 marks
- 1<sup>st</sup> Assignment in 8<sup>th</sup> Week of 15 marks

### Assessment

Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.