Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-7

Subject: Research Methodology and Ethics - BETBT17333

Type of course: Professional Core

Prerequisite: Basic knowledge of Research Methodology and Ethics

Rationale: Research Methodology and Ethics is included in the university curriculum to develop students ability to design and conduct scientific research in a systematic, reliable, and ethical manner. The subject enhances critical thinking, data analysis, and scientific communication skills while promoting integrity, transparency, and responsible research practices. It prepares students in Biotechnology and Food Technology to carry out research that meets academic standards, industry requirements, and ethical guidelines, thereby contributing to innovation and societal well-being.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	0	0	3	60	30	10	0	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE-Mid Semester Examination; V–Viva; CA-Continuous Assessment; ALA-Active Learning Activities.

Course Content:

Unit No.	Course content	Hrs.	% Weightage
1	**Introduction to Research Formulation and Design:** Motivation and objectives: Research methods vs. Methodology. Types of research: Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem,	12	25%

	selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.		
2	**Sampling and Data Analysis:** Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non-Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.	10	25%
3	**Philosophy, Ethics and Scientific Conduct:** Introduction to philosophy: definition, nature and scope, concept, branches, Ethics: definition, moral philosophy, nature of moral judgments and reactions, Ethics with respect to science and research, Intellectual honest and research integrity Scientific misconduct: falsification, fabrication, and plagiarism, Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data. Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bi variate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.	13	25%
4	**Publication Ethics:** Publication ethics: definition, introduction and importance, Best practices/standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest, Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types, Violation of publication ethics, authorship and contributor ship, Identification of publication misconduct, complaints and appeals, Predatory publishers and journals.	10	25%

Continuous Assessment:

Sr. No.	Active Learn	Marks
1.	**Research Problem Identification:** Identify a real-world research problem related to Biotechnology or Food	10

	Technology and prepare a brief concept note describing the research objectives and expected outcomes. Upload the assignment on the GMIU portal.	
2.	**Literature Review Exercise:** Conduct a structured literature review using research databases and summarize key findings, research gaps, and relevant references in a short report and submit on GMIU Web Portal.	10
3.	**Sampling Plan Design:** Develop a sampling strategy for a proposed research study, including sample size calculation and justification of the selected sampling method and upload to the GMIU Web Portal.	10
4.	**Ethics and Plagiarism Awareness Presentation:** Prepare and deliver a presentation explaining research ethics, plagiarism prevention, and responsible scientific conduct and submit on GMIU Web Portal.	10
5.	**Publication Ethics Case Study:** Analyze a case related to publication misconduct (e.g., plagiarism, duplicate publication, or predatory journals) and submit a written report discussing ethical implications and corrective actions. and submit on GMIU Web Portal.	10
Total		50

Suggested Specification table with Marks(Theory):60

Distribution of Theory Marks(Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	40%	30%	10%	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand the fundamental principles of research methodology and research design.
CO2	Apply appropriate sampling techniques and basic statistical methods for data collection and analysis.
CO3	Demonstrate ethical responsibility and integrity in conducting scientific research.
CO4	Recognize publication ethics standards and identify unethical research and publication practices.

Instructional Method:

- The course delivery method will depend upon the requirement of content and the need of students. The teacher in addition to the conventional teaching method by blackboard, may also use any of the tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- From the content,10% of topics are suggested for flipped mode instruction.
- Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory
- The internal evaluation will be done based on the Active Learning Assignment

Reference Books:

[1] Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
[2] C.R. Kothari, Research Methodology, methods & techniques, 2nd edition.
[3] Richard Veit, Christopher Gould & John Clifford – Writing, Reading and Research (2nd Edn.).
[4] MacIntyre, Alasdair (1967) A Short History of Ethics, London.
[5] Resnik, D. B. (2011). What is ethics in research & why is it important. National Institute of Environmental Health Sciences, 1-10
[6] Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN:978-81-939482-1-7. (www.insaindia.res.in/pdf/EthicsBook.pdf)
[7] Committee on Publication Ethics (COPE) – Guidelines on Publication Ethics