

GUJARAT TECHNOLOGICAL UNIVERSITY

BIO TECHNOLOGY (04) RESEARCH METHODOLOGY SUBJECT CODE: 2180410 B.E. 8th SEMESTER

Type of course: B.E. (Biotechnology)

Prerequisite: N.A.

Rationale: The objective of this course is to enable the students in developing the most appropriate methodology for their research studies and to make them familiar with the art of using different research methods and techniques.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
				PA	ALA	ESE	OEP			
4	2	0	6	70	20	10	30	0	20	150

Course Contents:

Sr. No.	Topics	Teaching Hours	Module Weightage
1	UNIT I: Research Methodology: An Introduction Meaning of Research, Objective of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India	10	16%
2	UNIT II: Defining the Research Problem and Research Design What is a Research Problem?, Selecting the Problem, Necessity of Defining the Problem, Meaning of Research Design, Need for Research Design, Future of a Good Design, Important Concepts Relating to Research Design, Different Research Design, Basic Principles of Experimental Designs	12	19%
3.	UNIT III: Sampling Design Census and sample survey, Implications of a Sample Design, Steps in sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of sample Designs, How to Select a Random Sample?, Random Sample from an Infinite Universe, Complex Random Sampling Designs	10	16%

4.	UNIT IV: Methods of Data Collection Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Difference between Questionnaires and Schedules, Some Other Methods of Data Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection	10	16%
5.	UNIT V: Data Analysis, Interpretation and Report Writing Data Analysis and Presentation Editing and coding of data, tabulation, graphic presentation of data, cross tabulation, Testing of hypotheses; type I and II errors, one tailed and two tailed tests of significance, Parametric and nonparametric tests for Univariate and Bivariate data. Tests of association; simple linear regression and other nonparametric tests, Meaning of Interpretation, Why Interpretation? Technique of Interpretation, Significance of Report Writing, Deferent Steps in Writing Report. Layout of the Research Report, Types of Report, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing a Research Report	22	33%

Suggested Specification table with marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	15	12	10	08	15

Legends: R= Remembrance; U= Understanding; A= Application; N = Analyze; E = Evaluate; C = Create and above Levels (**Revised Bloom's Taxonomy**)

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 above table.

Reference Books:

1. Research Methodology Methods and Techniques by C. R. Kothari, New Age International Publishers
2. Research Methodology by D. K. Bhattacharyya, Excel Books Publications.
3. Research Methodology: A Guide for Researchers in Management and Social Sciences by Taylor, Sinha & Ghoshal, PHI Publications

Course Outcome:

After learning the course, the students should be able to:

1. To develop essential research skills.
2. To develop technical writing skills.
3. To understand the basic concepts and techniques of research methods and their reporting.

List of Tutorials:

1. Difference between an experiment and survey.
2. Problems faced by researchers.
3. A research scholar has to work as a judge and derive the truth and not as a pleader who is only eager to prove his case in favour of his plaintiff. Justify the statement.

4. Examine the significance of research.
5. Research is much concerned with proper fact finding, analysis and evaluation. Do you agree? Support your answer.
6. Issues to be attended by researchers in formulating research problem.
7. Develop a research plan.
8. Different ways of sampling.
9. Merits and demerits of different data collection methods.
10. Interpretation is a fundamental component of research process. Justify the statement.
11. Layout of research report.

List of Open Source Software/learning website:

Students can refer to video lectures available on the websites including NPTEL. Students can refer to the CDs which are available with some reference books.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.