Gyanmanjari
Innovative University

Subject: Biostatics and Research methodology-MSCZO11505

Type of course: Minor

Prerequisite: Students should have a solid foundation in basic mathematics, including algebra and arithmetic, as well as familiarity with descriptive statistics and probability concepts.

Rationale: Biostatistics and research methodology are crucial for advancing scientific inquiry, offering essential tools for study design, data analysis, and result interpretation. As these fields evolve, new statistical techniques and research frameworks enhance our ability to derive meaningful insights from complex data. Understanding these methodologies is vital for evaluating interventions and shaping public health policies, ultimately leading to improved health outcomes. The ongoing refinement of biostatistical approaches promises to unlock further discoveries in health research.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
4	0	0	4	60	30	10	00	50	150

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

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Presentation** Faculty will assign the topic from syllabus to the students and students will prepare the presentation on given topic and upload it to GMIU web portal.	10

2	**Brain writing** Faculty will provide a picture, text passage or video clip, student observe, analyze and write about it and upload on GMIU web portal.	10
3	**Theme based poster** Faculty will provide specific theme to students and students will prepare specific theme based poster and upload on GMIU web portal	10
4	**Paper Report** Students will prepare a report on animal biodiversity found in Victoria Park (Bhavnagar) and submit it on GMUI web portal.	10
5	**Quiz** Faculty will conduct quiz session in classroom per unit of their respective subject.	10
	Total	50

Course Content:

Unit No.	Course content	Hrs	% Weightage
1	**Chapter-1 Basics of Biostatistics** Scope and Significance of Biostatistics. Steps in Statistical Investigation, Data and Variable (Collection, Types, Sources). Statistical Analysis Tools - Parametric and Non-Parametric; Bivariate and Multivariate Analysis. Measures of Central Tendency – mean, median and mode. **Chapter-2 Measures of Dispersion** Introduction, Characteristics. Quartiles and Percentiles. Merits and Demerits of Range, Quartile Deviation, Mean Deviation and Standard Deviation. Calculations/Problems for frequency table. Standard error. Skewness and Kurtosis (Brief account only).	15	25

2	**Chapter-2 Correlation Analysis** Correlation - types and methods of correlation analysis, Problems for Karl Pearson's correlation coefficient and Spearman's rank correlation. **Chapter- Regression Analysis** Regression and Line of Best Fit, Types and methods of regression analysis. Graphic Methods (Scatter method, Curve fitting). Algebraic method (Fitting of straight line through regression equation). Comparing correlation and regression. Probit Analysis (Brief account only).	15	25
3	**Chapter- 3 Testing of Hypothesis** Hypothesis and types, Confidence Interval, Sampling, Methods and Errors. Tests of significance (For large and small samples – Critical Ratio and P value). Z Test (Problem for small samples), Chi- Square Test – test of independence and goodness of fit (Problem for 2×2 table only). Student's 't' test (Problem for small samples comparing mean of two variable). F-test, Analysis of Variance (ANOVA - One way).Mc Nemar and Mann Whitney U test (Brief account only)	15	25
4	**RESEARCH METHODOLOGY** **Chapter- 5 Concepts of Research** Basic concepts of research -Meaning, Objectives, Motivation and Approaches. Types of Research - Descriptive/Analytical, Applied/ Fundamental, Quantitative/Qualitative, Conceptual/Empirical. Research methods versus Methodology, Research Process. **Chapter - Research Formulation** Research formulation - Observation and Facts, Prediction and explanation, Induction, Deduction. Defining and formulating the research problem, Selecting the problem and necessity of defining the problem. Literature review - Importance of literature review in defining a problem,	15	25

Suggested Specification table with Marks (Theory):

	Distribution of Theory Marks (Revised Bloom's Taxonomy)					
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20	20	30	30	0	0

Course Outcome: 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.

After learning the course the students should be able to:	
CO1	Explain concepts of statistics and research methodology.
CO2	Enhance skills to use tools and accessories in biological research.
CO3	Apply suitable statistical tests in research.
CO4	Develop analytical and critical thinking skills through problem solving.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
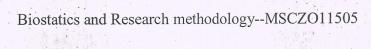
From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

Biostatics and Research methodology--MSCZO11505

1. Catherine, D. (2005). Introduction to Research Methods: A Practical Guide for Anyone Undertaking a Research Project (5th Edition)

2. Chap, T. Le. (2003). Introductory Biostatistics. John Wiley &Sons, NJ, USA.

3. Clough, P., & Nutbrown, C. (2007). A Student's Guide to Methodology: Justifying Enquiry. Sage, London.

4. Daniel, W.W. (2006). Biostatistics: A Foundation for Analysis in the Health Sciences (7th Edition). John Wiley & Sons, New York.

5. Freedman, D. F., & Pisani, R., & Purves, R. (2011). Statistics. Viva Books, New Delhi.

6. Dharmapalan, B. (2012). Scientific Research Methodology. Narosa Publishing House, New Delhi.

7. Gupta, S. P. (2014). Statistical methods for CA foundation course. Sultan Chand & Sons, New Delhi.

8. Kothari, C. R. (2009). Research Methodology: Methods and Techniques (2nd Edition.). NewAge International Publishers, New Delhi.

9. Paul, O. (2005). Writing Your Thesis. Vistaar Publications. New Delhi.

10. Rajathi, A. & Chandran, P. (2010). SPSS for You. MJP Publishers, Chennai.

11. Samuels, M. L., & Witmer, J. A., & Schaffner, A. (2016). Statistics for Life Sciences (5th Edition). Pearson Education Inc, New Delhi.

12. Sundar, Rao, P. S. S., & Richard, J. (2006). Introduction to Biostatistics and Research Methods (4th Edition). Prentice Hall, New Delhi.

13. Zar, J. H. (2008). Biostatistical Analysis (3rd Edition). Pearson Education Inc, New Delhi.