Competency-Based Dynamic Curriculum for MD/ MS UNANI
(PRESCRIBED BY NCISM)

Semester I Course - Biostatistics

(SUBJECT CODE : UNIPG-BS)

(Applicable from 2024-25 batch, from the academic year 2024-25 onwards until further notification by NCISM)

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BOARD OF UNANI, SIDDHA AND SOWA RIGPA
NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE
NEW DELHI-110026

PREFACE

Statistics plays a pivotal role in postgraduate studies, especially within Unani, where it is essential for conducting research, validating traditional knowledge, and advancing clinical applications. In Unani, the integration of statistical analysis allows scholars to analyze clinical data, ensure the standardization of formulations, and evaluate the efficacy of treatments. Additionally, the interpretation of literary research data from classical texts like Samhitas and manuscripts is critical for bridging ancient wisdom with modern scientific approaches.

This course introduces a comprehensive approach to biostatistics, emphasizing both theoretical understanding and practical application. Students will explore the use of statistics in clinical trials, formulation standardization, and data analysis from textual sources. Practical learning sessions focus on real-world applications, while experiential components guide students through analyzing classical Unani texts to derive meaningful insights using statistical methods.

Through this curriculum, students will gain valuable skills in statistical analysis and research methodology, empowering them to conduct robust, evidence-based research in Unani. The course is designed to enhance critical thinking, enabling scholars to contribute effectively to the field with a deepened understanding of both traditional knowledge and contemporary scientific practices.

INDEX

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Competency/Outcome-Based Dynamic Curriculum for MD/ MS UNANI

Subject Code : UNIPG-BS

Summary & Credit Framework

Module Number & Name	Credits	Notional Learning Hours	Maximum Marks of assessment of modules (Formative assessment)	Module Marks for Summative Assessment (University Examination)
1. Fundamentals of Statistics	1	30	25	10
2. Probability, Probability Distributions, Sampling Techniques, and Sample Size Determinations	2	60	50	25
3. Tests of significance and parametric statistical tests	2	60	50	25
4. Non-parametric statistical tests	1	30	25	15
5. Disease frequency; Demography and Vital statistics	1	30	25	15
6. Correlation and Regression Analysis	1	30	25	10
	8	**240**	**200**	**100**

Credit frame work

UNIPG-BS has 6 modules of 8 credits which includes 240 Notional Learning Hours. One Credit will be having 30 Hours of learner participation and teaching, practical and experiential learning will in the ratio of 1:2:3 i.e. One credit will have 5 hours of teaching, 10 hours of practical training and 13 hours of experiential learning and 2 hours of modular assessment for 25 marks.

Course Code and Name of Course

Course code	Name of Course
UNIPG-BS	Semester I Course - Biostatistics

Table 1 : Course learning outcomes and mapped Program learning outcomes

CO No	A1 Course learning Outcomes (CO) UNIPG-BS At the end of the course UNIPG-BS, the students should be able to-	B1 Course learning Outcomes mapped with program learning outcomes.
CO1	Demonstrate application of principles of Descriptive and Inferential Statistics in research.	PO4,PO7
CO2	Demonstrate use of appropriate statistical tests in research.	PO4,PO7
CO3	Analyze and present research data using suitable statistical methods, tools, and software.	PO4,PO5
CO4	Evaluate and interpret statistical data from research papers and publications.	PO4,PO8

Table 2 : Course contents (Modules- Credits and Marks)

2A Module Number	2B Module & units	2C Number of Credits	2D Notional Learning hours				2E Marks
			Theory	Practical Training	Experiential Learning including modular assessment	Total	
1	**M-1 Fundamentals of Statistics** This module provides an introduction to the fundamentals of statistics and its significance in the biomedical field. It emphasizes the importance of understanding how data is collected, classified, and analyzed, offering essential tools for interpreting research findings. By exploring various statistical methods, this module equips learners with the skills to describe and summarize data accurately, ensuring meaningful insights are drawn from research. It also addresses the correct and incorrect applications of statistics, highlighting the potential for misuse and how to avoid it. This knowledge is crucial for anyone involved in medical research or data-driven decision-making in healthcare. • **M1U1** Fundamentals of Statistics 1. Definition of Statistics: Fundamentals of Statistics and its applications to the biomedical field (Biostatistics), Use and misuse of Statistics. 2. Data – Definition, Types, Classification and presentation 3. Variables- Definition, Types 4. Descriptive Statistics - Measures of Central tendency – Mean, Median, Mode, Percentile 5. Measures of Dispersion- Range, Quartile deviation, Mean deviation, and Standard deviation and Co-efficient of variation	1	5	10	15	(30)	10

2	**M-2 Probability, Probability Distributions, Sampling Techniques, and Sample Size Determinations** This module introduces the concept of probability, covering its definitions, types, and fundamental laws. It explores key probability distributions, including normal, binomial, and Poisson distributions, along with their properties and applications. The module also discusses important concepts such as standard error, point estimates, and confidence intervals in the context of interpreting research results. Additionally, it focuses on sampling techniques, both probability and non-probability-based, and the principles of determining appropriate sample sizes for different types of studies, including descriptive, analytical, and randomized controlled trials (RCTs). • **M2U1** Probability and Probability Distributions Probability - Definitions, types, and laws of probability.Probability Distributions - 1. Normal distribution: Concept and Properties. 2. Different ways to test the assumption of normality. 3. Binomial Distribution, Poisson Distribution. 4. Definitions and explanation of Sampling distribution, Standard Error, Point Estimate, and Confidence interval • **M2U2** Sampling techniques and Sample size Determinations 1. Population and sample parameters 2. Sampling techniques (probability & non-probability based) and Sample size Determinations: 3. Sampling designs and prerequisites for sample size computation. 4. Computation of sample size for Descriptive studies, Analytical Studies, and RCTs.	2	10	20	30	(60)	25

3	**M-3 Tests of significance and parametric statistical tests** This module covers the essential concepts of hypothesis testing, including the formulation of null and alternate hypotheses, and the understanding of Type I and Type II errors. It delves into tests of significance, the level of significance, power of the test, and the interpretation of the p-value, distinguishing between statistical and clinical significance. Additionally, it introduces parametric tests such as the Z test, Student's t-test (paired and unpaired), F-test, and Analysis of Variance (ANOVA), including repeated measures ANOVA, which are crucial for analyzing and interpreting data in research studies. • **M3U1** Testing of hypothesis 1. Understand and apply the concept of null and alternate hypotheses 2. Define of Type I and type II errors, 3. Evaluate Test of significance, level of significance, power of the test 4. Calculate 'P' value and its interpretation, statistical significance, and clinical significance • **M3U2** Parametric tests 1. ‘Z' test 2. Student's 't' test: paired or dependent 3. Student's 't' test: unpaired or independent 4. 'F' test 5. Analysis of variance (ANOVA) test with post hoc Analysis 6. Repeated measures ANOVA with post hoc Analysis	2	10	20	30	(60)	25

4	**M-4 Non-parametric statistical tests** This module introduces non-parametric methods, focusing on their definition and fundamental principles. Non-parametric tests, such as the Chi-square test, Fisher's exact test, McNemar's test, Wilcoxon test, Mann-Whitney U test, Kruskal-Wallis, and Friedman test (with relevant post hoc tests like Dunn), are discussed for their application when data do not meet parametric assumptions. The module also highlights the key differences between parametric and non-parametric tests, helping learners understand when to use each approach based on the nature of the data and study design. • **M4U1** Non-parametric methods 1. Definition and fundamentals of non-parametric methods; Concept and application of Chi-square test and Fisher's exact test. 2. Mann-Whitney U test: Concept and application 3. McNemar's test and Wilcoxon Signed rank test- Concept and application 4. Kruskal–Wallis test with relevant post hoc tests: Concept and application 5. Friedman test with relevant post hoc tests: Concept and application; parametric vs non-parametric test.	1	5	10	15	(30)	15
5	**M-5 Disease frequency; Demography and Vital statistics** This module focuses on the measures of disease frequency, covering key concepts such as incidence, prevalence, odds ratio, relative risk, and risk difference, along with their confidence intervals. It explains the computation and interpretation of rates, ratios, and proportions in health data. The module also introduces demography, highlighting its importance and applications, particularly in fertility measures. Additionally, it covers vital statistics, including the significance and calculation of birth, mortality,	1	5	10	15	(30)	15

	morbidity rates, and hospital-related statistics, essential for understanding population health and healthcare management. • **M5U1** Measures 1. Measures of disease Frequency: Incidence and prevalence. 2. Odds ratio, Relative Risk and Risk difference, and their confidence intervals 3. Definition and computation of the measures Rate, Ratio, and Proportion 4. Demography and its importance and applications. Fertility measures 5. Vital statistics and its importance and applications. Birth rate, Mortality rates, Morbidity rates, and Hospital-related statistics.						
6	**M-6 Correlation and Regression Analysis** This module introduces the concepts of correlation and regression analysis, focusing on their properties, computation, and applications. It covers simple linear correlation, including Karl Pearson's correlation coefficient and Spearman's rank correlation. The module also explores linear and multiple regression analysis for predicting relationships between variables, along with logistic regression analysis used for binary outcomes. Additionally, it includes survival analysis, which is crucial for studying time-to-event data, commonly used in biomedical and clinical research. • **M6U1** Correlation and Regression Analysis 1. Concept, properties, computation, and applications of correlation. Understanding of the scatter diagram 2. Simple linear correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation.	1	5	10	15	(30)	10

	3. Linear and multiple regression analysis of their application and interpretation. 4. Logistic regression analysis: Concept and application. 5. Survival Analysis. Concept and application.						
		8	**40**	**80**	**120**	**240**	**100**

Table 3 : Modules - Learning objectives

3A Sr.No	3B Course Outcome	3C Learning Objective (At the end of the (lecture/practical/experiential) learning session, the students should be able to)	3D Notional learning Hours	3E Lecture/ Practical Training/ Experiential Learning	3F Domain/ Sub Domain	3G Level (Does/Shows how/ Knows how/Know)	3H Teaching Learning Methods
Module 1 : Fundamentals of Statistics							
Module Learning Objectives **(At the end of the module, the students should be able to)** 1. **Explain the fundamentals of Statistics and its application to the biomedical field (Biostatistics). Use and misuse of Statistics.** 2. **Define various types of data and variables.** 3. **Identify the data type apply, and interpret descriptive statistics to summarize the characteristics of a data set.**							
Unit 1 Fundamentals of Statistics 1. **Definition of Statistics: Fundamentals of Statistics and its applications to the biomedical field (Biostatistics), Use and misuse of Statistics.** 2. **Data – Definition, Types, Classification and presentation** 3. **Variables- Definition, Types** 4. **Descriptive Statistics - Measures of Central tendency – Mean, Median, Mode, Percentile** 5. **Measures of Dispersion- Range, Quartile deviation, Mean deviation, and Standard deviation and Co-efficient of variation** **References:** 1,2,3,4,5,6,7,8,9,10,11,12							
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**	**3H**

1	CO1,CO2,CO3	Define Statistics and Describe the concepts of Biostatistics. Use and misuse of Statistics	1	Lecture	CK	Know	L&PPT
2	CO1,CO2,CO3	Explain the data, variables, and their types	1	Lecture	CK	Knows-how	L&PPT
3	CO1,CO2,CO3	Appraise to enter, clean, group, and code for given data sets in Excel and other statistical software.	2	Practical Training 1.1	PSY-MEC	Shows-how	EDU,L&GD
4	CO1,CO2,CO3	Explain different methods of Presentation of data	1	Lecture	CE	Knows-how	L&GD
5	CO1,CO2,CO3	Construct the tables (tabulate) with one or more factors of classification manually /Statistical tool/software (Frequency distributions)	2	Practical Training 1.2	PSY-MEC	Does	PBL
6	CO1,CO2,CO3	Collect, enter, clean, and manually tabulate data collected/ statistical tool/ software.	3	Experiential-Learning 1.1	PSY-SET	Shows-how	PSM
7	CO1,CO2,CO3	Represent the quantitative and qualitative data Diagrammatically and graphically(Cumulative frequency distributions and their Graphical representation, Histogram, Frequency Polygon, Frequency Curve, Ogives, Population Pyramid, and Box Plot)	2	Practical Training 1.3	PSY-GUD	Shows-how	PBL
8	CO1,CO2,CO3	Data collection, enter,cleaning, tabulation, and graphically/ diagrammatically present the data collected manually/ statistical tool/ software	3	Experiential-Learning 1.2	PSY-SET	Shows-how	PBL
9	CO1,CO2,CO3	Explain the Measures of Central Tendency Mean(arthematic, geometric,harmonic) , Median, Mode and Proportion.	1	Lecture	CAP	Knows-how	L&PPT
10	CO1,CO2,CO3	Calculate and Demonstrate measures of Central tendency using different sets of data (5 each)	2	Practical Training 1.4	PSY-SET	Shows-how	PSM
11	CO1,CO2,CO3	Collect, enter, clean, and compute measures of central tendency manually/ statistical tool/ software	2	Experiential-Learning 1.3	PSY-SET	Shows-how	PAL
12	CO1,CO2,CO3	Explain the measures of Dispersion- Range, Quartile deviation, Mean	1	Lecture	CK	Knows-	L&PPT

		deviation, and Standard deviation and Co-efficient of variation.				how	
13	CO1,CO2,CO3	Calculate and Demonstrate measures of Dispersion using different sets of data	2	Practical Training 1.5	PSY-SET	Shows-how	D
14	CO1,CO2,CO3	Collect,enter,clean data with computing measures of dispersion with manually/ statistical tool/ software	2	Experiential-Learning 1.4	PSY-SET	Shows-how	C_L,D,DIS,PT,PrBL
15	CO1,CO2,CO3	Collect, enter, clean, present, and compute descriptive data analysis for one quantitative and qualitative variable manually/tool/software.	3	Experiential-Learning 1.5	PSY-GUD	Does	PAL

Practical Training Activity

Practical No	Name	Activity details

Practical Training 1.1	Data handling	• Demonstration by the teacher
		  ◦ Data entry, cleaning, grouping, and coding of given data sets in Excel.
		• Hands-on training
		  ◦ Divide students into three groups
		  ◦ The students should be provided sample datasets (one specific to domain/subject* and one demographic)to each group for data entry, cleaning, grouping, and coding of the given data set in Excel.
		  ◦ Encourage students to discuss their approaches within their groups.
		  ◦ Invite each group to narrate and show the procedure they followed with their dataset in Excel.
		  ◦ A discussion on the different methods used for text and numeric data, the challenges encountered, and the insights gained from the data
		• The teacher shall summarize the key concepts covered in the practical.

Practical Training 1.2	Graphically representinon of	

	qualitative data	• Demonstration by the teacher
		  ◦ Tabulation of given data set using Excel/Statistical Software/tools
		• Hands-on training
		  ◦ Divide students into small groups
		  ◦ The students should be provided Sample datasets(specific to domain/subject*) or can use previous data sets for hands-on practice.
		  ◦ Instruct each group to tabulate their assigned dataset.
		  ◦ Instruct the presentation of only qualitative data graphically and diagrammatically.
		  ◦ Encourage students to use excel/statistical tools/software for presentation.
		  ◦ Encourage students to discuss their approaches within their groups.
		• The teacher shall summarize the key concepts covered in the practical.

Practical Training 1.3	Diagrammatic and graphical representation of quantitative and qualitative data	• Demonstration by the teacher
		  ◦ Tabulation of given data set manually and using Statistical Software/tools
		• Hands-on training
		  ◦ Divide students into small groups
		  ◦ The students should be provided with sample datasets(one specific to domain/subject* and one demographic)or case studies for hands-on practice.
		  ◦ Instruct each group to tabulate their assigned dataset.
		  ◦ Instruct to present only quantitative data graphically.
		  ◦ Encourage students to use statistical tools/software for presentation.
		  ◦ Encourage students to discuss their approaches within their groups.
		• The teacher shall summarize the key concepts covered in the practical.

Practical Training 1.4	Calculation of measures of Central Tendency (3 Sets of Data)	• Demonstration by the teacher

		◦ Calculate the mean, median, and mode manually using Statistical Software/tools. • Hands-on training ◦ Divide students into small groups. ◦ The students should be provided Sample datasets (specific to domain/subject*) or can use previous data sets for hands-on practice. ◦ Instruct each group to calculate the mean, median, and mode for their assigned dataset. ◦ Encourage students to use statistical software for calculation and verification. ◦ Encourage students to discuss their approaches and findings within their groups. ◦ Invite each group to present their results. ◦ Facilitate a discussion on the differences between mean, median, and mode in various datasets and their merits and demerits. • The teacher shall summarize the key concepts covered in the practical.
Practical Training 1.5	Calculation of measures of Dispersion (3 Sets of Data)	• Demonstration by the teacher ◦ Calculating the measures of Dispersion manually and using Statistical Software/tools. • Hands-on training ◦ Divide students into small groups ◦ The students should be provided Sample datasets (specific to domain/subject*) or can use previous data sets for hands-on practice. ◦ Instruct each group to calculate the range, variance, standard deviation, etc., for their assigned dataset. ◦ Encourage students to use statistical software for calculation and verification. ◦ Encourage students to discuss their approaches and findings within their groups. ◦ Invite each group to present their results. ◦ Facilitate a discussion on the differences between range, variance, and standard deviation in various datasets. • The teacher shall summarize the key concepts covered in the practical.

Experiential learning Activity		
Experiential learning No	**Name**	**Activity details**
Experiential-Learning 1.1	Data collection, entry, and cleaning collected data	**Data Collection-**Students should collect data specific to their domain/ subject from sources such as clinics/ inpatient departments (IPD)/ laboratories/animal houses/ Central Research Facility/Drug testing laboratories/pharmacies or surveys, or data from existing datasets. Whichever is feasible, *Students may be given 2-3 days.* **Data Entry:** Once the data is collected, students should enter it into statistical software/ Tools
Experiential-Learning 1.2	Presention of the data .	**Data Entry and Cleaning:** Cleaning the Data entered into statistical software/ Tools. **Data tabulation:** They should create frequency distributions to visualize the data distribution. **Data presentation and interpretation:** They should present the tabulated data graphically/ diagrammatically and also interpret it.
Experiential-Learning 1.3	Measures of central tendency manually/ statistical tool/ software	**Data Collection-**Domain specific data collected in Experiential learning 1.1 taken **Data Cleaning:** Cleaning the data sets in statistical software/ Tools **Central Tendency:** Students should calculate measures of central tendency (mean, median, mode) **Interpreting Descriptive Statistics:** After calculating and visualizing measures of central tendency, students should interpret the results to draw meaningful conclusions about the dataset. They should identify patterns, trends, and relationships within the data.
Experiential-Learning 1.4	Measures of dispersion	**Data Collection--** Domain-specific data collected in Experiential learning 1.1 taken **Data Entry and Cleaning:** Once the data is collected, students should enter it into statistical software/ Tools **Measures of Dispersion:** Students should calculate measures of dispersion (range, variance, standard deviation) **Interpreting Descriptive Statistics:** After calculating and visualizing Measures of Dispersion, students should interpret the results to draw meaningful conclusions about the dataset. They should identify patterns, trends, and relationships within the data.
Experiential-Learning 1.5	Descriptive data analysis	**Data Collection--** Domain-specific data collected in Experiential learning 1.1 taken **Data Entry and Cleaning:** Once the data is collected, students should enter it into statistical software/ Tools **Data Exploration:** They should create frequency distributions and histograms to visualize the data distribution. **Central Tendency and Dispersion:** Students should calculate measures of central tendency (mean, median, mode) and measures of dispersion (range, variance, standard deviation) **Interpreting Descriptive Statistics:** After calculating and visualizing descriptive statistics, students should interpret the results to draw meaningful conclusions about the dataset. They should identify patterns, trends, and relationships within the data.

Modular Assessment	
Assessment method	**Hour**
Instructions - Conduct a structured Modular assessment. Assessment will be for 25 marks per credit. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. A.1.Practical structured Viva Prepare a 10 viva questions including all the topics of module 1. – 20 Marks 2.Answer key- Prepare the key points that need to be covered and marks to be allocated to different sections. Example - **Question:**What is mean? **Answer Key:*****Definition(1M)**: The **mean** is a measure of central tendency, also known as the arithmetic average of a dataset. ***Formula(1M)**: Mean = Sum of all values Number of values 3.Score all students as per answer key. B.Practical Record Book – 5 Marks Or Any practical in converted form can be taken for assessment. Or Any of the experiential as portfolio/ refelections / presentations can be taken as assessment.	2

Module 2 : Probability, Probability Distributions, Sampling Techniques, and Sample Size Determinations

Module Learning Objectives
(At the end of the module, the students should be able to)

1. Define and explain the Concept and laws of probability
2. Explain different probability distributions, standard error, point estimate, and confidence interval.
3. Explain and relate the various types of Sampling techniques.
4. Compute sample size for Descriptive studies, Analytical studies, and RCTs.

Unit 1 Probability and Probability Distributions Probability -
Definitions, types, and laws of probability.
Probability Distributions -

1. **Normal distribution: Concept and Properties.**
2. **Different ways to test the assumption of normality.**
3. **Binomial Distribution, Poisson Distribution.**
4. **Definitions and explanation of Sampling distribution, Standard Error, Point Estimate, and Confidence interval**

References: 13,14,21,22,23,24

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO2,CO4	Explain Sample Spaces and Events associated with a random experiment. Define probability and discuss the laws of probability.	1	Lecture	CK	Know	L&PPT
2	CO1,CO2,CO4	Generate questions on probability, experimental probability, Mutually	2	Experiential-	PSY-ADT	Shows-	BS,DIS,I

		Exclusive, and Exhaustive Events in probability.		Learning 2.1		how	BL,PT,PER,PSM
3	CO1,CO2,CO4	Define and discuss the properties of normal distribution and explain standard normal distribution.	1	Lecture	CAP	Knows-how	DIS,L&PPT
4	CO1,CO2,CO4	Explain ways to test the assumption of normality (based on measures of central tendency, histogram, Shapiro-Wilk test)	1	Lecture	CK	Know	L&PPT
5	CO1,CO2,CO4	Test and appraise the assumption of normality of given data sets using Excel and other software.	2	Practical Training 2.1	PSY-SET	Shows-how	D,PAL
6	CO1,CO2,CO4	Interpret results in Excel and other software for testing the normality of given data sets.	2	Practical Training 2.2	PSY-GUD	Shows-how	D
7	CO1,CO2,CO4	Discuss assumptions, properties, and the application of binomial and poison distribution	1	Lecture	CK	Know	L&PPT
8	CO1,CO2,CO4	Compute the mean and variance of normal, binomial, and poison distribution (given the probability distribution function).	2	Practical Training 2.3	PSY-ADT	Shows-how	BL,D
9	CO1,CO2,CO4	Identify and justify normal, binomial, and poison distribution using a secondary dataset /Published data	2	Experiential-Learning 2.2	PSY-ADT	Shows-how	BL,D,DIS,PAL,PER,PBL
10	CO1,CO2,CO4	Collect and present of different real-life events in Respective subject domains where they can apply normal, binomial, and poison concepts.	2	Experiential-Learning 2.3	PSY-ADT	Shows-how	BL,D
11	CO1,CO2,CO4	Define and explain Sampling distribution, Standard Error, Point Estimate, and confidence Interval	1	Lecture	CK	Know	L&PPT
12	CO1,CO2,CO4	Compute and interpret Standard Error, Point Estimate, and confidence interval for the mean.	2	Practical Training 2.4	PSY-ADT	Shows-how	D,DIS,PT,PER,PrBL
13	CO1,CO2,CO4	Compute and interpret Standard Error, Point Estimate, and confidence interval for proportion.	2	Practical Training 2.5	PSY-SET	Shows-how	BL,D,IBL,PER

14	CO1,CO2,CO4	Identify and interpret the point estimate and confidence interval in the given research papers/data sets.	2	Experiential-Learning 2.4	PSY-SET	Shows-how	BL,D
15	CO1,CO2,CO4	Identify and interpret the point estimate and confidence interval for collected data sets.	2	Experiential-Learning 2.5	PSY-SET	Shows-how	D,PT,PER

Unit 2 Sampling techniques and Sample size Determinations

1. **Population and sample parameters**
2. **Sampling techniques (probability & non-probability based) and Sample size Determinations:**
3. **Sampling designs and prerequisites for sample size computation.**
4. **Computation of sample size for Descriptive studies, Analytical Studies, and RCTs.**

References: 15,16,17,18,19,20

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO2,CO4	Explain the population, sample, parameter, and statistic.	1	Lecture	CK	Know	L&PPT
2	CO1,CO2,CO4	Describe different Sampling techniques (Probability based) (simple, stratified, systematic, cluster)	1	Lecture	CK	Know	L&PPT
3	CO1,CO2,CO4	Describe different Sampling techniques (non-probability based) (snow ball, convenience, quota)	1	Lecture	CK	Know	L&GD
4	CO1,CO2,CO4	Demonstrate Sampling techniques (probability)	2	Practical Training 2.6	PSY-SET	Shows-how	D,IBL
5	CO1,CO2,CO4	Demonstrate Sampling techniques (non-probability)	2	Practical Training 2.7	PSY-SET	Shows-how	D,PL,PT, PER
6	CO1,CO2,CO4	Concept and understanding of sample size and study design (Descriptive, Analytical, and all study Designs)	2	Lecture	CK	Know	L&PPT

7	CO1,CO2,CO4	Determine and Compute sample size for Descriptive study Designs manually, using Excel and other available software/tools.)	2	Practical Training 2.8	PSY-SET	Shows-how	D,DIS,PER,PrBL
8	CO1,CO2,CO4	Determine and compute sample size for analytical studies (manually, using Excel and other available software/tools).	2	Practical Training 2.9	PSY-SET	Shows-how	D,DIS,PT,PER,PBL
9	CO1,CO2,CO4	Determine and compute sample size for RCT study designs (manually, using Excel and other available software/tools).	2	Practical Training 2.10	PSY-SET	Shows-how	D,IBL,PBL
10	CO1,CO2,CO4	Recognize sampling designs and critique sample sizes in research papers. Also, give the recommendations if they contradict.	2	Experiential-Learning 2.6	PSY-SET	Shows-how	BL,BS,IBL,PAL,PER,SDL,TBL
11	CO1,CO2,CO4	Calculate sample size for an observational study, use appropriate sampling techniques, and collect the data.	3	Experiential-Learning 2.7	PSY-SET	Shows-how	D,IBL,PAL,PER,PBL
12	CO1,CO2,CO4	Calculate sample size for analytical study using appropriate sampling technique and collect the data.	3	Experiential-Learning 2.8	PSY-SET	Shows-how	D,PAL,PBL,TBL
13	CO1,CO2,CO4	Calculate sample size for RCT study using appropriate sampling technique and collect the data.	2	Experiential-Learning 2.9	PSY-SET	Shows-how	BL,D,DIS,PT,PER,PrBL,SDL
14	CO1,CO2,CO4	Build and justify different scenarios using appropriate Study design, sampling techniques, and sample size formula.	2	Experiential-Learning 2.10	PSY-SET	Shows-how	BS,PrBL,TBL
15	CO1,CO2,CO4	Plan and produce a simulated model for different probability Sampling techniques.	2	Experiential-Learning 2.11	PSY-SET	Shows-how	BS,D-M,RP
16	CO1,CO2,CO4	Plan and produce a simulated model for different non-probability sampling techniques.	2	Experiential-Learning 2.12	PSY-SET	Shows-how	D,IBL,PT,PER

Practical Training Activity		
Practical No	**Name**	**Activity details**

Practical Training 2.1	Normal Data	• Demonstration by the teacher
		  ◦ Test normality using statistical tools/ software.
		• Hands-on training/ presentation
		  ◦ Divide students into small groups
		  ◦ The students should be provided with Sample datasets (2 each) for hands-on practice.
		  ◦ Instruct each group to test the normality using measures of central tendency, Histogram, and Shapiro-Wilk test.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to present their results.
		• Conclusion and summarization
		  ◦ The teacher shall summarize the key concepts covered in the practical session and give inputs for further improvisation.

Practical Training 2.2	Interpretation of Normal Data.	• Demonstration by the teacher
		
		Interpretation of results after testing the normality using Excel and other software.
		
		• Hands-on training and Interpretation
		  ◦ Each group is provided with the data set (1 each) for hands-on practice.
		  ◦ Instruct the groups to test the normality of the given data set.
		  ◦ Advocate for each group to discuss the different ways of interpreting results, the challenges encountered, and the insights gained.
		  ◦ Then, students should be provided with only an output sheet/histogram/ result sheet from software/tool after testing

		for normality (2 each) to interpret the result as hands-on practice. • conclusion and summarization ◦ The teacher shall summarize the key concepts covered in the practical session and also give inputs for further improvisation.
Practical Training 2.3	Calculate the mean and variance of normal, binomial, and poison distribution.	• Demonstration by the teacher ◦ Calculation of means and variance of normal, binomial, and poison distribution for given data sets (manually/ Statistical Software/tools) • Hands-on training/ peer discussion ◦ Divide students into small groups ◦ Given the probability distribution function, the students should be provided with Sample datasets, ◦ Instruct the group to identify the type of probability distribution ◦ Direct each group to manually calculate the mean and variance of normal, binomial, and poison distribution for their assigned dataset. ◦ Encourage students to use statistical software for calculation and verification. ◦ Instigate brainstorming within the groups to discuss their approaches and findings. • conclusion and summarization ◦ The teacher shall summarize the key concepts covered in the practical session and also give inputs for further improvisation.
Practical Training 2.4	Standard Error and confidence interval	• Demonstration by the teacher ◦ Calculation of Standard Error, Point Estimate, and confidence interval for mean manually and using Statistical Software/tools • Hands-on training/ presentation ◦ Divide students into small groups

		◦ The students should be provided with Sample datasets for hands-on practice. ◦ Instruct each group to calculate the standard error, Point Estimate, and confidence interval for the mean for their assigned dataset. ◦ Encourage students to use statistical software for calculation and verification. ◦ Invite each group to present their results. • Conclusion and summarization ◦ The teacher shall summarize the key concepts covered in the practical session and also give inputs for further improvisation.
Practical Training 2.5	Standard Error and confidence interval Estimation.	• Demonstration by the teacher ◦ Calculation of Standard Error, Point Estimate, and confidence interval for mean manually and using Statistical Software/tools • Hands-on training/ Presentation ◦ Divide students into small groups ◦ The students should be provided with Sample datasets for hands-on practice. ◦ Instruct each group to calculate the Standard Error, Point Estimate, and confidence interval for proportions for their assigned dataset. ◦ Encourage students to use statistical software for calculation and verification. ◦ Invite each group to present their results. • Conclusion and summarization ◦ The teacher shall summarize the key concepts covered in the practical session and also give inputs for further improvisation.
Practical Training 2.6	Perform of probability sampling	• Demonstration by the teacher

		Probability sampling using real-world examples
		
		• Hands-on training / Peer learning/ Demonstration
		  ◦ Divide students into small groups.
		  ◦ Instruct each group to demonstrate data Collection using probability sampling techniques.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to demonstrate the probability sampling method.
		• Conclusion and summarization
		  ◦ The teacher shall summarize the key concepts covered in the practical session and also give inputs for further improvisation.

Practical Training 2.7	Non-probability sampling	• Demonstration by the teacher
		
		Non-probability sampling using real-world examples
		
		• Hands-on training/ Peer learning/ Demonstration
		  ◦ Divide students into small groups.
		  ◦ Instruct each group to demonstrate data Collection using non-probability sampling techniques.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to demonstrate the non-probability sampling method.
		• Conclusion and summarization
		  ◦ The teacher shall summarize the key concepts covered in the practical session and also give inputs for further improvisation.

Practical	Sample size for	

Training 2.8	Descriptive study Designs.	• Compute sample size for Descriptive study Designs (manually, Excel, and other available software/tools.)(5 for each case scenario)
		• Demonstration by the teacher
		  ◦ Train to identify different study designs and decide the sample size calculation method to be used.
		  ◦ Compute sample size for Descriptive study Designs (manually, Excel, and other available software/tools)
		• Hands-on training (problem-based learning)
		  ◦ Divide students into small groups
		  ◦ The students should be provided with a Sample case scenario (5 each) with all information needed for sample size calculation for hands-on practice.
		  ◦ Encourage students to identify the study design and calculate the sample size. Thereby, they will discuss the approaches and findings within their groups.
		  ◦ Invite each group to present and justify their results.
		• Conclusion and summarization
		  ◦ The teacher shall summarize the key concepts covered in the practical session and also give inputs for further improvisation.

Practical Training 2.9	Sample size for analytical studies.	• Determine and compute sample size for analytical studies (manually, using Excel and other available software/tools).
		• Demonstration by the teacher
		  ◦ Train to identify different study designs and decide the sample size calculation method to be used.
		  ◦ Compute sample size for analytical study Designs (manually, Excel, and other available software/tools)
		• Hands-on training (problem-based learning)
		  ◦ The students should be provided with a Sample case scenario (5 each) with all information needed for sample size calculation for hands-on practice.
		  ◦ Encourage students to identify the study design and calculate the sample size. Thereby, they will discuss the approaches and findings within their groups.
		  ◦ Invite each group to present and justify their results.
		• Conclusion and summarization
		  ◦ The teacher shall summarize the key concepts covered in the practical session and also give inputs for further

		improvisation.
Practical Training 2.10	Sample size for experimental study Design.	• Determine and Compute sample size for experimental (manually, Excel, and other available software/tools.) • Demonstration by the teacher ◦ Train to identify different study designs and train to calculate the sample size calculation for different study designs. ◦ Compute sample size for experimental study Designs (manually, Excel, and other available software/tools) • Problem-based learning ◦ The students should be provided with a Sample case scenario (5 each) with all information needed for sample size calculation for hands-on practice. ◦ Encourage students to identify the study design and calculate the sample size. Thereby, they will discuss the approaches and findings within their groups. ◦ Invite each group to present and justify their results. • Conclusion and summarization ◦ The teacher shall summarize the key concepts covered in the practical session and also give inputs for further improvisation.
Experiential learning Activity		
Experiential learning No	**Name**	**Activity details**
Experiential-Learning 2.1	Probability and experimental probability.	◦ Students will be divided into groups. ◦ Each group will discuss and pose an enquiry (2 each) ◦ Access to study resources (e-learning) will be provided so that students can find relevant resources.

		◦ Each group is asked to make a meaningful explanation using prior and new knowledge and share the findings. ◦ The group that proposed the enquiry is asked to evaluate/critic the group that is sharing the findings. **The teacher will evaluate the group findings,** summarize the key concepts, and give input for further improvisation.
Experiential-Learning 2.2	Normal, binomial, and poison distribution.	Identify and justify normal, binomial, and poison distribution from collected secondary dataset /Published data. **Data Collection-** Students should collect published/ secondary data from different sources. **Data Entry and Cleaning:** Once the data is collected, students should enter it into statistical software/ Tools **Data Exploration:** They should create histograms to visualize the data distribution and use statistical software/tools to test the distribution. **Interpreting Descriptive Statistics:** Students should interpret the results to draw meaningful conclusions about the dataset after visualizing descriptive statistics and calculating test statistics. They should identify and justify the distribution. **The teacher should summarize and conclude the session.**
Experiential-Learning 2.3	Normal, binomial, and poison Distribution.	**Data Collection-** Instructed to collect real-life events related to their subject domain where they can apply concepts of normal, binomial, and poison. **Data Exploration /Reflective Observation:** Students then carry out peer discussion on the collected data with the subject experts and seniors pgs. Finally, review the experience attained. **Interpreting /abstract conceptualization:** Students should conclude the learning achieved through experience. **The teacher should summarize and conclude the session.**
Experiential-Learning 2.4	Confidence interval estimation.	**Data Collection-** Students should collect 5 domain-specific research papers from databases (Google Scholar/PubMed/Cochrane/ Dissertation, etc. **Data Exploration:** Students should identify point estimates and confidence intervals in the domain-specific research paper. **Interpreting:** After identifying, students should interpret the point estimate and confidence interval to draw meaningful conclusions about the research paper. **The teacher should summarize and conclude the session.**
Experiential-Learning 2.5	Confidence interval - Identify and interpret	Identify and interpret the point estimate and confidence interval for collected data sets. **Data Collection-** Students should collect data from different sources or through surveys. **Data Entry and Cleaning:** Once the data is collected, students should enter it into statistical software/ Tools **Data Exploration:** They should calculate point estimates and confidence intervals from the collected data set. **Interpreting:** After calculating and visualizing, students should interpret the point estimate and confidence interval to draw

		meaningful conclusions about the dataset. **The teacher should summarize and conclude the session.**
Experiential-Learning 2.6	Sample size and Sampling designs.	**Data Collection-** Students should collect 5 research papers from databases (Google Scholar/PubMed/Cochrane/ dissertation, etc. **Data Exploration:** Students should Recognize the sampling designs and sample size studied in the research paper. **Interpreting:** Students should critique the sampling design sample sizes in research papers after identifying them. Also, give the recommendation if it contradicts. **The teacher should summarize and conclude the session.**
Experiential-Learning 2.7	Sample size for an observational study.	**Active experimentation: The student is instructed to** Step one: Select a topic for observational study Step two: Do a literature search for sampling variability, margin of error, confidence interval, and sample mean/proportion/ coefficient. Step three: calculate the sample size Step four: choose the appropriate sampling technique Step five: collect the data. Step six: submit a report**.** **The teacher shall study the submitted report and give feedback.**
Experiential-Learning 2.8	Sample size for analytical study.	**Active experimentation: The student is instructed to** Step one: Select a topic for analytical study Step two: Do the literature search for sampling variability, margin of error, confidence interval, and sample mean/proportion/ coefficient. Step three: calculate the sample size Step four: choose the appropriate sampling technique Step five: collect the data. Step six: submit a report**.** **The teacher shall study the submitted report and give feedback.**
Experiential-Learning 2.9	Calculate sample size for RCT.	**Active experimentation: The student is instructed to** Step one: Select a topic for RCT study Step two: Do the literature search for sampling variability, margin of error, confidence interval, and sample mean/proportion/ coefficient.

		Step three: calculate the sample size Step four: choose the appropriate sampling technique Step five: collect the data. Step six: submit a report**.** **The teacher shall study the submitted report and give feedback.**
Experiential-Learning 2.10	Study design, sampling techniques, and sample size formula.	**Active experimentation: The student is instructed to** Step one: Plan scenarios (5 each) Step two: Specify the study design Step three: specify the sampling technique to be used Step four: specify the sample size formula that has to be used. Step five: compile and submit a report **The teacher shall study the submitted report and give feedback.**
Experiential-Learning 2.11	Probability sampling techniques.	**Self-directed learning (role play/simulated worlds/ video)** Step one: Form a group of 5 members each Step two: plan and create simulated learning (role play/simulated worlds) for probability sampling. Step three: exhibit the created simulated learning
Experiential-Learning 2.12	Non-probability sampling techniques.	**Self-directed learning (role play/simulated worlds/ video)** Step one: Form a group of 5 members each Step two: plan and create simulated learning (role play/simulated worlds) for probability sampling. Step three: exhibit the created simulated learning

Modular Assessment

Assessment method	**Hour**
Instructions - Conduct a structured Modular assessment. Assessment will be for 25 marks per credit. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Working Portfolio on Experiential learning components of the module. 5 marks for each step. Student instructions 1. Submit a draft of your experiential learning.	4

2.Receive feedback you’re mentor on methodology. 3.Revise the report based on the feedback. 4.Include reflections on what you learned after each experiential learning. 5. Show drafts of experiential learning with notes on what was challenging and how you overcame the obstacles. and (25 Marks) Any practical in converted form can be taken for assessment. Or Any of the experiential as portfolio/ refelections / presentations can be taken as assessment.	

Module 3 : Tests of significance and parametric statistical tests

Module Learning Objectives
(At the end of the module, the students should be able to)

1. **Know the fundamentals of hypothesis testing and tests of significance**
2. **Identify and apply appropriate parametric tests and interpret the findings**

Unit 1 Testing of hypothesis

1. **Understand and apply the concept of null and alternate hypotheses**
2. **Define of Type I and type II errors,**
3. **Evaluate Test of significance, level of significance, power of the test**
4. **Calculate 'P' value and its interpretation, statistical significance, and clinical significance**

References: 25,26,27,28,29

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO2,CO4	Understand and explain the concept of null and alternate hypotheses (Examples)	1	Lecture	CK	Know	BL
2	CO1,CO2,CO3 ,CO4	Construct the null and alternate hypothesis	2	Practical Training 3.1	PSY-SET	Shows-how	BL
3	CO1,CO2,CO3 ,CO4	Define and explanation of Type I and Type II errors	1	Lecture	CC	Shows-how	L&PPT
4	CO1,CO2,CO3	Demonstrate type I & type II errors from the data collected from secondary	2	Practical	PSY-	Shows-	BL,D,PB

	,CO4	sources,		Training 3.2	GUD	how	L
5	CO1,CO2,CO3 ,CO4	Understand and describe Tests of significance (steps involved), level of significance, and power. Explain one-tail and two-tail tests.	1	Lecture	CAP	Knows-how	L&PPT
6	CO1,CO2,CO3 ,CO4	Distinguish tests of significance for different scenarios (one sample, two samples, independent, dependent, parametric, non-parametric) Differentiate one-tail and two-tail tests.	2	Practical Training 3.3	PSY-SET	Shows-how	BL,D,GBL
7	CO1,CO2,CO3 ,CO4	Collect data from primary/secondary sources like articles or theses, identify data as one sample/two sample/ independent/ dependent/ one-time point/repeated, and suggest appropriate parametric/non-parametric test	3	Experiential-Learning 3.1	PSY-SET	Does	BL,D,PT, PER,PBL
8	CO1,CO2,CO3 ,CO4	Outline the importance of the 'p' value and its interpretation. Distinguish the statistical significance and clinical significance	1	Lecture	CAP	Knows-how	L&PPT
9	CO1,CO2,CO3 ,CO4	Examine the data and evaluate the significance and power. Critic the significance (statistical vs. clinical) in the given scenario.	2	Practical Training 3.4	PSY-SET	Shows-how	D,PL,PT, TBL
10	CO1,CO2,CO3 ,CO4	Collect data from secondary sources like articles or theses. Identify the tests of significance to be applied. Critic and interpret on level of significance, power, type I & type II errors, and p-value.	3	Experiential-Learning 3.2	PSY-GUD	Does	BL

Unit 2 Parametric tests

1. **‘Z' test**
2. **Student's 't' test: paired or dependent**
3. **Student's 't' test: unpaired or independent**
4. **'F' test**
5. **Analysis of variance (ANOVA) test with post hoc Analysis**
6. **Repeated measures ANOVA with post hoc Analysis**

References: 30,31,32,33,34

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO2,CO3 ,CO4	Explain the 'Z' test, its application, and interpretation.	1	Lecture	CC	Knows-how	L&PPT
2	CO1,CO2,CO3 ,CO4	Calculate the 'Z' test using different statistical tools/software for a data set	2	Practical Training 3.5	PSY-SET	Shows-how	BL
3	CO1,CO2,CO3 ,CO4	Collect quantitative data from primary/secondary sources for a larger sample (n>30) with single/two groups. Utilizing data, do a Z test. Analyze the data with statistical tools and interpret the findings in terms of statistical and clinical significance.	3	Experiential-Learning 3.3	PSY-GUD	Does	BL
4	CO1,CO2,CO3 ,CO4	Explain the dependent 't' test, its application, and interpretation	1	Lecture	CAP	Knows-how	L&PPT
5	CO1,CO2,CO3 ,CO4	Demonstrate the 'dependent 't' test using different statistical tools/software for a data set	2	Practical Training 3.6	PSY-SET	Shows-how	BL
6	CO1,CO2,CO3 ,CO4	Collect quantitative data from primary/secondary sources for a sample with one group and two-time points. Utilizing data, do a dependent t-test. Analyze the data with statistical tools, Interpret the findings in terms of statistical and clinical significance.	3	Experiential-Learning 3.4	PSY-GUD	Does	BL
7	CO1,CO2,CO3 ,CO4	Explain the independent 't' test, its application, and interpretation	1	Lecture	CAP	Knows-how	L&PPT
8	CO1,CO2,CO3 ,CO4	Demonstrate the independent ‘t' test using different statistical tools/software for a data set	2	Practical Training 3.7	PSY-SET	Shows-how	BL
9	CO1,CO2,CO3 ,CO4	Collect quantitative data from primary/secondary sources for a sample with two groups and one-time points. Utilizing data, do an independent t-test. Analyze the data with statistical tools, Interpret the findings in terms of statistical and clinical significance.	3	Experiential-Learning 3.5	PSY-GUD	Shows-how	BL

10	CO1,CO2,CO3,CO4	Explain the 'F' test, its application and interpretation	1	Lecture	CAP	Knows-how	L&PPT
11	CO1,CO2,CO3,CO4	Demonstrate the 'F' test using different statistical tools/software for a data set	2	Practical Training 3.8	PSY-SET	Shows-how	BL,D,PER,PBL
12	CO1,CO2,CO3,CO4	Collect quantitative data from primary/secondary sources for a sample with more than two groups. Utilizing data, do an F test. Analyze the data with statistical tools, Interpret the findings in terms of statistical and clinical significance.	3	Experiential-Learning 3.6	PSY-SET	Shows-how	BL,BS,D,DSN,IBL,PER,PBL
13	CO1,CO2,CO3,CO4	Explain the ‘ANOVA’ test along with post hoc analyses, its application, and interpretation	1	Lecture	CAP	Knows-how	L&PPT
14	CO1,CO2,CO3,CO4	Demonstrate the 'ANOVA' test with analysis using different statistical tools/software for a data set	2	Practical Training 3.9	PSY-SET	Shows-how	BL,BS,D,DIS,IBL,PL
15	CO1,CO2,CO3,CO4	Collect quantitative data from primary/secondary sources for a sample with more than two groups and one-time points. Utilizing data, do ANOVA. Analyze the data with statistical tools, Interpret the findings in terms of statistical and clinical significance.	3	Experiential-Learning 3.7	PSY-GUD	Shows-how	D,DIS,PT,PER,PBL
16	CO1,CO2,CO3,CO4	Explain the 'repeated measures ANOVA' test along with post hoc analyses, its application, and interpretation	1	Lecture	CAP	Knows-how	L&PPT
17	CO1,CO2,CO3,CO4	Demonstrate the 'repeated measures ANOVA' test with Analysis using different statistical/software for data set tools	2	Practical Training 3.10	PSY-GUD	Shows-how	BL,D,DIS,PER,PBL,TBL
18	CO1,CO2,CO3,CO4	Collect quantitative data from primary/secondary sources for a sample with more than two groups and more than two-time points. Utilizing data, do repeated measures ANOVA. Analyze the data with statistical tools, Interpret the findings in terms of statistical and clinical significance.	3	Experiential-Learning 3.8	PSY-GUD	Does	D,PAL,PER,PBL,TBL

19	CO1,CO2,CO3 ,CO4	Collect quantitative data from primary/secondary sources for a sample with more than two groups and more than two-time points. Utilizing data, plan all parametric tests and assign levels of significance. Analyze the data with statistical tools, selecting the appropriate test. Interpret the findings in terms of statistical and clinical significance.	2	Experiential-Learning 3.9	PSY-GUD	Shows-how	D,DIS,IBL,PT,PER

Practical Training Activity

Practical No	Name	Activity details
Practical Training 3.1	Null and alternate hypothesis.	• Demonstration by the teacher ◦ Construction of null and alternate hypotheses in different research conditions, such as superiority/inferiority design and clinical, experimental studies, etc. ◦ Examples 1-2 for each condition: clinical, experimental studies - clinical, experimental, analytical studies –conditions: Test group T ?C Control group, T not less than C, T not more than C • Hands-on training ◦ Divide students into small groups and allot one research area for each group. ◦ Instruct each group to prepare possible research questions and research hypotheses. ◦ Students discuss and construct possible hypotheses. ◦ Invite each group to present their hypothesis. ◦ Discussion on the different classification techniques used, the challenges encountered, and the insights gained. • The teacher shall summarize the key concepts covered in the practical.
Practical Training 3.2	Type I & type II errors	• Demonstration by the teacher ◦ Datasets collected from research articles or theses demonstrate type I & II errors. ◦ Explain possible solutions to overcome them • Hands-on training

		◦ Divide students into small groups and allot one research data for each group. ◦ Facilitate the students by providing sample datasets or case studies for hands-on practice. ◦ Encourage students to discuss their findings & opinions within their groups. ◦ Invite each group to present their findings on type I & II errors. • Promote a discussion on the insights gained from the data • The teacher shall summarize the key concepts covered in the practical
Practical Training 3.3	Tests of significance	• Demonstration by the teacher ◦ Datasets collected from research articles or theses show how to identify different types of parametric/nonparametric tests to be applied for different conditions of data and differences in one/two-tail tests. ◦ • Hands-on training ◦ Divide students into small groups. ◦ The students should be provided Sample datasets or case studies for hands-on practice. ◦ Instruct each group to identify appropriate parametric or nonparametric tests for the assigned dataset. ◦ Encourage students to find similar conditions of data from the internet or any thesis. ◦ Encourage students to discuss their approaches and findings within their groups. ◦ Invite each group to present their results. ◦ Facilitate a discussion on identifying appropriate parametric or nonparametric tests and one/two-tail tests for various datasets. • The teacher shall summarize the key concepts covered in the practical.
Practical Training 3.4	Data significance and power.	• Demonstration by the teacher ◦ Calculating the ‘significance and power’ manually and using Statistical Software/tools. • Hands-on training

		◦ Divide students into small groups ◦ The students should be provided Sample datasets or case studies for hands-on practice. ◦ Instruct each group to calculate the significance and power of their assigned dataset. ◦ Encourage students to use statistical software for calculation and verification. ◦ Encourage students to discuss their approaches, findings, and interpretations within their groups. ◦ Invite each group to present their results and interpretation. ◦ Brainstorm on statistical and clinical significance in various datasets. • The teacher shall summarize the key concepts covered in the practical.
Practical Training 3.5	'Z' test Calculation using statistical tools/software.	• Demonstration by the teacher ◦ Demonstrate Z test manually and using Statistical Software/tools, for example, a data set of continuous data of a larger sample (n>30) • Hands-on training ◦ Divide students into small groups ◦ The students should be provided Sample datasets or case studies for hands-on practice. ◦ Instruct each group to calculate the Z variate and p-value for their assigned dataset. ◦ Encourage students to use statistical software for calculation and verification. ◦ Encourage students to discuss their approaches, findings, and interpretations within their groups. ◦ Invite each group to present their results and interpretation. • Facilitate a discussion on the differences in Z variate for various datasets. • The teacher shall summarize the key concepts covered in the practical.
Practical Training 3.6	Dependent 't' test.	• Demonstration by the teacher ◦ Calculating the ‘t’ value and p-value for a single group, two-time point data set having continuous data of smaller sample (n<30), manually and using Statistical Software/tools

		• Hands-on training ◦ Divide students into small groups ◦ The students should be provided Sample datasets or case studies for hands-on practice. ◦ Instruct each group to calculate the ‘t’ value and p value for their assigned dataset. ◦ Encourage students to calculate the t value manually/using Excel and statistical tables for ‘t.’ ◦ Encourage students to use statistical software for calculation and verification. ◦ Encourage students to discuss their approaches, findings, and interpretations within their groups. ◦ Invite each group to present their results and interpretation. • Facilitate a discussion on the differences in t value –p value for various datasets. • The teacher shall summarize the key concepts covered in the practical.
Practical Training 3.7	Independent 't' test	• Demonstration by the teacher ◦ Calculating the ‘t’ value and p-value for two groups, a one-time point data set having continuous data of smaller sample (n<30), manually and using Statistical Software/tools • Hands-on training ◦ Divide students into small groups ◦ The students should be provided Sample datasets or case studies for hands-on practice. ◦ Instruct each group to calculate the ‘t’ value and p value for their assigned dataset. ◦ Encourage students to calculate manually/using Excel and statistical tables for ‘t’. ◦ Encourage students to use statistical software for calculation and verification. ◦ Encourage students to discuss their approaches, findings, and interpretations within their groups. ◦ Invite each group to present their results and interpretation. • Facilitate a discussion on the differences in t value –p value for various datasets. • The teacher shall summarize the key concepts covered in the practical.
Practical Training 3.8	'F' test Calculation.	

		• Demonstration by the teacher ◦ Calculating the ‘F’ value and p-value and applying appropriate tests for Two groups, a one-time point data set having continuous data of smaller sample (n<30), manually and using Statistical Software/tools • Hands-on training ◦ Divide students into small groups ◦ The students should be provided Sample datasets or case studies for hands-on practice. ◦ Instruct each group to calculate the F and p values and apply analysis to their assigned dataset. ◦ Encourage students to calculate manually/using Excel and statistical tables for ‘t.’ ◦ Encourage students to use statistical software for calculation and verification. ◦ Encourage students to discuss their approaches, findings, and interpretations within their groups. ◦ Invite each group to present their results and interpretation. • Facilitate a discussion on the differences in F value –p value and posthoc analyses for various datasets. • The teacher shall summarize the key concepts covered in the practical.
Practical Training 3.9	'ANOVA' test Analysis	• Demonstration by the teacher ◦ Calculating the ‘F’ value and p-value and applying appropriate tests for Three or more groups, a one-time point data set having continuous data of smaller sample (n<30), manually and using Statistical Software/tools • Hands-on training ◦ Divide students into small groups ◦ The students should be provided Sample datasets or case studies for hands-on practice. ◦ Instruct each group to calculate the ‘F’ value and p-value and apply analysis to their assigned dataset. ◦ Encourage students to calculate manually/using Excel and statistical tables for ‘f’. ◦ Encourage students to use statistical software for calculation and verification. ◦ Encourage students to discuss their approaches, findings, and interpretations within their groups. ◦ Invite each group to present their results and interpretation. • Facilitate a discussion on the differences in F value –p value and post hoc analyses for various datasets. • The teacher shall summarize the key concepts covered in the practical.

Practical Training 3.10	Annova test - Repeated	• Demonstration by the teacher
		  ◦ Calculating the ‘F’ value and p-value and applying appropriate tests for one group, more than two-time points data set having continuous data, manually and using Statistical Software/tools
		• Hands-on training
		  ◦ Divide students into small groups
		  ◦ The students should be provided Sample datasets or case studies for hands-on practice.
		  ◦ Instruct each group to calculate the ‘F’ and p values and apply analysis to their assigned dataset.
		  ◦ Encourage students to calculate manually/using Excel and statistical tables for ‘f’.
		  ◦ Encourage students to use statistical software for calculation and verification.
		  ◦ Encourage students to discuss their approaches, findings, and interpretations within their groups.
		  ◦ Invite each group to present their results and interpretation.
		• Facilitate a discussion on the differences in F value –p value and post hoc analyses for various datasets.
		• The teacher shall summarize the key concepts covered in the practical.

Experiential learning Activity		
Experiential learning No	**Name**	**Activity details**
Experiential-Learning 3.1	Parametric/non-parametric test	Teacher activity: Divide students into multiple groups. Allot or mentor each group to select different types of data sets for the assignment. Guide them in using the statistical tools/software Student activity as Groups: Collection of data from primary/secondary sources: Data Collection- Students should collect data from different sources, such as articles or theses, by conducting interviews, clinical posting, or by gathering from existing datasets.

		Data Entry and Cleaning: Once the data is collected, students should enter it into Excel/statistical software/Tools Classify data as**:** independent/dependent Categorical or continuous data (Nominal/Ordinal/Scale) one sample/two samples/more than two samples one-time point /repeated measures Do appropriate descriptive statistics Find whether sampling is random or not. Find whether the distribution is Normal or not. Find the appropriate Statistical Test: parametric/non-parametric Which type of parametric /nonparametric Discuss the findings with your group members. Each group will present the findings and discussion by all students and faculty concerned to conclude. The teacher shall summarize the key concepts covered.
Experiential-Learning 3.2	level of significance, power, type I & type II errors, and p-value.	Teacher activity: Divide students into multiple groups. Allot or mentor each group to select different types of data sets for the assignment. Guide them in using the statistical tools/software. Student activity as Groups: Collection of data from secondary sources : Students should collect data from different sources, such as articles or theses, or by gathering data from existing datasets. Data Entry and Cleaning: Once the data is collected, students should enter it into Excel/statistical software/ Tools Analyze the data as follows: independent/dependent Categorical or continuous data (Nominal/Ordinal/Scale) one sample/two samples/more than two samples one-time point /repeated measures Do appropriate descriptive statistics Find whether sampling is random or not.

		Find whether the distribution is Normal or not. Identify the tests of significance to be applied. Decide the level of significance and p-value Calculate the power Discuss the possible type I & type II errors Critic and interpret the data set selected on the following level of significance power type I & type II errors p-value Discuss the findings with your group members. Each group will present the findings and discussion by all students and faculty concerned to conclude. **The teacher shall summarize the key concepts covered.**
Experiential-Learning 3.3	Z test	**Teacher activity:** Divide students into multiple groups. Allot or mentor each group to select different types of data sets for the assignment. Guide them in using the statistical tools/software **Student activity as Groups:** Data Collection- Students should collect data from different sources or through surveys. This can involve conducting interviews, gathering data from existing datasets, or collecting from a ward/class. Take care that the sample number is more than 30, has a continuous type, and follows random sampling. Collect data from two samples and two-time points. Data Entry and Cleaning: Once the data is collected, students should enter it into a datasheet/excel and statistical software/ Tools Data Exploration: Do appropriate descriptive statistics. (Mean, Median, range, variance, Standard deviation, Standard Error, etc.) Find whether the distribution is Normal or not. If following normal distribution, proceed with the Z test. Make Null and alternate hypotheses. (Superiority/inferiority or equal between groups). Do a test of significance, i.e., the ‘Z test’ for this data. Fix the level of significance at 0.05 or 0.01. Z Test: Perform the Z test an the prepared data sheet using statistical software/excel/manually. Use appropriate methods like one-tail (left or right) or two-tail tests. Interpretation: After calculating and visualizing descriptive and inferential statistics, students should interpret the results to draw meaningful conclusions about the dataset. Find whether the Null hypothesis proved or not.

		Find the possibilities errors. Discuss the Z variate, zone of acceptance and rejection. Analyze the data with statistical tools, selecting the appropriate test. Interpret the findings in terms of statistical and clinical significance. **The teacher shall summarize the key concepts covered.**
Experiential-Learning 3.4	Paired/dependent t-test'.	**Teacher activity:** Divide students into multiple groups. Allot or mentor each group to select different types of datasets for the assignment. Guide them in using the statistical tools/software **Student activity as Groups:** Data Collection- Students should collect data from different sources or through surveys. This can involve conducting interviews, gathering data from existing datasets, or collecting from a ward/class. Take care that the sample number is less than 30, has a continuous type, and follows random sampling. Collect data from one sample and two-time points. Data Entry and Cleaning: Once the data is collected, students should enter it into a datasheet/excel and statistical software/ Tools Data Exploration: Do appropriate descriptive statistics. (Mean, Median, range, variance, Standard deviation, Standard Error, etc.) Find whether the distribution is Normal or not. If following normal distribution, proceed to the paired/dependent t-test. Make Null and alternate hypotheses. (Superiority/inferiority or equal). Do a test of significance, i.e., 'paired/dependent t-test' for this data. Fix the level of significance at 0.05 or 0.01. 'Paired/dependent t-test': Perform the test an the prepared data sheet using statistical software/excel/manually. Use appropriate methods like one-tail (left or right) or two-tail tests. Interpretation: After calculating and visualizing descriptive and inferential statistics, students should interpret the results to draw meaningful conclusions about the dataset. Find whether the Null hypothesis proved or not. Find the possibilities errors. Analyze the data with statistical tools, selecting the appropriate test. Interpret the findings in terms of statistical and clinical significance. **The teacher shall summarize the key concepts covered.**
Experiential-Learning 3.5	Unpaired/independent t-test.	**Teacher activity:** Divide students into multiple groups. Allot or mentor each group to select different types of datasets for the assignment. Guide them in using the statistical tools/software

		Student activity as Groups: Data Collection- Students should collect data from different sources or through surveys. This can involve conducting interviews, gathering data from existing datasets, or collecting from a ward/class. Take care that the sample number is less than 30, has a continuous type, and follows random sampling. Collect data from two samples and one or two time points. Data Entry and Cleaning: Once the data is collected, students should enter it into a datasheet/excel and statistical software/ Tools Data Exploration: Do appropriate descriptive statistics. (Mean, Median, range, variance, Standard deviation, Standard Error, etc.) Find whether the distribution is Normal or not. If following normal distribution, proceed to 'unpaired/independent t-test'. Make Null and alternate hypotheses. (Superiority/inferiority or equal). Do a test of significance, i.e., unpaired/independent t-test for this data. Fix the level of significance at 0.05 or 0.01. 'Unpaired/independent t-test': Perform the test an the prepared data sheet using statistical software/excel/manually. Use appropriate methods like one-tail (left or right) or two-tail tests. Interpretation: After calculating and visualizing descriptive and inferential statistics, students should interpret the results to draw meaningful conclusions about the dataset. Find whether the Null hypothesis proved or not. Find the possibilities errors. Analyze the data with statistical tools, selecting the appropriate test. Interpret the findings in terms of statistical and clinical significance. **The teacher shall summarize the key concepts covered.**
Experiential-Learning 3.6	F test.	**Teacher activity:** Divide students into multiple groups. Allot or mentor each group to select different types of datasets for the assignment. Guide them in using the statistical tools/software **Student activity as Groups:** Data Collection- Students should collect data from different sources or through surveys. This can involve conducting interviews or, gathering data from existing datasets, or collecting from a ward/class. Take care that the sample number is more than 30, has a continuous type, and follows random sampling. Collect data from more than two samples. Data Entry and Cleaning: Once the data is collected, students should enter it into a datasheet/excel and statistical software/ Tools **Data Exploration:** Do appropriate descriptive statistics. (Mean, Median, range, variance, Standard deviation, Standard Error, etc.) Find whether the distribution is Normal or not. If following normal distribution, proceed to the 'F test'. Make Null and alternate hypotheses. (Superiority/inferiority or equal). Do a test of significance, i.e., 'F test' for this data. Fix the

		level of significance at 0.05 or 0.01. 'F test': Perform the test an the prepared data sheet using statistical software/excel/manually. Interpretation: After calculating and visualizing descriptive and inferential statistics, students should interpret the results to draw meaningful conclusions about the dataset. Find whether the Null hypothesis proved or not. Find the possibilities errors. Analyze the data with statistical tools, selecting the appropriate test. Interpret the findings in terms of statistical and clinical significance. **The teacher shall summarize the key concepts covered.**
Experiential-Learning 3.7	ANOVA. test	**Teacher activity:** Divide students into multiple groups. Allot or mentor each group to select different types of data sets for the assignment. Guide them in using the statistical tools/software **Student activity as Groups:** Data Collection- Students should collect data from different sources or through surveys. This can involve conducting interviews or, gathering data from existing datasets or collecting from a ward/class. Take care that the sample number is more than 30 with continuous type and follow random sampling. Collect data from more than two samples at one-time point. Data Entry and Cleaning: Once the data is collected, students should enter it into a datasheet/excel and statistical software/ Tools Data Exploration: Do appropriate descriptive statistics. (Mean, Median, range, variance, Standard deviation, Standard Error, etc.) Find whether the distribution is Normal or not. If following normal distribution, proceed to 'ANOVA'. Make Null and alternate hypotheses. (Superiority/inferiority or equal). Do a test of significance, i.e., 'ANOVA', for this data. Fix the level of significance at 0.05 or 0.01. 'ANOVA: Perform the test an the prepared data sheet using statistical software/excel/manually. Interpretation: After calculating and visualizing descriptive and inferential statistics, students should interpret the results to draw meaningful conclusions about the dataset. Find whether the Null hypothesis proved or not. Find the possibilities errors. Analyze the data with statistical tools, selecting the appropriate test. Interpret the findings in terms of statistical and clinical significance. **The teacher shall summarize the key concepts covered.**
Experiential-Learning 3.8	ANOVA	**Teacher activity:** Divide students into multiple groups.

		Allot or mentor each group to select different types of data sets for the assignment. Guide them in using the statistical tools/software **Student activity as Groups:** Data Collection- Students should collect data from different sources or through surveys. This can involve conducting interviews, gathering data from existing datasets, or collecting from a ward/class. Take care that the sample number is more than 30 with continuous type and follow random sampling. Collect data at more than two-time points. Data Entry and Cleaning: Once the data is collected, students should enter it into a datasheet/excel and statistical software/ Tools Data Exploration: Do appropriate descriptive statistics. (Mean, Median, range, variance, Standard deviation, Standard Error, etc.) Find whether the distribution is Normal or not. If following normal distribution, proceed to 'repeated measures ANOVA.' Make Null and alternate hypotheses. (Superiority/inferiority or equal). Do a test of significance, i.e., 'repeated measures ANOVA' for this data. Fix the level of significance at 0.05 or 0.01. 'Repeated measures ANOVA': Perform the test on the prepared data sheet using statistical software/excel/manually. Interpretation: After calculating and visualizing descriptive and inferential statistics, students should interpret the results to draw meaningful conclusions about the dataset. Find whether the Null hypothesis proved or not. Find the possibilities errors. Analyze the data with statistical tools, selecting the appropriate test. Interpret the findings in terms of statistical and clinical significance. **The teacher shall summarize the key concepts covered.**
Experiential-Learning 3.9	Parametric test	**Teacher activity:** Divide students into multiple groups. Allot or mentor each group to select different types of data sets for the assignment. Guide them in using the statistical tools/software **Student activity as Groups:** Data Collection- Students should collect data from different sources or through surveys. This can involve conducting interviews or, gathering data from existing datasets or collecting from a ward/class. Take care that the sample number is more than 30, has a continuous type, and follows random sampling. Collect data from more than two samples and at more than two-time points. Data Entry and Cleaning: Once the data is collected, students should enter it into a datasheet/excel and statistical software/ Tools Data Exploration: Do appropriate descriptive statistics. (Mean, Median, range, variance, Standard deviation, Standard Error, etc.) Find whether the distribution is Normal or not. If following normal distribution, proceed with an appropriate statistical test.

		Make Null and alternate hypotheses. (Superiority/inferiority or equal). Do a test of significance, i.e., a ‘parametric test’ for this data. Fix the level of significance at 0.05 or 0.01. Parametric Test: Perform the appropriate parametric test on the prepared data sheet using statistical software/excel/manually. Interpretation: After calculating and visualizing descriptive and inferential statistics, students should interpret the results to draw meaningful conclusions about the dataset. Find whether the Null hypothesis proved or not. Find the possible errors. Analyze the data with statistical tools, selecting the appropriate test. Interpret the findings in terms of statistical and clinical significance. **The teacher shall summarize the key concepts covered.**

Modular Assessment

Assessment method	**Hour**
Instructions - Conduct a structured Modular assessment. Assessment will be for 25 marks per credit. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. • Problem based assessment (15 Marks) 1. Provide a Scenario one each on *hypothesis formulation, *steps in testing of hypothesis *parametric tests and 2. Based on the information student shall formulate a hypothesis/steps in testing of hypothesis/ parametric test to be applied. 3. Example: **Scenario:** It has been observed that individuals who drink coffee before going to bed often take longer to fall asleep compared to those who do not consume coffee before bedtime.**Frame the null hypothesis and alternate hypothesis for the research domain.** **Null Hypothesis (H?):** Drinking coffee before going to bed has no effect on the time it takes to fall asleep. **Alternative Hypothesis (H?):** Drinking coffee before going to bed increases the time it takes to fall asleep. B. Performance assessment (10): 1.Provide students one Sampled data. 2.Ask them to perform manually the test statistics. and (25 marks)	4

Any practical in converted form can be taken for assessment. Or Any of the experiential as portfolio/ refelections / presentations can be taken as assessment.	

Module 4 : Non-parametric statistical tests

Module Learning Objectives
(At the end of the module, the students should be able to)

1. **Know the fundamentals of non-parametric statistical tests**
2. **Identify and apply appropriate non-parametric tests**

Unit 1 Non-parametric methods

1. **Definition and fundamentals of non-parametric methods; Concept and application of Chi-square test and Fisher's exact test.**
2. **Mann-Whitney U test: Concept and application**
3. **McNemar's test and Wilcoxon Signed rank test- Concept and application**
4. **Kruskal–Wallis test with relevant post hoc tests: Concept and application**
5. **Friedman test with relevant post hoc tests: Concept and application; parametric vs non-parametric test.**

References: 35,36,37,38,39,40,41,42,43,44

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO2,CO3 ,CO4	Explain non-parametric methods, their application, and interpretation Explain the Concept and application of the Chi-square test, Fisher's exact test.	1	Lecture	CK	Know	L&PPT
2	CO1,CO2,CO3 ,CO4	Calculate the Chi-square test and Fisher's exact test using statistical tools/software.	2	Practical Training 4.1	PSY-SET	Shows-how	BL
3	CO1,CO2,CO3 ,CO4	Collect the relevant data sets and apply the Chi-square test, Fisher's exact test	3	Experiential-Learning 4.1	PSY-SET	Does	BL

4	CO1,CO2,CO3 ,CO4	Explain the Mann-Whitney U test, and its application, and interpretation	1	Lecture	CAN	Knows-how	L&PPT
5	CO1,CO2,CO3 ,CO4	Calculate the Mann-Whitney U test using statistical tools/software.	2	Practical Training 4.2	PSY-SET	Shows-how	BL
6	CO1,CO2,CO3 ,CO4	Collect the relevant data sets and apply the Mann-Whitney U test.	3	Experiential-Learning 4.2	PSY-SET	Does	BL
7	CO1,CO2,CO3 ,CO4	Explain and apply McNemar's test and Wilcoxon's Signed rank test	1	Lecture	CAP	Knows-how	L&PPT
8	CO1,CO2,CO3 ,CO4	Calculate McNemar's test, and Wilcoxon Signed rank test using statistical tools/software.	2	Practical Training 4.3	PSY-SET	Shows-how	BL
9	CO1,CO2,CO3 ,CO4	Collect the relevant data sets and apply McNemar's test and Wilcoxon Signed rank test.	3	Experiential-Learning 4.3	PSY-SET	Shows-how	BL
10	CO1,CO2,CO3 ,CO4	Explain and apply the Kruskal–Wallis test with relevant post hoc tests.	1	Lecture	CAP	Knows-how	L&PPT
11	CO1,CO2,CO3 ,CO4	Calculate the Kruskal–Wallis test with relevant tests using statistical tools/software.	2	Practical Training 4.4	PSY-SET	Shows-how	BL
12	CO1,CO2,CO3 ,CO4	Collect the relevant data sets and apply the Kruskal–Wallis test with relevant post hoc test	2	Experiential-Learning 4.4	PSY-SET	Does	BL
13	CO1,CO2,CO3 ,CO4	Explain and apply the Friedman test with relevant post hoc tests. Parametriuc vs Non parametric test.	1	Lecture	CAP	Knows-how	BL
14	CO1,CO2,CO3 ,CO4	Calculate the Friedman test with relevant post hoc tests using statistical tools/software.	2	Practical Training 4.5	PSY-SET	Shows-how	BL
15	CO1,CO2,CO3 ,CO4	Collect the data sets, identify and apply relevant nonparametric tests(Chi-square test, Mann-Whitney U test, McNemar's test, Wilcoxon Signed rank, Kruskal–Wallis test, Friedman test with relevant tests)	2	Experiential-Learning 4.5	PSY-SET	Does	BL

Practical Training Activity		
Practical No	**Name**	**Activity details**

Practical Training 4.1	Chi-square test and Fisher's exact test (2 Sets of Data for each)	• Demonstration by the teacher
		  ◦ The collection of relevant data, data entry in statistical software, use of the appropriate application (Chi-square test and Fisher's exact test), viewing the outcome, analyzing it, and reporting the outcome.
		• Hands-on training
		  ◦ Divide students into small groups (3-5 in number)
		  ◦ The students should be provided with sample datasets for hands-on practice.
		  ◦ Instruct each group to collect data and enter it in statistical software, use the appropriate application (Chi-square test and Fisher's exact test), view the outcome, and analyze and report it.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to present their classification results.
		  ◦ A discussion on the techniques used, the challenges encountered, and the insights gained from the data
		• The teacher shall discuss, summarise, and conclude the session.

Practical Training 4.2	Mann-Whitney U test (2 Sets of Data)	• Demonstration by the teacher
		  ◦ Collection of relevant data, data entry in statistical software, use of the appropriate application (Mann-Whitney U test), viewing the outcome, analyzing and reporting the outcome.
		• Hands-on training
		  ◦ Divide students into small groups (3-5 in number)
		  ◦ The students should be provided with sample datasets for hands-on practice.
		  ◦ Instruct each group to collect data and enter it in statistical software, use the appropriate application (Mann-Whitney U test), view the outcome, and analyze and report the outcome.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to present their classification results.

		◦ A discussion on the techniques used, the challenges encountered, and the insights gained from the data • The teacher shall discuss, summarise, and conclude the session.
Practical Training 4.3	McNemar's test and Wilcoxon Signed rank test (2 Sets of Data for each)	• Demonstration by the teacher ◦ Collection of relevant data, data entry in statistical software, use of the appropriate application (McNemar's test and Wilcoxon Signed rank test), viewing the outcome, analyzing it, and reporting the outcome. • Hands-on training ◦ Divide students into small groups (3-5 in number) ◦ The students should be provided with sample datasets for hands-on practice. ◦ Instruct each group to collect data and enter it in statistical software, use the appropriate application (McNemar's test and Wilcoxon Signed rank test), view the outcome, and analyze and report it. ◦ Encourage students to discuss their approaches and findings within their groups. ◦ Invite each group to present their classification results. ◦ A discussion on the techniques used, the challenges encountered, and the insights gained from the data • The teacher shall discuss, summarise, and conclude the session.
Practical Training 4.4	Kruskal Wallis test (2 Sets of Data)	• Demonstration by the teacher ◦ Collection of relevant data, data entry in statistical software, use of the appropriate application, viewing the outcome, analyzing and reporting the outcome. • Hands-on training ◦ Divide students into small groups (3-5 in number) ◦ The students should be provided with sample datasets for hands-on practice. ◦ Instruct each group to collect data and enter it in statistical software, use the appropriate application (Kruskal Wallis test), view the outcome, and analyze and report the outcome. ◦ Encourage students to discuss their approaches and findings within their groups.

		◦ Invite each group to present their classification results. ◦ A discussion on techniques used, the challenges encountered, and the insights gained from the data • The teacher shall discuss, summarise, and conclude the session.
Practical Training 4.5	Friedman test (2 sets of Data)	• Demonstration by the teacher ◦ The collection of relevant data, data entry in statistical software, use of the appropriate application (Friedman test), viewing the outcome, analyzing it, and reporting the outcome. • Hands-on training ◦ Divide students into small groups (3-5 in number) ◦ The students should be provided with sample datasets for hands-on practice. ◦ Instruct each group to collect data and enter it in statistical software, use the appropriate application (Friedman test), view the outcome, and analyze and report the outcome. ◦ Encourage students to discuss their approaches and findings within their groups. ◦ Invite each group to present their classification results. ◦ A discussion on the techniques used, the challenges encountered, and the insights gained from the data • The teacher shall discuss, summarise, and conclude the session.
Experiential learning Activity		
Experiential learning No	**Name**	**Activity details**
Experiential-Learning 4.1	Application of Chi-square test and Fisher's exact test using secondary data	**Data Collection -**Collection of relevant data from hospitals, surveys, interviews, secondary data, etc by the students **Data Entry and Cleaning:** Once the data is collected, students should enter it into statistical software/ Tools **Identification of Appropriate statistical test-** Chi-square test and Fisher's exact test **Appropriate use of statistical tools and calculation**

		Interpreting of Statistics: After calculating, students should interpret the results to draw meaningful conclusions about the dataset. The teacher shall discuss, summarise, and conclude the session.
Experiential-Learning 4.2	Application of Mann-Whitney U test using secondary data	**Data Collection -**Collection of relevant data from hospitals, surveys, interviews, secondary data, etc by the students **Data Entry and Cleaning:** Once the data is collected, students should enter it into statistical software/ Tools **Identification of Appropriate Statistical Test-**Mann-Whitney U **Appropriate use of statistical tools and calculation** **Interpreting of Statistics:** After calculating, students should interpret the results to draw meaningful conclusions about the dataset. The teacher shall discuss, summarise, and conclude the session.
Experiential-Learning 4.3	McNemar's test and Wilcoxon's signed rank test.	**Data Collection -**Collection of relevant data from hospitals, surveys, interviews, secondary data, etc by the students **Data Entry and Cleaning:** Once the data is collected, students should enter it into statistical software/ Tools **Identification of Appropriate Statistical test-**McNemar's test and Wilcoxon Signed rank **Appropriate use of statistical tools and calculation** **Interpreting of Statistics:** After calculating, students should interpret the results to draw meaningful conclusions about the dataset. The teacher shall discuss, summarise, and conclude the session.
Experiential-Learning 4.4	Application of Kruskal Wallis test using secondary data	**Data Collection -**Collection of relevant data from hospitals, surveys, interviews, secondary data, etc by the students **Data Entry and Cleaning:** Once the data is collected, students should enter it into statistical software/ Tools **Identification of Appropriate Statistical Test-**Kruskal Wallis test **Appropriate use of statistical tools and calculation** **Interpreting of Statistics:** After calculating, students should interpret the results to draw meaningful conclusions about the dataset. The teacher shall discuss, summarise, and conclude the session.
Experiential-Learning 4.5	Application of Friedman test using secondary data	**Data Collection -**Collection of relevant data from hospitals, surveys, interviews, secondary data, etc by the students **Data Entry and Cleaning:** Once the data is collected, students should enter it into statistical software/ Tools **Identification of Appropriate Statistical Test-**Friedman test **Appropriate use of statistical tools and calculation** **Interpreting of Statistics:** After calculating, students should interpret the results to draw meaningful conclusions about the

		dataset. The teacher shall discuss, summarise, and conclude the session.

Modular Assessment	
Assessment method	**Hour**
Instructions - Conduct a structured Modular assessment. Assessment will be for 25 marks per credit. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Assessment method-Structured Educational Video- Assign each student one non-parametric tests. for making a Structured Educational Video. (25 marks) Student instructions 1. Prepare the script for the assigned non-parametric test, which includes – content, objectives, Key points and Step-by-Step Explanation of One Test. 2. Record the video and submit it to the mentor. Or Any practical in converted form can be taken for assessment. Or Any of the experiential as portfolio/ refelections / presentations can be taken as assessment.	2

Module 5 : Disease frequency; Demography and Vital statistics

Module Learning Objectives
(At the end of the module, the students should be able to)

- **Define and explain the basic measures of disease frequency, demography, and vital statistics**
- **Identify the appropriate use of measures of disease frequency, demography, and vital statistics in public health.**
- **Estimate the intensity of public health problems by using different measures.**

Unit 1 Measures

1. **Measures of disease Frequency: Incidence and prevalence.**
2. **Odds ratio, Relative Risk and Risk difference, and their confidence intervals**
3. **Definition and computation of the measures Rate, Ratio, and Proportion**
4. **Demography and its importance and applications. Fertility measures**
5. **Vital statistics and its importance and applications. Birth rate, Mortality rates, Morbidity rates, and Hospital-related statistics.**

References: 45,46,47,48,49,50,51,52,53,54,55

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO3,CO4	Define, compute, and explain the differences between the measures Rate, Ratio, and Proportion.	1	Lecture	CK	Know	L&PPT
2	CO1,CO3,CO4	Define incidence and prevalence (distinguish between point prevalence and period prevalence).	1	Lecture	CK	Know	L&PPT
3	CO1,CO3,CO4	Calculate the incidence and prevalence rates from raw data and explain the use of rates in public health.	2	Practical Training 5.1	PSY-SET	Shows-how	CD

4	CO1,CO3,CO4	Define and explain Odds ratio (OR), Relative Risk (RR), and risk difference in relevance to epidemiological research.	1	Lecture	CAP	Knows-how	L&PPT
5	CO1,CO3,CO4	Calculate and interpret OR, RR	3	Practical Training 5.2	PSY-GUD	Shows-how	BL,D,PT,PER
6	CO1,CO3,CO4	Calculate Confidence Interval for OR & RR.	3	Practical Training 5.3	PSY-GUD	Shows-how	BL,D,PT,PER
7	CO1,CO3,CO4	Explain Vital statistics, their importance, their uses and methods of obtaining vital statistics, Birth rate, Mortality rates, Morbidity rates, and Hospital-related statistics	1	Lecture	CAN	Knows-how	BL,L&PPT
8	CO1,CO3,CO4	Define Demography and explain the importance of statistics in demography. Define fertility measures (Total Fertility Rate (TFR), Age-Specific Fertility Rates(ASFR), Gross Reproduction Rate (GRR), and Net Reproduction Rate (NRR).).	1	Lecture	CAN	Knows-how	L&PPT
9	CO1,CO3,CO4	Calculate vital statistics and demographic statistics (Birth rates, death rates)	2	Practical Training 5.4	PSY-GUD	Shows-how	BL,D,PT,PER,PBL
10	CO1,CO3,CO4	Search the secondary data from freely available websites (like Census of India/NFHS/WHO fact sheets, etc.) to calculate measures of Vital Statistics and measures of Demography.	3	Experiential-Learning 5.1	PSY-GUD	Shows-how	BL,BS,D,PT,PER,PBL
11	CO1,CO3,CO4	Calculate measures of Vital Statistics for at least any three Indian states and at least any 3-time points using the secondary data.	2	Experiential-Learning 5.2	PSY-GUD	Shows-how	BL,BS,D,IBL,PT,PBL,PSM
12	CO1,CO3,CO4	Calculate the demographic measures for at least three Indian states and at least three-time points using the secondary data.	2	Experiential-Learning 5.3	PSY-ORG	Shows-how	BL,BS,D,DIS,PER,PBL
13	CO1,CO3,CO4	Compare & Contrast measures of Vital statistics & Demography for at least three Indian states and discuss.	2	Experiential-Learning 5.4	PSY-ORG	Shows-how	BL,BS,D,DIS,PT,P

							ER,PSM
14	CO1,CO3,CO4	Compare & Contrast measures of Vital statistics & Demography for at least any three years for three Indian states and discuss.	2	Experiential-Learning 5.5	PSY-ORG	Shows-how	BL,IBL,PAL,PER,PBL
15	CO1,CO3,CO4	Prepare a one-page report on data analysis and findings of the secondary data analysis	2	Experiential-Learning 5.6	PSY-GUD	Shows-how	BL,D,PT,PER,PBL

Practical Training Activity

Practical No	Name	Activity details

Practical Training 5.1	Incidence rate and prevalence rate calculation.	• Demonstration by the teacher
		  ◦ Collection of relevant data, data entry, manual work, entering statistical software, use of the appropriate application, viewing the outcome, analysis, and reporting the outcome.
		• Hands-on training
		  ◦ Divide students into small /three groups.
		  ◦ The students should be provided with sample datasets for hands-on practice.
		  ◦ Instruct each group to collect data and work manually.
		  ◦ Instruct each group to collect and enter data in statistical software, use appropriate applications, view the outcome, and analyze and report it.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to present their classification results.
		  ◦ A discussion on the techniques used, the challenges encountered, and the insights gained from the data
		• The teacher shall discuss, summarise, and conclude the session.

Practical Training 5.2	Calculation of OR, RR	• Calculation of OR, RR, and Confidence Interval for OR & RR using Statistical Software (3 Sets of Data)

		• Demonstration by the teacher
		  ◦ Collection of relevant data, data entry, manual work, entering in statistical software, use of the appropriate application, viewing the outcome, analysis, and reporting the outcome.
		• Hands-on training
		  ◦ Divide students into small /three groups.
		  ◦ The students should be provided with sample datasets for hands-on practice.
		  ◦ Instruct each group to collect data and work manually.
		  ◦ Instruct each group to collect data and enter it in statistical software, use appropriate applications, view the outcome, and analyze and report the outcome.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to present their classification results.
		  ◦ A discussion on the techniques used, the challenges encountered, and the insights gained from the data
		• The teacher shall discuss, summarise, and conclude the session
		• Divide the students into two groups, and a quiz can be conducted between the groups

Practical Training 5.3	Calculation of OR, RR	• Calculation of OR, RR, and Confidence Interval for OR & RR using Statistical Software (3 Sets of Data)
		• Demonstration by the teacher
		  ◦ Collection of relevant data, data entry, manual work, entering in statistical software, use of the appropriate application, viewing the outcome, analysis, and reporting the outcome.
		• Hands-on training
		  ◦ Divide students into small /three groups.
		  ◦ The students should be provided with sample datasets for hands-on practice.
		  ◦ Instruct each group to collect data and work manually.
		  ◦ Instruct each group to collect data and enter it in statistical software, use appropriate applications, view the outcome, and analyze and report the outcome.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to present their classification results.
		  ◦ A discussion on the techniques used, the challenges encountered, and the insights gained from the data

		• The teacher shall discuss, summarise, and conclude the session Divide the students into two groups, and a quiz can be conducted between the groups
Practical Training 5.4	Vital statistics and Demographic statistics(3 Sets of Data)	• Calculation of Vital statistics and Demographic statistics(3 Sets of Data) Crude birth rate, Age-specific birth rates, Crude death rate, Age-specific death rates, neonatal mortality rate, postneonatal mortality rate, Infant mortality rate, Maternal mortality rate, Morbidity rates, Disease-specific mortality rate, and Fertility rates. • Demonstration by the teacher ◦ Collection of relevant data, data entry, work manually, entering in Statistical software, use of the appropriate application, viewing the outcome, analysis, and reporting the outcome. • Hands-on training ◦ Divide students into small /three groups. ◦ The students should be provided with sample datasets for hands-on practice. ◦ Instruct each group to collect data and work manually. ◦ Instruct each group to collect data and enter it in statistical software, use the appropriate application, view the outcome, and analyze and report the outcome. ◦ Encourage students to discuss their approaches and findings within their groups. ◦ Invite each group to present their classification results. ◦ A discussion on the techniques used, the challenges encountered, and the insights gained from the data • The teacher shall discuss, summarize, and conclude the session • Divide the students into two groups, and a quiz can be conducted between the groups
Experiential learning Activity		
Experiential learning No	**Name**	**Activity details**

Experiential-Learning 5.1	Secondary data collection is used to calculate measures used in vital statistics and demographics.	Get the secondary data from freely available websites (like Census of India/NFHS/WHO fact sheets, etc.) to calculate Vital Statistics and Demography measures. Data Collection - Secondary data collection for at least any three Indian states and for any three time points by the students Data Entry and Cleaning: Students should enter the data into Excel statistical software/ Tools once the data is collected. **The teacher shall discuss, summarize, and conclude the session.**
Experiential-Learning 5.2	Calculation of measures used in Vital Statistics	Calculation of measures used in Vital Statistics for three Indian states and three time points Identification of Appropriate Statistical Test- Appropriate use of statistical tools and calculation Interpreting of Statistics: After calculating, students should interpret the results to draw meaningful conclusions about the dataset. **The teacher shall discuss, summarize, and conclude the session.**
Experiential-Learning 5.3	Calculation of measures used in Demography	Data Collection - Calculation of measures used in Demography for three Indian states and three time points by the students Identification of Appropriate Statistical Test- Appropriate use of statistical tools and calculation Interpretation of Statistics: After calculating, students should interpret the results to draw meaningful conclusions about the dataset. **The teacher shall discuss, summarize, and conclude the session.**
Experiential-Learning 5.4	Measure of vital statistics & demography	Measure of vital statistics & demography for at least **three states** and discuss. Crude birth rate, Age-specific birth rates, Crude death rate, Age-specific death rates, neonatal mortality rate, postneonatal mortality rate, Infant mortality rate, Maternal mortality rate, Morbidity & for any two Disease-specific mortality rate, and Fertility rates Data Collection - Measure vital statistics & demography for at least three states and discuss. Compare & contrast the rates for different states. (what rates are similar and different using statistical tests) Data Entry and Cleaning: Once the data is collected, students should enter it into statistical software/ Tools Identification of Appropriate Statistical Test- Appropriate use of statistical tools and calculation Interpreting of Statistics: After calculating, students should interpret the results to draw meaningful conclusions about the dataset. **The teacher shall discuss, summarize, and conclude the session.**
Experiential-Learning 5.5	Measures of vital statistics & demography	Data Collection - Measure vital statistics & demography for at least three states and discuss. Compare & contrast the rates for different time points. (what rates are similar and different using statistical tests)

	.	Data Entry and Cleaning: Once the data is collected, students should enter it into statistical software/ Tools Identification of Appropriate Statistical Test- Appropriate use of statistical tools and calculation Interpreting of Statistics: After calculating, students should interpret the results to draw meaningful conclusions about the dataset. **The teacher shall discuss, summarize, and conclude the session.**
Experiential-Learning 5.6	Secondary data analysis.	**The teacher shall give an overview of the one-page report.** **Step 1:** Define a clear title, background information (2 to 3 lines), and the study objective (one line). **Step 2:** Describe the data sources, variables used, cleaning (if applicable), and processing procedures. (4 to 5 lines) **Step 3:** Explain the statistical methods and tools used to analyze the data. Various statistical methods, such as descriptive and inferential, hypothesis testing, correlation, and regression analysis, can be used. (4 to 5 lines) Use simple data visualization techniques like tables or charts. (one chart/one table) **Step 4:** Present analysis results and interpretations. This section should highlight the main findings that address the objective. (4 to 5 lines). **Step 5:** Summarize analysis findings (2 to 3 lines). Suggest a recommendation based on results(2 to 3 lines). **The teacher shall review the report and give feedback on the report's content**.

Modular Assessment

Assessment method	**Hour**
Instructions - Conduct a structured Modular assessment. Assessment will be for 25 marks per credit. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. Open-response questions: (25 marks) 1. Frame 5 open response questions to assess the student’s real-world understanding of disease frequency and vital statistics. 2. Prepare rubrics and grade accordingly.	2

Example- Open response question- You are tasked with evaluating the effectiveness of a new vaccination program for reducing the incidence of a specific disease in a region from. Describe how you would use incidence rates and prevalence rates to assess the impact of the vaccination program. **Expected Response:** Incidence Rates: Measure the number of new cases of the disease during a specific period after the vaccination program is implemented. A decrease in the incidence rate would suggest the program is effective in preventing new cases. Prevalence Rates: Assess the overall number of cases, including existing and new cases, before and after the vaccination program. A reduction in prevalence may also indicate that the vaccination program is reducing the number of people currently affected by the disease. Assessment rubrics - *Excellent (5 Marks): understanding of the topic with minimal errors.*Very Good (4 Marks): Has good grasp but has some minor mistakes.*good(3Marks) *Fair (2 points): Understanding is limited, with several errors. *Poor (1 point): major misunderstandings or wrong answers. Or Any practical in converted form can be taken for assessment. Or Any of the experiential as portfolio/ refelections / presentations can be taken as assessment.	

Module 6 : Correlation and Regression Analysis

Module Learning Objectives
(At the end of the module, the students should be able to)

1. **Describe how correlation is used to identify relationships between variables**
2. **Describe how regression analysis is used to predict outcomes**

Unit 1 Correlation and Regression Analysis

1. **Concept, properties, computation, and applications of correlation. Understanding of the scatter diagram**
2. **Simple linear correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation.**
3. **Linear and multiple regression analysis of their application and interpretation.**
4. **Logistic regression analysis: Concept and application.**
5. **Survival Analysis. Concept and application.**

References: 56,57,58,59,60,61,62,63,64,65,66,67,68

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO2,CO3 ,CO4	Understand and describe the Concept of correlation and its importance in statistical analysis. Differentiate between positive, negative, zero, and spurious correlations. Understand and discuss the scatter diagram and properties of correlation coefficients.	1	Lecture	CK	Know	L&PPT
2	CO1,CO2,CO3 ,CO4	Explain the Pearson correlation coefficient and Spearman's rank correlation coefficient.	1	Lecture	CAN	Knows-how	L&PPT

3	CO1,CO2,CO3,CO4	Calculate and Interpret the Pearson Correlation Coefficient using Statistical tools/ Software	2	Practical Training 6.1	PSY-SET	Shows-how	BL
4	CO1,CO2,CO3,CO4	Apply and interpret Spearman's rank correlation coefficient using Statistical tools / Software.	2	Practical Training 6.2	PSY-SET	Shows-how	BL,D,DIS,PT,PER,PBL
5	CO1,CO2,CO3,CO4	Apply and interpret statistical techniques to calculate the Pearson correlation coefficients.	2	Experiential-Learning 6.1	PSY-GUD	Shows-how	BL,D,DIS,IBL,PL,PT,PER,PBL
6	CO1,CO2,CO3,CO4	Apply and interpret statistical techniques to calculate Spearman's rank correlation coefficients.	2	Experiential-Learning 6.2	PSY-GUD	Shows-how	BL,D,DIS,PL,PT,PER,PBL
7	CO1,CO2,CO3,CO4	Understand and describe the Concept of simple, linear, and multiple regression analysis, their application, and interpretation.	1	Lecture	CAP	Knows-how	L&PPT
8	CO1,CO2,CO3,CO4	Explain Logistic regression, its Assumptions, application, and interpretation.	1	Lecture	CAP	Knows-how	L&PPT
9	CO1,CO2,CO3,CO4	Demonstrate Simple Linear Regression Analysis using Statistical Software/tools.	2	Practical Training 6.3	PSY-SET	Shows-how	BL,D,IBL,PAL,PT,PER
10	CO1,CO2,CO3,CO4	Demonstrate Linear Regression Analyses with real-world datasets.	2	Experiential-Learning 6.3	PSY-GUD	Shows-how	BL,BS,D,PT,PER,PBL
11	CO1,CO2,CO3,CO4	Demonstrate Linear Regression Analyses with real-world datasets.	2	Experiential-Learning 6.4	PSY-GUD	Shows-how	BS,D,PL,PT,PER,PBL,TBL
12	CO1,CO2,CO3	Perform Binomial/Binary Logistic Regression Analysis using Statistical	2	Practical	PSY-	Shows-	BL,C_L,

	,CO4	Software/tools		Training 6.4	GUD	how	D,PT,PER ,PBL
13	CO1,CO2,CO3 ,CO4	Demonstrate Regression Analyses-with real-world datasets related to Binomial Logistic.	2	Experiential-Learning 6.5	PSY-GUD	Shows-how	BL,D,DIS ,PAL,PT, PER
14	CO1,CO2,CO3 ,CO4	Analyses and interpret Regression Analyses- Calculate Linear Regression their findings with real-world datasets related to Binomial Logistic	2	Experiential-Learning 6.6	AFT-CHR	Shows-how	BL,D,PT, PBL
15	CO1,CO2,CO3 ,CO4	Explain the Concept of Survival Analysis – Kaplan-Meier method and its application and interpretation	1	Lecture	CAN	Knows-how	L&PPT
16	CO1,CO2,CO3 ,CO4	Perform Survival Analysis - Kaplan-Meier method using Statistical Software	2	Practical Training 6.5	PSY-SET	Shows-how	BL,D,PE R,TBL
17	CO1,CO2,CO3 ,CO4	Apply statistical techniques on real-world datasets to calculate Survival Analysis - Kaplan-Meier method, and interpret their findings.	1	Experiential-Learning 6.7	AFT-SET	Does	BS,IBL,P BL,RLE

Practical Training Activity

Practical No	Name	Activity details

Practical Training 6.1	Pearson Correlation Coefficient (1 Set of Data each)	• Demonstration by the teacher
		  ◦ Calculation of Pearson Correlation Coefficient using Statistical Software/tools
		• Hands-on training
		  ◦ Divide students into small groups
		  ◦ The students should be provided Sample datasets or case studies for hands-on practice.
		  ◦ Instruct each group to calculate the Pearson correlation coefficient for their assigned dataset.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to present their calculated correlation coefficients and interpretations.
		  ◦ Facilitate the discussion on the strength and direction of the correlation, the significance level, and the potential implications of the results.

		• The teacher shall summarize the key concepts covered in the session.
Practical Training 6.2	Spearman's rank correlation coefficient (1 Set of Data each)	• Demonstration by the teacher ◦ Calculation of Spearman's rank correlation coefficient using Statistical Software/tools • Hands-on training ◦ Divide students into small groups ◦ The students should be provided Sample datasets or case studies for hands-on practice. ◦ Instruct each group to calculate Spearman's rank correlation coefficient for their assigned dataset. ◦ Encourage students to discuss their approaches and findings within their groups. ◦ Invite each group to present their calculated correlation coefficients and interpretations. ◦ Facilitate the discussion on the strength and direction of the correlation, the significance level, and the potential implications of the results. • The teacher shall summarize the key concepts covered in the session.
Practical Training 6.3	Simple Linear Regression Analysis using Statistical Software (1 Set of Data)	• Demonstration by the teacher ◦ Calculation of Simple Linear Regression using Statistical Software/tools • Hands-on training ◦ Divide students into small groups ◦ The students should be provided Sample datasets or case studies for hands-on practice. ◦ Instruct each group to calculate Simple Linear Regression for their assigned dataset. ◦ Encourage students to discuss their approaches and findings within their groups. ◦ Invite each group to present their calculated correlation coefficients and interpretations. ◦ Facilitate the discussion on the strength and direction of the correlation, the significance level, and the potential implications of the results. • The teacher shall summarize the key concepts covered in the session.

Practical Training 6.4	Binomial Logistic Regression Analysis(1 Set of Data)	• Demonstration by the teacher
		  ◦ Calculation of Binomial Logistic Regression using Statistical Software/tools
		• Hands-on training
		  ◦ Divide students into small groups
		  ◦ The students should be provided Sample datasets or case studies for hands-on practice.
		  ◦ Instruct each group to calculate Binomial logistic regression for their assigned dataset.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to present their calculated correlation coefficients and interpretations.
		  ◦ Facilitate the discussion on the strength and direction of the correlation, the significance level, and the potential implications of the results.
		• The teacher shall summarize the key concepts covered in the session.

Practical Training 6.5	Survival Analysis - Kaplan-Meier method (1 Set of Data)	• Demonstration by the teacher
		  ◦ Calculation of Survival Analysis - Kaplan-Meier method using Statistical Software/tools
		• Hands-on training
		  ◦ Divide students into small groups
		  ◦ The students should be provided Sample datasets or case studies for hands-on practice.
		  ◦ Instruct each group to calculate Survival Analysis - Kaplan-Meier method for their assigned dataset.
		  ◦ Encourage students to discuss their approaches and findings within their groups.
		  ◦ Invite each group to present their calculated correlation coefficients and interpretations.
		  ◦ Facilitate the discussion on the strength and direction of the correlation, the significance level, and the potential implications of the results.
		• The teacher shall summarize the key concepts covered in the session.

Experiential learning Activity		
Experiential learning No	**Name**	**Activity details**
Experiential-Learning 6.1	Pearson correlation coefficients	**Objective:** This experiential learning activity aims to deepen understanding of Pearson correlation coefficients by engaging students in hands-on exploration and analysis of real-world data sets. **Materials Needed:**1. Data sets (can be sourced from disciplines such as Epidemiology, economics, sociology, psychology, etc.); 2. Graphing software or tools like Excel or Google Sheets; 3. Calculator (optional, depending on the software used) **Activity Steps:** **Data Selection:** - Students shall choose their data from a given set of options. **Data Analysis:** Using software like Excel, Google Sheets, or other relevant statistical software, the student shall input the data and use the appropriate function to calculate the correlation coefficient. **Visualization:** Students shall create scatterplots of the data to visually represent the relationship between the variables. **Conclusion:** The student shall summarize the key takeaways from the activity.
Experiential-Learning 6.2	Spearman's rank correlation coefficients	**Objective:** This experiential learning activity aims to deepen their understanding of Spearman's rank correlation coefficients by engaging students in hands-on exploration and analysis of real-world data sets. **Materials Needed:**1. Data sets (can be sourced from disciplines such as Epidemiology, economics, sociology, psychology, etc.); 2. Graphing software or tools like Excel or Google Sheets; 3. Calculator (optional, depending on the software used) **Activity Steps:** **Data Selection:** - Students shall choose their data from a given set of options. **Data Analysis:** - Using software like Excel, Google Sheets, or other relevant Statistical software, the student shall input the data and use the appropriate function to calculate Spearman's rank correlation coefficient. **Visualization:** Students shall create scatterplots of the data to represent the relationship between the variables visually. **Conclusion:** The student shall summarize the key takeaways from the activity.
Experiential-Learning 6.3	Linear Regression Analyses.	**Objective:** This experiential learning activity aims to deepen understanding of Linear Regression Analyses by engaging students in hands-on exploration and analysis of real-world data sets. **Materials Needed:**1. Data sets (can be sourced from disciplines such as Epidemiology, economics, sociology, psychology, etc.); 2. Graphing software or tools like Excel or Google Sheets; 3. Calculator (optional, depending on the software used) **Activity Steps:** **Data Selection:** - Students shall choose their data from a given set of options.

		Data cleaning and preparation ensure the data is formatted correctly for analysis. The Student will calculate summary statistics and visualize the data using appropriate graphs (e.g., scatterplots) to understand the relationships between variables.
Experiential-Learning 6.4	Linear Regression Analyses	**Data Analysis:** - Using software like Excel, Google Sheets, or other relevant Statistical software, the student shall perform linear regression analysis and visualize the data using appropriate graphs (e.g., scatterplots) to understand the relationships between variables. **Interpretation**: Student shall interpret the results of their regression analysis, paying attention to the coefficients, significance levels, and goodness-of-fit measures
Experiential-Learning 6.5	Regression Analyses.	**Objective:** This experiential learning activity aims to deepen understanding of Binomial Logistic Regression Analyses by engaging students in hands-on exploration and analysis of real-world data sets. **Materials Needed:**1. Data sets (can be sourced from disciplines such as Epidemiology, economics, sociology, psychology, etc.); 2. Graphing software or tools like Excel or Google Sheets; 3. Calculator (optional, depending on the software used) **Activity Steps:** **Data Selection:** - Students shall choose their data from a given set of options. Data cleaning and preparation ensure the data is formatted correctly for analysis. The Student will calculate summary statistics and visualize the data using appropriate graphs (e.g., scatterplots) to understand the relationships between variables.
Experiential-Learning 6.6	linear regression analyses	**Data Analysis:** - Using software like Excel, Google Sheets or other relevant Statistical software, the student shall perform Binomial Logistic regression analysis and visualize the data using appropriate graphs (e.g., scatterplots) to understand the relationships between variables. **Interpretation**: Student shall interpret the results of their regression analysis, paying attention to the coefficients, significance levels, and goodness-of-fit measures
Experiential-Learning 6.7	Survival Analysis - Kaplan-Meier method	**Introduction: I**ntroducing survival analysis and its significance in analyzing time-to-event data, such as when a patient experiences a particular event (e.g., disease recurrence, death). Kaplan-Meier method is a non-parametric approach used to estimate the survival function from censored data. **Data Selection:** Students shall choose their own set of data from healthcare, epidemiology, and social sciences **Data Exploration:** Students shall explore their chosen data sets, identify the survival times and censoring indicators, and clean and prepare data, ensuring the data is formatted correctly for survival analysis. Students shall calculate summary statistics, such as the median survival time, and visualize the data using appropriate graphs (e.g., Kaplan-Meier survival curves).

		Kaplan-Meier Survival Analysis: Students shall perform Kaplan-Meier survival analysis using statistical software or tools like R, Python, or specialized survival analysis packages, estimate the survival function, plot the Kaplan-Meier survival curve, and interpret the results.

Modular Assessment	
Assessment method	**Hour**
Instructions - Conduct a structured Modular assessment. Assessment will be for 25 marks per credit. Keep structured marking pattern. Use different assessment methods in each module for the semester. Keep record of the structured pattern used for assessment. Calculate the Modular grade point as per table 6 C. **1.** Any practical in converted form can be taken for assessment. (10 Marks) Or Any of the experiential as portfolio/ refelections / presentations can be taken as assessment.(10 Marks) 2. Practical Record book (15Marks)	2

Table 4 : Practical Training Activity

Practical No	Practical name	Hours
1.1	Data handling	2
1.2	Graphically representinon of qualitative data	2
1.3	Diagrammatic and graphical representation of quantitative and qualitative data	2
1.4	Calculation of measures of Central Tendency (3 Sets of Data)	2
1.5	Calculation of measures of Dispersion (3 Sets of Data)	2
2.1	Normal Data	2
2.2	Interpretation of Normal Data.	2
2.3	Calculate the mean and variance of normal, binomial, and poison distribution.	2
2.4	Standard Error and confidence interval	2
2.5	Standard Error and confidence interval Estimation.	2
2.6	Perform of probability sampling	2
2.7	Non-probability sampling	2
2.8	Sample size for Descriptive study Designs.	2
2.9	Sample size for analytical studies.	2
2.10	Sample size for experimental study Design.	2

3.1	Null and alternate hypothesis.	2
3.2	Type I & type II errors	2
3.3	Tests of significance	2
3.4	Data significance and power.	2
3.5	'Z' test Calculation using statistical tools/software.	2
3.6	Dependent 't' test.	2
3.7	Independent 't' test	2
3.8	'F' test Calculation.	2
3.9	'ANOVA' test Analysis	2
3.10	Annova test - Repeated	2
4.1	Chi-square test and Fisher's exact test (2 Sets of Data for each)	2
4.2	Mann-Whitney U test (2 Sets of Data)	2
4.3	McNemar's test and Wilcoxon Signed rank test (2 Sets of Data for each)	2
4.4	Kruskal Wallis test (2 Sets of Data)	2
4.5	Friedman test (2 sets of Data)	2
5.1	Incidence rate and prevalence rate calculation.	2
5.2	Calculation of OR, RR	3
5.3	Calculation of OR, RR	3
5.4	Vital statistics and Demographic statistics(3 Sets of Data)	2
6.1	Pearson Correlation Coefficient (1 Set of Data each)	2

6.2	Spearman's rank correlation coefficient (1 Set of Data each)	2
6.3	Simple Linear Regression Analysis using Statistical Software (1 Set of Data)	2
6.4	Binomial Logistic Regression Analysis(1 Set of Data)	2
6.5	Survival Analysis - Kaplan-Meier method (1 Set of Data)	2

Table 5 : Experiential learning Activity

Experiential learning No	Experiential name	Credit Hours
1.1	Data collection, entry, and cleaning collected data	3
1.2	Presention of the data .	3
1.3	Measures of central tendency manually/ statistical tool/ software	2
1.4	Measures of dispersion	2
1.5	Descriptive data analysis	3
2.1	Probability and experimental probability.	2
2.2	Normal, binomial, and poison distribution.	2
2.3	Normal, binomial, and poison Distribution.	2
2.4	Confidence interval estimation.	2
2.5	Confidence interval - Identify and interpret	2
2.6	Sample size and Sampling designs.	2
2.7	Sample size for an observational study.	3
2.8	Sample size for analytical study.	3
2.9	Calculate sample size for RCT.	2
2.10	Study design, sampling techniques, and sample size formula.	2
2.11	Probability sampling techniques.	2
2.12	Non-probability sampling techniques.	2
3.1	Parametric/non-parametric test	3

3.2	level of significance, power, type I & type II errors, and p-value.	3
3.3	Z test	3
3.4	Paired/dependent t-test'.	3
3.5	Unpaired/independent t-test.	3
3.6	F test.	3
3.7	ANOVA. test	3
3.8	ANOVA	3
3.9	Parametric test	2
4.1	Application of Chi-square test and Fisher's exact test using secondary data	3
4.2	Application of Mann-Whitney U test using secondary data	3
4.3	McNemar's test and Wilcoxon's signed rank test.	3
4.4	Application of Kruskal Wallis test using secondary data	2
4.5	Application of Friedman test using secondary data	2
5.1	Secondary data collection is used to calculate measures used in vital statistics and demographics.	3
5.2	Calculation of measures used in Vital Statistics	2
5.3	Calculation of measures used in Demography	2
5.4	Measure of vital statistics & demography	2
5.5	Measures of vital statistics & demography .	2

5.6	Secondary data analysis.	2
6.1	Pearson correlation coefficients	2
6.2	Spearman's rank correlation coefficients	2
6.3	Linear Regression Analyses.	2
6.4	Linear Regression Analyses	2
6.5	Regression Analyses.	2
6.6	linear regression analyses	2
6.7	Survival Analysis - Kaplan-Meier method	1

Table 6 : Assessment Summary: Assessment is subdivided in A to G points

6 A : Number of Papers and Marks Distribution

Subject Code	Paper	Theory	Practical	Total
UNIPG-BS	1	100	NA	100

6 B : Scheme of Assessment

Credit frame work

UNIPG-BS has 6 modules of 8 credits which includes 240 Notional Learning Hours. One Credit will be having 30 Hours of learner participation and teaching, practical and experiential learning will in the ratio of 1:2:3 i.e. One credit will have 5 hours of teaching, 10 hours of practical training and 13 hours of experiential learning and 2 hours of modular assessment for 25 marks.

Module wise Assessment:will be done at the end of each module. Evaluation includes learners active participation to get Credits and Marks. Each Module may contain one or more credits.
Summative Assessment: Summative Assessment (University examination) will be carried out at the end of Semester I.

6 C : Calculation Method for Modular Grade Points (MGP)

Module Number & Name (a)	Credits (b)	Actual No. of Notional Learning Hours (c)	Attended Number of notional Learning hours (d)	Maximum Marks of assessment of modules (e)	Obtained Marks per module (f)	MGP =d*f/c*e*100
1. Fundamentals of Statistics	1	30		25		
2. Probability, Probability Distributions, Sampling Techniques, and Sample Size Determinations	2	60		50		
3. Tests of significance and parametric statistical tests	2	60		50		
4. Non-parametric statistical tests	1	30		25		
5. Disease frequency; Demography and Vital statistics	1	30		25		
6. Correlation and Regression Analysis	1	30		25		
MGP = ((Number of Notional learning hours attended in a module) X (Marks obtained in the modular assessment) / (Total number of Notional learning hours in the module) X (Maximum marks of the module)) X 100						

6 D : Semester Evaluation Methods for Semester Grade point Average (SGPA)

SGPA will be calculated at the end of the semester as an average of all Module MGPs. Average of MGPS of the Semester For becoming eligible for Summative assessment of the semester, student should get minimum of 60% of SGPA

SGPA = Average of MGP of all modules of all papers = add all MGPs in the semester/ no. of modules in the semester Evaluation Methods for Modular Assessment

A S.No	B Module number and Name	C MGP
1	Fundamentals of Statistics	C1
2	Probability, Probability Distributions, Sampling Techniques, and Sample Size Determinations	C2
3	Tests of significance and parametric statistical tests	C3
4	Non-parametric statistical tests	C4
5	Disease frequency; Demography and Vital statistics	C5
6	Correlation and Regression Analysis	C6
	Semester Grade point Average (SGPA)	(C1+C2+C3+C4+C5 +C6) / Number of modules(6)

S. No	Evaluation Methods
1.	Method explained in the Assessment of the module or similar to the objectives of the module.

6 E : Question Paper Pattern

MD/MS UNANI Examination UNIPG-BS

Sem I

Time: 3 Hours ,**Maximum Marks:** 100

INSTRUCTIONS: All questions compulsory

		Number of Questions	Marks per question	Total Marks
Q 1	Analytical based structured question (ABQ)	1	20	20
Q 2	Short answer questions (SAQ)	8	5	40
Q 3	Long answer questions (LAQ)	4	10	40

				100

Instructions for the paper setting.

1. Questions should be drawn based on the table 6F.
2. Marks assigned for the module in 6F should be considered as the maximum marks.
3. Refer table 6F before setting the questions. Questions should not be framed on the particular unit if indicated “NO”.
4. There will be a single application-based question (ABQ) worth 20 marks. No other questions should be asked from the same module where the ABQ is framed.
5. Except the module on which ABQ is framed, at least one Short answer question should be framed from each module.
6. Long answer question should be analytical based structured questions assessing the higher cognitive ability.
7. Use the Blue print provided in 6G or similar blue print created based on instructions 1 to 6.

6 F : Distribution for summative assessment (University examination)

S.No	List of Module/Unit	ABQ	SAQ	LAQ
(M-1)Fundamentals of Statistics Marks: (10)				
1	**(U-1)** Fundamentals of Statistics	No	Yes	Yes
(M-2)Probability, Probability Distributions, Sampling Techniques, and Sample Size Determinations Marks: (25)				
1	**(U-1)** Probability and Probability Distributions	Yes	Yes	Yes
2	**(U-2)** Sampling techniques and Sample size Determinations	Yes	No	Yes
(M-3)Tests of significance and parametric statistical tests Marks: (25)				
1	**(U-1)** Testing of hypothesis	Yes	Yes	Yes
2	**(U-2)** Parametric tests	Yes	Yes	Yes
(M-4)Non-parametric statistical tests Marks: (15)				
1	**(U-1)** Non-parametric methods	No	Yes	Yes
(M-5)Disease frequency; Demography and Vital statistics Marks: (15)				
1	**(U-1)** Measures	No	Yes	Yes
(M-6)Correlation and Regression Analysis Marks: (10)				
1	**(U-1)** Correlation and Regression Analysis	No	Yes	No

6 G : Blue Print for Summative assessment (University Examination)

Question No	Type of Question	Question Paper Format
Q1	**Application based Questions** **1 Question** **20 marks** **All compulsory**	M2.U1, . M2.U2 M3.U1, . M3.U2
Q2	**Short answer Questions** **Eight Questions** **5 Marks Each** **All compulsory**	1. M1.U1 **Or** . M6.U1 2. M2.U1 3. M3.U1 **Or** . M3.U2 4. M3.U2 5. M4.U1 6. M5.U1 7. M6.U1 8. M3.U2
Q3	**Analytical Based Structured Long answer Questions** **Four Questions** **10 marks each** **All compulsory**	1. M1.U1 **Or** . M2.U1 **Or** . M3.U1 **Or** . M5.U1 2. M2.U1 **Or** . M1.U1 **Or** . M3.U2 **Or** . M5.U1 3. M3.U2 **Or** . M1.U1 **Or** . M2.U1 **Or** . M5.U1 4. M5.U1 **Or** . M2.U1 **Or** . M1.U1 **Or** . M3.U1

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Abbreviations

Domain	
CK	Cognitive/Knowledge
CC	Cognitive/Comprehension
CAP	Cognitive/Application
CAN	Cognitive/Analysis
CS	Cognitive/Synthesis
CE	Cognitive/Evaluation
PSY-SET	Psychomotor/Set
PSY-GUD	Psychomotor/Guided response
PSY-MEC	Psychomotor/Mechanism
PSY-ADT	Psychomotor Adaptation
PSY-ORG	Psychomotor/Origination
AFT-REC	Affective/ Receiving
AFT-RES	Affective/Responding
AFT-VAL	Affective/Valuing
AFT-SET	Affective/Organization
AFT-CHR	Affective/ characterization
T L Method	
L	Lecture
L&PPT	Lecture with PowerPoint presentation
L&GD	Lecture & Group Discussion
L_VC	Lecture with Video clips
REC	Recitation
SY	Symposium
TUT	Tutorial
DIS	Discussions
BS	Brainstorming
IBL	Inquiry-Based Learning
PBL	Problem-Based Learning

CBL	Case-Based Learning
PrBL	Project-Based Learning
TBL	Team-Based Learning
TPW	Team Project Work
FC	Flipped Classroom
BL	Blended Learning
EDU	Edutainment
ML	Mobile Learning
ECE	Early Clinical Exposure
SIM	Simulation
RP	Role Plays
SDL	Self-directed learning
PSM	Problem-Solving Method
KL	Kinaesthetic Learning
W	Workshops
GBL	Game-Based Learning
LS	Library Session
PL	Peer Learning
RLE	Real-Life Experience
PER	Presentations
D-M	Demonstration on Model
PT	Practical
X-Ray	X-ray Identification
CD	Case Diagnosis
LRI	Lab Report Interpretation
DA	Drug Analysis
D	Demonstration
D-BED	Demonstration Bedside
DL	Demonstration Lab

DG	Demonstration Garden
FV	Field Visit
JC	Journal Club
Mnt	Mentoring
PAL	Peer Assisted Learning
C_L	Co Learning
DSN	Dissection
PSN	Prosection