OUTCOME-BASED DYNAMIC CURRICULUM for MD/ MS AYURVEDA
(PRESCRIBED BY NCISM)

अभ्यासात्प्राप्यते दृष्टिः कर्मसिद्धिप्रकाशिनी।

Semester I Course - Biostatistics

(SUBJECT CODE : AYPG-BS)

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

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BOARD OF AYURVEDA
NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE
NEW DELHI-110026

PREFACE

Statistics plays a pivotal role in postgraduate studies, especially within Ayurveda, where it is essential for conducting research, validating traditional knowledge, and advancing clinical applications. In Ayurveda, 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 Ayurvedic 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 Ayurveda. 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.

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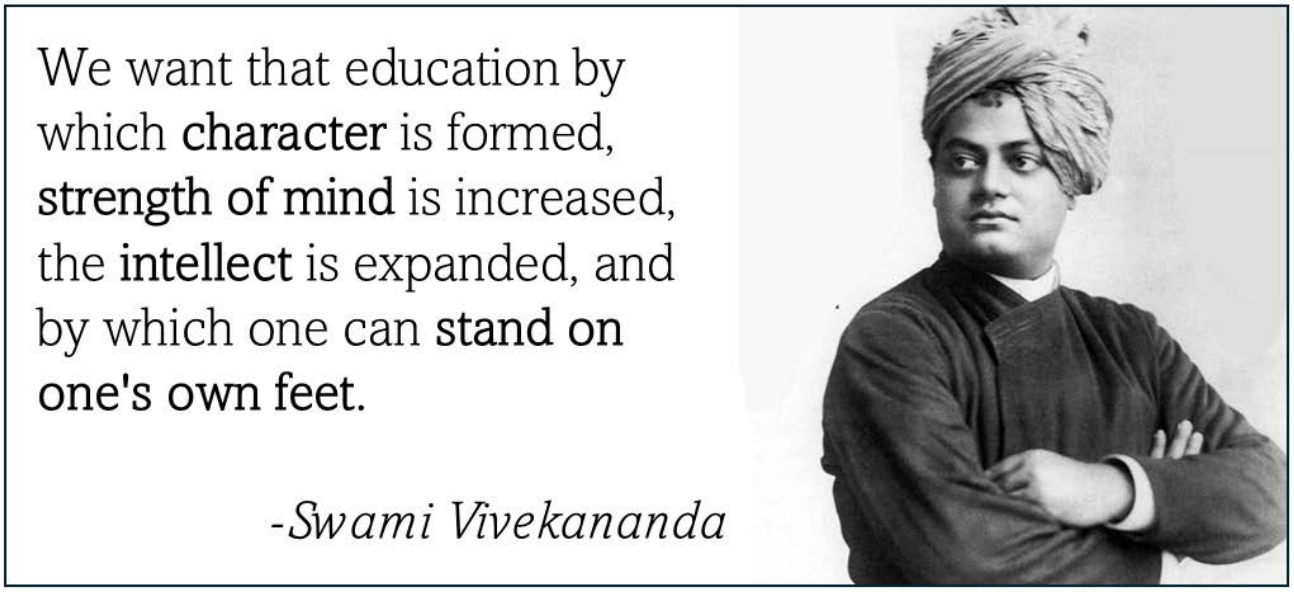

NCISM

OUTCOME-BASED DYNAMIC CURRICULUM for MD/ MS AYURVEDA

Subject Code : AYPG-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

AYPG-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
AYPG-BS	Semester I Course - Biostatistics

Table 1 : Course learning outcomes and mapped Program learning outcomes

CO No	A1 Course learning Outcomes (CO) AYPG-BS At the end of the course AYPG-BS, the students should be able to-	B1 Course learning Outcomes mapped with program learning outcomes.
CO1	Domonstarte aaplication of principals of Descriptive and Inferential Statistics in research.	PO1,PO5
CO2	Demonstrate use of appropriate statistical tests in research.	PO1,PO5
CO3	Analyze and present research data using suitable statistical methods, tools, and software.	PO3,PO6
CO4	Evaluate and interpret statistical data from research papers and publications.	PO4,PO5

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
AYPG-BS	1	100	NA	100

6 B : Scheme of Assessment

Credit frame work

AYPG-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 AYURVEDA Examination
AYPG-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

OUTCOME-BASED DYNAMIC CURRICULUM for MD/ MS AYURVEDA
(PRESCRIBED BY NCISM)

अभ्यासात्प्राप्यते दृष्टिः कर्मसिद्धिप्रकाशिनी।

Semester I Course - Research Methodology

(SUBJECT CODE : AYPG-RM)

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

ncism

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BOARD OF AYURVEDA
NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE
NEW DELHI-110026

PREFACE

The field of Ayurveda, with its rich history and profound insights into health and well-being, demands a rigorous and evidence-based approach to research. To advance the understanding and application of Ayurvedic principles, it is essential that postgraduate students are equipped with a solid foundation in research methodology.

This syllabus has been carefully crafted to provide students with a comprehensive insight into literature search, framing research questions, stating hypotheses, research design, data analysis, ethical considerations, and scientific writing. By mastering these essential skills, students will be well-prepared to conduct independent research, contribute to the scholarly literature, and advance the field of Ayurveda.

The syllabus covers a wide range of topics, from the fundamentals of research to advanced techniques such as systematic reviews and meta-analyses. In an effort directed to learner-centric education, it also incorporates practical and experiential elements, including case-based learning and hands-on exercises, to ensure that students can apply their knowledge to real-world research challenges. At the same time, the syllabus provides an adequate opportunity for a teacher to kindle research acumen amongst students.

It is believed that this syllabus will serve as a valuable resource for postgraduate students in Ayurveda. By diligently studying and applying the principles outlined herein, students can develop the skills and knowledge necessary to conduct rigorous and meaningful research that will contribute to the advancement of Ayurveda.

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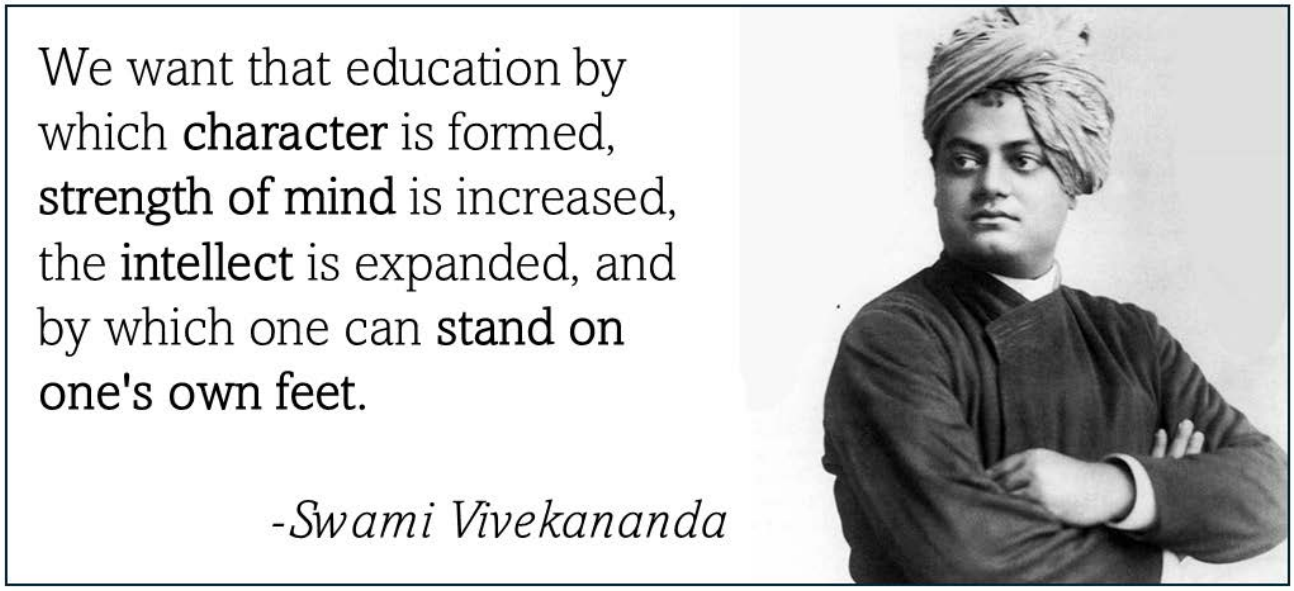

NCISM

OUTCOME-BASED DYNAMIC CURRICULUM for MD/ MS AYURVEDA

Subject Code : AYPG-RM

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. Research Basics	1	30	25	20
2. Ethics and Regulatory Aspects in Research	1	30	25	10
3. Research Types - Part 1	2	60	50	20
4. Research Types - Part 2	1	30	25	20
5. Research Types - Part 3	2	60	50	20
6. Research Communication	2	60	50	10
	9	**270**	**225**	**100**

Credit frame work

AYPG-RM has 6 modules of 9 credits which includes 270 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
AYPG-RM	Semester I Course - Research Methodology

Table 1 : Course learning outcomes and mapped Program learning outcomes

CO No	A1 Course learning Outcomes (CO) AYPG-RM At the end of the course AYPG-RM, the students should be able to-	B1 Course learning Outcomes mapped with program learning outcomes.
CO1	Demonstrates decision-making based on acquired knowledge, understanding various research types.	PO1,PO5
CO2	Conduct a comprehensive literature review to identify research gaps and define areas for future study.	PO2,PO5
CO3	Evaluate and appraise the literature to assess research gaps and the necessity for new studies.	PO2,PO5
CO4	Design and conduct research protocols using appropriate study designs and develop effective assessment tools tailored for Ayurveda.	PO2,PO5
CO5	Implement and monitor ethical and regulatory guidelines throughout the research process.	PO2,PO4,PO5
CO6	Prepare and disseminate research findings through presentations, publications in indexed journals and other professional platforms adhering to publication ethics.	PO2,PO5
CO7	Deliver impactful presentations of research projects to peers, demonstrating clarity, analysis, and professional communication.	PO2,PO5,PO6
CO8	Utilize information technology tools to enhance research capabilities, manage observations, and improve analytical accuracy.	PO7,PO8
CO9	Apply advanced instrumentation and modern techniques in Ayurvedic research to elevate study quality, accuracy and integrity.	PO3,PO5,PO7,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 Research Basics** The module 'Research Basics' provides a comprehensive foundation in research, focusing on integrating Ayurvedic principles with contemporary scientific methodologies. It emphasizes the significance of conducting thorough literature reviews, critically appraising classical Ayurvedic texts alongside modern studies, and understanding evidence-based practices in Ayurveda. The module also guides learners in identifying relevant research problems and developing clear, well-informed research questions and hypotheses, bridging the gap between traditional knowledge and modern scientific inquiry. • **M1U1** Overview of research process and evidence-based medicine • **M1U2** Research methods in Ayurveda Medicine • **M1U3** Literature search and critical appraisal of literature • **M1U4** Identification of research problem • **M1U5** Research question and Hypothesis	1	5	10	15	(30)	20
2	**M-2 Ethics and Regulatory Aspects in Research** The module 'Ethics and Regulatory Aspects in Research' covers essential ethical principles and guidelines crucial for conducting research in Ayurveda. It provides insights into the constitution and functioning of Institutional Ethics Committees for both human and animal studies, ensuring adherence to ethical standards. The module also highlights the National Pharmacovigilance Program for Ayurveda, focusing on adverse	1	5	10	15	(30)	10

	drug reporting methods. Additionally, it explores the scope and significance of Intellectual Property Rights (IPR) and patents, ensuring researchers understand their role in safeguarding innovations in the field of Ayurveda. • **M2U1** Basics of Ethics and Ethics Guidelines • **M2U2** Institutional Ethics Committees Institutional Ethics Committees (Human and Animal) - constitution and review process • **M2U3** National Pharmacovigilance Program National Pharmacovigilance Program for Ayurveda medicine and Adverse Drug reporting methods • **M2U4** Scope and Importance of IPR and Patents						
3	**M-3 Research Types - Part 1** The module 'Research Types - Part 1' offers a comprehensive understanding of various research types relevant to Ayurveda. It introduces learners to both qualitative and quantitative research methodologies, providing a detailed exploration of descriptive and observational study designs. The module emphasizes the importance of selecting appropriate research designs based on the nature of the inquiry, enabling researchers to systematically investigate Ayurvedic concepts and clinical practices. This balanced approach to qualitative and quantitative research ensures a thorough understanding of different study frameworks, allowing for a more nuanced and evidence-based exploration of Ayurveda. • **M3U1** Different types of research • **M3U2** Qualitative Research • **M3U3** Descriptive study designs • **M3U4** Observational study designs	2	10	20	30	(60)	20
4	**M-4 Research Types - Part 2** The module 'Research Types - Part 2' focuses on critical aspects of research accuracy and innovation in Ayurveda. It begins with an in-depth examination of bias in research and various strategies to minimize or	1	5	10	15	(30)	20

	eliminate it, ensuring the validity of study outcomes. The module then explores the methodology of Randomized Controlled Trials (RCTs), a gold standard in clinical research, and their application in Ayurvedic studies. Finally, it introduces learners to emerging and innovative study designs, equipping researchers with modern tools to advance evidence-based Ayurveda while maintaining rigorous scientific standards. • **M4U1** Bias and ways to eliminate bias • **M4U2** Randomized Controlled Trials • **M4U3** Newer study designs						
5	**M-5 Research Types - Part 3** The module 'Research Types - Part 3' examines essential research domains in Ayurveda. It covers preclinical studies as a foundation for drug research, highlights the significance of literary research, and emphasizes the development of tailored research tools. Additionally, it addresses the use of appropriate assessment tools and terminology, ensuring researchers are equipped to conduct rigorous investigations in Ayurveda. • **M5U1** Preclinical studies • **M5U2** Drug research • **M5U3** Literary research • **M5U4** Development of tools • **M5U5** Assessment Tools Use of appropriate assessment tools and terminology	2	10	20	30	(60)	20
6	**M-6 Research Communication** The module 'Research Communication' focuses on key elements of presenting research in Ayurveda. It covers writing research protocols, proposals, and synopses, along with the structure of dissertations. Learners will also explore the types and formats of journal articles and gain insights into conducting systematic reviews and meta-analyses, essential for synthesizing evidence in the field. • **M6U1** Research protocol writing	2	10	20	30	(60)	10

	Research protocol/proposal/Synopsis writing • **M6U2** Dissertation contents and structure • **M6U3** Types and structure of journal articles • **M6U4** Systematic review and meta-analysis • **M6U5** Publication guidelines • **M6U6** Referencing • **M6U7** Scientometrics • **M6U8** Publication Ethics						
		9	**45**	**90**	**135**	**270**	**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 : Research Basics							
Module Learning Objectives **(At the end of the module, the students should be able to)** 1. Describe the importance of evidence-based medicine, its levels, and the research process 2. Conduct literature review and critical appraisals of articles 3. Identify a research problem 4 . Frame research question, hypotheses, and objectives							
Unit 1 Overview of research process and evidence-based medicine **References:** 1,2,3							
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**	**3H**
1	CO1,CO2,CO3	Describe research process and importance of evidence-based medicine	1	Lecture	CC	Knows-how	L&PPT
2	CO1,CO2,CO3	Elaborate the current status of Ayurveda medicine research	2	Practical Training 1.1	PSY-GUD	Knows-how	PBL
3	CO1,CO2,CO3	Identify the level of evidence in Ayurveda research	2	Experiential-Learning 1.1	CC	Knows-how	CBL,DIS
Unit 2 Research methods in Ayurveda Medicine							

References: 4

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO2,CO3	Appreciate research concepts in Ayurveda medicine system	1	Lecture	CC	Knows-how	FC
2	CO1,CO2,CO3	Demonstrate different research concepts in Ayurveda medicine systems with examples	2	Practical Training 1.2	PSY-GUD	Shows-how	DIS,PrBL
3	CO1,CO2,CO3	List out the challenges and probable solutions in Ayurveda medicine research	2	Experiential-Learning 1.2	PSY-GUD	Shows-how	BS,PrBL

Unit 3 Literature search and critical appraisal of literature

References: 5

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO2,CO3	Describe the systematic approach of literature search using biomedical databases, search engines and software	1	Lecture	CC	Knows-how	L&PPT
2	CO1,CO2,CO3	Demonstrate literature search in medical databases	2	Practical Training 1.3	PSY-GUD	Shows-how	D,DIS
3	CO1,CO2,CO3	Conduct a literature search for a given scenario	3	Experiential-Learning 1.3	PSY-GUD	Shows-how	BS

Unit 4 Identification of research problem

References: 6,7

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO2,CO3	Describe the methods for identifying the research problem	1	Lecture	CC	Knows-how	L&PPT
2	CO1,CO2,CO3	Enlist different ways of identifying the research problem	2	Practical Training 1.4	PSY-GUD	Shows-how	PBL
3	CO1,CO2,CO3	Identify the research problem	3	Experiential-Learning 1.4	CAN	Shows-how	CBL

Unit 5 Research question and Hypothesis

References: 8

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO2,CO3	Define and explain characteristics of good research question, hypotheses- types and formulation, framing objectives	1	Lecture	CC	Know	FC
2	CO1,CO2,CO3	Demonstrate the qualities of good research questions (PICO/T and FINER approach), Demonstrate the importance of framing appropriate hypotheses and pertinent objectives.	2	Practical Training 1.5	PSY-GUD	Shows-how	PBL
3	CO1,CO2,CO3	Frame research questions, hypotheses, and study objectives.	3	Experiential-Learning 1.5	CAP	Knows-how	BS,PBL

Practical Training Activity

Practical No	Name	Activity details
Practical	Elaborate the current	The teacher will discuss a minimum of one major research initiative like‘A Science Initiative in Ayurveda’, CSIR-NMITLI

Training 1.1	status of Ayurveda medicine research	Ministry of Ayush research initiatives in COVID-19, or any other current important Ayurveda medicine research projects or research projects of other systems of medicine. Students can be divided into groups, and each group will be given a specific assignment, such as the whole system approach or the Black Box approach, and asked to summarise the impressions (uniqueness, relevance, importance) about the given research project. Brainstorming and group discussions of prospective research topics of the Ayurveda topics.
Practical Training 1.2	Demonstrate different research concepts in Ayurveda medicine systems with examples	The teacher will demonstrate a few research concepts quoted in Ayurveda medicine texts. Students will be divided into groups. Each group should refer to Ayurveda medicine texts quoting research concepts, enlist any five in their prospective study area, and submit assignments. Students will be encouraged to do GD on the submitted assignments and present their relevance and applications to current research trends.
Practical Training 1.3	Display and demonstrate literature search in medical databases	The teacher will demonstrate searching relevant articles using search engines by following MeSH terms, standard Ayurveda medicine terms [WHO publication], Filtering & Boolean operators; LitMaps; and e-resources of Ayurveda medicine systems. Following these students will do a teacher-guided activity. Compilation Students should be asked to select one topic and do a narrative review / Systematic review using the MeSH terms, compile at least 15 results, and submit it. Students should be aware using of the Namaste Portal.
Practical Training 1.4	Enlist different ways of identifying the research problem	The teacher will demonstrate different ways of identifying research problems like limitations/ lacunae/ research gap/ evidence gap/ future scope of published studies, current trends, integration of disciplines/systems, clinical observations, expert opinion, brainstorming, and national/ local thrust areas with examples. TBL The group of students will discuss the research problems and will present them under the points of the current scenario of the problem, Knowledge gap, Need of research question, Hypothesis, and Null hypothesis formation.
Practical Training 1.5	Demonstrate the qualities of good research questions using PICO/T in the clinical scenario and the FINER approach in both clinical and non-clinical	The teacher will demonstrate how to frame a research question (define and redefine), hypotheses, and objectives with examples reflecting different research types and subjects. Students will refer to a minimum of 5 research articles related to the study area and evaluate the research question, hypotheses, and objectives in these articles based on the criteria as demonstrated by the teacher. Fishbowl activity – Clinical scenarios will be given by the teacher. The half group will form the research question / Hypothesis / Objectives on the scenario. The other group will observe the question /Hypothesis with PICOT and FINER guidelines and will discuss it Group activity

	scenarios, hypotheses, and objectives.	A group of students will review the 5 articles, understand the research question and variables, and observe using PICOT and FINER guidelines.
Experiential learning Activity		
Experiential learning No	**Name**	**Activity details**
Experiential-Learning 1.1	Identify the level of evidence in Ayurveda medicine research	The teacher will divide students into 2 to 5 groups. The teacher will give a few scenarios or topics (both from Ayurveda medicine and contemporary medicine, for example, hypertension, diabetes, yoga procedures, therapeutic procedures, etc.) to a group of students. Each group should gather research works for each level of the evidence pyramid. In the end, the lacunae in evidence across the different examples will be identified and summarised.
Experiential-Learning 1.2	List out the challenges and probable solutions in Ayurveda medicine research.	The teacher will divide students into 2 to 5 groups. Each group should be assigned one concept quoted in Ayurveda medicine texts in the hospital community and record the challenges. Students shall share their observations and the teacher will summarise.
Experiential-Learning 1.3	Conduct a literature search for a given scenario	Students will identify a topic of interest related to their specialty and do a literature search using the systematic approach and then evaluate the collected literature under the guidance of a teacher.
Experiential-Learning 1.4	Identify the research problem	Students will be divided into 2 to 5 groups and each group will be involved in identifying the research problem using any of the methods demonstrated by the teacher, followed by a presentation and discussion.
Experiential-Learning 1.5	Frame research questions, hypotheses, and study objectives.	For the research problem identified in the previous unit “Research problem”, students will frame the research question, hypotheses, and objectives followed by discussion regarding the same as well as other possible research question formats.
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		2

table 6 C.

Project work: (25 marks)

Develop a research question, hypothesis, and objectives based on a given case scenario.

(Evaluation based on following checklists)

- PICOT / FINER criteria
- Self-explanatory
- H0 & H1 (where applicable)
- Primary & secondary objectives, their clarity, and relevance to the study

Or

Any practical in converted form can be taken for assessment..

Or

Any of the experiential as portfolio/ refelections / presentations can be taken as an assessment.

Module 2 : Ethics and Regulatory Aspects in Research

Module Learning Objectives
(At the end of the module, the students should be able to)
1 Illustrate basic principles of research ethics
2 Describe the composition and role of the research ethics committee
3 Appraise the Pharmacovigilance program for Ayurveda medicine and ADR reporting
4 Describe various types of IPR and patent process

Unit 1 Basics of Ethics and Ethics Guidelines

References: 9,10,11,12,13

3A	3B	3C	3D	3E	3F	3G	3H
1	CO5	Describe the history, need, role, and fundamental principles of ethics in research related to Humans and Animals.	1	Lecture	CC	Knows-how	FC,L_VC
2	CO5	Explain the history and contents of ICMR, ICH-GCP, and GCP-Ayurveda medicine guidelines.	1	Lecture	CC	Knows-how	L&PPT
3	CO5	Comprehend the contents of ICMR, ICH-GCP and GCP-Ayurveda medicine guidelines including the process of Clinical trial registration	1	Practical Training 2.1	PSY-GUD	Shows-how	DIS,PER
4	CO5	Enlist cases where the principle of autonomy and justice is upheld and compromised.	1	Practical Training 2.2	PSY-SET	Shows-how	PBL
5	CO5	Enlist cases where principles of beneficence/non-maleficence are upheld and compromised	1	Practical Training 2.3	PSY-SET	Shows-how	PBL
6	CO5	Demonstrate the ethical principles by developing a case scenario.	1	Experiential-Learning 2.1	AFT-VAL	Shows-how	CBL

7	CO5	Identify the ethical principles in a given case scenario.	1	Experiential-Learning 2.2	AFT-VAL	Shows-how	DIS,RP
Unit 2 Institutional Ethics Committees Institutional Ethics Committees (Human and Animal) - constitution and review process **References:** 14,15,16,17							
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**	**3H**
1	CO5	Explain the constitution, composition, review process, registration, and regulation of the Institutional human and animal ethics committee.	1	Lecture	CC	Knows-how	L&PPT
2	CO5	Construct the composition of the ethics committee through different case scenarios.	2	Practical Training 2.4	PSY-SET	Shows-how	CBL
3	CO5	Enlist the elements of the review process through different case scenarios	3	Practical Training 2.5	PSY-SET	Shows-how	CBL
4	CO5	Identify ethical issues specific to Ayurveda medicine research through different case scenarios.	2	Practical Training 2.6	PSY-SET	Shows-how	CBL,PBL,RP
5	CO5	Demonstrate the review process of IHEC	6	Experiential-Learning 2.3	AFT-VAL	Shows-how	PBL,RP
6	CO5	Demonstrate the review process of IAEC	5	Experiential-Learning 2.4	AFT-VAL	Shows-how	PBL,RP
Unit 3 National Pharmacovigilance Program National Pharmacovigilance Program for Ayurveda medicine and Adverse Drug reporting methods **References:** 18,19,20,21							
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**	**3H**

1	CO5	Explain the history, objectives, hierarchy, and ADR reporting method of the Pharmacovigilance program for Ayurveda medicine & H drugs.	1	Lecture	CC	Knows-how	L&PPT

Unit 4 Scope and Importance of IPR and Patents

References: 22,23,24,25

3A	3B	3C	3D	3E	3F	3G	3H
1	CO5	Outline the importance and various forms of IPR (copyright, trademark, industrial design, geographical designs, patents).	1	Lecture	CC	Knows-how	FC,L&PPT

Practical Training Activity

Practical No	Name	Activity details
Practical Training 2.1	Identify the contents of ICMR, ICH-GCP, and GCP-Ayurveda medicine guidelines including the process of Clinical trial registration.	Group Activity The teacher will present different sections of ICMR, ICH-GCP, and GCP-Ayurveda medicine guidelines. Students will be divided into 2 to 5 groups and each group will be assigned one key section from these guidelines and students will read and present the summary of the section. Following this, the teacher will demonstrate the process of Clinical trial registration. Students will assess the CTRI website.
Practical Training 2.2	Enlist cases where the principle of autonomy and justice is upheld and compromised.	The teacher will discuss cases like the Nuremberg trials, and Tuskegee Syphilis Experiments or create any case scenario related to the said ethics principles. Students will be divided into 2 to 5 groups and each group will be given a case scenario like decision making, informed consent, patient information sheet, treatment discrimination based on cultural or social status, voluntariness to withdraw, privacy, confidentiality, research misconduct, etc. The groups have to identify and analyze which ethics principle is upheld or compromised and also to suggest any corrective measures if required. Role plays by groups The importance of the Informed Consent form, Random selection of patients using software, ADR protocol, and Patient withdrawal guidelines should be emphasized.

Practical Training 2.3	Enlist cases where principles of beneficence/non-maleficence are upheld and compromised	The teacher will discuss cases such as Tuskegee Syphilis Experiments, Stanley Milgram's infamous experiment, or create any case scenario related to the said ethics principles. Students will be divided into 2 to 5 groups and each group will be given a case scenario to assess the risk-benefit ratio (for example vaccination trials, and anti-cancer trials). The groups have to suggest any corrective measures if possible. Brainstorming Discussions about ethics in Vaccination trials, New drug discovery, and Ethical approaches to enroll subjects having disorders like hypertension, Diabetes, Paediatric patients, etc, or are already on another medication.
Practical Training 2.4	Construct the composition of the ethics committee through different case scenarios.	The teacher will present the composition of the ethics committee. Students will be divided into 2 to 5 groups and each group will be given a case scenario like quorum requirements, gender representation, presence of sponsor representative during IEC, qualifications and responsibilities of members, absence of a veterinarian, CCSEA nominee, etc. The group has to identify, analyze, and present the mistake in the ethics committee composition. The teacher facilitates discussion among groups and summarises the key points.
Practical Training 2.5	Revise the elements of the review process through different case scenarios	The teacher will present the elements of the review process. Students will be divided into 2 to 5 groups and each group will be given a case scenario like wrong risk identification, review by voting/unanimous call, review in an emergency, expedited review, waiver of IEC review, conflict of interest, etc. Each group will identify, analyze, and present the mistake in the ethics review process. The teacher facilitates discussion among groups and summarises the key points.
Practical Training 2.6	Identify ethical issues specific to Ayurveda medicine research through different case scenarios.	The teacher will present case scenarios specific to Ayurveda medicine research, like the benefit of survey studies to participants, mineral formulations, cultural issues of certain medicines/ingredients, and discuss related ethical issues. Students will be divided into 2 to 5 groups and each group will be given a case scenario like ethics involved in therapeutic procedures, add-on therapy, yoga intervention, new dosage form, use of fewer animals, vulnerable population, sponsored pharma product, etc. Each group will analyze the ethical issues involved and suggest possible solutions. The teacher facilitates discussion among groups and summarises the key points.
Experiential learning Activity		
Experiential learning No	**Name**	**Activity details**
Experiential-Learning 2.1	Appraise the ethical principles by developing a case scenario.	Students will be divided into groups and the teacher will assign ethics principles for scenario development like privacy, confidentiality, voluntary participation, anonymity, no harm to participants, informed consent, vulnerability, etc. The group will develop the script for a skit to be enacted.

Experiential-Learning 2.2	Identify the ethical principles in a given case scenario.	The groups will enact the developed skit and other groups will identify the ethical principle. The teacher facilitates discussion among groups and summarises key aspects.
Experiential-Learning 2.3	Demonstrate the review process of IHEC	The teacher will develop dummy research protocols on human participants with challenging scenarios like an incomplete application form, need for insurance, deviation from initial protocol, violation, involving vulnerable populations like children, terminally ill, differently abled, etc. Students are divided into groups and each group will be given a dummy protocol, a week before the class and explained that they will be members of a mock IE review committee. During the class, each group will perform the mock review in front of the class and decide whether to approve or suggest changes for resubmission or reject. The teacher will facilitate discussion among groups and summarise key aspects.
Experiential-Learning 2.4	Demonstrate the review process of IAEC	The teacher will develop dummy research protocols involving animals with challenging scenarios like an incomplete application form, including higher animals, multiple animal groups, procedures causing harm to animals, redundant animal experiments, etc. Each group will be given a dummy protocol, a week before the class and explained that they will be members of a mock IAE review committee. During the class, each group will perform the mock review in front of the class and decide whether to approve or suggest changes for resubmission or reject. The teacher will facilitate discussion among groups and summarise key aspects.

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. **Mock review process** (Formative assessment is based on the presentation done during Experiential Learning in Unit-2—institutional ethics committees (human and animal)—constitution and review process) • *Assessment Checklist for IHEC mock review:* Trial protocol, written informed consent form(s), subject recruitment procedures (e.g. advertisements), written information to be provided to subjects, investigator's brochure on the study drugs, safety information, information about payments and compensation, investigator's curriculum vitae *Assessment Checklist for IAEC mock review:* Trial protocol, respective forms, criteria for animal selection and number required, investigator's brochure on the study drugs, safety information, information about analyses and disposal, investigator's curriculum vitae, visit to the animal house and look for the infrastructure and facilities.	2

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.. (25 Marks)	

Module 3 : Research Types - Part 1

Module Learning Objectives
(At the end of the module, the students should be able to)
1 Understand types of research
2 Comprehend different methods based on the type of research
3 Apply study designs in Ayurveda medicine Research

Unit 1 Different types of research

References: 26,95

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4	Distinguish different types of research	1	Lecture	CK	Knows-how	L&PPT
2	CO4	Display different types of research with examples	2	Practical Training 3.1	PSY-GUD	Shows-how	FC

Unit 2 Qualitative Research

References: 29

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4	Describe qualitative research - definition, characteristics, relevance, types, methods of data collection, and ways to maintain robustness like credibility, transferability, dependability, and confirmability.	3	Lecture	CC	Knows-how	L&GD,PER
2	CO4	Identify the methods used in qualitative research.	4	Practical	PSY-	Shows-	CBL,DIS

				Training 3.2	GUD	how	
3	CO4	Moderate/participate in Focussed Group Discussions and interviews to illustrate the methods of qualitative research.	6	Experiential-Learning 3.1	PSY-GUD	Shows-how	PBL,RP

Unit 3 Descriptive study designs

References: 31,98,99

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4	Explain and distinguish various types of descriptive studies (Case report, Case series, Cross-sectional, longitudinal)	3	Lecture	CC	Knows-how	L&PPT
2	CO4	Differentiate the descriptive studies in published literature – Case report	2	Practical Training 3.3	PSY-GUD	Shows-how	CBL,SDL
3	CO4	Differentiate the descriptive studies in published literature – Case series	2	Practical Training 3.4	PSY-GUD	Shows-how	CBL,SDL
4	CO4	Differentiate the descriptive studies in published literature – Cross-sectional study	2	Practical Training 3.5	PSY-GUD	Shows-how	CBL,SDL
5	CO4	Differentiate the descriptive studies in published literature – Longitudinal study	2	Practical Training 3.6	PSY-GUD	Shows-how	CBL,SDL
6	CO4	Acquire the knowledge of conducting various descriptive studies in hospital community/classroom/hostel.	10	Experiential-Learning 3.2	PSY-GUD	Shows-how	PrBL,TPW

Unit 4 Observational study designs

References: 32,33,102,103

3A	3B	3C	3D	3E	3F	3G	3H

1	CO4	Distinguish various types of observational studies (case-control, cohort, and cross-sectional analytical) and their applications	3	Lecture	CC	Knows-how	L&PPT
2	CO4	Differentiate the cross-sectional analytical studies in published literature.	2	Practical Training 3.7	PSY-GUD	Shows-how	CBL,SDL
3	CO4	Differentiate the case-control studies in published literature.	2	Practical Training 3.8	PSY-GUD	Shows-how	CBL,SDL
4	CO4	Differentiate the cohort studies in published literature.	2	Practical Training 3.9	PSY-GUD	Shows-how	CBL,SDL
5	CO4	Acquire the knowledge of conducting various observational studies.	10	Experiential-Learning 3.3	PSY-GUD	Shows-how	PBL,TPW

Practical Training Activity

Practical No	Name	Activity details
Practical Training 3.1	Demonstrate different types of research with examples	The teacher refers to and discusses a minimum of five research articles related to different types of research such as qualitative research, quantitative research, applied research, exploratory, translational research, implementation, and integrative/ interdisciplinary research, and classifies them under the category.
Practical Training 3.2	Differentiate methods used in qualitative research.	The teacher refers to and discusses do-don’ts in Focus group discussion (FGD), preparation of interview schedule and guide, interpretation of recorded interview (transcript, code, category, theme, sub-theme), and creating sociograms.
Practical Training 3.3	Appraise the descriptive studies in published literature – Case report	The teacher refers to and discusses a few Case reports. The student identifies the prerequisite for a case report and observations to be made and documented while dealing with a rare/ unique/interesting case. Each Student should select an article regarding the case report and review it through CARE Guidelines. Ask students to download the Checklist review the article as per the checklist and submit it.
Practical Training 3.4	Differentiate the descriptive studies in published literature –	The teacher refers to and discusses a few Case series. The student identifies the prerequisite for a case series, and observations to be made and documented. Each Student should select an article regarding the case series and review it through the Guidelines. Ask students to download

	Case series	the Checklist review the article as per the checklist and submit it.
Practical Training 3.5	Identify the descriptive studies in published literature – Cross-sectional study	The teacher refers to and discusses research articles/previous thesis on cross-sectional studies like ICMR InDIAB. The student identifies/ summarises the basic elements (setting, location, time, mode of selection, sampling), merits, and demerits of the cross-sectional study.
Practical Training 3.6	Differentiate the descriptive studies in published literature – longitudinal study	The teacher refers to and discusses research articles/previous studies on longitudinal studies like the Framingham Study. The student identifies/ summarises the basic elements (time, common characteristics of the group, assessment parameters), merits and demerits, and the applicability of the longitudinal study.
Practical Training 3.7	Identify the cross-sectional analytical studies in published literature.	The teacher refers to and discusses research articles/previous thesis on cross-sectional analytical studies. The student identifies/ summarises the basic elements (characteristics, data collection methods, bias), merits and demerits, applicability of cross-sectional analytical studies.
Practical Training 3.8	Appraise the case-control studies in published literature.	The teacher refers to and discusses research articles/previous theses on case-control studies. The student identifies/ summarises the basic elements (characteristics, data collection methods, bias, confounder, effect modifier, risk factors), merits and demerits, and applicability of case-control studies. The student should be assigned one article regarding a Case-control study. Review the article following STROBE guidelines and submit the report.
Practical Training 3.9	Appraise the cohort studies in published literature.	The teacher refers to discuss research articles on cohort studies. The student identifies/ summarises the basic elements (characteristics, data collection methods, bias, confounder, effect modifier, risk factors), merits and demerits, and applicability of cohort studies. Brainstorming Students should be given activities to think about cohort study research questions as per Ayurveda.
Experiential learning Activity		
Experiential learning No	**Name**	**Activity details**
Experiential-	Moderate/participate in	Students will be divided into 2 to 5 groups and each group will be assigned activities such as selection of an ideal qualitative

Learning 3.1	FGD, In-depth interview.	research method for a specific research problem, role play on sensitive and non-sensitive topics for FGD, role play depicting desirable and undesirable characters regarding moderator, participants, and interviewer. While one group is performing a role-play of FGD, the other groups can be involved in transcript and sociogram preparation.
Experiential-Learning 3.2	Acquire the knowledge of conducting various descriptive studies in the hospital community/classroom/hostel.	Students will be divided into 2 to 5 groups. Each group will be assigned a different study design and study setting such as a hospital community/classroom/hostel. Later the students should present the findings, followed by a group discussion on methodology aspects. The teacher will summarise the key points.
Experiential-Learning 3.3	Acquire the knowledge of conducting various observational studies.	Students will be divided into 2 to 5 groups. Each group identifies a scenario/ topic for observational study and further designs a study considering the basic elements (selection of case and matching control, bias elimination, measurement of exposure and outcome) of each study design. Students should review observational studies from indexed journals review them under STROBE guidelines and submit them.

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. **Case-based evaluation: (25 Marks)** Each student will be given a published paper on a specific study design to evaluate the elements of the respective study design. Assessment of the review based on the summary of the given published research paper emphasizing the elements of the respective research design and Any practical in converted form can be taken for assessment.. Or Any of the experiential as portfolio/ refelections / presentations can be taken as assessment.. (25 Marks)	4

Module 4 : Research Types - Part 2

Module Learning Objectives
(At the end of the module, the students should be able to)
1 Understand different research designs used for interventional studies.
2 Comprehend merits, demerits, and applications of different designs.
3 Apply study designs in Ayurveda medicine Research.

Unit 1 Bias and ways to eliminate bias

References: 34,35,36,37

3A	3B	3C	3D	3E	3F	3G	3H
1	CO1,CO4	Explain bias at various stages of clinical trials and describe ways to eliminate bias such as randomization, blinding, and control.	1	Lecture	CC	Knows-how	FC,L&GD,L&PPT

Unit 2 Randomized Controlled Trials

References: 104

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4	Explain various types (pilot/ proof of concept/ exploratory, randomized/ blinded/ controlled, Superiority/No- inferiority/ equivalence, phases of clinical trials) and methodological details (defining eligibility and withdrawal criteria, outcome assessment and variables, safety monitoring) of Interventional studies.	3	Lecture	CC	Knows-how	CBL,FC,L&PPT
2	CO4	Appraise the Interventional study designs in published literature.	10	Practical	PSY-	Shows-	CBL

				Training 4.1	GUD	how	
3	CO4	Acquire the knowledge of conducting various interventional studies.	4	Experiential-Learning 4.1	AFT-VAL	Shows-how	BS,CBL,PER
4	CO4	Acquire the knowledge of conducting various interventional studies.	4	Experiential-Learning 4.2	AFT-VAL	Shows-how	BS,CBL,PER
5	CO4	Acquire the knowledge of conducting various interventional studies.	5	Experiential-Learning 4.3	AFT-VAL	Shows-how	BS,CBL,PER

Unit 3 Newer study designs

References:

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4	Non-conventional study designs (Black box design, n-1 design, whole system research, flexible-dose design)	1	Lecture	CK	Knows-how	DIS,FC,L &PPT

Practical Training Activity

Practical No	Name	Activity details
Practical Training 4.1	Appraise the Interventional study designs in published literature.	The teacher refers to and discusses research articles/previous theses on different types of interventional studies.

Experiential learning Activity

Experiential learning No	Name	Activity details
Experiential-	Acquire the knowledge	Students will be divided into groups and each group will appraise the methodology for studies involving interventions of different

Learning 4.1	of conducting various interventional studies.	natures such as diet/therapeutic procedure /medicine/counseling through published literature and present in the forthcoming class. Each student will review the article, methodology, assessment criteria, inclusion and exclusion criteria, and study design and will present it.
Experiential-Learning 4.2	Acquire the knowledge of conducting various interventional studies.	Each group will then present the observations on the methodology, followed by a group discussion on differences between the methodologies, merits/demerits of various interventional studies, and identification of challenges and possible solutions in the case of Ayurveda medicine studies.
Experiential-Learning 4.3	Acquire the knowledge of conducting various interventional studies.	Further, each group will design an interventional study on the topic given by the teacher and present.

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. **Case-based evaluation:** Each student will be given a published paper on an interventional study design. Checklist of assessment: The assessment will be based on the article review done by the student over the elements of the respective interventional study design, like objectives, literature review, sampling techniques, randomization, blinding, methodology, statistical analysis, results, discussion, and outcomes. 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.. (25 Marks)	2

Module 5 : Research Types - Part 3

Module Learning Objectives
(At the end of the module, the students should be able to)
1 Comprehend the characteristics, methodology, and utility of different research studies.
2 Apply these different research studies in the context of Ayurveda medicine.

Unit 1 Preclinical studies

References: 38,39

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4,CO9	Explain the basics of in silico, in vitro, and in vivo studies.	3	Lecture	CC	Knows-how	L&PPT
2	CO4,CO9	Demonstrate cell culture studies and animal procedures.	1	Practical Training 5.1	PSY-GUD	Shows-how	FV,L_VC
3	CO4,CO9	Demonstrate the utility of in-vitro and in-vivo studies in the Ayurveda medicine context.	2	Practical Training 5.2	PSY-GUD	Shows-how	FV
4	CO4,CO9	Demonstrate in silico studies.	2	Practical Training 5.3	PSY-GUD	Shows-how	L_VC
5	CO4,CO9	Acquaint with instrumentation and procedures related to the in silico, in vitro, and in vivo studies.	6	Experiential-Learning 5.1	AFT-VAL	Shows-how	FV

Unit 2 Drug research

References: 40

3A	3B	3C	3D	3E	3F	3G	3H

1	CO4,CO9	Describe protocols for drug quality testing.	1	Lecture	CK	Knows-how	FC,L&PPT
2	CO4,CO9	Explain and demonstrate different instrumentation used in drug research.	1	Lecture	CK	Knows-how	D,FV,L_VC
3	CO4,CO9	Review principles and applications of instruments.	2	Practical Training 5.4	PSY-SET	Shows-how	DIS,FV,L_VC
4	CO4,CO9	Check the quality of a drug/formulation.	3	Practical Training 5.5	PSY-SET	Shows-how	L_VC,PT
5	CO4,CO9	Acquaint with pharmacy college/QC unit in Ayurveda medicine pharmacy.	4	Experiential-Learning 5.2	AFT-VAL	Shows-how	FV,SDL

Unit 3 Literary research

References: 92,93,94,105,106

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4,CO9	Define and describe the scope of literary research and the steps of manuscriptology.	1	Lecture	CK	Knows-how	L&PPT
2	CO4,CO9	Explore available manuscript resources.	5	Practical Training 5.6	PSY-SET	Shows-how	ML,SDL
3	CO4,CO9	Acquaint with manuscript library/ Oriental study institutions/ University Sanskrit departments/IKS center in IITs or Video on steps of manuscriptology.	5	Experiential-Learning 5.3	AFT-VAL	Shows-how	FV,SDL

Unit 4 Development of tools

References: 41

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4,CO9	Explain the importance and types of tools.	1	Lecture	CK	Knows-how	L&GD
2	CO4,CO9	Describe stages of tool development and methods for validating developed tools.	1	Lecture	CC	Knows-how	L&GD
3	CO4,CO9	Demonstrate the process of tool development and validation.	3	Practical Training 5.7	PSY-SET	Shows-how	CBL,DIS
4	CO4,CO9	Develop a questionnaire.	5	Experiential-Learning 5.4	AFT-VAL	Shows-how	SDL
Unit 5 Assessment Tools Use of appropriate assessment tools and terminology **References:** 42,43,44,45,46,47,48							
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**	**3H**
1	CO4,CO9	Identify appropriate assessment tool.	1	Lecture	CK	Knows-how	L&PPT
2	CO4,CO9	Demonstrate standard terminologies (e.g. WHO, ICD 11, DSM V, NAMASTE)	1	Lecture	CK	Knows-how	D,L&PPT
3	CO4,CO9	Search and choose the appropriate assessment tool.	2	Practical Training 5.8	PSY-SET	Shows-how	DIS,SDL
4	CO4,CO9	Apply appropriate assessment tools in a given Ayurveda medicine scenario	3	Experiential-Learning 5.5	AFT-VAL	Shows-how	DIS,SDL
5	CO4,CO9	Compare minimum 5 Ayurveda medicine terms and compare with standard	3	Experiential-	AFT-	Shows-	DIS,PBL

		terminology.		Learning 5.6	VAL	how	

Practical Training Activity

Practical No	Name	Activity details
Practical Training 5.1	Demonstrate cell culture studies and animal procedures.	The teacher will demonstrate either in the lab or with the help of a video on cell culture and animal studies (animal handling, blood collection, dosing)
Practical Training 5.2	Explore the utility of in-vitro and in-vivo studies in the Ayurveda medicine context.	The teacher will facilitate a group discussion on landmark in-vitro, and in-vivo studies and explore the limitations/ challenges/ possibilities of in-vitro and in-vivo studies in Ayurveda medicine like solubility of herbo-mineral formulations, therapeutic procedures, etc. Interaction with experts about designing and conducting in-vitro and in-vivo studies (Desirable)
Practical Training 5.3	Demonstrate in-silico studies.	The teacher demonstrates the use of various software and databases to explore the utilities of in-silico studies in different domains like UNPD. Students in groups are encouraged to work on the provided domain and present their work Self Directed learning Awareness about Molecular docking and Demonstration of software of molecular docking.
Practical Training 5.4	Review principles and applications of instruments.	The teacher demonstrates the functioning and utility of high-end instruments like Spectrophotometer, HPTLC, HPLC, GC, LCMS, XRD etc using repository videos.
Practical Training 5.5	Check the quality of a drug/formulation.	The teacher demonstrates experiments on drug/formulation quality testing. Students are divided into groups and each group is given either an herb or a formulation, to carry out the quality testing of the same and record the findings. Include experiments like foreign matter, Moisture content, Total ash, Acid insoluble ash, Extractive values, Specific gravity, Tablet disintegration test, Tablet hardness, pH value, Acid value, friability test, thin layer chromatography etc. (Practical demonstration may be combined with Experiential learning -EL-5.2)
Practical Training 5.6	Explore available manuscript resources.	The teacher demonstrates online Manuscript Search. Student searches online Manuscript catalogs related to Ayurveda medicine or published literature and compiles them (Desirable).
Practical	Demonstrate the process	The teacher demonstrates a minimum of two published articles regarding tool development and tool validation. Students are

Training 5.7	of tool development and validation.	divided into groups and are encouraged to search published articles on tool development and validation. The teacher facilitates discussion among the group and highlights the robustness of the tool. [Tool includes an index, scale, questionnaire, medical instrumentation, software, apps etc.]
Practical Training 5.8	Search & choose the appropriate assessment tool.	The teacher demonstrates criteria for choosing assessment tools such as relevance (eg. ethnicity, time frame), specificity (eg. Pain assessment in OA and RA), and requirement (eg. diagnosis, screening). Students are divided into groups and instructed to choose appropriate assessment tools for at least 2 clinical conditions (like WHO-QoL, Diabetic risk assessment, pain, and Ayurveda medicine items). The teacher facilitates discussion among the groups and highlights the key concepts. Peer group learning Students should collect at least five assessment tools from the previous article, Studies, and compile the information, and share it.
Experiential learning Activity		
Experiential learning No	**Name**	**Activity details**
Experiential-Learning 5.1	Acquaint with instrumentation and procedures related to in silico, in vitro, and in vivo studies.	After the visit, the student will write their observations about the facility, laboratory instrumentation, animal procedures, safety guidelines.
Experiential-Learning 5.2	Acquaint with pharmacy college/QC unit in Ayurveda pharmacy.	Students visit the pharmacy college/QC unit in Ayurveda medicine pharmacy and compile their observations. This activity can be clubbed with Practical 5.2.
Experiential-Learning 5.3	Acquaint with a manuscript library.	Visit a manuscript library or Oriental study institutions/ University Sanskrit departments/IKS center at IITs or Departments related to Ayurveda medicine. Optional – Repository Video on steps of manuscriptology.
Experiential-Learning 5.4	Develop a questionnaire.	Develop a questionnaire for Ayurveda medicine. Group activity based on various tools useful for Ayurveda medicine (Desirable).
Experiential-Learning 5.5	Apply appropriate assessment tools in a	Students will be divided into groups and given the task of searching for assessment tools from either theses, published articles, or projects in a given Ayurveda medicine scenario followed by brainstorming on the utility and limitations

	given Ayurveda medicine scenario	Assessment tools from various articles compilation (at least 5) The questionnaire designing for an assessment of physiological functions. Review of questionnaire design from various articles
Experiential-Learning 5.6	Define a minimum of 5 Ayurveda medicine terms and compare them with standard terminology.	The teacher will define a minimum of 5 Ayurveda medicine terms and compare them with standard terminology. Students are divided into groups and each group works on a minimum of two terms of Ayurveda medicine, coins Standard operative definitions for the same, and presents. The teacher facilitates discussion among groups and summarises the key concepts. Refer to Namaste portal, WHO terminology, articles, and Book-Translational Ayurveda by Sanjeev Rastogi.

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. SAQ: 5 questions (1 question from each unit) – 25 Marks • Field report evaluation: 25 marks Evaluation of summary reports of Field visits, experiments in the lab, or demonstrated instruments: The report will be evaluated on the basis of active participation during the visit/lab, observation book detailing the observations during the visit/lab, and record-keeping. **or** Any practical in converted form can be taken for assessment.. (25 Marks) and Any of the experiential as portfolio/ refelections / presentations can be taken as assessment.. (25 Marks)	4

Module 6 : Research Communication

Module Learning Objectives
(At the end of the module, the students should be able to)
1. Prepare a synopsis/research protocol/proposal and enlist dissertation contents
2. Manage references using the Reference Manager Tool
3. Comprehend types and structures of different journal articles and prepare articles as per reporting guidelines
4. Identify misconduct in scientific writing and its consequences
5. Differentiate between credible and predatory journals

Unit 1 Research protocol writing Research protocol/proposal/Synopsis writing

References: 49,50,51,52,53

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4,CO5,CO6 ,CO7,CO8	Explain the basic structure of the synopsis [Randomisation table, dummy table, GANTT chart, expected outcome, Budget]	2	Lecture	CC	Knows-how	L&PPT
2	CO4,CO5,CO6 ,CO7,CO8	Explain a checklist of synopsis/protocol and differentiate between academic protocol and funding proposal.	1	Lecture	CC	Knows-how	D,L&GD
3	CO4,CO5,CO6 ,CO7,CO8	Demonstrate the key points and processes of synopsis/protocol writing.	5	Practical Training 6.1	PSY-GUD	Shows-how	D,L&GD
4	CO4,CO5,CO6 ,CO7,CO8	Prepare an outline of the synopsis.	3	Experiential-Learning 6.1	AFT-VAL	Shows-how	CBL,DIS, SDL
5	CO4,CO5,CO6 ,CO7,CO8	Retrieve information about different funding agencies and their schemes especially applicable to students.	3	Experiential-Learning 6.2	AFT-VAL	Shows-how	CBL,DIS, SDL

Unit 2 Dissertation contents and structure

References: 54,55,56,57,58,59

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4,CO5,CO6,CO7,CO8	Explain the structure of the dissertation for different study designs (IMRAD); Orientation to online theses repositories such as Shodhganga.	1	Lecture	CC	Knows-how	L&PPT
2	CO4,CO5,CO6,CO7,CO8	Appreciate the structure of the dissertation with a focus on specific requirements as per the type and design of the research.	3	Practical Training 6.2	PSY-GUD	Shows-how	CBL,DIS,PER
3	CO4,CO5,CO6,CO7,CO8	Critically appraise the result and discussion section of the thesis.	5	Experiential-Learning 6.3	AFT-VAL	Shows-how	DIS,PBL,SDL

Unit 3 Types and structure of journal articles
References: 60,61

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4,CO5,CO6,CO7,CO8	Explain the structure of different types of journal articles.	1	Lecture	CC	Knows-how	L&PPT
2	CO4,CO5,CO6,CO7,CO8	Demonstrate the structure of different types of articles.	2	Practical Training 6.3	PSY-GUD	Shows-how	D,L&GD
3	CO4,CO5,CO6,CO7,CO8	Present an article in the journal club.	4	Experiential-Learning 6.4	AFT-RES	Shows-how	DIS,PER

Unit 4 Systematic review and meta-analysis
References: 62,63

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4,CO5,CO6	Elaborate the process of Systematic review and meta-analysis.	1	Lecture	CC	Knows-	L&PPT

	,CO7,CO8					how	
Unit 5 Publication guidelines **References:** 64,65,66,67,68,69,70							
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**	**3H**
1	CO4,CO5,CO6 ,CO7,CO8	Explain publication guidelines such as STROBE, PRISMA, ARRIVE, CARE, CONSORT, etc and their variations.	1	Lecture	CK	Knows-how	L&PPT
2	CO4,CO5,CO6 ,CO7,CO8	Access different reporting guidelines.	2	Practical Training 6.4	PSY-GUD	Shows-how	D,ML,SDL
3	CO4,CO5,CO6 ,CO7,CO8	Review a published article by using a checklist of particular reporting guidelines.	3	Experiential-Learning 6.5	PSY-GUD	Shows-how	CBL,DIS,PER
Unit 6 Referencing **References:** 71,72,73,74,75,76,77,78,79							
3A	**3B**	**3C**	**3D**	**3E**	**3F**	**3G**	**3H**
1	CO4,CO5,CO6 ,CO7,CO8	Explain the need for referencing and bibliography. Enlist the different citation styles and references manager.	1	Lecture	CC	Knows-how	L&PPT
2	CO4,CO5,CO6 ,CO7,CO8	Demonstrate using any one reference manager tool.	4	Practical Training 6.5	PSY-GUD	Shows-how	D,PT
3	CO4,CO5,CO6 ,CO7,CO8	Appreciate referencing styles for different types of documents like journal articles, books, book chapters, conference proceedings, dissertations, online content, and Ayurveda medicine texts	3	Experiential-Learning 6.6	AFT-RES	Shows-how	PL,PBL,SDL
Unit 7 Scientometrics **References:** 80,81,82,83,84							

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4,CO5,CO6 ,CO7,CO8	Explain journal impact factors (indexing databases, cite score, impact factor, Altimetric) and authors' impact metrics (h index, I 10 indices, G index).	1	Lecture	CC	Knows-how	L&PPT
2	CO4,CO5,CO6 ,CO7,CO8	Select an appropriate journal and identify its quality using scientometrics	2	Practical Training 6.6	PSY-GUD	Shows-how	D,DIS
3	CO4,CO5,CO6 ,CO7,CO8	Acquire knowledge about various aspects of scientometry.	3	Experiential-Learning 6.7	AFT-RES	Shows-how	SDL

Unit 8 Publication Ethics

References: 85,86,87,88,89,90,91

3A	3B	3C	3D	3E	3F	3G	3H
1	CO4,CO5,CO6 ,CO7,CO8	Explain ethical issues in publication (authorship criteria, plagiarism, falsification & fabrication of data).	1	Lecture	CK	Knows-how	L&PPT
2	CO4,CO5,CO6 ,CO7,CO8	Review guidelines related to Publication ethics (WAME, COPE, ICMJE, OSPA).	2	Practical Training 6.7	PSY-GUD	Shows-how	D,DIS
3	CO4,CO5,CO6 ,CO7,CO8	Check plagiarism using online software.	2	Experiential-Learning 6.8	PSY-GUD	Shows-how	SDL

Practical Training Activity

Practical No	Name	Activity details
Practical Training 6.1	Demonstrate the key points of synopsis/protocol	The teacher will demonstrate the key contents of the synopsis (title, introduction, need of study, research question, hypothesis, primary and secondary objectives) with a few examples.

	writing.	
Practical Training 6.2	Appreciate the structure of the dissertation with a focus on specific requirements as per the type and design of the research.	Students will be divided into groups and each group will be allotted a dissertation of a particular research design (clinical study, survey study, literary research, drug research, etc.) and they will be required to identify its specific elements (such as case report form in clinical study or questionnaire in survey study).
Practical Training 6.3	Demonstrate the structure of different types of articles.	The teacher will refer to different types of articles like editorial, original research articles, case reports, case series, case snippets, review articles, letters to the editor, short communication, perspective/ opinion/viewpoint, commentary, book review, debate/ discussions, vignette, etc. highlighting their structure and will explain the criteria to select a specific type. At the end of the session, the teacher will explain the concept of a journal club and allocate different types of articles to a group of students.
Practical Training 6.4	Access different reporting guidelines.	The teacher will demonstrate the different reporting guidelines using https://www.equator-network.org/
Practical Training 6.5	Demonstrate using any one reference manager tool.	The teacher will demonstrate the different features (searching, downloading, creating a library, importing to Word document etc) of any one reference manager tool such as EndNote, Mendeley, or Zotero. Following this, students will install the reference manager software, explore its features and then conduct an activity using the tool.
Practical Training 6.6	Select an appropriate journal and identify its quality using scientometrics.	The teacher will demonstrate the method of selecting an appropriate journal using manuscript matching tools like Journalfinder, Jane, Edanz, Endnote etc. and will subsequently demonstrate different metrics of journals shortlisted by the matching tools. Based on scientometrics, the teacher will explain how to identify predatory journals.
Practical Training 6.7	Review guidelines related to Publication ethics (WAME, COPE, ICMJE, OASPA).	The teacher demonstrates various guidelines related to Publication ethics like WAME, COPE, ICMJE, and OASPA- Open Access Scholarly Publishing Association.
Experiential learning Activity		

Experiential learning No	Name	Activity details
Experiential-Learning 6.1	Prepare an outline of the synopsis.	Students will be divided into groups and each group will be given a topic reflecting different types of research (drug research, clinical study, literary research, survey study, animal study, tool development etc) to prepare a framework of the synopsis, the students will present and critically appraise the key components.
Experiential-Learning 6.2	Retrieve information about different funding agencies and their schemes especially applicable for students.	Students will visit the websites of different funding agencies (Ministry of Ayush, ICMR, DST, DBT, CSIR, and others) browse through the different schemes, and select suitable schemes for postgraduate work.
Experiential-Learning 6.3	Critically appraise the result and discussion section of the thesis.	Students are divided into groups and each group will be assigned a dissertation/ research article (which follows the standard structure of the results and discussion section) to appreciate the difference between results and discussion along with the link between the two.
Experiential-Learning 6.4	Present an article in the journal club.	Students will present the articles allocated to them during the practical and critically review them under the guidance of the teacher.
Experiential-Learning 6.5	Review a published article by using a checklist of particular reporting guidelines.	Students will be divided into groups and each group will be assigned a different type of article. They have to check the contents of the article against the applicable reporting guidelines and present them.
Experiential-Learning 6.6	Appreciate referencing styles for different types of documents like journal articles, books, book chapters, conference proceedings, dissertations, online content, and Ayurveda medicine texts.	Students will be given different types of documents and asked to prepare referencing for the same following standard guidelines (like peer-reviewed journals).

Experiential-Learning 6.7	Acquire knowledge about various aspects of scientometry.	Students will be divided into groups and each group will search different author metrics for a minimum of 10 personalities/authors.
Experiential-Learning 6.8	Check plagiarism using online software.	Students will be divided into groups and each group will be given a topic to prepare a review and subject to plagiarism check using online free plagiarism software/ tools.

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. **Critical review of a published article.** Each student will be given a published article for review based on relevant publication guidelines. The student's review will be assessed on 1. Selection of appropriate guidelines (5 marks) 2. Review of article by ticking off the checklist (5 marks) 3. Summary of review mentioning guidelines, describing missed elements, and positive aspects of the paper (15 marks) and Any practical in converted form can be taken for assessment.(25 Marks) or Any of the experiential as portfolio/ reelections / presentations can be taken as assessment.(25 Marks)	4

Table 4 : Practical Training Activity

Practical No	Practical name	Hours
1.1	Elaborate the current status of Ayurveda medicine research	2
1.2	Demonstrate different research concepts in Ayurveda medicine systems with examples	2
1.3	Display and demonstrate literature search in medical databases	2
1.4	Enlist different ways of identifying the research problem	2
1.5	Demonstrate the qualities of good research questions using PICO/T in the clinical scenario and the FINER approach in both clinical and non-clinical scenarios, hypotheses, and objectives.	2
2.1	Identify the contents of ICMR, ICH-GCP, and GCP-Ayurveda medicine guidelines including the process of Clinical trial registration.	1
2.2	Enlist cases where the principle of autonomy and justice is upheld and compromised.	1
2.3	Enlist cases where principles of beneficence/non-maleficence are upheld and compromised	1
2.4	Construct the composition of the ethics committee through different case scenarios.	2
2.5	Revise the elements of the review process through different case scenarios	3
2.6	Identify ethical issues specific to Ayurveda medicine research through different case scenarios.	2
3.1	Demonstrate different types of research with examples	2
3.2	Differentiate methods used in qualitative research.	4
3.3	Appraise the descriptive studies in published literature – Case report	2
3.4	Differentiate the descriptive studies in published literature – Case series	2

3.5	Identify the descriptive studies in published literature – Cross-sectional study	2
3.6	Differentiate the descriptive studies in published literature – longitudinal study	2
3.7	Identify the cross-sectional analytical studies in published literature.	2
3.8	Appraise the case-control studies in published literature.	2
3.9	Appraise the cohort studies in published literature.	2
4.1	Appraise the Interventional study designs in published literature.	10
5.1	Demonstrate cell culture studies and animal procedures.	1
5.2	Explore the utility of in-vitro and in-vivo studies in the Ayurveda medicine context.	2
5.3	Demonstrate in-silico studies.	2
5.4	Review principles and applications of instruments.	2
5.5	Check the quality of a drug/formulation.	3
5.6	Explore available manuscript resources.	5
5.7	Demonstrate the process of tool development and validation.	3
5.8	Search & choose the appropriate assessment tool.	2
6.1	Demonstrate the key points of synopsis/protocol writing.	5
6.2	Appreciate the structure of the dissertation with a focus on specific requirements as per the type and design of the research.	3
6.3	Demonstrate the structure of different types of articles.	2
6.4	Access different reporting guidelines.	2
6.5	Demonstrate using any one reference manager tool.	4
6.6	Select an appropriate journal and identify its quality using scientometrics.	2

6.7	Review guidelines related to Publication ethics (WAME, COPE, ICMJE, OASPA).	2

Table 5 : Experiential learning Activity

Experiential learning No	Experiential name	Credit Hours
1.1	Identify the level of evidence in Ayurveda medicine research	2
1.2	List out the challenges and probable solutions in Ayurveda medicine research.	2
1.3	Conduct a literature search for a given scenario	3
1.4	Identify the research problem	3
1.5	Frame research questions, hypotheses, and study objectives.	3
2.1	Appraise the ethical principles by developing a case scenario.	1
2.2	Identify the ethical principles in a given case scenario.	1
2.3	Demonstrate the review process of IHEC	6
2.4	Demonstrate the review process of IAEC	5
3.1	Moderate/participate in FGD, In-depth interview.	6
3.2	Acquire the knowledge of conducting various descriptive studies in the hospital community/classroom/hostel.	10
3.3	Acquire the knowledge of conducting various observational studies.	10
4.1	Acquire the knowledge of conducting various interventional studies.	4
4.2	Acquire the knowledge of conducting various interventional studies.	4
4.3	Acquire the knowledge of conducting various interventional studies.	5
5.1	Acquaint with instrumentation and procedures related to in silico, in vitro, and in vivo studies.	6
5.2	Acquaint with pharmacy college/QC unit in Ayurveda pharmacy.	4
5.3	Acquaint with a manuscript library.	5

5.4	Develop a questionnaire.	5
5.5	Apply appropriate assessment tools in a given Ayurveda medicine scenario	3
5.6	Define a minimum of 5 Ayurveda medicine terms and compare them with standard terminology.	3
6.1	Prepare an outline of the synopsis.	3
6.2	Retrieve information about different funding agencies and their schemes especially applicable for students.	3
6.3	Critically appraise the result and discussion section of the thesis.	5
6.4	Present an article in the journal club.	4
6.5	Review a published article by using a checklist of particular reporting guidelines.	3
6.6	Appreciate referencing styles for different types of documents like journal articles, books, book chapters, conference proceedings, dissertations, online content, and Ayurveda medicine texts.	3
6.7	Acquire knowledge about various aspects of scientometry.	3
6.8	Check plagiarism using online software.	2

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
AYPG-RM	1	100	NA	100

6 B : Scheme of Assessment

Credit frame work

AYPG-RM has 6 modules of 9 credits which includes 270 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. Research Basics	1	30		25		
2. Ethics and Regulatory Aspects in Research	1	30		25		
3. Research Types - Part 1	2	60		50		
4. Research Types - Part 2	1	30		25		
5. Research Types - Part 3	2	60		50		
6. Research Communication	2	60		50		
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	Research Basics	C1
2	Ethics and Regulatory Aspects in Research	C2
3	Research Types - Part 1	C3
4	Research Types - Part 2	C4
5	Research Types - Part 3	C5
6	Research Communication	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 AYURVEDA Examination
AYPG-RM
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)Research Basics Marks: (20)				
1	**(U-1)** Overview of research process and evidence-based medicine	No	Yes	No
2	**(U-2)** Research methods in Ayurveda Medicine	No	Yes	Yes
3	**(U-3)** Literature search and critical appraisal of literature	No	Yes	Yes
4	**(U-4)** Identification of research problem	Yes	Yes	No
5	**(U-5)** Research question and Hypothesis	Yes	Yes	Yes
(M-2)Ethics and Regulatory Aspects in Research Marks: (10)				
1	**(U-1)** Basics of Ethics and Ethics Guidelines	No	Yes	Yes
2	**(U-2)** Institutional Ethics Committees	No	Yes	Yes
3	**(U-3)** National Pharmacovigilance Program	No	No	No
4	**(U-4)** Scope and Importance of IPR and Patents	No	No	No
(M-3)Research Types - Part 1 Marks: (20)				
1	**(U-1)** Different types of research	No	No	No
2	**(U-2)** Qualitative Research	Yes	Yes	No
3	**(U-3)** Descriptive study designs	Yes	No	Yes
4	**(U-4)** Observational study designs	Yes	Yes	No
(M-4)Research Types - Part 2 Marks: (20)				
1	**(U-1)** Bias and ways to eliminate bias	No	Yes	No
2	**(U-2)** Randomized Controlled Trials	Yes	Yes	Yes
3	**(U-3)** Newer study designs	No	No	No
(M-5)Research Types - Part 3 Marks: (20)				
1	**(U-1)** Preclinical studies	No	Yes	Yes
2	**(U-2)** Drug research	No	Yes	Yes
3	**(U-3)** Literary research	No	Yes	Yes
4	**(U-4)** Development of tools	Yes	No	Yes
5	**(U-5)** Assessment Tools	No	Yes	Yes
(M-6)Research Communication Marks: (10)				
1	**(U-1)** Research protocol writing	No	Yes	Yes
2	**(U-2)** Dissertation contents and structure	No	Yes	No

3	**(U-3)** Types and structure of journal articles	No	Yes	Yes
4	**(U-4)** Systematic review and meta-analysis	No	No	No
5	**(U-5)** Publication guidelines	No	Yes	No
6	**(U-6)** Referencing	No	Yes	No
7	**(U-7)** Scientometrics	No	Yes	No
8	**(U-8)** Publication Ethics	No	Yes	Yes

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**	M1.U4, . M1.U5 M3.U2, . M3.U3, . M3.U4 M4.U2 M5.U4
Q2	**Short answer Questions** **Eight Questions** **5 Marks Each** **All compulsory**	1. M1.U1 **Or** . M1.U2 **Or** . M1.U3 2. M1.U4 **Or** . M1.U5 **Or** . M2.U1 3. M2.U2 **Or** . M3.U2 **Or** . M3.U4 4. M4.U1 **Or** . M4.U2 **Or** . M5.U1 5. M5.U2 **Or** . M5.U3 **Or** . M5.U5 6. M6.U1 **Or** . M6.U2 **Or** . M6.U3 7. M6.U5 **Or** . M6.U6 8. M6.U7 **Or** . M6.U8
Q3	**Analytical Based Structured Long answer Questions** **Four Questions** **10 marks each** **All compulsory**	1. M1.U2 **Or** . M1.U3 **Or** . M1.U5 **Or** . M2.U1 2. M2.U2 **Or** . M3.U3 **Or** . M4.U2 **Or** . M5.U1 3. M5.U2 **Or** . M5.U3 **Or** . M5.U4 **Or** . M5.U5 4. M6.U1 **Or** . M6.U3 **Or** . M6.U8

Reference Books/ Resources

S.No	References
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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