

PG DEPARTMENT OF BIOSTATISTICS

COURSE OUTCOMES (COs)

On completion of the course students will be able to

COURSE COMPONENT	COURSE	COURSE OUTCOME
CORE PAPER-I	PROBABILITIES AND DISTRIBUTION THEORY	<p>CO1: Discuss about the fundamental concepts on probability of an event and explore the knowledge of Conditional probability and understand the concept of Baye’s theorem and its applications. Apply problem-solving techniques to solving real-world events.</p> <p>CO2: Recognize common probability distributions for discrete and continuous random variables. Understand the concept of convergence, central limit theorem, and large approximation, common methods for evaluating an inequalities performance and properties of desirable estimators.</p> <p>CO3: Recall well known distributions such as Bernoulli, geometric, uniform, exponential, and normal, Cauchy, gamma and beta distributions.</p> <p>CO4 : Compare the Families of discrete distributions (binomial, Poisson, Multinomial) Continuous distribution for Exponential and its applications.</p> <p>CO5 : Calculate the probabilities relevant to multivariate distributions, including marginal and conditional probabilities and the covariance of two randomvariables.</p>
CORE PAPER-II	STATISTICAL INFERENCE - I	<p>CO1: Understand the basic concepts of Point estimation methods, including optimal properties of a point estimator.</p> <p>CO2 : Demonstrates to apply Sufficient Statistic, factorization criterion, exponential family , completeness and invariance.</p> <p>CO3: Discuss the various concepts of obtaining estimators using estimation methods and its properties based on grouped data, Censored data and to explore the steps based on EM algorithm.</p> <p>CO4: Understand the basic form of a confidence interval based on small and large</p>

		<p>samples, deals with confidence interval estimation.</p> <p>CO5: Discuss Bayesian inference its Prior and posterior distributions and its rules, applications and estimation. Different types of loss functions and their applicability in different situations are discussed.</p>
CORE PAPER-III	POPULATION STUDIES	<p>CO1: Discuss the various sources of data in Demography and the students would be able to comprehend the basic concepts and definitions.</p> <p>CO2: Interpret the definitions in terms of fertility, mortality, Migration and construction of life table.</p> <p>CO3: Analyze the Population Growth and fit the data using various models such as Arithmetic, Geometric, Exponential, Logistic.</p> <p>CO4: Explain the Rates and Ratios – Person years lived, Crude and Specific Rates, Standardization – Direct and Indirect Methods : Components of Rates</p> <p>CO5: Relate the components of population change-Fertility, Mortality and Migration, Causes and consequences of change in the population.</p>
CORE PRACTICAL – I	CORE PRACTICAL - I (STATISTICAL COMPUTING - I) USING EXCEL	<p>CO1: Demonstrate knowledge of probability and the standard statistical distributions.</p> <p>CO2 :Demonstrate knowledge of fixed-sample and large-sample statistical properties of point and interval estimators.</p> <p>CO3 :Demonstrate knowledge of the properties of parametric and non parametric testing procedures.</p> <p>CO4 :Understand the measures of mortality, fertility and describe the concept of life tables.</p>

<p style="text-align: center;">ELECTIVE THEORY – I</p>	<p style="text-align: center;">STATISTICAL GENETICS</p>	<p>CO1 :Equip the students with the information of various fundamentals of genetics. CO2: Understand basic principles of Mendel’s law of inheritance and to apply chi square tests using genetical problems. CO3: Evaluating the principles to describe the genetics profile of populations as specified by Hardy-Weinberg law and apply the principles of Selection and breeding methods in plants and animals. CO4: Analyzing the results of multiple alleles and gene inheritance to provide statistical solutions to specific problems in the field. CO5 :Obtain qualitative and quantitative traits by using various selection methods.</p>
<p style="text-align: center;">CORE PAPER- IV</p>	<p style="text-align: center;">STATISTICAL INFERENCE – II</p>	<p>CO1: Formulate the null hypothesis and alternative hypothesis, level of significance, Type I error and Type II error and derive the Neyman Pearson Lemma. CO2: Explain, Evaluate and interpret the concept of Most Powerful test and Uniformly Most Powerful test for the distributions with Monotonic Likelihood Ratio property, under Neyman Pearson Lemma. CO3: Demonstrate the concepts of Unbiased test , Uniformly Most Powerful Unbiased Test and Locally most powerful (LMP) tests and able to apply the concept normal distribution. CO4 :Analyse the concept of Likelihood Ratio Test and Sequential Probability Ratio Test CO5: Utilize the Non Parametric procedures population distribution known test.</p>
<p style="text-align: center;">CORE PAPER- V</p>	<p style="text-align: center;">APPLIED REGRESSION ANALYSIS</p>	<p>CO1: Discuss Simple Linear Regression and Multiple Linear Regression models. Understand Multiple Linear Regression models and how these can be constructed using real time data. CO2 :Obtain estimates of parameters of Linear Regression models and prove their properties. Perform various testing of hypotheses procedures relevant to Linear Regression model and significance of the model. CO3: Apply model diagnostic checks and variance stabilizing transformations. Discuss</p>

		<p>the use of generalized and weighted least squares and that of dummy variables and their uses.</p> <p>CO4 :Describe Multi collinearity effect and its effect on model building. Apply methods for detecting Multi collinearity and influential observations.</p> <p>CO5: Explain the concepts of Nonlinear regression and their linear transformation model</p>
CORE PAPER- VI	DESIGN OF EXPERIMENTS	<p>CO1: Understand the basic concepts of Design of Experiments</p> <p>CO2: Demonstrates to apply design experiments using Randomized , Latin Square design efficiently and effectively.</p> <p>CO3: Analyse on measurements to be taken in account (the response), what are the conditions to study and what experimental material to use (the units) to give valid generalization from the given data</p> <p>CO4:Demonstrates the concepts of factorial experiments, Nested designs and Split- Split plot design experiment.</p> <p>CO5: Understand the concepts of Response surface methodology</p>
CORE PRACTICAL – II	CORE PRACTICAL - II (STATISTICAL COMPUTING - II) USING PYTHON	<p>CO1: Apply Regression techniques and discusses on the tests relating to simple and multiple regression models in real life problems.</p> <p>CO2: Discusses to plan, design and conduct experiments and to analyze the resulting data to obtain objective conclusions.</p> <p>CO3 :Apply appropriate tests of significance to a given problem and draw Inferences.</p> <p>CO4: Demonstrate knowledge of statistical inference for Contingency tables.</p> <p>CO5: Evaluate concepts of Interval estimation for odds ratio, log odds and relative risk</p>

<p style="text-align: center;">ELECTIVE THEORY – II</p>	<p style="text-align: center;">CATEGORICAL DATA ANALYSIS</p>	<p>CO1: Identify and summaries categorical data into 2*2/ I*J contingency tables.</p> <p>CO2: Apply and interpret ODDS ratio, RR and perform tests for independent of attributes in contingency tables using various methods.</p> <p>CO3: Demonstrate skills in using standard analytic methods for single and two-way classification data, including the use of Poisson and multinomial models for data, odds ratios, and Pearson's chi-squared and likelihood ratio statistics.</p> <p>CO4: Identify the need for, the structure, and the usefulness of, generalised linear models. Fit and interpret the results of fitting, generalised linear models, including log-linear models (for example trend models) and logistic regression models.</p> <p>CO5: Obtain and fit good models in three-way situations using a Various Matched-Pair Models.</p>
<p style="text-align: center;">CORE MAJOR- VII</p>	<p style="text-align: center;">APPLIED MULTIVARIATE ANALYSIS</p>	<p>CO1: Discussed about multivariate normal distribution and their real life applications. Understand the concept of Wishart distribution, Hotelling T2 and Mahalanobis D2 statistic.</p> <p>CO2: Methods of Multivariate analysis: Discuss about the basic concepts of Principal Component Analysis (PCA) and Factor Analysis (FA) and its applications. Explain the component terms in PCA and prove its properties.</p> <p>CO3: Explain the concepts of Canonical correlation and how it's differ from PCA and FA. Discuss the concepts of correspondence analysis and its applications. Explain the components of double weighting, weight of the profile, standardization method.</p> <p>CO4 :Understand the fundamental concepts of Discriminant and classification analysis and its applications for solving problem of real-world events.</p> <p>CO5: Discuss the concept of cluster analysis and explain its various types of measures, types of clusters and how its work on real data field.</p>

<p align="center">CORE MAJOR-VIII</p>	<p align="center">SAMPLE SURVEY DESIGNS</p>	<p>CO1 :Understand concepts and techniques in sampling methods. CO2 :Identify various statistical sampling schemes. CO3: Able to define and distinguish probability and non probability sampling. CO4: Implement Cluster sampling, Ratio and Regression estimation in real life problems CO5: Identify the concept of sampling error and its implications.</p>
<p align="center">CORE MAJOR-IX</p>	<p align="center">SURVIVAL ANALYSIS</p>	<p>CO1: Equip the students with the information of concept of survival data and various types of censoring. CO2 :Apply the concepts on parametric life distributions and also will be able to estimate Likelihood ratio test for accelerated failure time model. CO3: Estimate non-parametric survival function using Kaplan-Meier estimator and to compare average expectation of life based on age specific death using population life table. CO4 :Compare two or more independent groups by interpreting log rank test, Gehan Test, Mantel - Haentzel Test and Tarone - Ware tests. CO5: Predict Time-to-event data methods to analyze the effect of several risk factor on covariates using Cox-Proportional Hazard model.</p>
<p align="center">CORE MAJOR-X</p>	<p align="center">MACHINE LEARNING TECHNIQUES</p>	<p>CO1: Recognize the characteristics of machine learning strategies. CO2: Apply various supervised learning methods to appropriate problems. CO3: Identify and integrate more than one technique to enhance the performance of learning. CO4: Create probabilistic and unsupervised learning models for handling unknown pattern. CO5: Analyze the co-occurrence of data to find interesting frequent patterns.</p>

<p style="text-align: center;">ELECTIVE PRACTICAL</p>	<p style="text-align: center;">EXPLORATORY DATA ANALYSIS USING SPSS</p>	<p>CO1: Create and edit the data files, plot graphs using SPSS.</p> <p>CO2 : Compute descriptive statistics and perform inferential statistics using SPSS.</p> <p>CO3: Able to find the associations, relationships and variations among the Bivariate's and Multivariate's.</p> <p>CO4: Use the applications of theory in real time problems through software and summarize the results.</p> <p>CO5: Acquire the statistical software knowledge, which is essential required for projects in all disciplines.</p>
<p style="text-align: center;">CORE MAJOR-XI</p>	<p style="text-align: center;">CLINICAL TRIALS AND EPIDEMIOLOGY</p>	<p>CO1: Equip the students with the information of concept of protocol in clinical trial experiment.</p> <p>CO2 : Demonstrate various terminologies in clinical experiment involving different phases and the ethics, principles and conduct of clinical trial experiments with an overview of Phase I-IV trials. Various clinical trial design commonly employed in practice.</p> <p>CO3: Evaluating the principles of blinding in various trials and to determine trial size using statistical methods.</p> <p>CO4 : Distinguish the roles and relationships between epidemiology and biostatistics in the prevention of disease and the improvement of health.</p> <p>CO5: Obtain concepts, methods, and tools of public health data collection, analysis and interpretation by using various epidemiological study designs.</p>
<p style="text-align: center;">CORE MAJOR PRACTICAL- III</p>	<p style="text-align: center;">MACHINE LEARNING USING R</p>	<p>CO1: Understand basics of R environment and perform various operations on data using R</p> <p>CO2: Perform basic statistical procedures.</p> <p>CO3: Write and execute the code for Bivariate and Multivariate analyses.</p> <p>CO4: Create customized program for statistical problems. Access various machine learning methods and applications in R.</p> <p>CO5 : Specialized in Time Series and Survival Analysis.</p>

<p>ELECTIVE- IV</p>	<p>SAS PROGRAMMING</p>	<p>CO1: Understand the basic concepts to computer programming and presents a portion of the SAS, SAS Studio programming environment.</p> <p>CO2: Explain the topics related to computing in statistics such as creating, reading dataset from external file and examining errors. Work and understand the concepts of SAS datasets: sort, subset, merge, with SAS Data set</p> <p>CO3: Demonstrate the programming environment and major aspects about the SAS basic syntax that is necessary to write SAS code to perform basic statistical inference.</p> <p>CO4: Acquire specialized knowledge in the advanced areas on manipulating data sets and basic statistical data analysis using SAS</p> <p>CO5: Gain knowledge in necessary skills on the concepts of Connecting to Oracle and Other Database with SAS programming and also apply the learned techniques in Warehousing Business Intelligence Concepts.</p>
<p>ELECTIVE-V</p>	<p>FORECASTING AND DECISION MAKING TECHNIQUES</p>	<p>CO1: Understand sources of demand variability. Outline the role, methods and response in business forecasting and its applications. Describe Qualitative and Quantative forecasting.</p> <p>CO2 :Identify suitable time series models for a given real-life problem.</p> <p>CO3 :Briefly describe averaging techniques, trend and seasonal techniques,and regression analysis.</p> <p>CO4: Demonstrate advanced knowledge of the types of data analysis problems that can be appropriately dealt with using forecasting techniques.</p> <p>CO5: To learn various decision rules theories and its applications of decision</p>

		making as individuals, in groups, and in organizations. Understand decision problem, loss function, risk function and decision rules.
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