P. E. Society's

Modern College of Arts, Science and Commerce, Pune-16

DEPARTMENT OF STATISTICS

Class: M. Sc. (Gen) Pattern: Autonomous (Semester Pattern)

Program Specific Outcomes

PSO1: Students learn different techniques used in Industries and research used for carrying the analysis.
PSO2: Students will be well acquainted with various fields in statistical knowledge is useful.
PSO3: Students learn the team work while completing the project work.
PSO4: Students get knowledge and training of technical subjects and get more employability in upcoming industries.

22-ST-11: (Paper I, Sem. I) Basics of Real Analysis and Calculus

CO1) Students will learn Set theory thoroughly with relearning countable sets, limit points, interior points, compact sets in details.
CO2) Students learn sequences, series their convergence and divergence in details. And they can apply it for finding moments. They also learn change of order in summation of series.
CO3) Students learn high level calculus in details. They learn partial derivatives and their uses for change of variables, finding optimum values in details.
CO4) Students learn integration once again with respect to its new definition of Riemann Stieltjes integral. They also learn sufficient conditions for function to be Riemann and Riemann Stieltjes integral.
CO5) Students learn improper integral, double integral and Leibnitz theorem for interchange of diffentiation under integral sign.

22-ST-12: (Paper II, Sem. I) Linear Algebra and Numerical Methods

The students will be able to:
CO1) Review the basic notions in linear algebra those are often used in Statistical anlalysis.
CO2) Understand the fundamental properties of matrices including determinants, inverse of matrix, matrix factorization, eigenvalues and their transformations.

CO3) Define vector spaces, subspaces and their related results.
CO4) Illustrate various properties of canonical forms.
CO5) Study of inner product spaces.
CO6) Explain concepts of Gram Shmidt orthogonalization process.
CO7) Apply numerical methods to obtain approximate solutions to mathematical problems.

22-ST-13: (Paper III, Sem. I) Probability Distributions

CO1) Students will be able to explain the random variable as a measurable function on probability space using the concepts like sigma field, set function and measure,
CO2) Students should know about transformation of random variable of the type (i) one to one on to (ii) monotonic (iii) non monotonic and they can derive probability distributions of functions of random variables.
CO3) Students will be able to find expectation of random variable, necessity of existence of absolute moments, uniqueness of m.g.f. Also they can derive the probability distributions using p.g.f. , characteristic function and convolutions for sums of independent random variables.
CO4) Students should know about some other probability distributions such that Bivariate Poisson Distribution, Bivariate Exponential Distribution, Dirichlet Distribution, Non-central chi square , f and t distribution
CO5) Students will understand the concepts like order statistics, quadratic forms and distribution free statistics and explore the respective applications.

22-ST-14: (Paper IV, Sem. I) Sampling Theory

CO1) Students will able to apply various sampling methods for real life data.
CO2) Students will able to explain and to compare various allocations using stratified random sampling.
CO 3) Students will use practical applications of ratio and regression method of estimation
CO 4) Students will able to understand the basic principles underlying survey design and estimation
CO 5) Students will be able to apply unequal probability sampling designs viz. PPSWR, PPSWOR including Lahiri's method.

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22-ST-21: Probability theory

CO1) Students will recall the concept of field, measurable space, distribution function.
CO2) Students will understand the sequence of random variables.
CO3) Students will learn convergence in probability, distribution.
CO4) Students will be learn different theorems related to independence of random variables.

22-ST-22: (Paper II, Sem. II) Regression Analysis

CO1) Students will learn how to apply linear regression models in practice: identify situation where linear regression is appropriate; build and fit linear and multiple regression models with software; interpret estimates and diagnostic statistics; produce exploratory graphs
CO2) Students will learn about the theory underlying point estimation, hypothesis and confidence intervals for linear regression models.
CO3) Students will able to understand the diagnostic measures for Non-linear data such as transformation of data.
CO4) Students will able to understand the Ridge and Poisson Regression model as real life application.
CO5) Students will be able to apply regression technique in real life situation.

22-ST-23: (Paper III, Sem. II) Statistical Inference-I

The students will be able to:
CO1) Students should recall various terms for Fisher Information, interval estimation to understand the problem of statistical inference.
CO2) Students will be able to compute Cramer – Rao lower bound in order to find most efficient estimator.
CO3) Students will be able to estimate the parameters with multiple criteria
i) Minimum variance Bound Unbiased
ii) Rao-Blackwell Theorem
CO4) Students will be able to analyze the estimation techniques using Confidence Interval and Bayes estimation.
CO5) Students will be able to solve the problems based on testing of hypotheses

using various techniques.

22-ST-24: (Paper IV, Sem. II) Multivariate Analysis

CO1) Students will be able to understand difference between one and multidimensional random variables.
CO2) Students should know about principal component analysis and factor analysis.
CO3) Students will be able to know about Multivariate normal distribution
CO4) Students should be able to estimate MLEs of parameters of multivariate normal distribution and their sampling distribution.
CO5) Students will understand the concepts like Wishart distribution, Hotteling T^2 statistics, MANOVA techniques and their respective applications.

23-ST-31: Applied Stochastic Processes

CO1) Understand the standard concept and apply the techniques and constructions of discrete andcontinuous time Markov chains to solve problems involving n-step transition probabilities, hitting probabilities, and stationary distributions.
CO2) Understand how to choose best stochastic process for specific situation.
CO3) Distinguish between transient and recurrent states in given finite and infinite Markov chains.
CO4) Apply the stochastic analysis to realistic problems.
CO5) Understand renewal theory and branching processes with applications.

23-ST- 32: Design and Analysis of Experiments

CO1) Understand the concept of BIBD, connectedness, balancedness and orthogonality of design.
CO2) Understand the difference between fixed and random effect models.
CO3) Compare the pairs of treatment means using different methods. Construct Fractional factorial experiments and apply confounding in real life problems.
CO4) To use appropriate design for solving real life examples.
CO5) To learn the applications of different designs in agricultural experiments

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23-ST-33: Machine Learning

After completion of the course, students will be able to:
CO1) Apply appropriate learning algorithm for analyzing data.
CO2) Use appropriate R-packages for data analysis.
CO3) Design learning algorithms for new tasks.
CO4) Self-learn many other ML techniques.
CO5) Be a better data scientist.

23-ST-34(A): Bayesian Inference

After completion of the course students will able to:
CO1) Understand difference between classical and Bayesian appproach
CO2) Bayesian computation.
CO3) Credible intervals.

23-ST- 34 (B): Statistical Process control (SPC)

After completion of the course students will able to:
CO1) To use appropriate control charts
CO2) To use different sampling plans
CO3) To draw inference about process capability

23-ST-41: Asymptotic Inference

Course Outcomes:
After completion of the course students will able to:
CO1) Understand the concept of consistency and asymptotic normality.
CO2) Understand method of moments and percentiles, maximum likelihood To find consistentestimator and Cramer Huzurbazar theorem.
CO3) Apply likelihood ratio tests, Wald, Score and Bartlett's test in real life situations.
CO4) Compare various tests through relative asymptotic efficiency.

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23-ST- 42 (A): Econometrics and Time Series Analysis

After completion of the course students will able to:

CO1) Understand the concept of time series with its components and able to compute ACVF and ACF.

CO2) Remove trend and seasonality using different methods to convert the time series into stationary.

CO3) Apply auto regressive, moving average, ARMA, ARIMA, SARIMA models, Box-Jenkins approach to forecast time-series data empirically.

CO4) Check and validate models with its residual analysis and diagnostic checking.

CO5) Apply econometrics concepts in real life data.

23-ST- 42 (B): Operations Research

CO1) Understand basics and formulation of linear programming problems and appreciate their limitations; solve linear programming problems using graphical method.

CO2) Apply simplex method to solve real life problems.

CO3) Solve artificial variable technique, duality theory, revised simplex method, sensitivity analysis, and transportation and assignment problems.

CO4) Understand the concept of non-linear programming problem, PERT/ CPM, simulation, investment analysis with real life application

23-ST-43 (A): SURVIVAL ANALYSIS

After completion of the course students will able to:

CO1) Understand the concept of censoring, life distributions and ageing classes.

CO2) Gained the ability to recognize the difference between parametric and non-parametric survival models.

CO3) Estimate nonparametric survival function of the data.

CO4) To estimate survival function, cumulative hazard rate function using the so-called Kaplan-Meier estimator.

CO5) Use the test of exponentiality against nonparametric classes in real life problems.

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23-ST 43(B) Categorical Data Analysis

CO1) Appreciation of difference between linear models and logistic and log-Linear models.

CO2) Knowledge of models for categorical data analysis and ability to fit them snd interpret the results.

CO3) Awareness of dependence relationships amongst categorical variables.

CO4) Ability to use any related software to fit models for categorical data

23-ST-44(A): Computer Intensive Statistical Methods

After completion of the course students will able to:

CO1) to apply various methods like Bootstrap, Jackknife method.

CO2) To understamd MCMC methods for missing values

CO3) Smoothing techniques.

23-ST-44(B): Statistical Analysis of Clinical Trials

After completion of the course students will able to:

CO1) Learn data collection systems for good clinical practice

CO2) Knowledge of Pharmokintics, pharmodynamics

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