**5A 501 Measure and Probability**

After studying this course, the student will be able to

Understand, various definitions of probability and apply these appropriately for various real situations for calculation of Probability, distribution functions

Obtain expectations, characteristic functions and distribution functions from them.

Learn and apply laws of large numbers, central limit theorems

**5A 504 Stochastic Process**

**Course Outcomes**

 After studying this course, , the student will be able to

Understand and apply

* Markov chain models and their properties to obtain higher order transition probabilities , limiting probabilities and stationary distributions
* Random walk models for different real life criteria,
* Poisson process and Birth and death processes and other continuous parameter processes.

**ST5A -507 Statistical Methods**

**Learning Objectives :** To understand the basic knowledge on Organize, manage and present data and apply various statistical elementary tools in real life problems.

**Learning Outcomes:**

* Students should be able to organize data into frequency distribution also understand the general purpose for measuring variability.
* Apply the theoretical discrete and continuous probability distributions in the relevant application areas.
* Find the inter-relation between two or more phenomena with the help of curve fitting and correlation-regression analysis.

Analyse the different mathematical models with the help of statistical deigns and appropriate data and made valuable conclusions by proper evaluation

**ST5A - 505 Distribution Theory**

**Learning Objectives** : The course is oriented towards the formulation of mathematical concepts on probability and probability distributions and densities with practical applications.

**Learning Outcomes:**

* Apply selected probability distributions to solve problems.
* Translate real-world problems into probability models.
* Derive the probability density function of transformation of random variables.
* Calculate probabilities and derive the marginal and conditional distributions of bivariate random variables.
* Compute various inequalities, Mathematical Expectation and variance.
* Apply various distributions chi-square, t and F distribution to solve real life problems.

To study of the statistics of ordered (sorted) random variables and samples.

**M.Sc. Statistics II Sem**

**ST5A-506 Statistical Inference – I**

**Course Objective:** The course objective is to extracting parameters from noise-corrupted observations and measure the behavior of data within a population. And by the interval estimation to quantify the precision of the point estimate.

**Course Learning Outcomes**

After completing this course, students should have developed a clear understanding of:

 • Understand problem of statistical inference, problem of point estimation.

 • Properties of point estimator such Consistency, Unbiasedness, Sufficiency.

 • Obtain minimum variance unbiased estimator.

 • Obtain estimators using estimation methods such as Maximum likelihood, Minimum chi square, method of moments. Method of scoring, Properties of maximum likelihood estimator.

 • Quantify information in statistic using Fisher Information.

 • Construct minimal sufficient statistic and minimal sufficient statistic for exponential family.

 • Understand concept of: Rao-Blackwell theorem and complete family.

 • Explain Pitman’s family of distribution.

 • Understand problem of statistical inference, problem of Interval estimation.

 • Construct Confidence Interval (one and two parameter case).

**ST5A -508 Word Processing Though MS-Word and Introduction to spreadsheets:**

**Learning Objectives:** To enable the students to study MS Office and to enrich the practical knowledge in MS Office.

**Learning Outcomes:**

* After successful completion of this course students will be able to perform documentation and presenting skills in word and excel.
* To understand working knowledge of using Word’s themes and clip art to create a variety of visual effects, formatting text, copy and moving objects and text.
* Proficient in using Windows, word processing applications, spreadsheet applications, database applications and presentation graphics applications.
* Analyze statistical data using MS-Excel.
* Examine database concepts and explore the Microsoft Office Access environment.
* Learning formulas, creating charts and graphs that can easily explain or simplify complex information or data.
* Creating and producing a mail merge and analyzing data using Pivot Tables and Pivot Charts.

**ST5A- 602 Linear Models**

**Objective:**  The main objective of this course is students will learn the use of different useful tools used in regression analysis. They will learn about simple and multiple linear regression, non-linear regression and Generalize linear models (GLM) including logistic regression.

After learning this course, students will be able to :

• Understand the concept of Simple linear and Multiple linear regression

• Check for the violations of model assumptions using residual analysis and other statistical tests.

 • Learn to interpret different types of plots such as residual plots, normal probability plots etc.

 • Understand the problems of multicollinearity, variable selection and how to deal with them.

• Differentiate between linear and non-linear regression and how to apply them in real life situations.

• The use of R statistical software will be widely used for solving a wide range of problems. At the end of the course, students will become familiar with the implementation of regression models using R along with the interpretation of results using such implementation

**M.Sc. (Statistics)**

**ST5A – 603 : Designs of Experiments**

The course objective is to learn how to plan, design and conduct experiments efficiently and effectively, and analyze the resulting data to obtain objective conclusions. Both design and statistical analysis issues are discussed.

After completing this course, students should have developed a clear understanding of :

- The fundamentals concepts of design of experiments.

- Completely randomized design.

- Randomized block design.

- Latin square design.

- Full and confounded factorial designs with different levels.

**ST5A-502 Sample surveys and Official statistics**

Students who successfully complete the course should:

* understand the principles underlying sampling as a means of making inferences about a population,
* understand the difference between randomization theory and model based analysis,
* understand the concepts of bias and sampling variability and stragies for reducing these,
be able to analyse data from different sampling methods
* have an appreciation of the practical issues arising in sampling studies.
* Have knowledge about Indian official statistics and Indian statistical system

**ST5A-503 Linear Algebra**

This course will cover the analysis and implementation of algorithms used to solve linear algebra problems in practice. This course will enable students to acquire further skills in the techniques of linear algebra, as well as understanding of the principles underlying the subject.

After completing this course, students should have developed a clear understanding of :

* + The algebra of matrices
	+ Characteristics roots and vectors and theorems related to this
	+ Vector space and sub-space, linear dependence and independence
	+ Extreme of quadratic forms and real quadratic forms
	+ Orthonormal basis and orthogonal projection of a vector

**ST5A-506 Multivariate Analysis**

The learning objectives include

* The understanding of basic concepts associated with Multivariate Normal Distributions and their properties with special emphasis on Bivariate Normal Distribution.
* Understand the principles and characteristics of the multivariate data analysis techniques
* Analyzing Multivariate data using data reduction techniques like Principal Component Analysis, Factor Analysis.
* Classification method namely Discriminant Analysis.
* identify the most appropriate statistical techniques for a multivariate dataset
* carry out and apply commonly used multivariate data analysis techniques, and interpret results
* understand multivariate analysis of variance

**ST 5A 601 Statistical Inference II**

**Course Outcomes**

After studying this course, , the student will be able to

* Form different types of hypotheses for various tests of hypotheses
* Calculate size and power of tests for given test functions
* Obtain MP tests
* Try to obtain UMP test, Likelihood ratio test.
* Apply tests of significance like chi-square test, t tests, F tests etc.

**ST5A-604 ECONOMETRICS**

The learning objectives include :

* the knowledge about econometrics
* Estimation and extension of general linear model
* Understanding about autocorrelation and autoregression
* Analysing the simultaneous linear equation model
* Use of dummy variable and about homosedasticity and heterosedasticity.

**ST 5A 605 Operations Research I**

**Course Outcomes**

After studying this course, the student will be able to

 Formulate models related to and solve the:

* Linear programming problems, Transportation problems, Assignment Problems
* Inventory Models
* Queuing models

**ST 5A 606 Operations Research II**

**Course Outcomes**

After studying this course, the student will be able to

* Formulate models related to and solve the following operations research models:
	+ Non-linear programming Problems
	+ Integer programming,
	+ Goal programming,
	+ Dynamic-Programming,
	+ Basic Replacement models for various types of items
	+ Network scheduling problems using PERT, CPM techniques
* Solve many complicated real life problems approximately using Monte Carlos Techniques

**ST5A-610 Real Analysis**

**Course Learning Objectives:** This course is designed to enable the students toapply mathematical concepts and principles to perform numerical and symbolic computations. ·

**Course Learning Outcomes:**

To understand the basics of Real analysis.

* Students will be able to use mathematical induction to prove results involving natural numbers.
* Students will be able to demonstrate competence with the algebraic and order properties of real numbers and elementary properties of sequences and functions.
* To understand the concepts of continuity and convergence of sequence .
* Students will be able to demonstrate ability to use Taylor Theorem, the Mean value Theorem, and use L’Hôpital’s Rule to compute limits of functions.

It covers general theory of functions of a real variable, differentiation and integration of real functions, Riemann integration theory and elementary topics in general topology including metric spaces.