# FATIMA COLLEGE (AUTONOMOUS)

**Re-Accredited with "A" Grade by NAAC (3rd Cycle)**
**74th Rank in India Ranking 2020 (NIRF) by MHRD**
**Maryland, Madurai- 625 018, Tamil Nadu, India**

NAME OF THE DEPARTMENT : STATISTICS

NAME OF THE PROGRAMME : B.Sc. STATISTICS

PROGRAMME CODE : USST

ACADEMIC YEAR : 2020 - 2021

# FATIMA COLLEGE (AUTONOMOUS), MADURAI-18
## DEPARTMENT OF STATISTICS (SF)

**PROGRAMME CODE: USST**

| S. No | SEM. | COURSE CODE | COURSE TITLE | HRS | CREDITS | CIA Mks | ESE Mks | TOT. MKs |
|---|---|---|---|---|---|---|---|---|
| | I | 19ST1CC1 | Basic Statistics | 6 | 4 | 40 | 60 | 100 |
| | | 19ST1CC2 | Probability Theory | 6 | 4 | 40 | 60 | 100 |
| | | 19ST1AC1 | Calculus | 5 | 5 | 40 | 60 | 100 |
| | II | 19ST2CC3 | Descriptive Statistics | 6 | 4 | 40 | 60 | 100 |
| | | 19ST2CC4 | Discrete Probability Distribution | 6 | 4 | 40 | 60 | 100 |
| | | 19ST2AC2 | Algebra | 5 | 5 | 40 | 60 | 100 |
| | I & II | 19ST1NME/ 19ST2NME | Fundamentals of Statistics | 2 | 2 | 40 | 60 | 100 |
| | III | 19ST3CC5 | Distribution Theory II | 6 | 4 | 40 | 60 | 100 |
| | | 19ST3CC6 | Sampling Theory | 6 | 4 | 40 | 60 | 100 |
| | | 19ST3AC3 | Linear Programming | 5 | 5 | 40 | 60 | 100 |
| | | 19ST3SB1 | Practical Statistics I | 2 | 2 | 40 | 60 | 100 |
| | IV | 19ST4CC7 | Statistical Inference - I | 6 | 4 | 40 | 60 | 100 |
| | | 19ST4CC8 | Applied Statistics | 6 | 4 | 40 | 60 | 100 |
| | | 19ST4AC4 | Linear Algebra | 5 | 5 | 40 | 60 | 100 |
| | | 19ST4SB2 | Practical Statistics – II | 2 | 2 | 40 | 60 | 100 |

**For those who join in 2016 onwards**

| S. No | SEM. | COURSE CODE | COURSE TITLE | HRS | CREDITS | CIA Mks | ESE Mks | TOT. MKs |
|---|---|---|---|---|---|---|---|---|
| | V | ST5CC9 | Statistical Inference - II | 6 | 5 | 25 | 75 | 100 |
| | | ST5CC10 | Design of Experiments | 6 | 5 | 25 | 75 | 100 |
| | | ST5CC11 | Computer Programming with C | 6 | 5 | 25 | 75 | 100 |
| | | ST5CCP1 | C Practical | 2 | 2 | 40 | 60 | 100 |
| | | ST5ME1 | Real Analysis | 6 | 6 | 25 | 75 | 100 |
| | | ST5ME2 | Multivariate Analysis | 6 | 6 | 25 | 75 | 100 |
| | | ST5SB3 | Practical Statistics - III | 2 | 2 | 50 | 50 | 100 |
| | | ST5SB4 | Statistical Software - SPSS | 2 | 2 | 50 | 50 | 100 |
| | VI | ST6CC12 | Statistical Quality Control | 5 | 4 | 25 | 75 | 100 |
| | | ST6CC13 | Stochastic Processes | 6 | 6 | 25 | 75 | 100 |
| | | ST6CC14 | Operations Research | 5 | 4 | 25 | 75 | 100 |
| | | ST6ME3 | Actuarial Statistics | 5 | 5 | 25 | 75 | 100 |

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|---|---|---|---|---|---|---|---|---|
| | | ST6ME4 | Regression Analysis | 5 | 5 | 25 | 75 | 100 |
| | | ST6ME5 | Numerical Methods | 5 | 5 | 25 | 75 | 100 |
| | | ST6ME6 | Industrial Statistics | 5 | 5 | 25 | 75 | 100 |
| | | ST6SB5 | Practical Statistics - IV | 2 | 2 | 50 | 50 | 100 |
| | | ST6SB6 | Statistical Software - R | 2 | 2 | 50 | 50 | 100 |

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**DEPARTMENT OF STATISTICS**

# I B.Sc STATISTICS

## SEMESTER –I

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST1CC1 | Basic Statistics | Lecture | 6 | 4 |

**COURSE DESCRIPTION**

This course introduces the historical development of statistics, presentation of data, descriptive measures and fitting mathematical curves to the data.

**COURSE OBJECTIVES**

To enable the students to analyze the given data and make them solve simple real life problems related to descriptive measures in statistics.

**UNIT –I COLLECTION OF DATA (18 HRS.)**

Introduction – Primary and Secondary data – Methods of Collecting Primary data – Drafting the Questionnaire – Pretesting the Questionnaire – Specimen Questionnaire – Sources of Secondary data – Editing Primary and Secondary data – Precautions in the use of Secondary data.

**UNIT –II CLASSIFICATIONAND TABULATION OF DATA (18 HRS.)**

Introduction – Meaning and Objectives of Classification – Types of Classification – Formation of a Discrete Frequency Distribution - Formation of a Continuous Frequency Distribution – Tabulation of data – Parts of a Table – General rules of Tabulation – Types of Tables**.**

**UNIT –III DIAGRAMATICAND GRAPHIC PRESENTATION (18 HRS.)**

Introduction – Significance of Diagrams and Graphs – General rules for Constructing Diagrams – Types of Diagrams – Graphs – Graphs of Frequency Distributions.

**UNIT –IV MEASURES OF CENTRAL TENDENCY (18 HRS.)**

Introduction – Objectives of Averaging – Requisites of a Good Average – **Types of Averages – Arithmetic Mean – Median – Mode – Geometric Mean – Harmonic Mean –** Self Study**.**

**UNIT –V MEASURES OF DISPERSION (18 HRS.)**

Introduction – Significance of Measuring Variation – Properties of a Good Measure of Variation- Methods of Studying Variation – Which Measure of Dispersion to use.

**TEXT:**

S.P.Gupta, *Statistical Methods*, Sultan Chand & Sons, Revised edition (2014).

Chapters: 3, 5, 6, 7, 8.

**REFERENCES:**

1. S.C.Gupta and V.K.Kapoor , *Fundamentals of Mathematical statistics*, Sultan Chand & Sons, Revised edition (2014).
2. Arumugam and Thangapandi Isaac, *Statistics*, New Gamma publishing house, (2012).

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## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Recognizes investigation, investigator, enumerator and enumeration and explain different methods of data collection. |
| CO 2 | Identifies the need of Classification and Tabulation |
| CO 3 | Construct and analyze graphical display to summarize data. |
| CO 4 | Explain and evaluates various measure of central tendency |
| CO 5 | Compute and interpret measure of centre and spread of data. |

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# I B.Sc STATISTICS

## SEMESTER –I

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST1CC2 | Probability Theory | Lecture | 6 | 4 |

**COURSE DESCRIPTION**

This course introduces the concepts of functions and its properties, theorems related to random variables.

**COURSE OBJECTIVES**

To enable the students understand the concepts of random variable and distribution functions, expectation, conditional expectation and variance, generating functions, law of large numbers.

**UNIT –I THEORY OF PROBABILITY I** **(18 HRS.)**

Introduction – Basic Terminology – **Mathematical Probability – Statistical Probability – Subjective Probability – (**Self Study) – Mathematical Tools – Axiomatic Approach to Probability.

**UNIT –II THEORY OF PROBABILITY II** **(18 HRS.)**

**Extended Axiom of Addition– (**Self Study) and Axiom of Continuity – Bayes Theorem – Geometric Probability.

**UNIT –III RANDOM VARIABLES AND DISTRIBUTION FUNCTIONS**

**(18 HRS.)**

Introduction – Distribution Function – Discrete Random Variable – Continuous Random Variable – Two Dimensional Random Variables.

**UNIT –IV MATHEMATICAL EXPECTATION** **(18 HRS.)**

Introduction – Mathematical Expectation – Expected Value of Function of a Random Variable – Properties of Expectation – Properties of Variance – Covariance – Some Inequalities Involving Expectation – Moments of Bivariate Probability Distributions – Conditional Expectation and Conditional Variance.

**UNIT –V GENERATING FUNCTIONS AND LAW OF LARGE NUMBERS**

**(18 HRS.)**

Moment Generating Function – Cumulants – Characteristics Function – Inversion Theorem – Uniqueness Theorem of Characteristics Function – Necessary and Sufficient Condition for Independence of Random Variables in Terms of Characteristics Functions – Hally Bray Theorem – Continuity Theorem for Characteristics Functions – Chebychve's Inequality – Convergence in Probability.

**TEXT:**

S.C.Gupta and V.K.Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, Revised edition (2014).

**REFERENCES:**

Arumugam and Thangapandi Isaac, *Statistics*, New Gamma publishing house (2012).

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## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Identify from a probability scenario events that are simple, complementary, mutually exclusive, and independent. |
| CO 2 | Recognize multiplication rule for two independent events, the addition rule for union of two events, and the complement rule. |
| CO 3 | Describe the main properties of probability distribution and random variables. |
| CO 4 | Construct discrete and continuous random variables |
| CO 5 | Apply general properties of the expectation and variance operators |

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# I B.Sc STATISTICS

## SEMESTER –I

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST1AC1 | Calculus | Lecture | 5 | 5 |

**COURSE DESCRIPTION**

This course covers differentiation and integration of functions of one variable.

**COURSE OBJECTIVES**

To enable the students to understand higher derivatives, curvature, singular points, envelopes, asymptotes, reduction formula, multiple integrals and Fourier series in calculus.

**UNIT –I HIGHER DERIVATIVES AND CURVATURE (15 HRS.)**

$n^{th}$ Derivative of some standard functions- Leibnitz theorem- p-r equations – Curvature , centre and radius of curvature

**UNIT –II EVOLUTE, ENVELOPES AND MULTIPLE POINTS (15 HRS.)**

Evolutes - Envelopes - Multiple points – classification of double points – cusps – nodes –conjugate points.

**UNIT –III REDUCTION FORMULA (15 HRS.)**

Reduction formula for $\sin^n x$, $\cos^n x$ ,$\tan^n x$, $\cot^n x$, $\operatorname{cosec}^n x$, $\sec^n x$, and $\sin^m x \cos^n x$.

**UNIT –IVMULTIPLE INTEGRALS (15 HRS.)**

**Jacobian** - (Self Study) – Double and Triple integrals

**UNIT –V FOURIER SERIES (15 HRS.)**

Definition – Sine Series & Cosine Series.

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**TEXT:**

S. Arumugam and A. ThangapandiIssac - *Calculus* (Differential and Integral Calculus) **-** New Gamma Publishing House (2012).

**UNIT I:** (PART I Sections – 2.12, 2.13, 3.3 and 3.4)

**UNIT II:** (PART I Sections – 3.5, 3.6 and 3.10)**UNIT III:** (PART II Section 2.8)

**UNIT IV: (**PART I Section 3.9, PART II Sections 3.1, 3.2 and 3.3)

**UNIT V:** (PART II Chapter 5)

**REFERENCES:**


1. Narayanan and Manickavasagam Pillai, *Calculus*, S.Viswanathan (Printers & Publishers) Pvt Ltd (2008).
2. Anit. M.Agarwal, *Differential Calculus*, MeerutArihantPrakashan (2008).
3. Shanthi Narayanan- *Differential Calculus*, Shyam Lal Chairtable Trust (1994).
4. Shanthi Narayanan, *Integral Calculus*, S.Chand and Company Ltd (1994).

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## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Explain higher derivatives and apply Leibnitz theorem to find the $n^{th}$ derivative of functions. |
| CO 2 | Explain multiple points, Envelopes, nodes and conjugate points |
| CO 3 | Construct reduction formula for trigonometric functions. |
| CO 4 | Define Jacobian, double & triple integrals and apply the knowledge of change of variables to solve the problems in double and triple integrals. |
| CO 5 | Construct Fourier series by recalling integration. |

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# I B.Sc STATISTICS

## SEMESTER –II

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST2CC3 | Descriptive Statistics | Lecture | 6 | 4 |

**COURSE DESCRIPTION**

This course introduces measurement of relationship in terms of quantitative and qualitative data.

**COURSE OBJECTIVES**

This course imparts the knowledge of correlation, regression and association of attributes to students.

**UNIT –I SKEWNESS, MOMENTS AND KURTOSIS** **(18 HRS.)**

Introduction – Tests of Skewness – Measures of Skewness – Moments – Kurtosis.

**UNIT –II CORRELATION ANALYSIS I** **(18 HRS.)**

Introduction – Significance of the Study of Correlation – Correlation and Causation – Types of Correlation – Methods of studying Correlation – Graphic Method – **Karl Pearson's Coefficient of Correlation – Coefficient of Correlation – (**Self Study) and Probable Error**.**

**UNIT –III CORRELATION ANALYSIS II** **(18 HRS.)**

Coefficient of Determination – Properties of the Coefficient of Correlation – Rank Correlation Coefficient.

**UNIT –IV REGRESSION ANALYSIS** **(18 HRS.)**

Introduction – Uses of Regression Analysis – Correlation and Regression Analysis: A Comparison – Regression Lines – Regression Lines –

**Regression Equations** – Regression Equations in case of Correlation Table – Standard Error of Estimate.

**UNIT –V ASSOCIATION OF ATTRIBUTES (18 HRS.)**

Introduction –Difference between Correlation and Association – Notation and Terminology – Consistency of Data – Association and Disassociation – Methods of Studying Association – Association of Three Attributes.

**TEXT:**

S.P.Gupta, *Statistical Methods*, Sultan Chand & Sons, Revised edition (2014).

Chapters: 9, 10, 11, 12.

**REFERENCES:**

1. S.C.Gupta and V.K.Kapoor, *Fundamentals of Mathematical statistics,* Sultan Chand & Sons, Revised edition (2014).
2. Arumugam and Thangapandi Isaac, *Statistics*, New Gamma publishing house, (2012).

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## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Evaluates and interprets the nature of skewness and kurtosis |
| CO 2 | Identify the direction and strength of a correlation between two factors. |
| CO 3 | Compute and interpret the spearman correlation coefficient. |
| CO 4 | Calculate and interpret the coefficient of determination |
| CO 5 | Recognize regression analysis applications for purpose of description and prediction. |

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# I B.Sc STATISTICS

## SEMESTER –II

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST2CC4 | Discrete Probability Distribution | Lecture | 6 | 4 |

**COURSE DESCRIPTION**

This course introduces probability functions for random variables that are defined for different probabilistic situations.

**COURSE OBJECTIVES**

This course exposes students the various important discrete probability models and real life situations where these distributions provide appropriate models.

**UNIT –I BERNOULLI AND BINOMIAL DISTRIBUTIONS (18 HRS.)**

Moments of Bernoulli Distribution – Moments of Binomial Distribution –RecurrenceRelation for the Moments of Binomial Distribution – Factorial Moments of Binomial Distribution - Mean Deviation about Mean of Binomial Distribution – Mode of Binomial Distribution – Moment Generating Function of Binomial Distribution - Additive Property of Binomial Distribution – Characteristic Function of Binomial Distribution Cumulants of the Binomial Distribution - **Recurrence Relation for Cumulants of Binomial Distribution– (**Self Study) - Probability Generating Function of Binomial Distribution - Recurrence Relation for the Probabilities of Binomial Distribution.

**UNIT –IIPOISSON DISTRIBUTION (18 HRS.)**

Moments of Poisson Distribution–Mode of Poisson Distribution – RecurrenceRelation for the Moments of Poisson Distribution – Moment

Generating Function of Poisson Distribution - Characteristic Function of Poisson Distribution - **Cumulants of Poisson Distribution – (**Self Study) - Additive Property of Independent Poisson Variates - Probability Generating Function of Poisson Distribution - Recurrence Relation for the Probabilities of Poisson Distribution.

**UNIT –III NEGATIVE BINOMIAL DISTRIBUTION (18 HRS.)**

Moment Generating Function of Negative Binomial Distribution - Cumulants of Negative Binomial Distribution – Poisson distribution as a Limiting case of Negative Binomial Distribution - Probability Generating Function of Negative Binomial Distribution – Deduction of Moments of Negative Binomial Distribution from those of Binomial Distribution.

**UNIT –IV GEOMETRIC AND HYPERGEOMETRIC DISTRIBUTIONS (18 HRS.)**

Moments of Geometric Distribution – Moment Generating Function of Geometric Distribution – Mean and Variance of the Hyper geometric Distribution – Factorial Moments of the Hyper geometric Distribution – Approximation to Binomial Distribution – Recurrence Relation for the Hyper geometric Distribution.

**UNIT –V MULTINOMIAL AND POWER SERIES DISTRIBUTIONS (18 HRS.)**

**Moments of Multinomial Distribution– (**Self Study)– Moment Generating Function of Power Series Distribution – Recurrence Relation for Cumulants of Power Series Distribution.

**TEXT:**

S.C.Gupta and V.K.Kapoor, *Fundamentals of Mathematical statistics*, Sultan Chand & Sons, Revised edition (2014).

**REFERENCES:**

1. Arumugam and Thangapandi Isaac, *Statistics*, New Gamma publishing house, (2012).

2. S.P.Gupta, *Statistical Methods,* Sultan Chand & Sons, Revised edition (2014).

## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Recognize cases where the Binomial distribution could be an appropriate model. |
| CO 2 | Able to apply the Poisson distribution to a variety of problems. |
| CO 3 | Explore the key properties such as the moment generating function, cumulant of a negative binomial distribution. |
| CO 4 | Understand and derive the formula for the geometric and hyper geometric probability mass function. |

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# I B.Sc STATISTICS

## SEMESTER –II

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST2AC2 | Algebra | Lecture | 5 | 5 |

**COURSE DESCRIPTION**

This course introduces the concept of classical algebra to the students of Statistics

**COURSE OBJECTIVES**

To enable the students to learn the fundamentals of Algebra and this includes topics like binomial, exponential and logarithmic series and theory of equations.

**UNIT –I BINOMIAL SERIES (15 HRS.)**

Summation and approximation using binomial Series.

**UNIT –II EXPONENTIAL AND LOGARITHMIC SERIES (15 HRS.)**

Exponential and logarithmic series (Proof not expected). **Summation and approximation using exponential and logarithmic series– (**Self Study)**.**

**UNIT –III THEORY OF EQUATIONS (15 HRS.)**

Introduction – remainder theorem - an equation of $n^{th}$ degree has exactly n roots - relation between the roots and coefficients-irrational roots – imaginary roots – Symmetric functions of the roots in terms of the coefficients. Sum of the powers of the roots (Newton's theorem)

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**UNIT –IV TRANSFORMATION OF EQUATIONS (15 HRS.)**

Transformation of equations –reciprocal roots - reciprocal equations – properties of equations – removal of terms – transformation in general

**UNIT –V THE NATURE OF THE ROOTS OF THE EQUATION (15 HRS.)**

Descartes rule of signs – Rolles' theorem – multiple roots – solutions of numerical equations - Newtons method and Honers method to solve algebraic equations.

**TEXT:**

T. K. Manicavachagom Pillay, T Natarajan and K. S. Ganapathy,*Algebra* Volume I, S. Viswanathan (Printers and Publishers), Pvt. Ltd. (2013).

**UNIT I-** Chapter 3: Sections 10, 12& 14, **UNIT II-** Chapter 4: Sections 1-9, 11-12 **UNIT III, IV, V - Chapter** 6: Sections 1-30

**REFERENCES:**


1. P.R.Vittal and V.Malini, *Algebra and Trigonometry*, Margham Publications (2008).
2. Sudhir K Pundir Singh, *Algebra and Trigonometry*, Meerat Pragathirakashan (2003)

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## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Define binomial series, logarithmic and exponential series and solve problems. |
| CO 2 | Identify relations between the roots and co-efficients of equations. |
| CO 3 | Explain the transformations of equations |
| CO 4 | Recognize the important methods in finding roots of the given polynomial. |
| CO 5 | Solve algebraic equations using Newton's method and Horner's method. |

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# I B.Sc STATISTICS

## SEMESTER – I & II

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST1NME / 19ST2NME | Fundamentals of Statistics | Lecture | 2 | 2 |

**COURSE DESCRIPTION**

This course is designed to make the students learn the basics of statistics

**COURSE OBJECTIVES**

To enable the students understand the origin and the need of statistics and the statistical data.

**UNIT –I INTRODUCTION** **(6 HRS.)**

Origin, meaning and functions of statistics – general uses - relation with other disciplines-limitations and misuses of statistics.

**UNIT –II COLLECTION OF DATA** **(6 HRS.)**

Methods of collection: Complete enumeration – sample survey

**UNIT –III SCRUTINY OF DATA** **(6 HRS.)**

Primary data - methods of collection - secondary data sources.

**UNIT –IV MEASURES OF CENTRAL TENDENCY** **(6 HRS.)**

Arithmetic mean - weighted mean – median - mode

**UNIT –V MEASURES OF DISPERSION** **(6 HRS.)**

Range- standard deviation

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**TEXT:**

S.P.Gupta, *Statistical Methods*, Sultan Chand & Sons, Revised edition (2014).

**REFERENCES:**

1. S.C.Gupta and V.K.Kapoor, *Fundamentals of Mathematical Statistics*- Sultan Chand & Sons, Revised edition (2002).
2. Arumugam and Thangapandi Isaac, *Statistics,* New Gamma publishing house, (2006).

## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Summarize the origin of statistics and its relation with other disciplines. |
| CO 2 | Identify the method of collecting the statistical data. |
| CO 3 | Classify the primary and secondary data. |
| CO 4 | Find the mean, median and mode for the given distribution and analyse |
| CO 5 | Explain the various measures of dispersion and analyse |

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# II B.Sc STATISTICS

## SEMESTER –III

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST3CC5 | Distribution Theory - II | Lecture | 6 | 4 |

**COURSE DESCRIPTION**

This course is designed toexpose the students various important continuous probability models

**COURSE OBJECTIVES**

To enable the students understand the continuous probability distribution and real life situations where these distributions provide appropriate models.

**UNIT –I NORMAL DISTRIBUTION (18 HRS.)**

Normal distribution as a limiting form of binomial distribution-chief characteristics of the normal distribution – mode, median, moment generating function of normal distribution - cumulant generating function of normal distribution – moments of normal distribution – a linear combination of independent normal variates - points of inflexion of normal curves – mean deviation about mean for normal distribution - area property – error function - importance of normal distributions - fitting of normal distribution

**UNIT –II RECTANGULAR, BETA AND GAMMA DISTRIBUTIONS (18 HRS.)**

Moments of rectangular distribution -m.g.f of rectangular distribution – characteristics function of rectangular distribution - mean deviation about mean of rectangular distribution – m.g.f of gamma distribution – cumulant generating function of gamma distribution – additive function of gamma

distribution - beta distribution of first kind – beta distribution of second kind.

**UNIT –III EXPONENTIAL AND CAUCHY DISTRIBUTIONS (18 HRS.)**

Moment generating function of exponential distribution - **characteristic function of Cauchy distribution – moments of Cauchy distribution – (**Self Study).

**UNIT –IV SAMPLING DISTRIBUTION (CHI-SQUARE) (18 HRS.)**

Introduction – derivation of the $\chi^2$ distribution – moment generating function of the $\chi^2$ distribution – some theorems on $\chi^2$ distribution – linear transformation – applications of $\chi^2$ distribution.

**UNIT –V SAMPLING DISTRIBUTION (t, F) (18 HRS.)**

Introduction – student's 't' distribution – applications of 't' distribution – distribution of sample correlation coefficient when population correlation coefficient $\rho = 0$ - f distribution – applications of f distribution – relation between t and f distributions – relation between f and $\chi^2$ distribution.

**TEXT:**

S.C.Gupta and V.K.Kapoor, *Fundamentals of Mathematical Statistics,* Sultan Chand & Sons, Revised edition (2014).

Chapters: 9, 15, 16

**REFERENCES:**

1. Arumugam and Thangapandi Isaac, *Statistics*, New Gamma publishing house, (2012).
2. S.P.Gupta, *Statistical Methods*, Sultan Chand & Sons, Revised edition (2014).

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## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Recognize cases where the normal distribution could be an appropriate. |
| CO 2 | Understand and derive the moments, moment generating functions, characteristic functions of rectangular, beta and gamma distribution. |
| CO 3 | Explore the key properties such as the moment generating function and cumulants of exponential and Cauchy distribution |
| CO 4 | Recall the definition of a t statistic in terms of statistics of a sample from a normal distribution |
| CO 5 | State and apply the definitions of the t, F and Chisquare distributions in terms of the standard normal. |

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# II B.Sc STATISTICS

## SEMESTER –III

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST3CC6 | Sampling Theory | Lecture | 6 | 4 |

**COURSE DESCRIPTION**

This course is introduced to the students to impart the basic knowledge of statistical sampling concepts.

**COURSE OBJECTIVES**

To enable the students understand the concept of statistical sampling and to make them conduct sample survey independently by selecting the suitable sampling techniques.

**UNIT –I SAMPLE SURVEY** **(18 HRS.)**

Census and Sample surveys - principle steps in sample survey - principles of sample survey - sampling and non-sampling errors - **advantages of sampling over complete census– (**Self Study)- limitations of sampling.

**UNIT –II SIMPLE RANDOM SAMPLING** **(18 HRS.)**

Sampling from finite population - **simple random sampling with and without replacement– (**Self Study)– procedure of selecting a random sample - unbiased estimate, variance of the estimates –finite population correction - estimation of standard error from a sample.

**UNIT –III STRATIFIED RANDOM SAMPLING** **(18 HRS.)**

Stratified random sampling - properties of the estimates - unbiased estimates of the mean and variance of the estimates of the mean-optimum

and proportional allocations – relative precision of a stratified sampling and simple random sampling - estimation of gain in precision in stratified sampling.

**UNIT –IV SYSTEMATIC SAMPLING** **(18 HRS.)**

Systematic sampling - estimate of mean and variance of the estimated mean – comparison of simple and stratified with systematic random sampling, systematic sampling with cluster sampling, methods for populations with linear trend.

**UNIT –V RATIO ESTIMATOR** **(18 HRS.)**

Ratio estimators: Ratio estimates, variance of the ratio estimates - Bias of the ratio estimates. Regression estimators: Linear regression estimate regression estimates with pre assigned b-regression estimates when b is computed from the sample.

**TEXT:**

1. S.C.Gupta, and V.K. Kapoor, *Fundamentals of Applied Statistics*, Sultan Chand & Co., 11th edition (2014).
2. William G. Cochran, *Sampling Techniques*, John Wiley Sons (1999).

**REFERENCES:**

1. Daroga Singh and F.S.Choudary, *Theory and Analysis of Sample Survey Designs*, New age international publishers (1986).
2. P.V. Sukhatame and B.V.Sukhatame, *Sampling Theory of Surveys with Applications*, ISAS publishers, 3rd Edition (1957).
3. S.Sampath, *Sampling Theory and Methods*, Narosa Publishing House (2001).

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## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Illustrate census and sampling and their advantages and disadvantages |
| CO 2 | Recognizes probability and non-probability sampling |
| CO 3 | Identifies sampling and non-sampling errors. |
| CO 4 | Differentiates the SRSWOR, SRSWR, methods of SRS – lottery method and random number table method. |
| CO 5 | Describes different kinds of sampling – simple random sampling, systematic sampling, stratified sampling and cluster sampling |

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# II B.Sc STATISTICS

## SEMESTER –III

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST3AC3 | Linear Programming | Lecture | 5 | 5 |

**COURSE DESCRIPTION**

The course provides appropriate methods for the efficient computation of optimal solutions to problems which are modelled by objective function and linear constraints.

**COURSE OBJECTIVES**

This course enable the students convert real life problems into a Mathematical problem and to solve them using different techniques like graphical method, simplex method, Big – M method, Two - phase method and dual simplex method.

**UNIT –I MATHEMATICAL FORMULATION OF LPP (15 HRS.)**

Mathematical formulation – classification - graphical solutions of lpp- **simple examples of lpp - slack and surplus variables - standard form of lpp – (**Self Study)**.**

**UNIT–II SIMPLEX METHOD (15 HRS.)**

Definition of objective function - linear and non-negative constraints - feasible solution - basic feasible solution - optimum basic feasible solution - degenerate solution - evaluation and net evaluation - unbounded solutions and conditions for optimality of a feasible solution in terms of net evaluations (no proof) - pivotal element - computational procedure of the

simplex method - tie for entering basis vector and leaving basis vector- solution using artificial variables.

**UNIT –III METHOD AND TWO PHASE METHOD (15 HRS.)**

Charne's method of penalities and two phase simplex method - restricted and unrestricted variables - inverse of a matrix using simplex method

**UNIT –IV TRANSPORTATION PROBLEM (15 HRS.)**

Mathematical formulation - existence of feasible solution - feasible solution by north west corner rule - matrix minima method - Vogel's approximation method -optimal solution to a TP by modified distribution method - degeneracy in TP -unbalanced TP.

**UNIT –V ASSIGNMENT PROBLEM (15 HRS.)**

Mathematical formulation - assignment algorithm rule for finding optimal assignment - unbalanced AP - travelling salesman problem as an AP.

**TEXT:**

KantiSwarup, P.K.Gupta and Man Mohan, *Operation Research*, Sultan Chand and sons, New Delhi - 11th Edition (2003).

**REFERENCES:**

1. P.K.Gupta and Man Mohan, *Problems in Operation Research*, Sultan Chand and sons, New Delhi, 11th Edition (2007).
2. Prem Kumar Gupta and D.S.Hira, *Operations Research*, S.Chand and Company, Ram Nagar, New Delhi, Edition (2007).

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## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Formulate linear programming problems and solve by graphical method |
| CO 2 | Classify simplex, two phase and Big - M method to solve linear programming problems |
| CO 3 | Illustrate Duality in Linear programming |
| CO 4 | Recognize and formulate transportation, assignment problems and find the optimal solution |

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# II B.Sc STATISTICS

## SEMESTER –III

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST3SB1 | Practical Statistics I | Lecture & Practical | 2 | 2 |

**COURSE DESCRIPTION**

The course provides problems related to measure of central tendency, measure of dispersion, and measures of association of attributes.

**COURSE OBJECTIVES**

To expose the students the analysis of statistical techniques in real life situations.

1. Problems based on measure of central tendency
2. Problems based on measure of dispersion..
3. Problems based on moments, skewness and kurtosis
4. Computation of Karl Pearson correlation co-efficient.
5. Correlation coefficient for a bivariate frequency distribution.
6. Concurrent deviation
7. Rank correlation.
8. Regression Equations..
9. Computation of various measures of associations of attributes.

**TEXT:**

1. S.C.Gupta and V.K.Kapoor, *Fundamentals of Mathematical statistics*, Sultan Chand & Sons, Revised edition (2002).

## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Calculate measures of central tendency. |
| CO 2 | Classify measures of dispersion, skewness and kurtosis. |
| CO 3 | Compute correlation, regression and measures of association of attributes |

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# II B.Sc STATISTICS

## SEMESTER –IV

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST4CC7 | Statistical Inference - I | Lecture | 6 | 4 |

**COURSE DESCRIPTION**

This course introduces the concepts of statistical estimation theory.

**COURSE OBJECTIVES**

To enable the students understand the various statistical estimation methods of parameters and its applications in solving real life problems

**UNIT –I POINT ESTIMATION THEORY (18 HRS.)**

Parametric estimation: estimator - characteristics of an estimator - consistency and unbiasedness of an estimator - Cramer-Rao inequality. Efficiency-asymptotic efficiency of an estimator- estimators based on sufficient statistics- Neyman's factorization theorem (without proof) - Rao-Blackwell theorem

**UNIT –II METHODS OF POINT ESTIMATION-I (18 HRS.)**

Methods of point estimation - **method of Maximum Likelihood Estimator (MLE) – (**Self Study)- Properties of MLEs (without proof) – Problems based on MLEs.

**UNIT–III METHODS OF POINT ESTIMATION-II (18 HRS.)**

Method of moments – problems-method of least squares - method of minimum Chi-square-method of minimum variance-Minimum Variance Unbiased Estimation (MVUE)-Problems based on MVUE.

**UNIT –IV INTERVAL ESTIMATION-I (18 HRS.)**

Concept of interval estimation - interval estimation in case of large samples- confidence interval for proportions, means and variances based on normal distribution.

**UNIT –V INTERVAL ESTIMATION-II (18 HRS.)**

Interval estimation for small samples – confidence intervals for means, variances, correlation coefficient and regression coefficient based on Chi square, Student's t, and f distributions.

**TEXT:**

S.C. Gupta and V.K.Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, New Delhi, 11th Edition (2002).

**REFERENCES:**

1. M.Kendall and A.Stuart, *The advanced theory of Statistics*, Vol. II, Charles Griffin, (1961).
2. V.K.Rohatgi, *Statistical Inference*, John Wiley and sons (1984).
3. R.V Hogg, A.T.Craig. and Tannis, *Introduction to Mathematical Statistics*, Prentice Hall, England (1995).

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## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Describe how to estimate population parameters with consideration of error |
| CO 2 | Compute a point estimate of the population mean |
| CO 3 | Interpret a confidence interval and confidence level. |
| CO 4 | Conduct inference about the difference in the means of two Normal distributions, including cases where the underlying variances are known or unknown. |

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## SEMESTER –IV

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST4CC8 | Applied statistics | Lecture | 6 | 4 |

**COURSE DESCRIPTION**

This course provides some of the applications of statistics which includes topics such as curve fitting, time series, index numbers, interpolation and extrapolation, birth and death rates.

**COURSE OBJECTIVES**

To enable the students understand and appreciate the applications of Statistics

**UNIT –I CURVE FITTING** **(18 HRS.)**

Fitting of a straight line, **second degree parabola– (**Self Study), exponential and power curves.

**UNIT –II ANALYSIS OF TIME SERIES** **(18 HRS.)**

Components of a time series- measurements of trends.

**UNIT –III INDEX NUMBERS** **(18 HRS.)**

Classification and methods-Tests of adequacy- Chain index numbers - **consumer price index numbers– (**Self Study).

**UNIT –IV INTERPOLATION AND EXTRAPOLATION** **(18 HRS.)**

Interpolation – Methods- Extrapolation

**UNIT –V VITAL STATISTICS** **(18 HRS.)**

Introduction – Vital Statistics Defined – Uses of Vital Statistics – Methods of Obtaining Vital Statistics – Measurement of Fertility –

Reproduction Rates. Crude Death Rate – Specific Death Rates – Standardized Death Rates – Infant Mortality Rate – Neo-Natal Mortality Rate – Maternal Mortality Rate – Natural Increase Rate – Net Migration Rate – Vital Index – Life Tables.

**TEXT:**

1. S. Arumugam and Thangapandi Isaac, *Statistics*, New Gamma publishing house (2006).
2. S.P.Gupta, *Statistical Methods*- Sultan Chand & Sons, Revised edition (2014).

**REFERENCES:**

S.C.Gupta and V.K.Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, Revised edition (2002).

## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Construct curve fitting. |
| CO 2 | Define and explain analysis of time series and index numbers. |
| CO 3 | Classify interpolation and extrapolation |
| CO 4 | Evaluate birth, death rate, infant mortality and neo natal mortality rate. |

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## SEMESTER –IV

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST4AC4 | Linear Algebra | Lecture | 5 | 5 |

**COURSE DESCRIPTION**

This course will focus on matrix as linear transformations relative to a basis of a vector space.

**COURSE OBJECTIVES**

To enable the students to understand matrix and vector space concepts which can be applied in Graph Theory, Linear Programming, Physics and Chemistry etc.,

**UNIT –I VECTOR SPACES** **(15 HRS.)**

Definition and Examples – Subspaces – Linear Transformation – Span of a set

**UNIT –II BASIS AND DIMENSION** **(15 HRS.)**

Linear Independence – Basis and Dimension – Rank and Nullity - Matrix of a Linear Transformation

**UNIT –III INNER PRODUCT SPACES** **(15 HRS.)**

Definition and Examples – Orthogonality – Orthogonal Complement

**UNIT –IV THEORY OF MATRICES** **(20 HRS.)**

Algebra of Matrices – Types of Matrices – The Inverse of a Matrix – Elementary Transformations. Rank of a Matrix **–Simultaneous Linear Equations – Characteristic Equation and Cayley Hamilton Theorem – Eigen Values and Eigen Vectors(Self Study).**

**UNIT –V BILINEAR FORMS** **(10 HRS.)**

Bilinear forms – Quadratic forms

**TEXT:**

S. Arumugam and A.ThangaPandi Isaac*Modern Algebra*, Scitech Publications (India) Private Limited (2003)**.** Chapters 5,6,7,8**.**

**REFERENCES:**

1. A.R.Vasishtha, *Modern Algebra,* Krishna Prakashan Media (P) Ltd.,Delhi (2006).
2. N.S.Gopalakrishnan, *University Algebra*, New Age International Limited- II Edition (2005).

## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Define Vector Space and explain its various concepts |
| CO 2 | Illustrate Inner Product Spaces |
| CO 3 | Define basic concepts of matrices and solve linear equations |
| CO 4 | Appraise Eigen Value and Eigen Vectors of matrices |
| CO 5 | Describe bilinear forms and quadratic forms |

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# II B.Sc STATISTICS

## SEMESTER –IV

***For those who joined in 2019 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | 19ST4SB2 | Practical Statistics II | Lecture &Practical | 2 | 2 |

**COURSE DESCRIPTION**

The course provides an application related to the concepts of sampling theory, & sampling distribution for large & small samples.

**COURSE OBJECTIVES**

To expose the students analyze the statistical techniques in real life situations

1. Fitting of Binomial Distribution
2. Fitting of Poisson Distribution
3. Fitting of Normal Distribution
4. Fitting of Exponential Distribution
5. Fitting of Cauchy Distribution
6. Sampling Theory - Simple Random Sampling, Stratified Random Sampling, Systematic Random Sampling
7. Sampling Distribution for Large Sample
8. Sampling Distribution for Small sampling

## COURSE OUTCOMES

On the successful completion of the course, students will be able to:

| NO. | COURSE OUTCOMES |
|---|---|
| CO 1 | Interpret the fitting of discrete and continuous distributions. |
| CO 2 | Calculate the sampling distributions for large and small samples. |

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# III B.Sc STATISTICS

## SEMESTER –V

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST5CC9 | Statistical Inference – II | Lecture | 6 | 5 |

**COURSE DESCRIPTION**

The course provides the basics of hypothesis testing with emphasis on some commonly encountered hypothesis tests in statistical data analysis.

**COURSE OBJECTIVES**

To enable the students have a better understanding on testing of hypothesis in statistical data analysis.

**UNIT –I TESTING OF HYPOTHESIS (20 HRS.)**

Statistical Hypothesis – Simple and composite hypothesis, Null and alternative Hypothesis, Two types of errors, statistical test, size of a test, level of significance, critical region, power of the test- Steps in solving testing of hypothesis problem - Most powerful test (definition) – Neymann-Pearson lemma – Simple problems based on Binomial, Poisson, Uniform, Normal & exponential distributions.

**UNIT –II UNIFORMLY MOST POWERFUL TESTS (20 HRS.)**

Power function and power curve(definition) – one parameter exponential family, Monotone likelihood Ratio property- Best critical region - Simple problems based on BCR - UMP tests for the parameters of univariate Normal and Exponential distributions.

**UNIT –III LIKELIHOOD RATIO TEST (LRT) (20 HRS.)**

Definition of LRT –Parameter space - Properties of LRT tests (Statements only) – Theorem based on LRT - Test for the mean of normal population - Test for the variance of normal population - **Test for equality of means of 2 independent normal populations – Test for equality of variances of 2 independent normal populations – (**Self Study).

**UNIT –IVNON-PARAMETRIC TESTS (20 HRS.)**

Sign test, Wilcoxon signed rank test, Median test, Mann-Whitney U test, Runs test- test for randomness.

**UNIT –VSEQUENTIAL PROBABILITY RATIO TEST (20 HRS.)**

Sequential Probability Ratio Test – Definition and properties of SPRT (without proof), simple problem based on OC and ASN for Binomial, Bernoulli, Poisson & Normal distributions.

**TEXT:**

1. S.C Gupta and V.K.Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons Pvt. Ltd. New Delhi (2002).
2. S.P. Gupta, *Fundamentals of Statistics*, Sultan Chand & Sons Pvt. Ltd. New Delhi.

**REFERENCES:**

1. A.M.Mood, F.A.Graybill and D.C.Boes, *Introduction to the theory of Statistics*, McGraw Hill (1974).
2. R.V.Hogg and A.T.Craig, *Introduction to mathematical statistics*, 3rd edition (1972).
3. A.M.Goon, M.K.Gupta and B.Das Gupta, *An outline of statistical theory*, Volume I, 6th revised edition World Press ltd, Calcutta (1980)
4. P.G.Hod, *Introduction to mathematical statistics*, Asia publishing house (1971).
5. V.K.Rohatgi, *An introduction to probability theory and Mathematical Statistics*, Wiley Eastern (1984).

6. Marek Fisz, *Probability theory and Mathematical Statistics*, John Wiley (1961).
7. M.R.Spiegal, *Theory and problems of probability and statistics*, Schaum's outline series, McGraw Hill (1982).
8. G.W.Snedecor and W.G.Cochran, *Statistical methods*,6th edition (1967):

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## SEMESTER –V

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST5CC10 | Design of Experiment | Lecture | 6 | 5 |

**COURSE DESCRIPTION**

This course is introduced to the students to understand the fundamental principles of experimental designs.

**COURSE OBJECTIVES**

To enable the students understand the fundamentals of experimental designs, analysis tools and techniques, interpretation and applications.

**UNIT –I FUNDAMENTAL PRINCIPLES OF EXPERIMENTS (18 HRS.)**

Terminology in Experimental statistics – Principles of experimental design - Replication, Randomization and Local Control Techniques

**UNIT –II LINEAR MODEL AND ITS CLASSIFICATIONS I (18 HRS.)**

Completely Randomized Design (CRD) and its analysis-**Randomized Block Design (RBD) – (**Self Study)andits analysis - **Latin Square Design (LSD)– (**Self Study)and its analysis.

**UNIT –III ANALYSIS OF VARIANCE (18 HRS.)**

Definition – Assumption – One way classification – Two way classification (one observation per cell ) - Two way classification with m observation per cell

**UNIT –IV LINEAR MODEL AND ITS CLASSIFICATIONS II (18 HRS.)**

Missing plot technique – Meaning – Analysis of missing plot design (Fisher's Rule) –Analysis of RBD with one missing observation - Analysis of

RBD with two missing observation - Analysis of LSD with one missing observation

**UNIT –V FACTORIAL EXPERIMENTS (20 HRS.)**

Advantages of factorial experiment – Definition $2^2$ , $2^3$ and $2^n$ factorial experiments and their analysis – Confounding-Partial and Complete confounding in $2^3$ - Split plot design and its analysis, BlBD- definition and parameters .

**TEXT:**

1. S.C. Gupta and V.K. Kapoor, *Fundamentals of Applied Statistics*, Sultan Chand & Sons (2007).

**REFERENCES:**

1. D.Montgomery, *Design ofExperiments*, John Wiley and Son (2009).
2. M.N.Dass and N.C.Gin, *Design and Analysis of Experiments*, Wiley Eastern, New Delhi (1986)
3. Kempthorne, *Design and Analysis of Experiments*, John Wiley. New York (1956).

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# III B.Sc STATISTICS

## SEMESTER –V

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST5CC11 | Computer Programming in C | Lecture | 6 | 5 |

**COURSE DESCRIPTION**

This course provides skills in designing and writing simple programs in C.

**COURSE OBJECTIVES**

To enable the students to learn the basic concepts of data input, output, operators, expressions, controlstatements, arrays, handling of strings and user – defined functions. to write C programs,

**UNIT –I C FUNDAMENTALS, OPERATORS AND EXPRESSION (20 HRS.)**

Character Set – C Tokens – Keywords and Identifiers – Constants – Variables – Data types – Declaration of Variables – Assigning Values to Variables – Defining Symbolic Constants – Operators & Expressions : Introduction – **Arithmetic of operators – Relational operators – Logical operators – Assignment operators – Increment and decrement operators – Conditional operator – Bitwise operators – Special operators– (**Self Study)– Arithmetic expressions – Evaluation of expressions – Precedence of arithmetic operators – Some computational problems – Type conversions in expressions – Operator precedence and associativity – Mathematical functions.

**UNIT –II DATA INPUT, OUTPUT & CONTROL STATEMENTS (20 HRS.)**

Reading a character – Writing a character – Formatted input – Formatted output - Decision Making and Branching: IF Statement – the IF

ELSE statement – Nesting of IF..ELSE statements – The ELSE IF ladder – The switch statement - The ?: Operator – the GOTO statement – Decision Making and Looping : The WHILE statement – the DO statement – the FOR statement – Jumps in loops

**UNIT –III ARRAYS& HANDLING OF STRINGS (20 HRS.)**

One Dimensional Arrays – Two Dimensional Arrays – Initializing Two Dimensional Arrays – Handling of Character Strings: Declaring and Initializing String Variables – Reading String from Terminal – Writing Strings to Screen – Arithmetic Operations on Characters – Putting Strings together – Comparison of two Strings – String Handling Functions – Table of Strings

**UNIT IV: USER – DEFINED FUNCTIONS & POINTERS (20 HRS.)**

Need for User-Defined Functions – A Multi-function Program – Form of C Functions – Return Values and their Types – Calling a Function – Category of Functions – No Arguments and No Return Values – Arguments but No Return Values – Arguments with Return Values – Handling of Non-Integer Functions – Nesting of Functions – Recursion – Functions with Arrays - the scope and lifetime of variables in functions. Pointer : Understanding Pointers – Accessing the Address of a Variable – Declaring and Initializing Pointers – Accessing a Variable through its Pointer – Pointer Expressions – Pointer Increment and Scale Factor – Pointers and Arrays.

**UNIT V: STRUCTURES & FILES (20 HRS.)**

Structure definition – Giving values to members – Structure initialization – Comparison of structure variables – Arrays of structures – Arrays within structures – Structures within structures – Structures and functions –Unions – Size of structures – Bit fields. File Management in C: Defining and opening a file-closing a file-Input / Output operations on files-Error handling during I / O operations-Random access to files-Command line arguments.

**Text Book:-**

Programming in ANSI C by E. Balagurusamy, Tata McGraw-Hill Publishing Company Ltd. - 2000

Chapters: 2 to 10 excluding section 7.5 (Multidimensional Arrays),

Chapters 11: sections 11.1-11.8 and Chapter 12.

**Reference Books:-**

1) Theory and problems of programming with C – Byron S. Gotfried (Schaums Series)The C programming language – Kernighan &Ritchil.

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# III B.Sc STATISTICS

## SEMESTER –V

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST5CCP1 | C Practical | Practical | 2 | 2 |

1. To find the area of a square
2. To find the area of a circle
3. To find the area of a triangle
4. To find Simple interest
5. Solving Quadratic equations
6. Checking primes
7. Arranging numbers in ascending order
8. Reversing digits of a number
9. Finding the values of ncr, npr.
10. Palindrome
11. Matrix addition
12. Matrix multiplication
13. Transpose of a matrix
14. Trace of a matrix
15. Alphabetizing names
16. Mean and Standard deviation
17. To find Correlation Coefficient
18. Straight line fitting by the method of least squares
19. To print n th Fibonacci number
20. To read a series of words form a terminal

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# III B.Sc STATISTICS

## SEMESTER –V

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST5ME1 | Real Analysis | Lecture | 5 | 5 |

**COURSE DESCRIPTION**

This course introduces the basic concepts in analysis and to enable the students understand fundamental ideas and theorems in analysis.

**COURSE OBJECTIVES**

To enable the students understand the basic concepts of sequences and series, connectedness and compactness and proof techniques.

**UNIT –I REAL VALUED FUNCTIONS AND REAL SEQUENCE (15 HRS.)**

Real valuedfunctions **- equivalence - countability- real numbers–** (Self Study)– least upper bound- definition of sequence and subsequence – limit of a sequence.

**UNIT –II CONVERGENTAND DIVERGENT SEQUENCES (15 HRS.)**

Convergent sequences –divergent sequences-bounded sequences- monotone sequences- operations on convergent sequences- operations on divergent sequences- Cauchy sequences

**UNIT –III SERIES OF REAL NUMBERS (15 HRS.)**

Series- convergence and divergence of series – series with non-negative terms – alternating series- conditional convergence and absolute convergence- test for absolute convergence

**UNIT –IV LIMITS AND METRIC SPACES (15 HRS.)**

Limit if a function on the real line- metric spaces- limit in metric spaces- functions continuous on a metric space- functions continuous on the real line

**UNIT –V CONNECTEDNESS, COMPLETENESS AND COMPACTNESS**

**(15 HRS.)**

Open sets- closed sets- more about open sets- connected sets- bounded sets- complete metric spaces- compact metric spaces

**TEXT:**

Richard R. Goldberg, *Methods of Real Analysis***,** Oxford & IBH Publishing co.Pvt. Ltd.

**REFERENCES:**

1. S. Arumugam and A.Thangapandi Issac, *Modern Analysis*
2. Copson, *Metric spaces*, Universal book stall, New Delhi (1989).
3. Walter Rudin, *Mathematical Analysis*, MC-craw hill international, Third edition.

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## SEMESTER –V

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST5ME2 | Multivariate Analysis | Lecture | 5 | 5 |

**COURSE DESCRIPTION**

The course covers multivariate normal distribution, hotelling $T^2$ statistics, multivariate classification and discrimination analysis, principal components and cluster analysis.

**COURSE OBJECTIVES**

To derive statistical inference based on multivariate statistical analysis.

**UNIT –I MULTIVARIATE NORMAL DISTRIBUTION (15 HRS.)**

Multivariate normal distribution and its properties - **Maximum Likelihood Estimators of parameters, distribution of sample mean vector – (**Self Study), sample dispersion matrix.

**UNIT –II PARTIAL AND MULTIPLE CORRELATION COEFFICIENTS**

**(15 HRS.)**

Partial and multiple correlation coefficients - Null distribution - Application in testing. Null distribution of Hotelling's T2 statistics. Application in tests on mean vector for one and more multivariate normal populations and also on equality of the components of a mean vector in a multivariate normal population

**UNIT –III CLASSIFICATION AND DISCRIMINATION (15 HRS.)**

Classification and discrimination procedures for discrimination between two multivariate normal populations – Linear Discriminant function, Mahalanobis Distance, tests associated with Discriminant

functions, probabilities of misclassification and their estimation, classification into more than two multivariate normal populations.

**UNIT –IV PRINCIPAL COMPONENT ANALYSIS (15 HRS.)**

Principal component Analysis, Canonical variables and canonical correlation, clustering-similarity measures- hierarchical algorithms- Single Linkage, Non-hierarchical Clustering

**UNIT –V CONTINGENCY TABLES (15 HRS.)**

Contingency Tables, Correspondence Analysis for Two Dimension Contingency Table.

**TEXT:**

1. T.W. Anderson, *An Introduction To Multivariate Statistical Analysis*, 2nd Edition Wiley (1983).
2. R.Johnson and Wichern *Applied Multivariate Statistical Analysis*, Pearson, 6th edition (2008).

**REFERENCES:**

1. Brain S. Everitt and Graham Dunn, *Applied Multivariate Data Analysis*, 2nd Edition (2001)
2. Neil H.Timm, *Applied Multivariate Analysis*, Springer (2002).
3. Verlag Dallas E. Johnson, *Applied Multivariate Methods For Data Analysts*, Duxbury Press (1998).
4. William.R.Dillon and Mathew Goldstein *Multivariate Analysis Methods and Applications*, John Weily (1984).

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**DEPARTMENT OF STATISTICS**

# III B.Sc STATISTICS

## SEMESTER –V

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST5SB3 | Practical Statistics III | Practical | 2 | 2 |

**COURSE DESCRIPTION**

The course provides an application based on MLEs, analysis of time series, index numbers and vital statistics & cure fitting.

**COURSE OBJECTIVES**

To expose the students to the analysis of statistical techniques in real life situations.

1. Confidence interval for proportions means and variances based on Normal distribution.

2. Confidence intervals for means, variances, correlation coefficient

3. Problems based on MLEs.

4. Fitting of a straight line, second degree and Parabola, exponential

5. Analysis of Time Series

6. Index Numbers - Chain index numbers-consumer price index numbers

7. Interpolation and Extrapolation

8. Vital Statistics

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# III B.Sc STATISTICS

## SEMESTER –V

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST5SB4 | Statistical software – SPSS | Practical | 2 | 2 |

**COURSE DESCRIPTION**

The course is introduced to learn a programming language which helps to handle all aspects of data analysis using statistical software SPSS.

**COURSE OBJECTIVES**

To expose the students on the applications of statistical analysis using SPSS

1. Diagrammatic Representation Bar Chart, Pie Diagram
2. Construction of Discrete and Continuous Frequency Tables from raw data
3. Graphical Representation - Histogram , Box- Whiskers plot
4. Descriptive Statistics
5. Simple correlation, Rank correlation,
6. Regression Fitting of Poisson distribution
7. Fitting of Normal distribution
8. Parametric tests – Means, Variances and Proportions
9. Chi – square test for goodness of fit
10. Chi – square test for independence samples

11. Non- Parametric tests Sign test, Wilcoxon test, Mann-Whitney U test, Median test, Run test, Kolmogorov Smirnov one sample test, Kruskal Wallis
12. ANOVA – one way and two way
13. Design of Experiment – CRD, RBD, LSD
14. Factorial Experiment - $2^2 2^3$ experiments with total and partial confounding.

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# III B.Sc STATISTICS

## SEMESTER –VI

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST6CC12 | Statistical Quality Control | Lecture | 5 | 4 |

**COURSE DESCRIPTION**

This course is designed to introduce students to statistical quality control emphasizing those aspects which are relevant for SQC's practical implementation

**COURSE OBJECTIVES**

. To introduce the students the basics of Statistical Quality Control and to enable them describe quality characteristics and relationships

**UNIT–1 STATISTICAL QUALITY CONTROL (15 HRS.)**

Basis of Statistical Quality Control - Definition – Benefits – Process control and Product control - Control Limits , Specification Limits and tolerance Limits – Control Charts – Control Limits – **Tools for Statistical Quality Control– (**Self Study) - application of theory of runs in quality control.

**UNIT – II CONTROL CHART FOR VARIABLES (15 HRS.)**

Control chart for variables – The General theory of Control Chart – **Definition of Control Chart** – **Learning Outcomes of the Control Charts–** **(**Self Study)- $\bar{X}$ and R Charts – Control limits for $\bar{X}$ Chart – Control limits for R Chart - Interpretation of control charts X and R. - $\sigma$ chart – Basis of sub grouping - plotting X and R results - determining the trial control limits

**UNIT – III CONTROL CHART FOR ATTRIBUTES (15 HRS.)**

Control chart for attributes –Control chart for fraction defective (p-chart) – Control chart for number of defectives (d-chart) – Interpretation of p chart –Control chart for number of defects per unit (c-chart) – c- charts for variable sample size – Applications of c-chart

**UNIT –IV SAMPLING PLANS (15 HRS.)**

Acceptance of sampling plans for attributes - Producer's risk and consumer's risk - concepts of AQL, LTPD, AOQ, AOQL, ATI and ASN – single and double sampling plans - OC, AOQ, ATI curves for single - OC, ASN, ATI curves for Double sampling plans. – Single sampling vs Double sampling plans – Sequential sampling plan.

**UNIT –V RELIABILITY (15 HRS.)**

Reliability: Definition of reliability – Basic elements of reliability –Bath tub curve - Achievement of reliability – Designing for reliability – measurement an of reliability – cost of reliability - maintenance and reliability – MTBF — MTTR – Hazard analysis –MTTF –quality and reliability – Reliability of series , parallel and mixed systems.

**TEXT BOOKS:**

1. V.K.Kapoor, and S.P.Gupta, *Fundamentals of applied statistics*, Sultan Chand and sons (1978).
2. M. Mahajan, Statistical Quality Control (2005).

**REFERENCE BOOKS:**

**1.** E.L. Grant, and R.S. Laven Worth, *Statistical Quality Control*, McGraw Hill.

**2.** R.C.Gupta, *Statistical Quality Control* (1974).
**3.** D.C.Montgomery, *Introduction to Statistical Quality Control*, John Waley& Sons (1983).
**4.** S.K.Ekambaram, *Statistical basis of Acceptance sampling*, Asia Publishing House(1963).

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## SEMESTER –VI
***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST6CC13 | Stochastic Processes | Lecture | 6 | 6 |

**COURSE DESCRIPTION**

This course covers Markov chains in discrete time, the Poisson process and the Markov processes in continuous time

**COURSE OBJECTIVES**

To expose the students to the basics of stochastic process and to clarify Markov chain, Poisson process and pure birth

**UNIT –I STOCHASTIC PROCESSES (20 HRS.)**

Definition of stochastic process, classification of stochastic process according to time parameter space and state space - examples of stochastic process. Concept of Stationary and independent increment process

**UNIT –II MARKOV CHAIN (20 HRS.)**

Markov chain – definitions and examples – higher transition probabilities – Chapman – Kolmogorov equations (discrete) - simple problems only.

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**UNIT –III POISSON PROCESS** **(20 HRS.)**

. **Poisson Process – (**Self Study) – Postulates – Properties – Related distributions – exponential, uniform, geometric and **negative binomial distributions – (**Self Study).

**UNIT –IV BIRTH AND DEATH PROCESS** **(20 HRS.)**

Pure Birth Process – Yule-Fury process – Birth and Death Process – Immigration - Emigration processes

**UNIT –V TIME SERIES** **(20 HRS.)**

Time Series - **Introduction Moving Average Process– (**Self Study)– Autoregressive Process - Autoregressive Process of Order Two – Autoregressive Moving Average process (ARMA Process

**TEXT BOOKS:**


1. J. Medhi, *Stochastic Process*, New age International, $4^t$ $h$ edition (2009).
   Chapter 1(1.5,) Chapter 2(2.1, 2.2), chapter 3(3.1, 3.2, 3.3.3, 3.4), Chapter10(10.1, 10.2).
2. T. Veerarajan, *Probability, Statistics and Random Processes*, Second edition,TataMcGraw-Hill Publishing Company Ltd., New Delhi (2003).


**REFERENCE BOOKS:**


1. W. Feller, *Introduction to Probability Theory and its Applications*, Volume I, Wiley Eastern Ltd, New York (1972).
2. S. Karlin and H.M.Taylor, *A Fist course in Stochastic Processes*, Academic Press, New York (1975).
3. S.M. Ross, *Stochastic Processes*, John Wiley and Sons, New York (1983).

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## SEMESTER –VI

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST6CC14 | Operations Research | Lecture | 5 | 4 |

**COURSE DESCRIPTION**

This helps in solving in different environments that needs decisions.

**COURSE OBJECTIVES**

To aim at familiarizing the students with quantitative tools and techniques, which are frequently applied to business decision making and to provide a formal quantitative approach to problem solving.

**UNIT – I SEQUENCING PROBLEM (15 HRS.)**

Introduction – problem of sequencing – Basic terms used in sequencing - Processing n jobs through two machines – **Processing n jobs through k machines - Processing 2 jobs through k machines**( Self Study).

**UNIT –II GAMES AND STRATEGIES (15 HRS.)**

Introduction – Two person zero sum games – Some basic terms - The maximin-minimax principle – Games without saddle points – mixed

strategies – Graphical solution of 2 x n and m x 2 games – Dominance property – Arithmetic method for n x n game – General solution of m x n rectangular games.

**UNIT –III INVENTORY CONTROL (15 HRS.)**

Introduction – The Inventory decisions – Cost associated with inventories – Factors affecting inventory control - Economic Order Quantity(EOQ) – Deterministic inventory problems with no shortages - Deterministic inventory problems with shortages – Probabilistic inventory problems.

**UNIT –IV QUEUING THEORY (15 HRS.)**

Introduction- Queuing system – Elements of Queuing system – Operating characteristics of queuing system – Probability distributions in queuing systems – Classification of queuing models – Definition of transient and steady states – Poisson queuing systems –Model I (M/M/1):(∞ / FIFO) – Model II (M/M/I): (∞/SIRO) - Model III (M/M/1): (N/FIFO).

**UNIT –V NETWORK SCHEDULING BY PERT/CPM (15 HRS.)**

Introduction – Network and basic components – Logical sequencing – Rules of network construction – Critical path analysis – probability considerations in PERT

**TEXT BOOK:**

**UNIT I** - Chapter 12: Sections 12.1 to 12.6

**UNIT II** - Chapter 17: Sections 17.1 to 17.9

**UNIT III** - Chapter 19: Sections 19.1 to 19.7, 19:12.1, 19:12.2

**UNIT IV** - Chapter 20: Sections 20.1 to 20.8 (Up to model III)

**UNIT V** - Chapter 21: Sections 21.1 to 21.6

**REFERENCES:**

1. Prem Kumar Gupta and D.S Hira, *Problems in Operations Research*, Sultan Chand & Co. Ltd., Revised edition (2009).

2. P.K Gupta and Man Mohan, *Problems in Operations Research*, Sultan Chand & Sons (2007).

## III B.Sc STATISTICS

## SEMESTER –VI

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST6ME3 | Actuarial statistics | Lecture | 5 | 5 |

**COURSE DESCRIPTION**

The course covers the applications of insurance and finance.

**COURSE OBJECTIVES**

The Actuarial statistics curriculum aims at providing the academics and professional training to students who wish to join the actuarial profession

**UNIT –I SIMPLE & COMPOUND INTEREST** **(15 HRS.)**

Elements of simple & compound interest - nominal rate of interest i(m) and effective rate of interest i – Force of interest δ - relationship between different rates of interest- expression for δ by use of calculus - relationship between nominal and effective rates of interest - present value – varying rates of interest – equation of value – equated time – **simple discount – discount & discounted value – (**Self Study**).**

**UNIT –II ANNUITIES** **(15 HRS.)**

Annuities – immediate annuity – annuity due – perpetuity - deferred annuities - present values, accumulated amounts of annuities. Increasing and decreasing annuities.

**UNIT –III REDEMPTION OF LOANS (15 HRS.)**

Redemption of Loans – Amortization and Sinking Funds - Average Yield of interest on the Life Fund of an insurance office. Simple Problems

**UNIT –IV PREMIUM (15 HRS.)**

Premiums; general principles, natural premiums, office & net premiums, loading for expenses with and without profit premiums, adequacy of premiums, relative consistency. Simple Problems.

**UNIT –V POLICY VALUES (15 HRS.)**

Policy values - retrospective and prospective policies; Surplus – sources of surplus, distribution of surplus.

**TEXT BOOKS:**

1. Dixit, S.P., Modi, C.S., Joshi, R.V.(2000): Mathematical Basis of life Assurance, IC-81 (Published by Insurance Institute of India, Bombay - 400001).
2. Frank Ayers, J.R. (1983): Theory and problems of mathematics of finance, Schaum's outline series, McGraw-Hill book company, Singapore.

**REFERENCE BOOKS:**

1. Donald, D.W.A. (1975): Compound Interest and Annuities certain, Heinemann, London
2. Zima, P. and Brown, R.L. (2005): Theory and problems of mathematics of finance, 2nd edition, Tata McGraw - Hill.

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# III B.Sc STATISTICS

## SEMESTER –VI

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST6ME4 | Regression Analysis | Lecture | 5 | 5 |

**COURSE DESCRIPTION**

This course focuses on building a greater understanding on statistical tools for applying the linear regression model and its generations.

**COURSE OBJECTIVES**

To expose the students to regression models applicable to real life situation.

**UNIT –I CORRELATION** **(15 HRS.)**

Partial and multiple correlation coefficients, relationships among simple, multiple and partial correlation coefficients – biserial correlation coefficients.

**UNIT –IISIMPLE LINEAR REGRESSION MODEL - I** **(15 HRS.)**

Simple linear regression model: Description of the data model – estimation of parameters by least square method and test of hypothesis –

index of fit – predicted values and standard errors – evaluation of fit – analysis of residuals.

**UNIT –III SIMPLE LINEAR REGRESSION MODEL - II (15 HRS.)**

Effect of outliers in simple regression – model, adequacy and residual plots – deletion of data points – **transformation of variables – transformation to achieve linearity** (Self Study) – transformation to stabilize variance – removal of heterogeneity – principles of weighted least squares.

**UNIT –IV MULTIPLE LINEAR REGRESSION (15 HRS.)**

Multiple linear regressions: Description of the Data model – properties of least squares estimators – predicted values and standard errors in multiple regression – generalized least squares.

**UNIT –V INFERENCE ON GLM (15 HRS.)**

Inference on GLM: Test of hypothesis on the linear model – Assumption about the explanatory variable – testing a subset of regression coefficient equals to zero – testing of equality of regression coefficients.

**TEXT BOOK:**

D.C.Montgomery, E.A Peck,. and G.G.Vining, *Introduction to linear regression analysis*, third edition, John Wiley and Sons, Inc. (2003).

**REFERENCES:**

1. N.R.Draper,. and H.Smith, *Applied Regression Analysis*, third edition, John Wiley and Sons, Inc. (2003).
2. J.Johnson, *Econometric methods*, third edition, McGraw-Hill International (1984).
3. V.K.Kapoor, and S.C.Gupta, *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons (2007).

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# III B.Sc STATISTICS

## SEMESTER –VI

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST6ME5 | Numerical Methods | Lecture | 5 | 5 |

**COURSE DESCRIPTION**

This course enables the students to solve equations using various Numerical Methods

**COURSE OBJECTIVES**

To enable the students to solve Algebraic, Transcendental, Differential Equations using various Numerical methods like Bisection, Runge-Kutta, Euler and Taylor

**UNIT –I ALGEBRAIC AND TRANSCENDENTAL EQUATIONS (15 HRS.)**

Introduction - Bisection method - Iteration method – Regula-falsi method – Newton-Raphson method. (No derivations).

**UNIT –II SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS (15 HRS.)**

Introduction- – Gauss Elimination method – Gauss Jordan method – Calculation of inverse of a matrix – Gauss Jacobi Iteration method – Gauss-Seidel iteration method.(No derivations).

**UNIT –III FINITE DIFFERENCES & INTERPOLATION (15 HRS.)**

. **Difference operators – Other difference operators-Relation between the operators – (**Self Study) - Newton's forward Interpolation formula-**Newton's backward Interpolation formula– (**Self Study)– Gauss forward Interpolation formula - **Gauss backward Interpolation formula– (**Self Study)–Stirling's formula - Lagrange's interpolation formula – Divided difference – Newton's Divided difference formula – Inverse interpolation.(No derivations

**UNIT –IV NUMERICAL DIFFERENTIATION AND INTEGRATION (15 HRS.)**

Derivatives using Newton's forward difference formula-Derivatives using Newton's backward difference formula- Derivatives using Central difference formula-Maxima and minima of the interpolating polynomial-Numerical Integration – Trapezoidal Rule – Simpson's one third rule.(No derivations

**UNIT –V NUMERICAL SOLUTION OF DIFFERENTIAL EQUATION (15HRS.)**

Taylor series method – Picard's method – Euler's method – Modified Euler's method- Runge -Kutta methods –Second order Runge-Kutta method-Higher order Runge-Kutta method Predictor-Corrector formulae-Milne's Predictor-Corrector formulae-Adam's Predictor- Corrector equations.(No derivations

**TEXT BOOK:**

M.K.Venkataraman, *Numerical Methods in Science and Engineering*, The National publishing company, fifth edition.

**REFERENCES:**

1. S.Arumugam, Thangapandi Isaac and A. Soma Sundaram, *Numerical Analysis*, New Gamma Publishing House (2007).

2. S.S.Sastry, *Introductory Methods of Numerical analysis*, Prentice Hall of India Private Limited (1991)

## III B.Sc STATISTICS

## SEMESTER –VI

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST6ME6 | Industrial Statistics | Lecture | 5 | 5 |

**COURSE DESCRIPTION**

This course is concerned with maintaining and improving the quality of goods and services

**COURSE OBJECTIVES**

This course enables the students competent to undertake industrial researches

**UNIT –I INVENTORY PLANNING** **(15 HRS.)**

. Inventory planning: Concept of planned inventory policies: Deterministic models - Policy when inventory levels are reviewed continuously and demands occur uniformly with and without shortage costs Economic order quantity.

**UNIT –II PRODUCTION PLANNING** **(15 HRS.)**

. Policy for production planning when inventory levels are reviewed periodically Stochastic models Single period model with no set up cost having zero or non-zero initial stock {(s,S) policy} Solving special cases using computer packages.

**UNIT –III FORECASTING** **(15 HRS.)**

Forecasting: Concept of forecasting and its applications in manufacturing and non manufacturing industrial situations Different methods of forecasting including average, last value, weighted average(exponential smoothing) **Forecasting in presence of linear trends using least square methods**(Self Study) - Forecasting in presence of seasonal effects Solving special cases using computer package.

**UNIT –IV RELIABILITY** **(15 HRS.)**

. Reliability: Definitions and relationships between survival function, hazard function, hazard rate of a non-negative random variable - Parametric distributions: Weibull, amma, Lognormal and Exponential as life time distributions - Concept of aging, IFR, IFRA classes of distributions and their dual.

**UNIT –V STRUCTURE FUNCTIONS** **(15 HRS.)**

Coherent system as binary function: Minimal cut and path sets (vectors) -Representation of structure function of series, parallel and k out of n: G systems of independent components - Minimal cut and path structure functions - Dual of a coherent structure Derivation of reliabilities of above structures.

**TEXT BOOK:**

1. H.A. Taha, *Operations Research*, Macmillan Publishing Co. (1999).
2. F.S.Hiller and G.J.Libermann, *Introduction to Operations Research*, 6th Edition, McGraw Hill (1995).
3. L.J.Bain and Enghardt, *Statistical Analysis of Reliability and Life Testing Models*, Marckel Dekker (1991).

**REFERENCES:**

1. S.Zacks, *Introduction to Reliability Analysis, Probability models and Statistical methods*, Springer Verlag (1992).
2. R.E.Barlow and F.Proschan, *Statistical theory of Reliability and Life testing:Probability models*, Holt, Rinehart and Winston (1975)

## III B.Sc STATISTICS

## SEMESTER –VI

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST6SB5 | Practical Statistics IV | Lecture &Practical | 2 | 2 |

**COURSE DESCRIPTION**

The course provides an application related to statistical quality control, non parametric tests & design of experiments

**COURSE OBJECTIVES**

To expose the students to the analysis of statistical techniques in real life situations.

1. Control Charts for Variables - $\bar{X}$, R chart
2. Control Charts for Attributes - p, np, c-chart
3. Acceptance sampling for attributes – single sapling plan – OC, AOQ, ASN and ATI
4. Acceptance sampling for attributes – Double sampling plan – OC, AOQ, ASN and ATI curves

5. Non- Parametric tests - Sign test, Wilcoxon test, Mann-Whitney U test, Median test, Run test, Kolmogorov Smirnov one sample test, Kruskal Wallis
6. Anova – One way and Two way
7. Design of Experiment – CRD, RBD, LSD
8. Missing Plot
9. Factorial Experiment - $2^2 2^3$ experiments with completely confounding
10. Factorial Experiment - $2^2 2^3$ experiments with partially confounding.

## III B.Sc STATISTICS

## SEMESTER –VI

***For those who joined in 2016 onwards***

| PROGRAMME CODE | COURSE CODE | COURSE TITLE | CATEGORY | HRS/WEEK | CREDITS |
|---|---|---|---|---|---|
| USST | ST6SB6 | Statistical Software - R | Lecture and Practical | 2 | 2 |

**COURSE DESCRIPTION**

The course is introduced to learn a programming language which helps to handle all aspects of statistical software.

**COURSE OBJECTIVES**

To expose the students on the applications of statistical analysis using statistical package.

1. Diagrammatic Representation Bar Chart, Pie Diagram
2. Construction of Discrete and Continuous Frequency Tables from raw data
3. Graphical Representation - Histogram , Box- Whiskers plot

4. Descriptive Statistics
5. Simple correlation, Rank correlation,
6. Regression Fitting of Poisson distribution
7. Fitting of Normal distribution
8. Parametric tests – Means, Variances and Proportions
9. Chi – square test for goodness of fit
10. Chi – square test for independence samples
11. Non- Parametric tests Sign test, Wilcoxon test, Mann-Whitney U test, Median test, Run test, Kolmogorov Smirnov one sample test, Kruskal Wallis
12. ANOVA – one way and two way
13. Design of Experiment – CRD, RBD, LSD
14. Factorial Experiment - $2^2 2^3$ experiments with total and partial confounding.

**REFERENCE BOOKS:**

1. SudhaPurohit, Sharad D Gore and Shailaja R. Deshmukh, Narosa Publishing House, New Delhi (2015).
2. Jured. P. Lander, *R for everyone, advance Analytics and Graphics*, Addison-Wesley, USA (2014).
3. Online help manuals and other materials available in R project site will form basis for the course

HOD's Signature

Dr. E. Helena
Head & Assistant Professor
Department of Mathematics (SF)