ANNAMALAI UNIVERSITY

Affiliated Colleges

202. B.Sc STATISTICS

Programme Structure and Scheme of Examination (under CBCS)
(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

Part	Course Code	Study Components & Course Title	Credit	Hours/ Week	Maximum Marks		
					CIA	ESE	Total
		SEMESTER – I					
I	23UTAML11/ 23UHINL11 / 23UFREL11	Language – I பொது தமிழ் – I/ Hindi-I/ French-I	3	6	25	75	100
II	23UENGL12	General English – I	3	6	25	75	100
III	23USTAC13	Core – I Descriptive Statistics	5	5	25	75	100
	23USTAC14	Core –II : Probability Theory	5	5	25	75	100
	23UMASE15	Elective - I (Generic / Discipline Specific) – Mathematics for Statistics	3	4	25	75	100
		Skill Enhancement Course-1(NME-I)	2	2	25	75	100
	23USTAF17	Foundation Course: Quantitative aptitude	2	2	25	75	100
		Total	**23**	**30**			**700**
		SEMESTER – II					
I	23UTAML21/ 23UHINL21 / 23UFREL21	Language – II பொது தமிழ் – II/ Hindi-II/ French-II	3	6	25	75	100
II	23UENGL22	General English –II:	3	6	25	75	100
III	23USTAC23	Core –III: Matrix and Linear Algebra	5	5	25	75	100
	23USTAC24	Core –IV Distribution theory	5	5	25	75	100
	23UNUME25	Elective - II (Generic / Discipline Specific) Numerical Methods - I	3	4	25	75	100
IV		Skill Enhancement Course –2 (NME-II)	2	2	25	75	100
	23USECG27	Skill Enhancement Course –3 Internet and its Applications (Common Paper)	2	2	25	75	100
		Total	**23**	**30**			**700**
	List of Non – Major Elective offered to other Department						
I	23USTAN16	Statistical methods I	2	2	25	75	100
II	23USTAN26	Statistical methods II	2	2	25	75	100

SEMESTER: I PART: III CORE COURSE – I	23USTAC13: DESCRIPTIVE STATISTICS	Credit:5 Hours:5

The main objectives of the course are:

1. It explains the important concepts of statistics and statistical data.
2. It provides to formulate the visualization of frequency distribution.
3. Also they measure the averages, dispersions, lack of symmetry, moments, relationship among variables.
4. Estimate and predict the unknown and future values.
5. Study of non-linear and consistency of the data.

Unit-I: Statistics: Introduction - Definition – Functions - Applications - Limitations. Organising a Statistical Survey: Planning the survey - Executing the survey-Collection of Data: Primary and secondary data - Methods of collecting primary data - Sources of secondary data. Sampling: Census and Sample methods. Classification-Types - Formation of frequency distribution-Tabulation - parts of a Table - Types. Diagrammatic representation – Types. Graphical representation - Graphs of frequency distributions. Merits and Limitations of diagrams and graphs.

Unit-II: Measures of Central tendency: Introduction-Definitions-Types - Mean-Median-Mode-Geometric mean-Harmonic Mean-Weighted mean - Merits and Demerits-Measures of Dispersion: Introduction – Definition – Types – Range - Quartile deviation - Mean deviation - Standard deviation - Co-efficient of variation – Lorenz curve - Merits and Demerits.

Unit-III: Skewness: Introduction-Definition-Types-Karl Pearson's – Bowley's - Kelly's methods – Their merits and demerits. Kurtosis: Introduction-Definition-Types-Its merits and demerits. Moments: Introduction - Definition-Types - Raw, Central moments and their relations

Unit-IV: Correlation analysis: Introduction - Definition - Types – Ungrouped and Grouped data – Probable error – properties - Rank correlation – Partial and Multiple correlations - Regression analysis: Introduction - Definition – Regression Equations -Multiple regression - Principle of least squares for first degree, Second degree, Exponential and Power curves.

Unit-IV Mathematical Expectations: Introduction- Expected value of a random variable (Discrete and Continuous)-Expected value of function of a random variable - Properties of Expectation-Properties of variance- Covariance. Inequalities involving expectation: Cauchy Schwartz and Markov inequalities.

Unit -V Generating functions: M.G.F-Properties-Uniqueness theorem - C.G.F-Properties- P.G.F-Properties. Characteristic Function: Properties–Inversion theorems (Statement only)- Uniqueness theorem (Statement only). Chebychev's Inequality (Statement and Proof). Law of Large Numbers (L.L.N): Convergence in probability - Properties: Weak L.L.N - properties-Bernoulli's L.L.N (Statement and Proof) - Khinchin's theorems (Statement only).

Recommended Text

1. Gupta S.C. and Kapoor V.K (2015): Fundamentals of Mathematical Statistics, Sultan Chand & Sons.

Reference Books

1. Rohatgi, V.K. (1984): An introduction to probability theory and mathematical statistics.
2. Hogg. R.V. and Craig. A.T. (1978) : Introduction to Mathematical Statistics, McGraw Hill Publishing Co. Inc. New York.

3. Mood A.M. Graybill, F.A. and Bose. D.C. (1974): Introduction to the theory of Statistics, McGraw Hill Publishing Co. Inc. New York.

4. Sanjay Arora and Bansilal (1989): New Mathematical Statistics, Satyaprakashan, New Delhi

Website and e-Learning Source: e-books, tutorials on MOOC/SWAYAM courses on the subject

www.khanacademy.org/math/statistics-probability/random-variables-stats-library
https://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2014/

Learning Outcome

Students will be able to

CLO-1: Describe the scope, functions, applications and limitations of Statistics.
CLO-2: Also to explain the statistical survey, collection of data, sampling and presentation of data.
CLO-3: Discuss the importance and uses of central values and dispersions for the various types of data.
CLO-4: Also to measure the various measures of averages and scatteredness of the mass of data in a series.
CLO-5: Explain about the lack of symmetry, rth moments and peakedness of the frequency distributions.
CLO-6: Ability to apply in data

SEMESTER: I PART: III CORE COURSE – II	23USTAC14: PROBABILITY THEORY	Credit:5 Hours :5

Objectives of the Course

main objectives of this course are:

1. To describe the importance and scope of probability theory and to predict the chance of an experimental outcomes.
2. It provides the study of random variable, distribution function, mathematical expectation,
3. Generating function and law of large numbers.
4. Two-dimentional variables and its distributions

Unit-I Theory of Probability: Introduction-Basic terminology- Definition - Axiomatic approach – Types of Events - Conditional Probability - Addition and Multiplication theorems of Probability for 'two' and 'n' events (Statement and Proof) - Boole's inequality (Statement and Proof)- Bayes' theorem of Probability (Statement and Proof with numerical illustration -very simple problems)

Unit-II Random variables and Distribution functions: Introduction - Discrete random variable: Probability mass function- Discrete distribution function, Properties. Continuous random variable : Probability density function and properties, measures of central tendency, dispersion, Skewness and kurtosis for continuous Probability distribution.

Unit-III Two dimensional random variables - Joint probability mass function- Marginal probability function, Conditional probability function. Two dimensional distribution functions-Marginal distribution functions - Joint density function-Marginal density function - Conditional distribution function - Conditional probability density function. Transformation of One - Dimensional and Two Dimensional random variable (concept only).

Unit-IV Mathematical Expectations: Introduction- Expected value of a random variable (Discrete and Continuous)-Expected value of function of a random variable - Properties of Expectation-Properties of variance- Covariance. Inequalities involving expectation: Cauchy Schwartz and Markov inequalities.

Unit-V Generating functions: M.G.F-Properties-Uniqueness theorem - C.G.F-Properties- P.G.F-Properties. Characteristic Function: Properties–Inversion theorems (Statement only)- Uniqueness theorem (Statement only). Chebychev's Inequality (Statement and Proof). Law of Large Numbers (L.L.N): Convergence in probability - Properties: Weak L.L.N - properties-Bernoulli's L.L.N (Statement and Proof) - Khinchin's theorems (Statement only).

Recommended Text

1. Gupta S.C. and Kapoor V.K (2015): Fundamentals of Mathematical Statistics, Sultan Chand & Sons.

Reference Books

1. Rohatgi, V.K. (1984): An introduction to probability theory and mathematical statistics.
2. Hogg. R.V. and Craig. A.T. (1978) : Introduction to Mathematical Statistics, McGraw Hill Publishing Co. Inc. New York.
3. Mood A.M. Graybill, F.A. and Bose. D.C. (1974): Introduction to the theory of Statistics, McGraw Hill Publishing Co. Inc. New York.

Sanjay Arora and Bansilal (1989): New Mathematical Statistics, Satyaprakashan, New Delhi

Website and e-Learning Source

e-books, tutorials on MOOC/SWAYAM courses on the subject
www.khanacademy.org/math/statistics-probability/random-variables-stats-library
https://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2014/

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1: Understand concepts of probability and Identify the different approaches of probability theory

CLO-2: Define the random variable and its respective probability values and to compare a discrete and continuous random variable.

CLO-3: Calculate the expected value of a random variable variance, covariance, moments and find the conditional expectation and variance of bi-variate random variable.

CLO-4: Estimate the measures of central values, Dispersions, Skewness and Kurtosis through the generating function

CLO-4: Calculate the mean and variance through some law of large numbers.

CLO-5: Understand bivariate random variables and its distributions

CLO-6: Aplication of probability theory in real life

SEMESTER: I PART: III Elective -I	(Discipline Specific) 23UMASE15 Mathematics for Statistics	Credit:3 Hours:4

The main objectives of this course are:

1. The overall objective of the study is to create deep interest in learning mathematics which develop broad and balance knowledge and understanding definitions, concepts, principles and theorems.
2. It helps the students to enhance the ability of learners to apply the knowledge and skill acquired by them to solve specific theoretical and applied problems in mathematics.
3. It also encourages the students to develop a range of generic skill helpful in employment, internships in social activities.

Unit-I Rational fractions: Proper and improper rational fractions. Partial fractions: Forms of partial fractions.

Unit-II Series: Summation and approximations related to Binomial, Exponential and Logarithmic series -Taylor's series, Fourier series for even and odd functions.

Unit-III Theory of equations: Polynomial equations with real coefficients- imaginary and irrational roots-solving equations with related roots-equation with given numbers as roots-equation whose roots are symmetric functions of roots.

Unit-IV Differential calculus: Functions – Different types – simple valued and many valued – Implicit and Explicit functions, Odd and even functions, periodic functions, algebraic and transcendental functions. Inverse functions, Limit of a function – Some standard limit (without proof) Differentiation of standard functions- standard rules of differentiation-Addition, subtraction, multiplication and quotient rules – function of function rule.

Unit-V Successive differentiation: Leibnitz's theorem, nth derivatives of standard functions – simple problems. Partial differentiation: Successive partial differentiation. Maxima and Minima for two variable functions. Homogenous function – Euler's theorem on homogenous function.

Recommended Text

1. Duraipandian, P. and Udaya Baskaran, S. (2014): Allied Mathematics, Vol. – I&II,S.Chand & Company Pvt. Ltd.
2. Vittal, P.R(2012). Allied Mathematics, Margham Publications.

Narayanan,SManickavachagamPillai(1993): Ancillary Mathematics, Book II : (Containing Differential Calculus) S. Viswanathan Pvt, Ltd

Reference Books

1. Narayanan,S and ManickavachagamPillai (1993): Ancillary Mathematics (Vol. II,Part I) : (Containing Trignometry) S. ViswanathanPvt. Ltd .
2. Narayanan, S and ManickavachagamPillai (1993): Ancillary Mathematics, Book I : (Containing Algebra). S. Viswanathan Pvt.Ltd .
3. S.J.Venkatesan (2019), Algebra,Sri Krishna Publications ,Chennai-77 , skhengg1999@gmail.com

Website and e-Learning Source: e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome

Students will be able to

CLO-1 Distinguish between proper and improper fractions. Express an algebraic fraction as the sum of its partial fractions.

CLO-2 Demonstrate the knowledge to determine the sums, expansion and approximation of series including binomial, exponential, logarithmic and fourier.

CLO-3 Solve problems about polynomials with real coefficients, imaginary and irrational roots. Explain the relationship between the derivative of a function as a function and the notion of the derivative.

CLO-4 Calculate limits of a function.

CLO-5 Obtain the nth derivative in successive differentiation. Apply Euler's theorem on homogenous function

CLO-6 Obtain the mathematical knowledge and skills for the better understanding of statistics as a mathematical science

SEMESTER: I PART: IV	[FOUNDATION COURSE] **23USTAF17: QUANTITATIVE APPTITUDE**	**Credit:2** **Hours:2**

Course Objectives

1. This course is designed to suit the need of the outgoing students. and
2. To acquaint them with frequently asked patterns in quantitative aptitude
3. To acquaint them with logical reasoning during various examinations and campus interviews.

Unit I:

Ratio And Proportion, Percentages, Square root and Cube Root, Lowest Common Multiple (LCM) and Highest Common Factor (HCF).

Unit II: Logarithm, Permutation and Combinations, Simple Interest and Compound Interest.

Unit III:

Time and Work, Time, Speed and Distance.

Unit IV:

Data Interpretation, Tables, Column Graphs, Bar Graphs and Venn Diagrams.

Unit V: Blood Relation, Coding and Decoding, Calendars and Seating Arrangements.

Course Outcomes

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

1. Understand the basic concepts of quantitative ability
2. Understand the basic concepts of logical reasoning Skills
3. Acquire satisfactory competency in use of reasoning
4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability.
5. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

Text Books (In API Style)

1. Agarwal , R. S. *A Modern Approach To Verbal & Non Verbal Reasoning*
2. Sijwali, B. S. *Analytical and Logical reasoning.*
3. Agarwal , R. S. *Quantitative aptitude for Competitive examination*.

Supplementary Readings

Sijwali, B. S. *Analytical and Logical reasoning for CAT and other management entrance tes*

SEMESTER: II PART: III (CORE COURSE – III)	23USTAC23: Matrix and Linear Algebra	Credit:5 Hours :5

The main objectives of this course are:

1. To study the basic operations of transpose and inverse of matrices
2. To know the structure of orthogonal and unitary matrices
4. To learn the invariance properties of ranks
5. To know and to apply the concepts of vector space and matrix polynomials.

Unit I Matrices-Transpose-Conjugate transpose- Reversal law for the transpose and conjugate transpose. Adjoint of a matrix, Inverse of a matrix, Singular and Non -Singular matrices,

Unit II Reversal law for the inverse of product of two matrices.Commutativity of inverse and transopose of matrix, Commutativity of inverse and conjugate transopose of matrix,Orthogonal and Unitary Matrices,Product of unitary matrices, Partitioning of matrices.

Unit III Rank of a matrix, Echelon form, Rank of transpose, Elementary transformations, Elementary matrices, Invariance of rank through elementary transformations, Reduction to Normal form, Equivalent matrices.

Unit-IV Vector space – Linear Dependence - Basis of a vector space –Sub-space - Properties of Linearly Independent and Dependent systems, Row and Column spaces, Equality of Row and Column ranks, Rank of Sum and Product of matrices

Unit-V Matrix polynomials, Characteristic roots and vectors,Relation between characteristic roots and characteristic vectors, Algebraic and Geometric multiplicity, Nature of characteristic roots in case of special matrices, Cayley- Hamilton theorem.

Recommended Text: Vasishtha.A.R (1972) : Matrices, KrishnaprakashanMandir, Meerut.

Reference Books: 1.Shanthinarayan, (2012) : A Text Book of Matrices, S.Chand& Co, New Delhi

2.M.L.Khanna (2009), Matrices, Jai PrakashNath& Co

Website and e-Learning Source: e-books, tutorials on MOOC/SWAYAM courses on the subject

https://samples.jbpub.com/9781556229114/chapter7.pdf

https://www.vedantu.com/maths/matrix-rank

https://textbooks.math.gatech.edu/ila/characteristic-polynomial.html

https://www.aitude.com/explain-echelon-form-of-a-matrix/

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Do basic operations of matrices
CLO-2 Understand various transactions of matrices and its applications
CLO-3 Understand various properties of matrices
CLO-4 Able to understand vector space and its applications
CLO-5 Able understand eigen vector and its applications
CLO-6 Able understand vector and matrix applications

SEMESTER: II PART: III CORE COURSE –IV	23USTAC24: DISTRIBUTION THEORY	Credit:5 Hours:5

The main objectives of this course are:

1. To learn discrete distributions
2. To learn continuous distributions
3. to understand Distributions generated from mathematical functions
4. learn normal distribution and its properties
5. understand about sampling distributions

Unit I

Binomial distribution – moments, recurrence relation, mean deviation, mode, moment generating function, characteristic function, cumulants. Fitting of Binomial Distribution. Poisson distribution – moments, mode, recurrence relation, moment generating function, characteristic function, cumulants. Fitting of Poisson distribution. Negative binomial distribution – m.g.f., cumulants. Fitting of Negative binomial distribution.

Unit II Geometric distribution – lack of memory, moments, m.g.f.- Hypergeometric distribution – mean, variance, approximation to Binomial, recurrence relation – Multinomial distribution – m.g.f., mean and variance.

Unit III Normal Distribution – chief characteristics of the normal distribution and normal probability curve, mean, median, mode, m.g.f. characteristic function, moments, points of inflexion, mean deviation, Area property – Rectangular distribution – moments, m.g.f., characteristic function, mean deviation about mean.

Unit-IV Exponential distribution – m.g.f., characteristic function, memory less property – Gamma distribution – m.g.f., cumulants and central moments, reproductive property – Beta distribution – First kind and second kind – constants.

Unit-V Functions of Normal random variables leading to t, Chi-square and F-distributions (derivations, properties and interrelationships).

Recommended Text:

1. Gupta, S.C. Kapoor, V.K. (2007) Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi
2. Goon, A.M. Gupta M.K. and Das Gupta B (1977) An Outline of Statistical Theory, Vol I, 6/e, World Press, Calcutta.
3. Hogg, R.V. and Graig, A.T. (1978) : Introduction to Mathematical Statistics, A/e, Mc.Graw Hill Publishing Co.Inc., New York

Reference Books

1.Mood, A.D. Graybill, F.A. and Boes, D.C (1974): Introduction to the Theory of Statistics, 3/e, Mc.Graw Hill, New York.

Website and e-Learning Source

e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 identify discrete distributions appeared in real life situations
CLO-2 understand some continuous distributions and its applications
CLO-3 connection between some of the real values mathematical functions and its application in distribution theory
CLO-4 understand normal distribution and its properties
CLO-5 understand sampling distributions and its applications in real life
CLO-6 identify probability models in real data and estimate population parameters

SEMESTER: II PART: III Elective II	(Discipline Specific) 23UNUME25 NUMERICAL METHODS-I	Credit:3 Hours:4

The main objectives of this course are:

1. To introduce the study of algorithms that used numerical approximation for the problems of Mathematical analysis.
2. To solve mathematical problems numerically

Unit I The Solution of Numerical Algebraic and Transcedental Equations: Bisection Method, Iteration Method, Regula Falsi Method, Newton – Raphson Method. Hornor's Method

Unit II Solution of Simultaneous Linear Algebraic Equations:Guass – Elimination Method, Guass–Jordan Method, Guass – Jacobi Method, Guass –Seidel Method.
Finite Differences: Operators. Interpolation for Equal intervals: Newton's Forward Interpolation Formula and Newton's Backward Interpolation Formula, Evaluation of missing terms.

Unit III Central Difference Interpolation Formula For Equal Intervals:
Guass Forward Interpolation Formula,Gauss Backward Interpolation Formula, Sterlings Formula, Bessel's Formula, Laplace- Everett's Formula.

Unit-IV Interpolation with Unequal Intervals: Divided Differences, Newton's Divided Differences Interpolation Formula, Lagrange's Interpolation Formula and Inverse Lagrange's Interpolation, Method of reversal of series.

Unit-V Numerical Differentiation: Numerical Differentiation based on Newton's Forward and Backward Interpolation Formula – Computation of Second order derivatives.
Numerical Integration:General Quadrature formula for equidistant ordinates, Trapezoidal Rule,Simpson's $1/3^{rd}$ Rule, Simpson's $3/8^{th}$ Rule and Weddle's Rule.
Numerical Solution of Ordinary Differential Equations:Taylor Series Method, Picard's Method and Runge – Kutta Method. (Simple Problems Only Without Derivation)

Recommended Text

1. Kandasamy, P., Thilagavathy, K. (2003): Calculus of Finite Differences and Numerical Analysis, S.Chand Publications.
2. Balasubramaniam and Venkatraman(1972): Numerical mathematics part I and II by Rochouse and Sons

Reference Books

1. Kalavathy, S., and Thomson. (2004): Numerical Methods, Vijay Nico::le Publications.
2. Gupta, B.D. (2004): Numerical Analysis, Konark Publications
3. Venkatachalapathy, S.G. (2004): Calculus of Finite Differences and Numerical Analysis, Margam Publications.
4. Gerald Wheatley, (1970): Applied Numerical Analysis, Pearson Education Publications.

Jain, M.K., Iyengar, S.R., Jain, R.K., (1994): Numerical Methods Problems and Solutions, New Age International Publishers

Website and e-Learning Source: e-books, tutorials on MOOC/SWAYAM courses on the subject www.nptel.com

Course Learning Outcome

Students will be able to

CLO-1 Solve numerically equations that cannot have direct solution
CLO-2 solve system of linear equations
CLO-3 understand the need of interpolation
CLO-4 handle numerical differentiation
CLO-5 do integration numerically
CLO-6 get a foundation on algorithms to solve a mathematical problem

List of Non – Major Elective offered to other Department

SEMESTER: I PART: IV NME- I	23USTAN16: STATISTICAL METHODS I	Credit:2 Hours :2

Course Objective(s)

To enable students to learn basics of statistics and its applications

UNIT - I

Statistics - Definitions - limitation of statistics - collection of data - primary data - secondary data - Diagrammatic and Graphical representation of data.

UNIT - II

Descriptive Measures - Mean, Median, mode, standard deviation, skewness and kurtosis (ungrouped data only).

UNIT - III

Concept of sample and Population - Preparation of questionnaire and Pre-testing - Simple random, Stratified random and Systematic sampling techniques.

UNIT - IV

Study of relationship between variables: Concept of correlation - Karl Pearson and Spearman rank correlation - simple problems. Qualitative: Contingency tables - Measures of Association. Concept of simple regression - simple problems.

UNIT - V

Elements of Compound interest (nominal and effective rates of interest, annuities certain, present values, accumulated amounts, deferred annuities) - the functions included in compound interest - tables and their uses.

Text Books:

1. Gupta,S.P. (2014): Statistical Methods, Sultan Chand& Sons Pvt Ltd. New Delhi.
2. Federation of Insurance Institutes Study Courses - Mathematical Basis of Life Assurances F1,2.

Reference Books:

1. Kapoor, V.K. and Gupta, S.P. (1978): Fundamentals of Applied Statistics, Sultan Chand & Sons.

Course Outcomes

1. After studied unit - 1, the student will be able to know visualization of data

2. After studied unit - 2, the student will be able to know computations of various statistical measures of data

3. After studied unit - 3, the student will be able to know sample selection and various sampling procedures

4. After studied unit - 4, the student will be able to know relationship among variables and fitting of simple regression model

5. After studied unit - 5, the student will be able to know computation of interest calculations

SEMESTER: II PART: IV NME -II	23USTAN26 STATISTICAL METHODS II	Credit:2 Hours :2

Course Objective(s)

To enable students to learn the concept of estimation of unknown parameters of the population and hypothesis testing problem.

UNIT - I

Population growth and change - arithmetic, geometric and exponential growth rates - Population estimation and projection.

UNIT - II

Measures of mortality - Crude and Specific rates- Infant mortality rate - direct and indirect standardization of death rates - Complete life table.

UNIT - III

Estimation - Point estimation - interval estimation - mean - variance - proportions - simple problems.

UNIT - IV

Parametric Tests - Testing of significance of small and large sample tests - t-test, chi-square test - F test - z-test.

UNIT - V

Non- Parametric tests - Sign test, Wilcoxon test, Mann-Whitney U Test. Median test, Run test, Kolmogorov - Smirnov One Sample test. Chi- Square Tests - Goodness of fit - Test of independence of attributes.

Text Books:

1. Gupta,S.P (2014): Statistical Methods, Sultan Chand & Sons .
2. Kapoor, V.K. and Gupta, S.P. (1978): Fundamentals of Applied Statistics, Sultan Chand & Sons.

Reference Books:

1. Rohatgi, V.K. (1984) An introduction to probability theory and Mathematical Statistics, Wiley Eastern.

Course Outcomes

CLO 1. After studied unit - 1, the student will be able to know computation of population growth rate

CLO 2. After studied unit - 2, the student will be able to know the concept of mortality and its calculations

CLO 3. After studied unit - 3, the student will be able to know the concept of estimation of parameter

CLO 4. After studied unit - 4, the student will be able to know various parametric testing procedures

CLO 5. After studied unit - , the student will be able to know various Non parametric testing procedures

SEMESTER :I PART: III	DEPARTMENT ELECTIVE-I: PAPER-2 23USMAE15-2 STATISTICAL METHODS AND THEIR APPLICATION-I	CREDIT : 3 HOURS : 4

COURSE OUTCOME:

1: develop the skill of statistical methods and its representations.
2: solve by mean ,median and mode
3: calculate range, deviation and its measures.
4: solve the skewness and its coefficients.
5: understand the correlationand regression analysis.

UNIT–I: INTRODUCTION **Hours: 12**

scope and limitations of statistical methods - classification of data -Tabulation of data - Diagrammatic and Graphical representation of data - Graphical determination ofQuartiles ,Deciles and Percentiles.

UNIT-II: **MEASURES OF LOCATION** **Hours: 12**

Arithmetic mean, median, mode, geometric mean and Harmonic mean and their properties**.**

UNIT –III: MEASURES OF DISPERSION **Hours: 12**

Measures of dispersion : Range, Quartile deviation, mean deviation, Standard deviation,combined Standard deviation, and their relative measures.

UNIT –IV: MEASURES OF SKEWNESS **Hours: 12**

Measures of Skewness Karl Pearson's, Bowley's, and kelly's and co-efficient ofSkewness and kurtosis based on moments.

UNIT –V: CORRELATION **Hours: 12**

Correlation - Karl Pearson - Spearman's Rank correlation – concurrent deviation methods. Regression Analysis: Simple Regression Equations.

TEXT BOOK:

1.Fundamental of Mathematical Statistics - S.C. Gupta & V.K. Kapoor - Sultan Chand

SUPPLEMENTARY READINGS:

1.Statistical Methods - Snedecor G.W. & Cochran W.G. oxford & +DII

2. Elements of Statistics - Mode . E.B. - Prentice Hall

3. Statistical Methods - Dr. S.P. Gupta - Sultan Chand & Sons

Outcome Mapping

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**2**	**3**	**2**	**2**
CO2	**1**	**2**	**2**	**3**	**1**
CO3	**3**	**3**	**3**	**2**	**2**
CO4	**1**	**2**	**3**	**2**	**2**
CO5	**1**	**3**	**3**	**3**	**1**

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:II PART:III	DEPARTMENT ELECTIVE II : PAPER-1 23USMAE25-1 STATISTICAL METHODS AND THEIR APPLICATIONS-II	CREDIT:3 HOURS:4

COURSE OBJECTIVES

1. To know about statistics
2. To know about measurs of centeal tendencies and dispersion
3. To know about correlation and regression
4. To know the concept of probability and distribution
5. To apply test of significance

UNIT I : Introduction to curve **Hours: 10**

Curve fitting by the methods of least squares - Y = a x + b, Y = a x2 + b x + c, Y = a xb, Y = a e bx and Y= abx

UNIT II: SAMPLE SPACE **Hours: 12**

Events - probability - Addition and Multiplication Theorem - conditional probability -Baye's Theorem. Mathematical expectation Addition and Multiplication theorem, Chebychev's Inequality.

UNIT III: STANDARD DISTRIBUTIONS **Hours:12**

Standard distributions - Binomial, Poisson, Normal distribution and fitting of these distributions

UNIT IV: TEST OF SIGNIFICANCE **Hours:12**

Test of Significance- small sample and large sample test based on mean, S.D. correlationand proportion - confidence interval.

UNIT V: ANALYSIS OF VARIANCE **Hours:12**

Analysis of variance - One and Two way classifications - Basic principle of design of Experiments - Randomisation, Replication and Local control - C.R.D., R.B.D. and L.S.D.

Text Books (In API Style)

1.Fundamental of Mathematical Statistics - S.C. Gupta & V.K. Kapoor - Sultan Chand

SUPPLEMENTARY READINGS:

1.Fundamental of Applied Statistics - S.C. Gupta & V.K. Kapoor – Sultan Chand
2. Statistical Methods - Snedecor G.W. & Cochran W.G. oxford & +DII
3. Elements of Statistics - Mode . E.B. – Prentice Hall

Outcome Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	**2**	**3**	**3**	**3**	**2**
CO2	**1**	**3**	**2**	**2**	**3**
CO3	**3**	**3**	**3**	**2**	**2**
CO4	**3**	**3**	**2**	**2**	**2**
CO5	**1**	**3**	**3**	**3**	**3**

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER :I PART: III	DEPARTMENT ELECTIVE -II : PAPER-2 23URMTE25-2 RESOURCE MANAGEMENT TECHNIQUES	CREDIT : 3 HOURS : 4

COURSE OUTCOME:

1: use knowledge of operational research in LPP.
2: understand analogies between transportation problem, phenomena in operational Research.
3: formulate physical problems as operational research using assignment models
4: classify operational research, game theory, interpret the solutions.
5: interpret solutions in network analysis.

UNIT–I LINEAR PROGRAMMING **Hours: 12**

Definitions of OR - formulations of Linear programming problem - Graphical methods of solution - The simplex method - Artificial variables techniques - The Big-M method.

UNIT-II: **TRANSPORTATION MODELS** **Hours: 12**

Central difference Operators – Central differences formulae: Gauss Forward and Backward formulae – Sterling's formula – Bessel's formula (No derivations of formulae, simple problems only).

UNIT –III: **ASSIGNMENT MODELS** **Hours: 12**

Definition of Assignment models - Mathematical representation of assignment model- Solution of the assignment model - The Hungarian methods for solution of the assignment models – unbalanced assignment problem

SEQUENCING PROBLEM

Sequencing problems – Johnson's Algorithm- processing 'n' jobs through two machines - processing 'n' jobs through three machines - processing two jobs through 'm' machines .

UNIT –IV: GAME THEORY **Hours: 12**

Definitions - Rules for game theory - Rule 1 look for a pure strategy - Rule 2 reduce game by dominance - Rule 3 Solve for mixed strategy - Mixed strategies (2x2 games) - Mixed strategies (2xn games & mx2 games) - mixed strategies (3x3 or higher games).

UNIT –V: **NETWORK ANALYSIS** **Hours: 12**

Basic tools and techniques of project managements - Network logic - Numbering the events - Activity on node diagram - Critical path method - Program evaluation and review technique [PERT].

TEXT BOOK:

1. Prem Kumar Gupta, D.S. Hira [2008], "Operation Research", S. Chand & Company Ltd, Re

Print 2010, New Delhi.
Unit-I: Chapters: 1&2 –1: 1.2,2: 2.2, 2.3, 2.10, 2.11: 2.11.1, 2.11.2
(Pg: 4 to 5, 37 to 97,141 to 165)
Unit-II: Chapter 3: 3.1 to 3.4 (Pg: 212 to 248)
Unit-III: Chapters 4 &5: 4: 4.1-4.6, 5: 5.1, 5.4-5.7
(Pg: 306 to 334 , 381 to 382 & 387 to 408)
Unit-IV: Chapter 8: 8.4: 8.4.2 – 8.4.8(Pg: 692 to 724)
Unit-V: Chapter 14: 14.1 to 14.9(Pg: 1001 to 1050)

SUPPLEMENTARY READINGS:

1. Operation Research", Dr.S.J.Venkatesan, [2012], Sri Krishna Publications, Chennai.
2. Taha H. A.[2003], "Operations Research" , Macmillan Publishing Company, New York
3. J. K. Sharma, [2001], "Operations Research Theory and Applications", Macmillan, Delhi
4. P.R. Vittal [2003], "Operations Research" , Margham Publications, Chennai.

Outcome Mapping

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**2**	**3**	**2**	**2**
CO2	**1**	**2**	**2**	**3**	**1**
CO3	**3**	**3**	**3**	**2**	**2**
CO4	**1**	**2**	**3**	**2**	**2**
CO5	**1**	**3**	**3**	**3**	**1**

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:II	**SKILL ENHANCEMENT COURSE-II(NME)**	**CREDIT:2**
PART: IV	**23UBCAN26 : MULTIMEDIA SYSTEMS**	**HOURS:2**

COURSE OBJECTIVES

1. Understand the definition of Multimedia
2. To study about the Image File Formats, SoundsAudio File Formats
3. Understand the concepts of Animation and Digital Video Containers
4. To study about the Stage of Multimedia Project
5. Understand the concept of Ownership of Content Created for Project Acquiring Talent

UNIT I : Multimedia Definition **Hours:6**

Use Of Multimedia-Delivering Multimedia- Text:About Fonts and Faces - Using Text in Multimedia -Computers and Text Font Editing and DesignTools-HypermediaandHypertext.

UNIT II:Images **Hours:6**

Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound -DigitalAudio-MidiAudio-Midivs.DigitalAudio-MultimediaSystemSoundsAudio File Formats - Vaughan's Law of Multimedia Minimums - Adding SoundtoMultimediaProject.

UNIT III:Animation **Hours:6**

The Power of Motion-Principles of Animation-Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays-DigitalVideoContainers-ObtainingVideo Clips -ShootingandEditingVideo

UNIT IV:Making Multimedia **Hours:6**

The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-MultimediaProductionTeam.

UNIT V:PlanningandCosting **Hours:6**

TheProcessofMakingMultimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content andTalent:AcquiringContent-OwnershipofContentCreatedforProject-AcquiringTalent

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1.understand the concepts, importance, application and the process of developing multimedia

2.to have basic knowledge and understanding about image related processings

3.To understand the framework of frames and bit images to animations

4.Speaks about the multimedia projects and stages of requirement in phases of project.

5.Understanding the concept of cost involved in multimedia planning, designing, and producing

Text Books (In API Style)

1.TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001. “

Supplementary Readings

1.RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applications",PearsonEducation,2012

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	3	3	2	1
CO 2	3	2	3	3	2	1
CO 3	3	2	3	3	2	1
CO 4	3	2	3	3	1	1
CO 5	3	3	3	3	1	1
Weightage of course contributed to each PSO	15	11	15	15	8	5

S-Strong-3 M-Medium-2 L-Low-1