THIRUVALLUVAR UNIVERSITY

SERKKADU, VELLORE–632115

B.Sc. STATISTICS

SEMESTER - II

SYLLABUS

FROM THE ACADEMIC YEAR

2023 – 2024

S.No.	Part	Study Components Course Title		Ins. Hrs /week	Credit	Title of the Paper	Maximum Marks		
SEMESTER II							**CIA**	**Uni. Exam**	**Total**
1.	I	Language	Paper-2	6	3	Tamil/Other Languages	25	75	100
2.	II	English	Paper-2	4	3	English	25	75	100
3.	II	NMSDC: Language Proficiency for Employability	Paper-1	2	2	Overview of English Communication	25	75	100
4.	III	Core Course –CC III	Paper-2	4	4	Matrix and Linear Algebra	25	75	100
5.	III	Core Course –CC IV	Paper -3	4	4	Distribution Theory	25	75	100
6.	III	Core Course	Practical	2	2	Practical – I Data Analysis Using MS – Excel	25	75	100
7.	III	Elective II Generic/ Discipline Specific	Elective II	6	3	Real Analysis	25	75	100
8.	IV	Skill Enhancement Course SEC-2	Paper2	2	2	Basic Computers(MS Excel)	25	75	100
9.	IV	Skill Enhancement Course SEC-3 (Discipline Specific)	Paper 1	2	2	Quantitative Aptitude	25	75	100
		Sem. Total		**32**	**25**		**225**	**675**	**900**

SEMESTER-II

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">Matrix and Linear Algebra</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">Core III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">--</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">Basic vector and matrix theory</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">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
3. To learn the invariance properties of ranks
4. To know and to apply the concepts of vector space and matrix polynomials.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">Unit I Matrices-Transpose-Conjugate transpose- Reversal law for the transpose and conjugate transpose. Ad joint of a matrix, Inverse of a matrix, Singular and Non -Singular matrices,</td></tr>
<tr><td colspan="8">Unit II Reversal law for the inverse of product of two matrices. Commutatively of inverse and transpose of matrix, Commutatively of inverse and conjugate transpose of matrix.</td></tr>
<tr><td colspan="8">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.</td></tr>
<tr><td colspan="8">Unit-IV Vector space – Linear Dependence - Basis of a vector space –Sub-space- Properties of Linearly Independent and dependent system, Row and Column spaces, Equality of Row and Column ranks, Rank of Sum and Product of matrices</td></tr>
<tr><td colspan="8">Unit-V Matrix polynomials, Characteristic roots and vectors, Relation between characteristic roots and characteristic vectors, Algebraic and Geometric multiplicity, Clayey- Hamilton theorem.</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="8">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">1. Vasishtha.A.R (1972) : Matrices, KrishnaprakashanMandir, Meerut.</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="8">1. Shanthinarayan, (2012) : A Text Book of Matrices, S.Chand& Co, New Delhi
2. M.L.Khanna (2009), Matrices, Jai PrakashNath& Co</td></tr>
</table>

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/

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

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	M	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	M	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weight age	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">Distribution Theory</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">Core IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">--</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">Calculus</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">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</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">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.</td></tr>
<tr><td colspan="7">Unit II Geometric distribution – lack of memory, moments, m.g.f.- Hyper geometric distribution – mean, variance, approximation to Binomial, recurrence relation – Multinomial distribution – m.g.f., mean and variance.</td></tr>
<tr><td colspan="7">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 -Importance of Normal Distribution.</td></tr>
<tr><td colspan="7">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.</td></tr>
<tr><td colspan="7">Unit-V Functions of Normal random variables leading to t, Chi-square and F-distributions (derivations, properties and interrelationship)</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="7">Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
</table>

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. 4.
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.

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

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	M	M	S	M
CLO4	S	S	S	M	S	S	S	M	M
CLO5	S	M	M	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

LO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weight age	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">Real Analysis</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">Elective – II (Discipline specific)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2"></td></tr>
<tr><td>Semester</td><td>II</td></tr>
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<tr><td colspan="2">4</td><td colspan="2">-</td><td>--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Number theory and Arithmetic</td></tr>
<tr><td colspan="2">Objectives of theCourse</td><td colspan="6">The main objectives of this course are:
1. To study the basic operations of sets and functions
2. To know the structure of the real sequence and its convergence
3. To learn series and its convergence
4. To learn the limits, continuity and derivative of real valued functions
5. To know and to apply the Riemann integration</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">Unit I
Operations on sets, Functions, Real valued functions, Equivalence, Countability, Real Numbers, Cantor set, Least Upper Bounds, Greatest Lower Bound.</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit II Definition of Sequence, Subsequence, Limit of a sequence, Convergent and Divergent sequences, Oscillating sequence, Bounded and Monotone sequences, Operations on convergent sequences, Limit Infimum, Limit Supremum.</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit III Definition of Series, Convergent and Divergent series, series with nonnegative terms, alternating series, conditional convergence, absolute convergences and test for absolute convergence</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit-IV Limit of a function on the real line, Increasing and Decreasing functions, Continuous function, Derivatives, Derivative and continuity, Rolle’s Theorem, Mean value theorem, Taylor’s theorem</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit-V Concept of Riemann Integral, Upper and Lower sums, Upper integral and Lower Integral Riemann integrability, Necessary and Sufficient condition for Riemann integrable, Properties of Riemann integrals, Fundamental theorem</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved
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	2. Walter Rudin (2017), Principles of Mathematical Analysis, 3rd Edition, McGraw-Hill
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject https://tutorial.math.lamar.edu/classes/calci/thelimit.aspx https://www.mathsisfun.com/calculus/derivatives-introduction.html https://www.math.ucdavis.edu/~hunter/m125b/ch1.pdf https://math.hmc.edu/calculus/hmc-mathematics-calculus-online-tutorials/single-variable-calculus/taylors-theorem/ http://www.ms.uky.edu/~droyster/courses/fall06/PDFs/Chapter06.pdf

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 do basic operations of sets and understand set functions
CLO-2 understand sequence and its convergence
CLO-3 understand series and its convergence
CLO-4 identify real valued functions and its discontinuity
CLO-5 understand integration concepts
CLO-6 understand probability functions as set functions and get knowledge on discrete and continuous nature of it

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	S	S	M
CLO2	S	S	S	S	M	S	S	S	M
CLO3	S	S	S	M	S	M	S	S	M
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weight age	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Title of the Course		(Data Analysis Using MS – Excel)					
Paper Number		CORE PARACTICAL-1					
Category	Core	Year	I	Credits	2	Course Code	
		Semester	II				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		-	-	2	2		

Objectives:

1. To enable the students to gain computer practical knowledge about the concepts of statistics.
2. To apply the measures of descriptive statistics and probability in real life situations using MSexcel
3. To provide practical knowledge in random variables, probability distributions, expectation,moment generating function, matrices, Rank of matrices.

Practical Exercises:

1. Computation of Measures of Central Tendency for discrete data using MS Excel (Mean,Median, Mode, Geometric Mean, Harmonic Mean)
2. Computation of Measures of Central Tendency for Continuous data using MS Excel (Mean,Median, Mode, Geometric Mean, Harmonic Mean)
3. Computation of Measures of dispersion for discrete data using MS Excel ()
4. Computation of Measures of dispersion for Continuous data using MS Excel ()
5. Graphical Presentation of data (Histogram, Frequency Polygon, Ogives) Using MS Excel.
6. Computation of Co-efficient of Skewness and Kurtosis – Karl Pearson's and Bowley's datausing MS Excel
7. Fitting of Binomial distribution – Direct Method using MS Excel.
8. Fitting of Poisson distribution – Direct Method using MS Excel.
9. Fitting of Exponential distribution – Direct Method using MS Excel.
10. Problems based on univariate probability distributions.
11. Problems based on probability.
12. Calculating Inverse matrix in Excel.
13. Calculating Transpose matrix in Excel.
14. Calculating Rank matrix in Excel.

Note:

Question Paper Setting:

5 questions are to be set without omitting any unit. All questions carry equal marks.Any 3 questions are to be answered in 3 hours duration out of 5.

SEMESTER II

SEC- 2: MS EXCEL

Hours/Week: 2 **Credits: 2**

Unit I

Introduction to MS Excel - Introduction, Navigating MS Excel, Cells, Rows, and Columns, Formulas, Sheet Tabs, Page Margins, Page Orientation, Page Breaks and Printing. Worksheets and Workbooks: Definition of Worksheets and Workbooks, Naming of Worksheets, Adding and Deleting Worksheets, Hiding/ Un hiding Worksheets, Hiding Columns and Rows, Saving Workbooks, Saving an Existing File, Headers and Footers, Inserting, Deleting, copy and Renaming of Worksheets.

Unit II

Entering & Editing Information - Entering Data, Labels and Values, Copying Cells, Rows and Columns, Pasting Cells, Rows, and Columns, Paste an Item from the Clipboard, Inserting and Deleting Rows and Columns, Filling and Editing Cell Data, Find and Replace, Go to Cell Data, Locking Rows and Columns, Spell Check, AutoCorrect.

Unit III

Formatting & Adding Elements to a Worksheet - Change Font Styles and Sizes, Adding Borders and Colours to Cells, change a Column Width and Row Height, Merge Cells, Applying Number Formats, Creating Custom Number Formats, Align Cell Contents, Cell Styles, Conditional Formatting, Freeze and Unfreeze Rows and Columns, Adding and Modifying Images, Removing A Background, Cropping and Rotating an image, compressing a Picture, Inserting AutoShapes, Adding WordArt, Clip Art, and a Hyperlink.

Unit IV

Advance Excel - What if Analysis – Goal Seek, Scenario Analysis, Data Tables, Solver Tool, Logical Function – if, nested if. Lookup Functions – Vlookup / HLookup, Index and Match, User Interface using Lookup, Nested VLookup. Pivot Tables.

Data Visualization – Charts Elements, Customizing Layouts & Styles, Formatting Chart Elements, Bar and Columns Chart, Histogram and Pareto Charts, Line Charts and Trendlines, Pie and Donut Charts,

Scatter Plots, Bubble Charts, Box and Whisker Charts in Excel.

Unit V

MS Excel using the Data Analysis TookPak - Descriptive Statistics in Excel - Central Tendency (Mean, Median, Mode), Variability (Standard Deviation, Variance, Range).

Inferential Statistics - t tests (Independent t and Dependent t), Analysis of Variance (ANOVA), Post Hoc Tests, Correlation, Simple and Multiple Regression.

BOOKS FOR REFERENCE

1. Beverly Dretzke, Statistics with Microsoft Excel Fourth Edition
2. Neil J.Salkind, Excel Statistics
3. Larry Pace, The Excel Data and Statistics Cookbook, Third Edition
4. **Kumar Bittu, Microsoft Office 2010**
5. Frag Curtis, Step by Step Microsoft Excel 2013
6. John Walkenbach, 101 Excel 2013 Tips, Tricks and Time severs
7. Salkind Neil J, Statistics for people who (Think They) Hate Statistics, Using MS- Excel

SEMESTER: II PART: IV	SEC-3 **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*