MARUDHAR KESARI JAIN COLLEGE FOR WOMEN (AUTONOMOUS)

VANIYAMBADI–635 751

Department of Statistics

For

Undergraduate Programme

Bachelor of Science in Statistics

From the Academic Year 2024 – 25

Semester-III						
24UFTA31	Tamil-3	4	1	0	0	3
24UFEN31	English-3	4	1	0	0	3
24USTC31	CC–5–Distribution Theory	3	2	1	0	5
24USTC32P	CC-6(Practical)- Statistical Practical-IV	0	0	4	0	2
24UMAA35 24UCSA32	EC-4AL-1.Numerical Methods 2.Programming in C	2	1	1	0	4
24UMAA35P 24UCSA32P	EC-5 AL (Practical)- 1.Numerical Methods . 2. Programming in C	0	0	2	0	2
24USTS31	SEC -4 R Programming	1	0	1	0	2
24UAEC31	AEC–2 HUMAN VALUES AND PROFESSIONAL ETHICS	1	1	0	0	2
					30	**23**

Semester-IV						
24UFTA41	Tamil-4	4	1	0	0	3
24UFEN41	English-4	4	1	0	0	3
24USTC41	CC–7 Sampling Theory	3	1	2	0	5
24USTC42P	CC-8 (Practical)- Statistical Practical-V	0	0	4	0	2
24USTA41 24USTA42	EC-6 AL-1.Python Programming 2. Programming in C++	2	1	1	0	4
24USTA41P 24USTA42P	EC-7 AL (Practical)- 1.Python Programming 2. Programming in C++	0	0	2	0	2
24USTS41	SEC–5 Data Mining	1	0	1	0	2
24UAEC41	AEC–3 ENVIRONMENTAL STUDIES	1	1	0	0	2
					30	**23**

Studentsmustcompleteatleastoneonlinecourse(MOOC)fromplatformslikeSWAYAM,NPTEL,orNanmudalvanwithinthefifth semester.Additionally,engaginginaspecifiedSelf-learningCourseismandatorytoqualifyforthedegree,andsuccessful participation will beacknowledgedwithanextracreditof2*.

Part–1 & 2	Tamil & English	4	SEC	Skill Elective Course	5
CC	Core Course	15	FC	Foundation Course	1
EC-AL	Elective Course– Applied	7	AEC	Ability Enhancement Course	4
EC	Elective Course-Major	4	SLC	Self-Learning Course	1

II YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24USTC31	Distribution Theory	Core Course-5	3	2	1	0	5	6	25	75	100

Learning Objectives	
LO1	To understand the fundamental concept of probability distribution, including its types, properties, and how it is used to model random variables
LO2	To apply the essential properties of discrete distribution
LO3	To evaluate normal distribution and its characteristics, such as symmetry, mean, and the empirical rule
LO4	To explore the uniform and exponential distribution
LO5	To evaluate the concept of Gamma distribution & Beta distribution including its properties.

Unit	Content	Hours
1	Introduction to Probability distribution-Bernoulli distribution-Binomial distribution – moments-moment generating function-characteristic function-Additive properties of Binomial Distribution -cumulants -Simple Problems. Poisson distribution – moments-moment generating function-characteristic function- Additive properties of Poisson distribution –cumulants-Simple Problems	18
2	Negative binomial distribution – moment generating function-Cumulants. Geometric distribution – lack of memory-moments-moment generating function - Hyper geometric distribution – mean and variance of the Hyper geometric distribution– Multinomial distribution –mean and variance.	18
3	Normal Distribution – chief characteristics of the normal distribution-median-mode –Moments-moment generating function-Cumulants -points of inflexion,Area property -Importance of Normal Distribution. Simple Problems.	18
4	Exponential distribution – moment generating function- characteristic function, memory less property –Rectangular Or Uniform Distribution-Moments- Moment Generating function- Characteristics function-Simple Problems	18
5	Gamma distribution – moment generating function and cumulants and central moments-Additive property of Gamma distribution (reproductive property) – Beta distribution – First kind and second kind – constants.	18
Total		90

Theory-80% Problem-20%

CO	Course Outcomes **The student will be able to**
CO1	Apply the fundamental concept of probability distributions, identify and differentiate between various types Probability distribution.
CO2	Analyze the nature of various probability distributions, including geometric and hyper geometric distributions, to solve real-world problems.
CO3	Derive the properties of Normal distribution in continuous probability distribution
CO4	Apply Exponential & Uniform distribution and its characteristics
CO5	Analyze the Gamma and Beta distributions including their properties
Textbooks:	
1	Gupta S.C.and Kapoor V.K(2015):Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
2	A.M.Goon,M.K.Gupta &B.Dasgupta(1980):An outline of Statistical theory,Vol.I,6th revised, World Press.
Reference Books:	
1	Hogg.R.V.and Craig.A.T.(1978):Introduction to Mathematical Statistics, 6th Mc Graw Hill Publishing Co.Inc.NewYork
2	Hogg.R.V.and Craig.A.T.(1978):*I* Introduction to Mathematical Statistics 7th Mc Graw Hill Publishing Co.Inc.NewYork.
3	Rohatgi,V.K.(1984):An Introduction to Probability Theory and Mathematical Statistics,2nd Edition
Web resources:	
1	https://www.geeksforgeeks.org/discrete-probability-distribution
2	https://www.knime.com/blog/continuous-probability-distribution
3	https://www.scribbr.com/statistics/probability-distributions

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	2	3	3	3	3
CO2	3	3	3	2	2	2	2	2	3	2	2
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	3	3	3	2	3	2	2	2	3	3	2
CO5	3	3	3	2	3	2	2	2	3	3	3
Total	15	15	15	10	14	12	10	12	15	14	13
Average	3	3	3	2	2.8	2.4	2	2.4	3	2.8	2.6

3 – Strong, 2- Medium, 1- Low

II YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24USTC32P	Statistical Practical-IV	Core Practical-6	0	0	4	0	2	4	25	75	100

Learning Objectives	
LO1	To understand and apply Probability distribution and its concept.
LO2	To fit the various distribution model in discrete distribution.
LO3	To gain practical knowledge of Normal distribution.
LO4	To understand practical knowledge in exponential and beta distribution
LO5	To apply Gamma and Beta distribution and its concepts.

	Content	Hours
	1. Binomial distribution 2. Fitting a Binomial distribution 3. Poisson Distribution 4. Fitting a Poisson Distribution 5. Normal distribution 6. Fitting a Normal distribution 7. Exponential distribution 8. Uniform distribution 9. Gamma Distribution 10. Beta distribution of First kind & Second kind	60
Total		60
Problems-100%		

CO	Course Outcomes The student will be able to
CO1	Understand and analyze discrete probability distributions, and to compute the mean and variance to make informed decisions based on probabilistic models.
CO2	Apply continuous probability distributions, and to calculate their mean and variance in order to analyze and interpret real-world data and make informed decisions.
CO3	Create the practical applications of the χ^2 (chi-square) statistic in real-life problems, such as testing hypotheses, analyzing categorical data, and evaluating the goodness of fit in various fields like market research, medicine, and social sciences.
CO4	Apply the concepts of Uniform and Exponential distributions to model real-life phenomena
CO5	Analyze the nature and applications of distributions such as the Gamma and Beta distributions, understanding their characteristics, and applying them to model various real-life situations
Textbooks:	
1	Gupta S.C.and Kapoor V.K(2015):Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
2	A.M.Goon,M.K.Gupta &B.Dasgupta(1980):An outline of Statistical theory,Vol.I,6th revised,WorldPress.
Reference Books:	
1	Hogg.R.V.and Craig.A.T.(1978):Introduction to Mathematical Statistics, 6th Mc Graw Hill Publishing Co.Inc. NewYork.
2	Hogg.R.V.and Craig.A.T.(1978):*I* Introduction to Mathematical Statistics 7th Mc Graw Hill Publishing Co.Inc.NewYork.
3	Rohatgi,V.K.(1984):An Introduction to Probability Theory and Mathematical Statistics,2nd Edition

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	2	3	3	3	3
CO2	3	3	3	2	2	2	2	2	3	2	2
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	3	3	3	2	3	2	2	2	3	3	2
CO5	3	3	3	2	3	2	2	2	3	3	3
Total	15	15	15	10	14	12	10	12	15	14	13
Average	3	3	3	2	2.8	2.4	2	2.4	3	2.8	2.6

3 – Strong, 2- Medium, 1- Low

II YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAA35	Numerical Methods	Elective Course -4	2	1	1	0	4	4	25	75	100

Learning Objectives	
LO1	To develop Solution of Numerical Algebraic and Transcendental Equations.
LO2	To introduce the study of Simultaneous Linear Algebraic Equations and Finite differences.
LO3	To acquire the knowledge on central difference interpolation formula for Equal intervals.
LO4	To analyze applications on Newton's divided difference formula and Lagrange's interpolation Formula
LO5	To evaluate derivatives using Newton's forward and backward differences formulae and numerical integration.

Unit	Content	Hours
1	**The Solution of Numerical Algebraic and Transcendental Equations** Iteration Method, Regular Falsi Method, Newton–Raphson Method. **Chapter 1: Sections 1.2 to 1.4**	12
2	**Solution of Simultaneous Linear Algebraic Equations** Gauss – Elimination Method, Gauss–Jordan Method, Gauss –Jacobi Method. **Finite Differences:** Operators**, Interpolation for Equal intervals:** Newton's Forward Interpolation Formula and Newton's Backward Interpolation Formula. **Chapter: Sections 2.1 to 2.2,2.5,** **Chapter 3: Sections 3.1** **Chapter 4: Sections 4.1,4.2,4.3**	12
3	**Central Difference Interpolation Formula for Equal Intervals** Gauss Forward Interpolation Formula, Gauss Backward Interpolation Formula, Sterling's Formula. **Chapter5: Sections 5.1 to5.5**	12
4	**Interpolation with Unequal Intervals** Divided Differences, Newton's Divided Differences Interpolation Formula, Lagrange's Interpolation Formula and Inverse Lagrange's Interpolation. **Chapter6:Sections 6.1,6.2,6.5& 6.7**	12
5	**Numerical Differentiation** Numerical Differentiation based on Newton's Forward and Backward Interpolation Formula. **Numerical Integration:** General Quadrature formula for equidistant ordinates, Trapezoidal Rule, Simpson's 1/3rd Rule, Simpson's 3/8th Rule. **Chapter 7: Sections 7.1 to 7.3,7.7 to 7.9,7.13 to 7.14**	12
	Total	**60**

Theory-80% Problem-20%

CO	Course Outcomes The student will be able to
CO1	Compute derivatives on Numerical Algebraic and Transcendental Equations
CO2	Find Solutions of Simultaneous Linear Algebraic Equations and Interpolation.
CO3	Understand the need of interpolation
CO4	Work on numerical methods to approximate derivatives by applying Newton's forward and backward differences formulae.
CO5	Get Knowledge of advanced numerical differentiation and numerical integration techniques
Textbooks:	
1	P.Kandasamy and K.Thilagavathy, Calculus of Finite differences & Numerical Analysis, S. Chand & Company Ltd., New Delhi, 2003.
Reference Books:	
1	H.C.Saxena, Finite differences and Numerical analysisS.Chand&Co.,Delhi,1991.
2	M.K.Venkataraman, Numerical methods for Science and Engineering National Publishing Company,Chennai,1992.
3	T.K.Manicavachagom Pillay and Narayanan, Numerical Analysis, Viswanathan (Printers /Publishers) Pvt.Ltd, 1994.
4	Dr.B.S.W.Goel, Numerical Analysis, Chand off set Printer, Chennai
5	B.D.Gupta, Numerical Analysis, Konark Pub.Ltd,Delhi,2001.
Web resources:	
1	https://ocw.mit.edu/courses/22-15-essential-numerical-methods-fall-2014/pages/syllabus//
2	https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2004//

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	2	3	2	3	3	3	3
CO5	3	2	2	2	3	2	3	3	3	3	3
Total	15	14	14	14	14	14	14	15	15	15	15
Average	3.0	2.8	2.8	2.8	2.8	2.8	2.8	3.0	3.0	3.0	3.0

3–Strong, 2-Medium, 1-Low

II YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAA35P	Practical - Numerical Methods	Elective Practical 5	0	0	2	0	2	2	25	75	100

Learning Objectives	
LO1	To learn Newton–Raphson Method, Gauss Elimination Methods and Gauss–Jacobi Method.
LO2	To work on Newton's Forward Interpolation Formula and Backward Interpolation Formula
LO3	To analyze Lagrange's Interpolation, Newtons Forward Formula for Derivatives.
LO4	To understand Trapezoidal Rule.
LO5	To understand Simpson's 1/3rd Ruleand Simpson's 3/8th Rule.

	Content	Hours
	1. Newton–Raphson Method. 2. Gauss Elimination Methods. 3. Gauss–Jacobi Method. 4. Newton's Forward Interpolation Formula. 5. Newton's Backward Interpolation Formula. 6. Lagrange's Interpolation. 7. Newtons ForwardF ormula for Derivatives. 8. Trapezoidal Rule. 9. Simpson's1/3rdRule. 10. Simpson's3/8thRule.	30
	Total	30
	Problem 100%	

CO	Course Outcomes The student will be able to
CO1	Find the roots of Newton–Raphson Method, Gauss Elimination and Gauss–Jacobi Method
CO2	Interpolate methods and understand methods.
CO3	Calculate Lagrange's Interpolation, Newtons Forward Formula for Derivatives.
CO4	Understand the method and applying to approximate area and evaluating its accuracy.
CO5	Work on problems in Simpson's1/3rdRuleand3/8thRule.
Textbooks:	
1	P.Kandasamy and K.Thilagavathy, Calculus of Finite differences & Numerical Analysis, S.Chand&Company Ltd., New Delhi, 2003
Reference Books:	
1	H.C. Saxena, Finite differences and Numerical analysis S. Chand & Co., Delhi, 1991.
2	M.K. Venkataraman, Numerical methods for Science and Engineering National Publishing Company,Chennai, 1992
3	T.K. Manicavachagom Pillay and Narayanan, Numerical Analysis, Viswanathan (Printers /Publishers) Pvt. Ltd, 1994.
4	Dr. B.S.W. Goel, Numerical Analysis, Chand offset Printer, Chennai
5	B.D .Gupta ,Numerical Analysis, Konark Pub.Ltd, Delhi, 2001.
Website and e-learning source	
1	https://ocw.mit.edu/courses/22-15-essential-numerical-methods-fall-2014/pages/syllabus/
2	https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2004/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	2	3	2	3	3	3	3
CO5	3	2	2	2	3	2	3	3	3	3	3
Total	15	14	14	14	14	14	14	15	15	15	15
Average	3.0	2.8	2.8	2.8	2.8	2.8	2.8	3.0	3.0	3.0	3.0

3 – Strong, 2- Medium, 1- Low

II YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCSA32	Programming in C	Elective Course - 4	2	1	1	0	4	4	25	75	100

Learning Objectives	
LO1	To understand Programming basics and the fundamentals of C.
LO2	To apply Data types in C, Mathematical and logical operations, Using control statement and loops
LO3	To analyze Arranging data in arrays with algorithm
LO4	To explore Learning the functions parameters Implementing
LO5	To apply Pointers and file operations

Unit	Content	Hours
1	Introduction to Programming: Introduction to computers, Computer characteristics, Hardware vs software, Steps to develop a program, Software development life cycle, Structured programming, Types of programming languages, Introduction to c, Developing a c program, Console input and output functions, Error diagnostics, Debugging techniques	12
2	Operators and Expressions: Identifiers and keywords, Data types, Constants, Variables, Declarations, Expressions, Statements, Arithmetic operators, Unary operators, Relational and logical operators, Assignment operators, Conditional operator Branching, if- else statement, which statement, go to statement, Looping, while statement, do- while statement, for statement, Nested control structures, break statement, continue statement.	12
3	Arrays and Strings: Defining an array, Processing an array, Multidimensional arrays, Searching algorithm, Linear search, Sorting algorithm, Bubble sort algorithm, Strings, Defining a string, Initialization of strings, Reading and writing a string, Processing the strings.	12
4	Functions: Functions, Overview, Defining a function, Accessing a function, Function prototypes, Passing arguments to a function, Passing arrays to functions, Recursion. Pointers and Structures: Fundamentals, Pointer declarations, Passing pointers to functions, Structure & Union	12
5	File system : Types of file, working with files, File Handling, file operation, Sequential and Random Access Files. Standard I/O Functions: fscanf(), fprintf(), fgets(), fputs(), Command Line Arguments.	12
Total		60

Theory 80% Problem 20%

CO	Course Outcomes The student will be able to
CO1	Understand basic Structure of the C-Programming, declaration and usage of variable
CO2	Develop conditional and iterative statements to write C programs
CO3	Implement arrays and strings in your C program.
CO4	Apply code reusability with functions
CO5	Programs that use Pointers to access arrays, strings and functions.
Textbooks:	
1	Byron Gottfried, "Schaum's Outline of Programming with C", 3rd edition, 2016, McGraw Hill Education (India), ISBN: 9780070145900
2	Let Us C: Authentic guide to C programming language - 19th Edition – 15 December 2022 by Yashavant Kanetkar
3	A Textbook of Basics of C Programming – 2020 - Vikash Kumar Gupta, ISBN: 978-93-87394-89-6
4	Programming in C KTU [EST 102] Paperback – 26 April 2022 by Vijitha RobinsonKailas SreeChandran
Reference Books:	
1	C Programming Books for Beginners and Advanced By jasdeepbhatia| December 26, 2023
2	C Programming Language, 2nd Edition by Brian W. Kernighan, Dennis Ritchie Released 1988
3	Programming in C ,Stephen G. Kochan, Third Edition
Web resources:	
1	www.w3schools.com/
2	www.javatpoint.com/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	2	3	3	2	2	3	3
CO3	3	2	3	3	3	3	3	3	3	2	2
CO4	3	3	3	3	2	3	3	2	2	3	3
CO5	3	2	3	3	3	3	3	3	3	2	2
Total	15	12	15	15	13	15	15	13	13	12	12
Average	3	2.4	3	3	2.6	3	3	2.6	2.6	2.4	2.4

3–Strong, 2-Medium, 1-Low

II YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCSA32P	Practical-Programming in C	Elective Practical-5	0	0	2	0	2	2	25	75	100

Learning Objectives	
LO1	To introduce students to the basic knowledge of programming fundamentals of C language
LO2	To impart writing skill of C programming to the students and solving problems.
LO3	To impart the concepts like looping, array, functions, pointers, file, structure
LO4	To impart the concepts like looping, array, functions, pointers, file, structure
LO5	To impart the concepts like looping, array, functions, pointers, file, structure

	Content	Hours
	1. Write a Program to calculate and display the volume of a CUBE having its height (h=10cm), width (w=12cm) and depth (8cm). 2. Write a program to take input of name, roll no and marks obtained by a student in 4 subjects of 100 marks each and display the name, roll no with percentage score secured. 3. Write a Program to perform the arithmetic expression using switch statement. 4. Write a program to generate all prime numbers up to nth number. 5. Program to print product of two matrices. 6. Program to concatenate two strings without using library functions. 7. Program to find factorial of a given number using function. 8. Find Square Root, numerical differentiation, numerical integration using functions and recursion. 9. Program to print the elements of array using pointers. 10. Implementation of Text Processing using Strings	30
Total		**30**
Problem 100%		

CO	Course Outcomes **The student will be able to**
CO1	Understand the logic for a given problem. Write the algorithm of a given problem.
CO2	Recognize and understand the syntax and construction of C programming code.
CO3	Learn the methods of iteration or looping and branching
CO4	Make use of different data-structures like arrays, pointers, structures and files
CO5	Write programs to printout put on the screen as well as in the files.
Textbooks:	
1	Byron Gottfried, "Schaum's Outline of Programming with C",3rd edition, 2016, Mc Graw Hill Education (India), ISBN:9780070145900
2	Let Us C:Authentic guide to C programming language-19th Edition–15 December 2022 by Yashavant Kanetkar
3	A Textbook of Basics of C Programming – 2020 -Vikash Kumar Gupta, ISBN: 978-93-87394-89-6
4	Programming in CKTU [EST102] Paperback–26 April 2022 by Vijitha Robinson(Kailas Sree Chandran
5	ByronGottfried,"Schaum's Outline of Programming with C",3rd edition,2016,Mc Graw Hill Education (India), ISBN:9780070145900
Reference Books:	
1	C Programming Books for Beginners and Advanced By jasdeepbhatia | December26,2023
2	C Programming Language, 2nd Edition by Brian W. Kernighan, Dennis Ritchie Released March 1988
3	Programming in C, Stephen G.Kochan, Third Edition
Web resources:	
1	https://www.w3schools.com/
2	https://www.tpointtech.com/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	2	3	3	2	2	3	3
CO3	3	2	3	3	3	3	3	3	3	2	2
CO4	3	3	3	3	2	3	3	2	2	3	3
CO5	3	2	3	3	3	3	3	3	3	2	2
Total	15	12	15	15	13	15	15	13	13	12	12
Average	3	2.4	3	3	2.6	3	3	2.6	2.6	2.4	2.4

3 – Strong, 2- Medium, 1- Low

II YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24USTS31	R Programming		1	0	1	0	2	2	25	75	100

Learning Objectives	
LO1	To learn the fundamental concepts of 'R' using R Gui and R Studio
LO2	To understand the special data structures of R language Character Vector, Array, Matrix and List
LO3	To provide knowledge for various control structures
LO4	To provide knowledge in Data types and packages
LO5	To understand about graphical analysis pie and bar charts

Unit	Content	Hours
1	Introduction: History of R- Benefits of Using R – Working with code Editor: RGui and R Studio - Starting your First R Session - Sourcing a script - Navigating the workspace- Vectors: Creating vectors- combing vectors repeating vector - Getting values in and out of vectors- working with logical vectors	6
2	Using character vector for text data - Manipulating text - Factoring in Factors - Naming matrix rows and columns - Calculating with matrices- Creating an array- Creating a list Creating a list - Extracting elements from lists - Changing elements in lists	6
3	Control Structures: Conditional control structures: if statement - if..else statement - switch statement - Loops: for, while and repeat loops - break and next statement. Functions: The Function Keyword - Arguments - Return Values- Computing basic statistics: mean, median, mode, correlation and covariance.	6
4	Getting data into and out of R: Working with other data types - Getting your data out of R - Working with Files and Folders. Packages: Finding packages, installing packages, loading packages, updating package and unloading packages.	6
5	Introduction to Graphical Analysis: Box-Whiskers plots - Scatter plots - Pairs plots - Line charts - Pie charts - Bar charts: single category bar chats and multiple category bar charts.	6
	Total	**30**

	Theory-100%

Course Outcomes	
CO	**The student will be able to**
CO1	Understand the basics of R programming
CO2	Work with vectors and matrices
CO3	Acquire the knowledge of various control structures
CO4	Parse data files using built-in functions
CO5	Apply the various statistical functions and produce high quality graphics
Text books:	
1	Andrie Devries And Jorismeys , "R Programming For Dummies", Wiley Publications, Isbn:978-81-265-5201-6. (Unit 1 : chapter-2,3,4) (Unit 4: chapter 12,14) (Unit 2 chapter 5,6,7)
2	Tilman M .Davis “The Book of R”, No Starch Press, 2016 (Unit 3: chapter 10,11,3)
3	Paul Teetor, "R Cook Book",O'relly Publications, First Edition, 2011, Isbn: 978-0-596-80915-7 (Unit 5: Chapter 10)
4	Alex Nordeen, Learn R Programming In 24 Hours: Complete Guide For Beginners, Guru99, 2020.
5	Dr.Mark Gardener, "Beginning R- The Statistical Programming Language", Wiley Publications, Isbn: 978-81-265-4120-1.
Reference Books:	
1	Joseph Adler, "R In Nutshell A Desktop Quick Reference",Isbn:978-0-596- 80170-0
2	Roger D. Peng, "R Programming For Data Science", Leanopub, 2015
3	Matloff, Norman, And Matloff, Norman S, The Art Of R Programming: A Tour Of Statistical Software Design, No Starch Press, 2011
4	Lovelace, Robin, And Gillespie, Colin. Efficient R Programming: A Practical Guide to Smarter Programming, O'reilly Media, 2016.
5	Jeeva Jose, Beginner's Guide For Data Analysis Using R Programming., Khanna Publishing House,2019
Web Resources:	
1	https://www.tutorialspoint.com/r/index.htm
2	https://www.youtube.com/watch?v=_V8eKsto3Ug
3	https://www.youtube.com/watch?v=SYYUBytX1ng

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	3	3	3
CO2	3	3	2	2	2	3	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	2	2	1
CO4	3	2	3	3	3	2	3	3	2	2	2
CO5	3	3	3	2	3	3	3	3	3	3	3
Total	15	14	14	13	14	14	13	15	13	13	12
Average	3	2.8	2.8	2.6	2.8	2.8	2.6	3	2.6	2.6	2.4

3 – Strong, 2- Medium, 1- Low

II YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24USTC41	**Sampling Theory**	**Core**	**3**	**2**	**1**		**5**	**6**	**25**	**75**	**100**

Learning Objectives	
LO1	To introduce the fundamental principles and practices of sample surveys.
LO2	To provide a comprehensive understanding of Simple Random Sampling (SRS) techniques and their statistical properties.
LO3	To learn the principles of stratified Random sampling, related notations, and how to estimate population parameters and their variances.
LO4	To learn how to estimate population parameters using systematic samples and evaluate their sampling variance.
LO5	To know how to select samples with unequal probabilities, understand PPS sampling with and without replacement, and estimate population totals and their variances.

Unit	**Content**	**Hours**
1	Introduction of Sampling-Parametric & Statistic-Basic concepts of sample surveys – Advantages of Sampling –Principal steps in Sample survey, Sampling unit – Sampling frame – Census– Probability Sampling and Non-probability sampling	18
2	Simple random sampling, Methods of selection, Sampling with and Without replacement – Properties of estimates, Variance of the Estimates Finite population correction, Estimation of Standard error, Confidence limits -Simple random sampling with replacement-Qualitative characteristics, Sample size determination for proportions and continuous data.	18
3	Stratified random sampling, principles of stratification, Notations –Estimation of population mean and its variance – Estimated variance and confidence limits, Allocation techniques -equal allocation, proportional allocation, Neymann allocation and optimum allocation, Relative Precision of Stratified random and Simple Random sampling-Estimation of gain due to stratification.	18
4	Systematic sampling –Relation to cluster sampling, Estimation of population mean and its sampling variance – Comparison of systematic Sampling with stratified random samples	18
5	Varying Probability sampling, Selection of one unit with PPS, PPS Sampling with replacement, Estimator for population total and its variance, Selection procedures.	18
	Total	**90**

Theory 80% Problem 20%

CO	Course Outcomes The students will be able to
CO1	Understand the basic concepts of sample surveys and explain their role in statistical data collection and analysis.
CO2	Apply appropriate methods of selecting Simple Random Sampling.
CO3	Understand the principles of stratified random sampling and explain the rationale for stratification in survey design.
CO4	Explain the concept and methodology of Systematic Sampling**,** and how it is implemented in practice.
CO5	Understand the principles of varying probability sampling and its importance in survey methodology.
Text books:	
1	1. Cochran, W.G. (1978) : Sampling Techniques, John Wiley Eastern
2	Singh. D. and Chaudry F.S. (1986) : Theory and Analysis of Sample Surveys Design Wiley Eastern Ltd.
Reference Books:	
1	Gupta S.C. and Kapoor V.K (2007) : Fundamentals of Applied Statistics, Sultan Chand and Sons, New Delhi.
Website and e-Learning Source	
1	http://ocw.jhsph.edu/courses/statmethodsforsamplesurveys/pdfs/ lecture2.pdf
2	https://www.questionpro.com/blog/stratified-random-sampling/
3	https://www.scribbr.com/methodology/systematic-sampling

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	2	3	3	3	3
CO2	3	3	3	3	2	2	2	2	3	2	2
CO3	3	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	2	3	2	2	2	3	3	2
CO5	3	3	3	2	3	2	2	2	3	3	3
Total	15	15	15	12	14	12	10	12	15	14	13
Average	3	3	3	2.4	2.8	2.4	2	2.4	3	2.8	2.6

3 – Strong, 2- Medium, 1- Low

II YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24USTC42P	**Statistical Practical-V**	**Core Practical**	**0**	**0**	**4**	**0**	**2**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To introduce the fundamental concepts and principles of probability sampling methods of simple random Sampling.
LO2	To develop understanding of procedures for drawing samples from a population with and without replacement.
LO3	To explain the estimation of population parameters such as mean, total, and variance using various sampling designs.
LO4	To enable students to analyze and compare the efficiency of different sampling techniques based on their variances and standard errors.
LO5	To provide an understanding of varying probability sampling methods, particularly Probability Proportional to Size (PPS) sampling, and to develop the ability to estimate population totals and their variances using appropriate selection procedures.

	Content	**Hours**
I	**Simple Random sampling** Drawing Sample from the Population with Replacement Drawing Sample from the Population without Replacement. Estimation of Population Mean. Estimation of Total Variance and its Standard Error.	15
II	**Stratified random Sampling** Estimation of Mean Variance of the Population Means Variance of the estimator of Mean under Proportional and Optimal allocations	15
III	**Systematic random sampling** Estimation of Mean and Variance Comparison of Simple Random Sampling, Stratified Random Sampling and Systematic Random Sampling	15
IV	**Varying Probability sampling**, Selection of one unit with PPS, PPS Sampling with replacement, Estimator for population total and its variance, Selection procedures.	15
	Total	**60**
	Practical-100%	

CO	Course Outcomes The Student will able to
CO1	Apply simple random sampling techniques to select samples and estimate population parameters with and without replacement..
CO2	Compute estimates of population mean, total, and variance along with their standard errors under different sampling methods.
CO3	Apply stratified random sampling and evaluate estimators under proportional and optimal allocation schemes.
CO4	Apply systematic random sampling to estimate population mean and variance and assess its relative efficiency.
CO5	Interpret PPS sampling techniques with and without replacement to select representative samples and accurately estimate population totals and their variances.
Text Book	
1	Cochran, W.G. (1978) : Sampling Techniques, John Wiley Eastern
2	Singh. D. and ChaudryF.S. (1986) : Theory and Analysis of Sample Surveys Design Wiley Eastern Ltd.
Reference Book	
1	Gupta S.C. and Kapoor V.K (2007) : Fundamentals of Applied Statistics, Sultan Chand and Sons, New Delhi.

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	2	3	3	3	3
CO2	3	3	3	2	2	2	2	2	3	2	2
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	3	3	3	2	3	2	2	2	3	3	2
CO5	3	3	3	2	3	2	2	2	3	3	3
Total	15	15	15	10	14	12	10	12	15	14	13
Average	3	3	3	2	2.8	2.4	2	2.4	3	2.8	2.6

3 – Strong, 2- Medium, 1- Low

II YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24USTA41	**Python Programming**	**Elective**	**2**	**1**	**1**	**0**	**4**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the concepts of Operators, Expression, Data types and its Operations.
LO2	To Understanding Decision Making, Looping statements and Functions.
LO3	To Identify and use Python's core data types: Numbers, Strings, Lists, Tuples, Sets, and Dictionaries.
LO4	To Construct various types of graphs and diagrams in python
LO5	To compute and interpret descriptive statistical measures—such as central tendency, dispersion, skewness, correlation, and regression—using Python for data analysis.

Unit	Content	Hours
1	**Basics of Python Programming:** History of Python – Features of Python– Literal – Constants – Variables – Identifiers – Keywords – Comments – Indentation – Operators – Expressions - Type conversions.	12
2	**Flow Control:** Decision Making – if Statement – if else statement– if elif else statement – Nested if statement – Loops – for loop – for loop with else statement – while loop– while loop with else statement– Nested loop – Control statements – Function Definition – Function calling– Function Arguments – Anonymous Function – Recursive Function.	12
3	**Modules and Packages:** Built - in Modules – Creating Modules– Import Statement – Locating Modules – Namespaces and Scope– The dir() function – The reload() function – Packages in Python – Data and Time Modules . Data Types and Operations: Numbers – Strings – List – Tuple – Set – Dictionary.	12
4	**Visualizing Data With Graphs:** Understanding the Cartesian Coordinate Plane– Creating Graphs with Matplotlib – Marking Points on your Graphs–Simple bar diagram, Multiple bar diagram, subdivided bar diagram,Pie diagram,Scatter plot, Histogram, Box plot.	12
5	**Descriptive Statistics with Python:** Measures of central Tendency-Finding Mean, Median–Mode and Creating a Frequency Table– Measures of Dispersion, Skewness–Range-quartile-deviation-Standard-deviation-Pearsons skewness– Calculating the correlation and Regression	12

	Total	**60**
	Theory 80% Problem 20%	

CO	**Course Outcomes** The students can able to
CO1	Write simple programs on python using Expression and Data Types.
CO2	Develop program using Control flow statements
CO3	Create and manage reusable Python code through the use of modules and packages.
CO4	Apply Matplotlib tools to create and customize a variety of graphical representations of data.
CO5	To apply Python programming to calculate, visualize, and interpret key descriptive statistics, correlations, and simple regression relationships within real-world datasets.
Textbooks:	
1	Jeeva Jose, "Taming Python by Programming", Revised Edition, Khanna Publishing, 2019.ISBN :978-93-86173-34-8. (Unit - 1 to 3)
2	Amit Saha "Doing Math with Python: Use Programming to Explore Algebra, Statistics, Calculus, and More!" Publisher: William Pollock (Unit - 4 & 5)
Reference Books:	
1	VamsiKurama,"Python Programming:A Modern Approach",Pearson Education.
2	Ashok Kamthaneet.al,Programming and Problem Sovling with Python, 2nd Edition,TMH
3	ReemaThareja, "Python Programming using problem solving approach", First Edition, 2017,Oxford University Press
Web Resources:	
1	https://www.programiz.com/python-programming
2	https://www.guru99.com/python-tutorials.html
3	https://www.youtube.com/watch?v=ev3CPFYOKcc

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	3	2	3	2	2	2	2	3
CO2	3	3	2	3	2	3	2	3	3	3	2
CO3	2	3	2	3	3	2	2	3	3	3	2
CO4	3	2	2	3	3	3	3	3	3	3	3
CO5	3	3	2	3	3	3	2	3	3	3	2
Total	14	14	10	15	13	14	11	14	14	14	12
Average	3	3	2	3	3	3	2.2	3	3	3	2

3 – Strong, 2- Medium, 1- Low

II YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24USTA41P	**Python Programming Lab**	**Elective Practical**	**0**	**0**	**2**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	To Understand and apply Python programming concepts to manipulate various data types such as strings, lists, tuples, sets, and dictionaries.
LO2	To Develop modular and efficient programs using Python operators, expressions, and user-defined functions.
LO3	To i Visualize and interpret data effectively using graphical representations such as line charts, bar charts, pie charts, scatter plots, and other plots with the Matplotlib library.
LO4	To Apply descriptive statistical techniques in Python to compute measures of central tendency, dispersion, and skewness for data analysis.
LO5	To Analyze and model relationships between variables using correlation and regression methods to support data-driven insights and predictions.

	List of Programs	**Hours**
	1. Write a program to explore String 2. Write a program to explore List 3. Write a program to explore Set 4. Write a program to explore Tuple 5. Write a program to explore Dictionaries Functions. 6. Write a program to demonstrate usage Operators 7. Write a program to demonstrate usage Functions 8. Write a program to drawing Line Chart and Bar Chart using Mat plot lib. 9. Write a program to drawing Multiple bar chart using Mat plot lib 10. Write a program to drawing Subdivided bar chart using Mat plot lib 11. Write a program to drawing Pie chart using Mat plot lib 12. Write a program to drawing Pie chart using Mat plot lib 13. Write a program to drawing Scatter using Mat plot lib 14. Write a program to demonstrate Measures of Central Tendancy (Mean. Median & Mode) 15. Write a program to demonstrate Measures of Dispersion (Range,Quartile Deviation, Standard Deviation) 16. Write a program to demonstrate Measures of Skewness 17. Write a program to demonstrate Correlation 18. Write a program to demonstrate Regression	30
	Total	**30**

Problem 100%

CO	Course Outcomes The students will able to
CO1	Apply Python programming concepts to manipulate fundamental data types such as strings, lists, tuples, sets, and dictionaries effectively.
CO2	Demonstrate the use of operators and user-defined functions to develop modular and efficient Python programs.
CO3	Utilize the Matplotlib library to visualize data through various graphical representations including line charts, bar charts, pie charts, scatter plots, and other statistical plots.
CO4	Perform descriptive statistical analysis using Python to compute measures of central tendency, dispersion, and skewness.
CO5	Analyze relationships between variables through correlation and regression techniques, and interpret results for data-driven decision-making.
Textbooks:	
1	Jeeva Jose, "Taming Python by Programming", Revised Edition, Khanna Publishing, 2019.ISBN :978-93-86173-34-8. (Unit - 1 to 3)
2	Amit Saha "Doing Math with Python: Use Programming to Explore Algebra, Statistics, Calculus, and More!" Publisher: William Pollock (Unit - 4 & 5)
Reference Books:	
1	VamsiKurama,"Python Programming:A Modern Approach",Pearson Education.
2	Ashok Kamthaneet.al,Programming and Problem Sovling with Python, 2nd Edition,TMH
Web Resources:	
1	https://www.programiz.com/python-programming
2	https://www.guru99.com/python-tutorials.html
3	https://www.youtube.com/watch?v=ev3CPFYOKcc

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	3	2	2	2	3
CO2	3	3	2	3	2	3	2	3	3	3	2
CO3	2	3	3	3	3	2	3	3	3	3	2
CO4	3	2	2	3	3	3	3	3	3	3	3
CO5	3	3	2	3	3	3	2	3	3	3	2
Total	14	14	12	15	13	14	13	14	14	14	12
Average	3	3	2.4	3	3	3	3	3	3	3	2

3 – Strong, 2- Medium, 1- Low

II YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24USTA42	**Programming in C++**	**Elective**	**2**	**1**	**1**	**0**	**4**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To be able to explain the difference between object-oriented programming and procedural programming.
LO2	To be able to apply object-oriented techniques to solve bigger computing problems.
LO3	To be able to program using C++ features such as composition of objects, operator overloading, inheritance and polymorphism, file I/O, etc.
LO4	To be able to build C++ classes using appropriate encapsulation and design principles.
LO5	To use File Handling and Standard Template Library (STL)

Unit	Content	Hours
1	**Introduction to Object Oriented Programming**-Basic Concepts of OOP, Basic Elements of C++: Tokens, Keywords, Identifiers, Variables, Basic Data Types in C++, Operators in C++.Decision and Control Structures: if Statement, if-else Statement, switch Statement, while, do-while, for.	12
2	**Functions in C++:** The Main Function, Function Prototyping, Call by Reference, Call by Value, Inline Function, Function Overloading- Classes and Objects: Specifying a Class, Defining Member functions, Nesting of Member Functions, Static Data Member and Member Function, Friend Function.	12
3	**Constructors and Destructors**: Constructors, Default Constructor, Parameterized Constructor, Constructor Overloading, Copy Constructor, and Destructor. Operator Overloading: Defining Operator Overloading, Overloading Unary Operators and Overloading Binary Operators.	12
4	**Inheritance**: Introduction, Defining Derived Class, Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance. Virtual Functions: Virtual Function, Pure Virtual Functions.	12
5	**Working with Files**: Introduction, Classes for File Stream Operations, Opening and Closing a File, Detecting end-of-file, Sequential Input and Output Operations, Updating a File: Random Access, Error Handling During File Operations, Command Line Arguments.	12
	Total	**60**

Theory 80% Problem 20%

CO	Course Outcomes The students will able to
CO1	Explain the difference between object-oriented programming and procedural programming.
CO2	Understand the Program using C++ features such as composition of objects, operator overloading, inheritance and polymorphism, file I/O, etc.
CO3	Apply Build C++ classes using appropriate encapsulation and design principles.
CO4	Apply object-oriented techniques to solve bigger computing problems.
CO5	Analyze Implement and debug efficient C++ programs to solve complex problems.
Textbooks:	
1	E. Balagurusamy - Object-Oriented Programming with C++ - Tata McGraw Hill Publishing Company Limited, 4th Edition.
Reference Books:	
1	Bjarne Stroustrup - The C++ Programming Language, Addison-Wesley, 4th Edition, 2013.
2	Robert Lafore - Object-Oriented Programming in C++, Sams Publishing, 4th Edition, 2002.
Web Resources:	
1	https://cplusplus.com/doc/tutorial/#google_vignette

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	2	3	3	2	2	2	2
CO3	3	3	3	3	3	2	2	2	3	3	3
CO4	3	3	3	3	3	2	2	2	3	3	3
CO5	3	3	3	3	3	2	2	3	3	3	2
Total	15	15	15	15	14	12	12	12	14	13	12
Average	3	3	3	3	2.8	2.4	2.4	2.4	2.8	2.6	2.4

3 – Strong, 2- Medium, 1- Low

II YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24USTA42P	**Practical-Programming in C++ Lab**	**Elective Practical**	**0**	**0**	**2**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives		
LO1	To students will practice using switch statements for decision-making based on user input.	
LO2	To the students will learn how to use pointers to manipulate variables directly in C++.	
LO3	To students will learn how to create multiple functions with the same name but different parameter types, improving code readability and usability.	
LO4	To students will learn about different types of inheritance in C++, enhancing their understanding of object-oriented programming (OOP) principles.	
LO5	To students will learn how to use integrators with std::vector, which is crucial for traversing and manipulating elements in C++ STL containers.	
	Content	**Hours**
	1. Write a C++ program to demonstrate Class and Objects. 2. Write a C++ program to demonstrate function overloading. 3. Write a C++ program to demonstrate the Friend Functions. 4. Write a C++ program to demonstrate Parameterized Constructor, Copy Constructor and Destructor. 5. Write a program to demonstrate operator overloading for Unary operator. 6. Write a program to demonstrate operator overloading for Binary operator. 7. Write a C++ program to demonstrate: a)Single Inheritance •Multilevel Inheritance • Multiple Inheritance b)Hierarchical Inheritance. 8. Write a C++ program to demonstrate Virtual Functions. 9. Write a C++ program to perform Sequential I/O Operations on a file. 10. Write a C++ program to find the Biggest Number using Command Line Arguments.	30
	Total	**30**
	Problem 100%	

CO	Course Outcomes The Students will able to
CO1	Know concepts in operator overloading, function overloading & polymorphism.
CO2	Write, compile and debug programs in C++ language.
CO3	Design programs involving constructors, destructors.
CO4	Reuse of code using inheritance.
CO5	To implement the concept of files, templates and exceptions.
Textbooks:	
1	E. Balagurusamy - Object-Oriented Programming with C++ - Tata McGraw Hill Publishing Company Limited, 4th Edition.
Reference Books:	
1	Bjarne Stroustrup - The C++ Programming Language, Addison-Wesley, 4th Edition, 2013.
2	Robert Lafore - Object-Oriented Programming in C++, Sams Publishing, 4th Edition, 2002.
Web Resources:	
1	https://cplusplus.com/doc/tutorial//

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	2	3	3	2	2	3	3
CO3	3	2	3	3	3	3	3	3	3	2	2
CO4	3	3	3	3	2	3	3	2	2	3	3
CO5	3	2	3	3	3	3	3	3	3	2	2
Total	15	12	15	15	13	15	15	13	13	12	12
Average	3	2.4	3	3	2.6	3	3	2.6	2.6	2.4	2.4

S-Strong-3 M-Medium-2 L –Low

II YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24USTS41	Data Mining	Skill Enhancement Course	1	0	1	0	2	2	25	75	100

Learning Objectives	
LO1	To provide foundational knowledge on data mining concepts, functionalities, and data warehousing techniques.
LO2	To study the architecture of data mining systems, query languages, and the process of data generalization and summarization.
LO3	To learn the basic concepts and algorithms for mining association rules from large databases.
LO4	To understand classification and prediction methods including decision tree induction and Bayesian classification.
LO5	To study the concepts and methodologies of cluster analysis, including partitioning, hierarchical, density-based, and grid-based methods.

Unit	Content	Hours
1	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction.	6
2	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Characterization and Comparison: Concept Description, Data Generalization and Summarization.	6
3	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases.	6
4	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification	6
5	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Partitioning Methods – Hierarchical Methods-Density Based Methods-Grid based methods – Outlier and Outliers analysis –Outliers Detection Methods	6
	Total	**30**
	Theory-100%	

CO	Course Outcomes The students will be able to
CO1	Understand the basic concepts and functionalities of data mining and data warehousing.
CO2	Explain the architecture of data mining systems and use data mining query languages effectively.
CO3	Analyze and generate association rules from large datasets.
CO4	Apply classification and prediction techniques such as decision tree and Bayesian methods to real-world problems.
CO5	Demonstrate understanding of clustering concepts and apply different clustering algorithms to group data.

Text books:	
1	Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.
2	P.Rizwan Ahmed, Data Mining, Margham Publications, Chennai, 2012
3	Data Mining Techniques, Arun K Pujari, University Press
4	Data Mining: Concepts and Techniques, 3rd Edition, Jiawei Han, MichelineKamber, Jian Pei
Reference Books:	
1	K.P. Soman, Shyam Diwakar, V. Ajay "Insight into Data Mining Theory and Practice ", Prentice Hall of India Pvt. Ltd, New Delhi
2	Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques', Cambridge University Press, 2019
Web Resources:	
1	https://www.geeksforgeeks.org/data-science/data-mining/
2	https://www.geeksforgeeks.org/machine-learning/association-rule/

Mapping with Programme Outcomes and Programm Specific Outcome

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	3	2	2	2	2	2
CO2	2	2	2	3	2	2	2	2	2	3	2
CO3	2	2	2	3	1	2	2	2	2	3	3
CO4	3	3	3	3	1	3	3	2	3	3	2
CO5	2	3	3	3	2	2	3	3	3	3	3
Total	12	12	10	14	8	12	12	11	12	14	12
Average	2	2	2	3	2	2	2	2	2	3	2

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