

Subject Code: 1ET1100302	Subject Title: Computational Statistics
Prerequisite	Basic knowledge of statistics and probability. Familiarity with programming concepts and a programming language

Course Objectives:

1. Understand the basic principles of probability and statistical inference
2. Implement statistical computations using user-friendly software
3. Analyze and visualize data using statistical tools
4. Apply computational techniques to solve simple statistical problems
5. Interpret and communicate the results of statistical analyses

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	01	02	05	70	30	30	20	150

Subject Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	Solutions of Non-Linear Equations: Absolute, Relative and Percentage Error, Roots of an equation, Linear and non-Linear equations (Definition and Difference), Methods for finding roots of non-Linear equations: Bisection Method, False Position Method, Self-Iterative Method(Method of Successive approximation), Newton-Raphson Method and secant Method - Example only- No algorithm	07	15
2	Solution of Simultaneous Linear Equations: Definitions : System of linear equations, Existence of unique roots, multiple roots and no roots, Difference between direct and iterative methods, Gauss-Elimination Method, Gauss Jordan Method, Gauss-seidel Iterative Method, Jaccobi's Iterative Method	08	20
3	Random Variables: Definition of random variable, discrete and continuous random variables, functions of random variables, probability mass function, probability density function, Distribution function, Properties of Distribution function, Definition of bivariate random variable, bivariate distribution	07	15

4	Discrete and Continuous Probability Distributions: Bernoulli distribution, Binomial distribution, Poisson distribution, Uniform distribution, Normal distribution, Exponential distribution	08	20
5	Sampling: Meaning of population and sample, need for sampling, Definition of population size and sample size, Sampling methods (i) Non probabilistic sampling methods- convenience, quota, judgmental, purposive (ii) Probabilistic sampling methods- simple random sampling method, stratified random sampling method, systematic sampling method, two stage sampling method, cluster sampling method, sequential sampling method	07	15
6	Correlation and Regression: Bivariate distribution, Correlation coefficients, Regression lines, Formulas for Regression coefficients, Rank correlation.	07	15

Text Books:

1. Gupta.S.C. and Kapoor.V.K. (2014): Fundamentals of Mathematical Statistics, Sultan Chand and sons.
2. Numerical Methods in Engineering & Sciences by B.S. Grewal , Khanna Publications
3. Medhi.J. (1992): Statistical Methods an Introductory Text , Wiley Eastern Ltd.
4. Douglas C. Montgomery, George C. Runger(2018), Applied Statistics and Probability for Engineers, Wiley

Reference Books:

1. Härdle, Wolfgang; Okhrin, Ostap; Okhrin, Yarema (2017), Basic Elements of computational Statistics, Springer
2. Sheldon M. Ross (2006): Introductory Statistics , 2/e, Elsevier Publications.
3. Numerical Methods for engineers. S C Chapra and R P Canale .McGraw Hill International Edition

Course Learning Outcomes (CLO):

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Find an approximate solution of algebraic equations using appropriate method.	Understanding
CLO2	Find an approximate solution of system of linear equations using appropriate iterative method.	Understanding
CLO3	Understand and apply the basic concepts of probability, random variables, probability distribution.	Understanding
CLO4	Use statistical methodology and tools in the engineering problem solving process.	Applying
CLO5	Understand the basic concepts of Correlation and regression	Understanding

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	L		M													
CLO2	M	L														
CLO3	L				L											
CLO4	M	M	L		L											
CLO5	M	L	L													

H:High, M:Medium, L:Low

List of Practical:

1. Develop a C program to find a root of a non-linear equation using Bisection method.
2. Develop a C program to find a root of a non-linear equation using False Position method.
3. Develop a C program to find a root of a non-linear equation using Secant method.
4. Develop a C program to generate n values from the probability mass function.
5. Develop a C program to find a root of a non-linear equation using Newton-Raphson method.
6. Develop a C program to find Coefficient of Correlation for a given data.
7. Develop a C program to implement a regression line of x on y and y on x.
8. Develop a C program to implement probability using binomial distribution and Poisson distribution.

List of Open Source Software/learning website:

1. Khan Academy: The Khan Academy website provides free online courses and tutorials on various topics, including probability, statistics, and data analysis. You can visit their website at <https://www.khanacademy.org/>.
2. Coursera: Coursera offers online courses from top universities and institutions worldwide. They have a variety of courses related to probability, statistics, and data analysis. You can explore their offerings at <https://www.coursera.org/>.