

<b>Course No:</b> GE 201	<b>Course Name:</b> Numerical Analysis and Statistical Techniques	<b>Credits</b>			
		L=3	T= 0	P = 0	Total:4

**Objective:**

This course is designed with an objective to

- Discuss different methods of Numerical Analysis.
- Explain different statistical methods and techniques.

**Prerequisite:**

Basics of calculus, idea about Statistical data, measures of central tendency, combination, permutation sampling

**Learning Outcome:**

At the end of the course, students are expected to be able to:

- Apply different numerical methods in practical problems.
- Use and apply various statistical techniques in real life problems.
- Write computer programs on different numerical and statistical techniques.
- Create software on different numerical and statistical techniques.

**Part : A**

Total Marks: 100

( In Semester Evaluation –40 & End Semester Evaluation –60)

**Unit 1 : Interpolation**

**12 L**

Interpolation : Interpolation with equal intervals – Newton’s forward and backward interpolation formula, use of operators  $\Delta$  and  $E$  in polynomial interpolation, interpolation with unequal intervals – relation between divided differences and simple differences, Newton’s general divided difference formula, and Lagrange’s interpolation formula.

**Unit 2 : Numerical Differentiation and Integration**

**12 L**

Solution of system of Linear equation: Cramer’s rule, elimination method by Gauss, Jordan’s method, Gauss-Seidel’s method. Solution of numerical equation using Newton-Raphson method. Maximum or minimum value of the function using numerical differentiation. General quadrature formula of numerical integration, Trapezoidal rule, Simpsons one –third and three-eighth’s rule’s, Weddle’s rule. Numerical Solution of Differential Equations: Euler’s method, Picard’s method of successive approximation and Runge-Kutta method.

**Unit 3 : Probability theory**

**12 L**

Basic terminology, different definitions of probability, elementary theorem with illustration, conditional probability – Bayes theorem (without proof) with real life examples, Random variables and their density and distribution functions. Mathematical expectations and its use in decision making (problems), variance and covariance, addition and multiplication theorem of expectation, moments and moment generating functions and their application.

**Unit 4 : Probability distributions and Test of significance:**

**12 L**

Binomial, Poisson and Normal distributions and their simple properties (without derivation of the distribution), tests of significance, t-test, F-test (Emphasis should be given on numerical problems).

**Unit 5 : Correlation and Regression Analysis**

**12 L**

Karl-Pearson’s coefficient of correlation, Rank correlation coefficient, Lines of regression, Method of Least squares, Fitting of second degree polynomial using the method of least squares.

**Text Books:**

1. Bhisma Rao, G.S.S. B., “*Probability and Statistics for Engineers*”, 3rd edition, Scitech Publications, 2006.
2. Das N.G, “*Statistical Methods*”, 4<sup>th</sup> Edition, Tata McGraw Hill, 2012.

**Reference Books:**

1. Gupta, S.P. “*Statistical Methods*”, 5th edition, Chand & Sons publication, 2012.
2. Gupta, S.C. and V.K. Kapoor, “*Fundamentals of Mathematical Statistics*”, 5<sup>th</sup> edition 2010, S Chand & Sons publication
3. Dixit, J.B. “*Numerical Methods*”, First Edition, 2010, University Science Press

**Discussion:**

- Real life applications with programming approach

**Part B: Practical**

Total Marks : 50

(In Semester Evaluation – 20 & End Semester Evaluation – 30)

1. To calculate different Statistical Measures using R and MS-Excel
2. Basics of data Analysis using R
3. Solving Numerical Methods by using C programming language.