UMA033-Numerical and Statistical Methods
(Only for Electrical and Electrical Instrumentation and Control (ELE & EIE) branches)

L	T	P	Cr
3	0	2	4.0

Prerequisite(s): None

Course Objective: The main objective of this course is to understand and implement various numerical and statistical methods to solve engineering, physical and real life problems.

Basic of Errors: Floating-point representation, rounding and chopping errors.

Non-Linear Equations: Bisection, fixed-point iteration, Newton - Raphson's method for simple and multiple roots and order of convergence.

Linear Systems and Eigen-Values: Gauss elimination method using partial pivoting, Gauss--Seidel method, Rayleigh's power method for eigen-values and eigen-vectors.

Interpolation and Approximations: Lagrange (with error analysis) and Newton's divided difference interpolation formulas, Newton's forward interpolation.

Numerical Integration: Newton-Cotes quadrature formulae (Trapezoidal and Simpson's rules), Gauss - Legendre quadrature formulae.

Differential Equations: Solution of initial value problems using Euler's, Modified Euler's and Runge-Kutta methods (fourth-order).

Curve Fitting: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

Probability Distribution: Random variables, Mathematical expectations, Definition of probability distribution (Probability Mass Function and Probability Density Function), Binomial, Poisson, Geometric, Uniform and Normal distributions

Correlation and Regression: Bivariate distribution, correlation coefficients, regression lines, formula for regression coefficients.

Laboratory Work: Lab experiments will be set in consonance with materials covered in the theory using **Matlab**.

Course Outcomes: Upon successful completion of the course, the students will be able to

1. learn how to obtain numerical solution of nonlinear equations using bisection, Newton, and fixed-point iteration methods.
2. solve system of linear equations numerically using direct and iterative methods.
3. analyze the correlated data using the least square and regression curves.
4. solve integration and initial value problems numerically. .
5. Solve real life problems using various probability distributions.
6. Approximate the data and functions using interpolating polynomials.

Texts books:

1. K. Atkinson and W. Han, Elementary Numerical Analysis, 3rd Edition, John Willey &Sons, 2004.

2. Brian Bradie, A friendly Introduction to Numerical Analysis, prentice Hall, 2007
3. Richard L. Burden and J. Douglas Faires, Numerical Analysis, 8th edition, Brooks Cole, 2004
4. Richards A. Johnson, Probability and Statistics for Engineers, 8th edition, PHI learning, 2011.
5. Meyer, P. L., Introductory Probability and Statistical applications, 2nd edition, Oxford, 1970

References:

2. Curtis F. Gerald and Patrick O. Wheatley, Applied Numerical Analysis, 7th Edition, Pearson, 2003.
3. Walpole, Ronald E., Myers, Raymond H., Myers, Sharon L., and Keying, Ye, Probability and Statistics for Engineers and Scientists, 8th edition Pearson Education, 2007
4. Steven C. Chapara, Applied Numerical Methods with MATLAB for Engineers and Scientist, 2nd edition, McGraw Hill publishing, 2007

Evaluation Scheme:

Sr.No.	Evaluation Elements	Weight age (%)
1.	MST	25
2.	EST	40
3.	Sessionals (May include assignments/quizzes)	15
4.	Laboratory evaluation	20