

**ME201: NUMERICAL AND STATISTICAL ANALYSIS**  
**CREDITS = 5 (L=3, T=0, P=2)**

**Course Objective:**

To introduce numerical and statistical techniques used in engineering analysis.

**Teaching and Assessment Scheme:**

Teaching Scheme			Credits	Assessment Scheme				
L	T	P		Theory		Practical		Total Marks
			ESE	CE	ESE	CE		
3	0	2	5	70	30	30	20	150

**Course Contents:**

Unit No.	Topics	Teaching Hours
1	<b><u>Error Analysis, Solution of algebraic and transcendental equations:</u></b> Floating point number representation, Round-off errors and truncation errors in numerical computation, error propagation, and numerical instability. Bisection method, Regula-Falsi method, Newton-Raphson method, Secant method.	06
2	<b><u>Solution of Simultaneous Linear Equations:</u></b> Gauss Elimination with backward substitution, Gauss-Jordon and Gauss Seidel method.	04
3	<b><u>Numerical Integration and Differentiation:</u></b> Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Gauss quadrature. Newton's Forward-difference, Backward-difference and Divided-difference formula.	09
4	<b><u>Numerical Solution of Ordinary Differential Equations:</u></b> Initial-Value and Boundary-Value Problems, Single Step and Multi-Step Methods, Taylor series method, Euler's method, Euler's modified method, Runge-Kutta method of 2nd, 3rd and 4th orders, Multistep methods.	06

Unit No.	Topics	Teaching Hours
5	<b><u>Polynomial Interpolation:</u></b> Lagrange methods, Newton's forward and backward interpolation formulae, Gauss's forward and backward difference formulae, Interpolation with unequal interval: Newton's divided difference formula.	05
6	<b><u>Probability and Statistics:</u></b> Review of fundamental concepts of probability and sampling theorems, Conditional probability, Mean, median, mode and standard deviation function of Discrete and Continuous distributions, Normal, Poisson and Binomial distributions, Linear Regression analysis and curve fitting.	10
<b>TOTAL</b>		<b>40</b>

**List of References:**

1. Steven Chapra and Raymond Canale, "Numerical Methods for Engineers", 6<sup>th</sup> edition, Tata McGraw-Hill.
2. Balagurusamy E., "Numerical Methods", Prentice Hall of India.
3. Steven C Chapra, "Applied Numerical Methods with MATLAB", 3<sup>rd</sup> edition, Tata McGraw Hill Publishing Co Ltd.
4. Sastry S. S., "Introductory Methods of Numerical Analysis", 5<sup>th</sup> edition, Prentice Hall of India.
5. Rao V. Dukkipati, "Applied Numerical Methods Using MATLAB", New Age International Publishers.
6. Erwyn Kreyszig, "Advanced Engineering Mathematics", 10<sup>th</sup> edition, John Wiley and Sons, 2008.

**Course Outcomes (COs):**

At the end of this course students will be able to ...

1. Evaluate errors associated with floating point computations
2. Demonstrate the numerical techniques for accurate and efficient solution of models based on linear and nonlinear systems of equations, ordinary differential equations.
3. Apply numerical techniques to practical problems in mechanical engineering.
4. Apply various statistical models and methods for drawing conclusions and making decisions under uncertainty in engineering contexts
5. Use software tools for the implementation and application of numerical methods and the visualization of results.