BVM ENGINEERING COLLEGE [AN AUTONOMOUS INSTITUTION]

2IT05: COMPUTER ORIENTED NUMERICAL METHODS
CREDITS – 4 (LTP:3,0,1)

Course Objective:
To get familiarized with different numerical methods used to model and implement engineering problems.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per week)			Credits	Assessment Scheme				Total Marks
				Theory		Practical		
L	T	P	C	ESE	CE	ESE	CE	
3	0	2	4	60	40	20	30	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	**Modeling and Error analysis:** Mathematical modeling and engineering problem solving, Role of computers and software in modeling, Approximations and errors, Significant figures, accuracy and precision, Errors, round-off and truncation errors, error propagation.	04
2	**Algebraic and Transcendental Equation:** Bisection Method, Iteration method, Method of false position, Newton-Raphson method, Secant method, Muller's method, Rate of convergence of Iterative methods. Case studies.	06
3	**Interpolation:** Finite Differences, Newton's forward and backward formula, Gauss forward and backward formula, Interpolation with unequal intervals: Lagrange's interpolation, Newton Divided difference formula, Spline interpolation. Case studies.	06
4	**Numerical Integration:** Introduction, Newton-Cotes integration formulas; Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules, Weddle's rule. Case studies.	06
5	**Systems of Linear Algebraic Equations:** Mathematical background, Solution of linear system by Gauss elimination and Gauss-Jordon method; pitfalls and techniques for improvement, matrix inversion, Gauss Jacobi and Gauss-Seidel methods. Case studies.	09
6	**Curve Fitting:** Mathematical background, Least squares linear and polynomial regression. Case studies.	04
7	**Ordinary Differential Equations:** Picards method and Taylor series method, Euler's method, Runge-Kutta methods, Predictor-Corrector methods. Case studies.	05

Unit No.	Topics	Teaching Hours
8	**Methods for Statistical Analysis:** Frequency distributions, Data analysis, Expectations and moments, Correlation and regression, Trend analysis, Seasonal effects, Cyclical fluctuation, Moving average, Mean Square Error, Predictions.	05
	Total	**45**

List of References:

1. S. C. Chapra, and R. P. Canale, "*Numerical Methods for Engineers*", 7th Edition, Tata McGraw-Hill, New Delhi.
2. B. S. Grewal, "*Numerical methods in Engineering and Science*", Khanna Publishers, Delhi.
3. M. Goyal, "*Computer Based Numerical and Statistical Techniques*", Laxmi Publication (P) Ltd., New Delhi.
4. Miller, "*Mathematical Statistics with applications*", 8th Edition, Pearson Education.
5. R. S. Salaria, "*Computer Oriented Numerical Methods*", 5th Edition, Khanna Publisher.

Course Outcomes (COs):

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

1. Identify and classify the numerical problem to be modeled.
2. Understand the characteristics of the methods to correctly interpret the results.
3. Estimate the amount of error inherent in different numerical methods.
4. Acquire knowledge of gradient, divergence, convergence and their various applications.
5. Understand the numerical solution of root finding methods, curve fitting methods, matrix calculations and linear and nonlinear polynomials.
6. Assess the approximation techniques to formulate and apply appropriate strategy to solve real world problems.