KL University
Department of Electronics & Computer Engineering
M.Tech (wcsn) First Semester 2015-2017

Course Code : 15-EM5109
Course Title : Computational Methods and Error Analysis
Course Structure : 3-2-0
Credits : 4
SYLLABUS:

Unit I: Error Analysis: Errors in Numerical calculations, Solution of algebraic and transcendental equations: Bisection Method, Iteration method, Newton-Raphson method, Secant method, Muller method.

Interpolation: Newton's forward and Newton's backward interpolation formulas, Cubic spline interpolation; Lagrange's interpolation and Newton's divided difference interpolation for unequal intervals.

Unit II: Curve fitting: Fitting of straight line, parabola, power curve, exponential curve using method of least squares and method of weighted least squares; Method of least squares for continuous functions; Grams-Schmidth process.

Unit III: Numerical differentiation and Numerical Integration: Errors in numerical differentiation, Newton's forward and backward formulas; cubic spline method, maxima and minima of tabulated functions.

Numerical integration: Simpson's formulae, Weddle's rule, Boole's rule, cubic splines, Romberg integration.

Unit IV: Matrices and Linear system of equations: Formation of system of linear equations, Gauss elimination methods, Gauss-Jacobi iterative method, Gauss-Seidal iterative method, Power method to find eigen values.

Numerical solution of Ordinary differential equations: Euler's method, modified Euler's method, 4^{th} order Runge-Kutta method, and Runge-kutta method for simultaneous first order ordinary differential equations.

Unit V: Finite difference method: Solution of BVP by finite differences, Classification of Partial differential equations, solution of PDE by finite differences: Laplace and Poisson equation by Gauss-Seidal method.

Text Books:

1. Introductory Methods to Numerical Analysis by S.S. Sastry, 4^{th} edn., PHI.

2. Numerical Methods for Scientific and Engineering computations by M.K. Jain, S.R.K. Iyengar,

and R.K. Jain, 4^{th} edn., New Age publishers.

Reference Books:

1. Higher Engineering Mathematics by B.S. Grewal, 40^{rd} edn, Khanna publishers.

2. Advanced Engineering Mathematics by Erwin Kreyszig, 8^{th} edn, Wiley publishers. dory