National Institute of Technology Karnataka, Surathkal

Course Details and Evaluation Plan

Course Code and Title	: MA207 - Numerical Methods
(L-T-P) Credits	: (3-0-0)3
Course Instructor	: Dr. Vishwanath Kadaba Puttanna
Teaching Department	: Mathematical and Computational Sciences (MACS)
Evaluation Plan	: - Discuss and Decide -
Objective of the course	: Imparting knowledge of basic numerical methods useful for solving mathematical problems arising while modelling various engineering applications
Skill development of the student is expected from the course	: Understanding the concept of solving equations numerically and to write algorithms/codes to solve these equations using any Python programming language
Course Coverage	: 40 hours lecture Schedule

Contents

- Errors and Approximations - Floating point errors, Round-off errors, Absolute and relative errors.
- Solution of Algebraic, Transcendental and Polynomial equation- Bisection, Regula-falsi, Newton-Raphson and fixed point iteration methods, Mullers method.
- Linear system equations - Iterative Methods: Jacobi, Gauss-Siedel and Successive over relaxation methods. Extension of Newton's method to nonlinear system of equations.
- Interpolation: Newton's, Lagrange's and Hermite's interpolation. Curve fitting using the principle of least squares
- Numerical Differentiation: Through Polynomial Interpolation - Deduction of first and second order formulae
- Numerical Integration: Newton-Cotes formula, Trapezoidal and Simpson's 1/3rd and 3/8th rules, Method of undetermined coefficients
- Numerical solution of ordinary differential equations (Initial value problems): Euler's and higher order Taylor series methods, Runge-Kutta methods, Predictor-Corrector methods.

Reference books

1. R L Burden, J D Faires, Numerical Analysis, 7th edition, Thomson, 2007 (**Textbook**)
2. K E Atkinson, An Introduction to Numerical Analysis, 2nd edition, John-Wiley and Sons.
3. D. Kincaid, W. Cheney, Numerical Analysis Mathematics of Scientific Computing, 3rd Edition, 2009.
4. M K Jain, S R K Iyengar and R K Jain, Numerical methods for Scientific and Engineering computation, Wiley Eastern, 1985
5. W. H. Press, S A Teukolsky, W T Vetterling, B P Flannery, Numerical Recipes in C/Fortran - The Art of Scientific Computing, Cambridge University Press, 2007.