

Department of Mathematical and Computational Sciences
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Course Details and Evaluation Plan

Course Code	: MA608
Course Title	: Computational Mathematics
L-T-P	: 3-0-0
Credits	: 3
Course Instructor	: Dr. P. Sam Johnson
Teaching Department	: Mathematical and Computational Sciences (MACS)
Evaluation Plan	: Weightage of Mid-sem is 25 % Weightage of End-sem is 50 % Weightage of Quizzes and Classroom Activities is 25 %

Course Contents

- Computer arithmetic - Floating point errors, Round-off errors, Absolute and relative errors;
- Polynomial interpolation: Lagrange and Newton's interpolation methods, Hermite interpolation; Curve fitting using least-square principle;
- Numerical differentiation through polynomial interpolation: Deduction of first and second order formulae;
- Numerical integration: Newton-Cotes formula, Trapezoidal and Simpsons 1/3rd and 3/8th rules, Method of undetermined coefficients;
- Solution of linear system: Gauss-Elimination and LU-factorization, Basic iterative methods - a) Jacobi, b) Gauss-Siedel, c) Successive over relaxation methods;
- Finding root of an equation: (polynomial and transcendental) - Bisection and Regula-falsi methods (bracketing roots), Newton- Raphson (Newton) method, fixed point iterations, Mullers method; Extension of Newton's method to nonlinear system of equations;
- Numerical solution of ODEs (IVPs): Euler's and higher order Taylor series methods, Runge-Kutta methods, Predictor-Corrector methods: a) Modified Euler method, b) Linear multi-step methods.

References

1. R L Burden and J D Faires, "Numerical Analysis - Theory and Applications", Cengage Learning, 2005.
2. S D Conte and C De Boor, "Elementary Numerical Analysis", Tata McGraw-Hill, 2006.
3. W H Press, S A Teukolsky, W T Vetterling and B P Flannery, "Numerical Recipes in C/Fortran - The Art of Scientific Computing", Cambridge University Press, 2007.