

MA2032 Numerical Analysis

1. Course code and title : MA2032 Numerical Analysis
2. Course category : MAE (Elective)
3. Course credit : 3-0-0-3
4. Prerequisite course : NIL
5. Consent of teacher : YES
6. Learning objectives : This is a basic course in numerical analysis. It is often difficult to find an exact solution to many science and engineering problems. It is for these kinds of problems that a numerical method may generate a good answer. The objective of this course is to make the students familiar with essentials of numerics and its ideas such as interpolation, solutions to linear and nonlinear equations, solutions to differential equations and eigen value problem.
7. Learning outcomes: Upon successful completion, the students will be familiar with various numerical methods for solving science and engineering problems.
8. Syllabus: Linear functional, interpolation by polynomial, error estimation, numerical differentiation and integration.

Solution of a system of linear equations: Gaussian elimination, solution by iteration, pivoting strategy, triangular factorization, ill-conditioning, norms.

Eigenvalue problem, power method, QR method.

Solution of a nonlinear equation by iterative methods like bisection, secant methods and Newton-Raphson method.

Newton's method, rate of convergence, solution of a system of nonlinear equations.

Numerical solution of ordinary differential equations: Euler and Runge-Kutta methods, multi-step methods, predictor-corrector methods, order of convergence, finite difference methods, numerical solutions of elliptic, parabolic, and hyperbolic partial differential equations.

Exposure to software packages like IMSL subroutines, MATLAB.

Texts:

1. S. D. Conte and Carl de Boor, Elementary Numerical Analysis- An Algorithmic Approach (3rd Edition), McGraw-Hill, 1980.
2. E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley (1999).