

Numerical Analysis I

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- Text: “Numerical Mathematics and Computing”
by Ward Cheney & David Kincaid
- Prereq.: Linear Algebra; Elementary Differential Equation
Knowledge of MATLAB or any program language
- Grade: 2 tests – 60 %
HWs and Projects – 40 %
- General Description: This course is designed to meet the needs of students wishing to gain knowledge in the theory of computational procedures using the computer, including a study of linear systems, algebraic and transcendental equations, approximations of functions by interpolating polynomials, and numerical differentiations and integrations.
- Objective: **Review of Taylor’s Series**
 - Discussion of Taylor’s theorem and its application
 - Review of Fortran 90 in the form of suggestions for good programming**Number Representation and Errors**
 - The floating-point number system used in computers
 - Loss of significance due to roundoff-error**Locating Roots of Equations**
 - Bisection method and its convergence analysis
 - Newton’s method and its convergence analysis
 - Secant method and its convergence analysis**Interpolation and Numerical Differentiation**
 - Polynomial interpolation
 - Numerical computations of $f'(x)$ and $f''(x)$**Numerical Integration**
 - Numerical Estimation of the definite integral $\int_a^b f(x)dx$
 - Romberg Algorithm and Simpson’s rule
 - Gaussian Quadrature**Systems of Linear Equations and MATLAB**
 - Solving a system of n linear equations in n unknowns
 - Gaussian Elimination and LU factorization
 - Solver for special structure such as tridiagonal & banded systems
- References: “Elementary Numerical Computing” by R. Skeel & J. Keiper
“MATLAB Manual”