ES 361 – Computing Methods in Engineering

Course outline

1. Mathematical modeling of engineering problems: aim of the course, some concepts in approximations. The errors due to chopping, rounding, truncation. (3 hrs)
2. Solution of nonlinear equations: graphical method, bracketing methods (bisection and false-position methods); open methods (simple fixed-point iteration, Newton-Raphson and secant methods). (8 hrs)
3. System of nonlinear equations (simple fixed-point iterations, Newton’s method). (3 hrs)
4. Solution of linear system of equations: direct methods (Gauss elimination methods, LU decomposition method, ill-conditioned systems and pivoting strategies), indirect methods: (Jacobi and Gauss Seidel methods). (8 hrs)
5. Approximation of functions: Least-squares regression, interpolation (Newton and Lagrange interpolating polynomials) (8 hrs)
6. Numerical differentiation and numerical integration (trapezoidal and Simpson's rules and Gauss quadrature). (4 hrs)
7. Numerical solution of ordinary differential equations: initial value problems (Taylor, Euler and Runge-Kutta methods), boundary value problems (shooting and finite difference methods). (8 hrs)

Textbook:


References


Grading Policy: Midterms + Homework %65
Final %35

Please note that:

- Attendance is considered as cooperation with the instructor in the learning process. An *NA grade* is given, if regular attendance is not maintained.
- If a student misses any of the exams and has a *valid excuse*, then a *makeup exam* will be given after the finals.