Mathematics 340

Numerical Analysis (3)

(Effective Spring 2016)

Prerequisite: CSCI 221 and MA252; CSCI 301 or MA310.

Catalog Description: Formulation of numerical problems for solution on a digital computer. Error analysis and control, nonlinear equations, differentiation, integration, systems of equations, differential equations, curve fitting, eigenvalue problems.

Learning Outcomes for Major: This course addresses one or more of the student learning outcomes for the major.

Upon completion of his/her degree from the University of Tennessee at Martin with a major in mathematics, the graduate will be able to:

i. apply mathematical concepts and principles to perform numerical and symbolic computations.
ii. use technology appropriately to investigate and solve mathematical and statistical problems.
iii. write clear and precise proofs.
iv. communicate effectively in both written and oral form.
v. demonstrate the ability to read and learn mathematics and/or statistics independently.

Teaching Objectives: The student will:

1. Understand sources of computer error - how to estimate and minimize them.
2. Find roots of equations using bisection, secant, and Newton-Raphson Method.
3. Write and implement programs for numerical integration using Riemann sums (trapezoidal rule) and Romberg integration.
4. Solve systems of linear equations and invert matrices using Gaussian elimination.
5. Interpolate and fit curves using linear (least square) and Lagrangian methods.
6. Solve differential equations using Euler's method, Runge-Kutta and predictor-corrector methods.

Text(s): An Introduction to Numerical Methods A MATLAB Approach (3rd edition), Kharab and Guenther, CRC Press, Taylor and Francis Group, 2011. ISBN: 978-1-4398-6899-7.

Outline:

Chapter	Title (Sections)
2	Number system and errors
3	Roots of equations
4	Systems of linear equations
5	Interpolation
8	Numerical optimization
9	Numerical differentiation
10	Numerical integration
12	Numerical methods for differential equations
13	Boundary-value problems
14	Eigenvalues and eigenvectors

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