

MONTGOMERY COLLEGE
Dept. of Engineering, Physical and Computer Science
ENES 240 Scientific and Engineering Computation

Course Description:

ENES 240 Scientific and Engineering Computation 3 credits
Introduction to fundamental methods of numerical analysis including roots of equations, systems of linear equations (Gaussian elimination, matrix diagonalization, inversion and iterative methods), interpolation and curve fitting, numerical integration and ordinary differential equations. Example problems in the context of engineering applications are solved using a variety of software tools, including structured programming and high-level computer packages such as MATLAB.
PREREQUISITE: Completion of one semester Calculus. Concurrent enrollment in MATH 182 or higher. *Two hours lecture, two hours laboratory each week.*

Instructor:

C. Alex Hou, PhD, PE
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Required Textbook:

Applied Numerical Methods with MATLAB for Engineers and Scientists, 2nd edition,
Author: Steven C. Chapra, Published by McGraw Hill

Main Objectives of the Course:

1. To teach the fundamentals of numerical methods, with emphasis on the most essential methods.
2. To provide students with opportunity to enhance their programming skills using MATLAB environment to implement algorithms.
3. To teach the use of MATLAB as a tool for solving more complicated problems in science and engineering.

Course Contents:

1. Introduction to Engineering Computation
2. Graphics and Programming with MATLAB
 Basics of MATLAB and Plotting
 Programming Concepts – script, function, I/O, repetitions, decisions
3. Round-off and Truncation Errors
4. Roots of Nonlinear Equations
 Bracketing Methods and Open Methods
5. Linear Algebra and Matrices Operation
 Determinant, Inverse and Eigenvalues
 Gauss Elimination/Gaussian-Jordan Methods and Iterative Method

6. Interpolation and Curve Fitting
 - Polynomial and interpolation
 - Least Square Regression
7. Numerical Integration
 - Trapezoidal and Simpson's Rule and others
8. Numerical Differentiation
9. Numerical Solution to Ordinary Differential Equations
 - Euler and Runge-Kutta Methods
 - Higher Order and System ODEs
10. Symbolic Math Processing

Grade:

6 Homework/Projects	20%
3 Tests	45%
LAB Exercises	15%
Final Exam	20%

Reference Books:

1. *Numerical Methods for Engineers and Scientists: An Introduction with Applications Using MATLAB, 2nd edition*, by A. Gilat and V. Subramaniam, Wiley.
2. *Introduction to MATLAB for Engineers and Scientists*, by Delores Etter, Prentice Hall.
3. *Essential MATLAB for Engineers and Scientists 4th edition*, by B. Hahn and D. Valentine, Academic Press.
4. *Introduction to MATLAB 7 for Engineers*, by William Palm III, McGraw Hill.

Make-Up Exam Policy:

Make-up exams are only given to the students who are officially excused. Please contact the instructor at least three days before the exam to rearrange the make-up test. If emergency occurs that students can't prearrange the make-up test, students need to talk to instructor as soon as possible and provide documents to prove the situations. In these cases, doctor's letter, government's paper and other official documents are accepted.

Support Service:

A student who may need an accommodation due to a disability should talk to me as early as possible. A letter from Disability Support Service (DSS) authorizing your accommodations will be needed.