MONTGOMERY COLLEGE
Dept. of Physics and Engineering, Rockville
ES 240 Scientific and Engineering Computation

Course Description:

ES 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 MA 182 or higher. *Two hours lecture, two hours laboratory each week.*

Instructor:

Dr. Sasan Haghani
Adjunct Professor
Department of Physics and Engineering
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Required Textbook:

Applied Numerical Methods with MATLAB for Engineers and Scientists, 4th edition,
Author: Steven C. Chapra, Published by McGraw Hill

Reference Books:

1. *Introduction to MATLAB for Engineers and Scientists*, by Delores Etter, Prentice Hall.
2. *Engineering Problem Solving with MATLAB*, 2nd edition, by Delores Etter, Prentice Hall.
3. *Introduction to MATLAB 7 for Engineers*, by William Palm III, McGraw Hill.
4. *Numerical Methods using MATLAB, 2nd edition*, by George Lindfield and John Penny, Prentice Hall.
5. *Handouts and Study Guides for ES 240*, by James O'Brien and Chienann Hou

Course Contents:

1. Introduction to Engineering Computation
2. Graphics and Programming with MATLAB
   2D Plotting and Basic Programming
3. Roots of Nonlinear Equations
   Bracketing Methods and Open Methods
4. Round-off and Truncation Errors
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
   Errors and "Goodness" of fit
7. Numerical Integration
   Trapezoid Rule and Simpson's Rule
8. Numerical Solution to Ordinary Differential Equations
   Euler and Modified Euler and Runge Kutta Methods
   Higher Order and System ODEs
9. Symbolic Math Processing

Class Attendance Policy: Attendance is strongly recommended to achieve the objectives of the course. The instructor reserves the right not to admit students who are late to class.

General Policies:

1. Attendance at tests is mandatory. Absence from an examination will not be excused except in cases of an illness or other emergency that is verified by appropriate written documentation. For example, in case of illness a written statement from a physician is required with inclusive dates under care. Unexcused absence from an examination will result in a grade of zero. It is the student's responsibility to see the instructor as soon as possible in regard to an excused absence. All make up work must be scheduled no later than the last day of classes in the semester.
2. Students are responsible for all material covered in the class as well as announcements for homework assignments, assignment due dates, and test dates.
3. If a class is missed due to school closure, the regularly scheduled test or lecture will occur the next time the class meets.
4. Late homeworks will not be accepted. Homeworks will be collected as the beginning of class on the due date. Please clearly print your name, course number, homework number and date of submission. Homeworks must be written neatly and legible otherwise they will be receiving a grade of zero. Homework must be clearly identified by problem number in order and only the materials asked should be turned in. Homework grade is based on the procedures you approach to the problems and the correctness of the answer, **not the numbers of pages**. However, you need to provide enough documents to show how you get the answers. Printouts of commands from command window, script/function m-files, results and graph are considered sufficient. There is a total of eight Homework sets but only the best six will be counted towards your final grade. The best way to gain the points for homework is to start it early and turn them in on time.
5. Cell phones must be turned off while in lecture. The instructor reserves the right to alter the mentioned policies as circumstances may dictate. If such a change is made, the students will be notified in class.
6. In-Class Exercises will be collected at the end of the class.

Grading Scheme:

Five Exams 18% each In class participation and exercises 10%

Your final grade will be based on:

GRADE	Percentage
A	90-100$
B	80-89%
C	70-79%
D	60-69%
F	Below 60%

Other Information:

About In-Class Exercises: In-class exercises will be given during lab period occasionally. In general, the exercise will be open book, open discussion, so you can seek any helps as much as you can.

Academic Integrity: All homework, projects, and examinations are to be the results of your efforts only. Your rights and responsibilities as a student at Montgomery College are described in the Student Code of Conduct available at:
http://www.montgomerycollege.edu/departents/academicevp/Student_PandP.htm

Support Services: Any student who may need an accommodation due to disability, please make an appointment to see me during office hour. A letter from the Disability Support Services authorizing your accommodations will be needed. Any student who may need assistance in the event of an emergency evacuation must identify to the Disability Support Services Office. Guidelines for emergency evacuations for individuals with disabilities are found at: http://www.montgomerycollege.edu/dss/evacprocedures.htm