EEL 3420 Engineering Analysis
Spring 2006

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Textbooks: Applied Numerical Methods with MATLAB for Engineers and Scientist by Steven C. Chapra, McGraw Hill, 2005.

1998-99
Catalog Data: EGN3420: PR: High level Language or equivalent; MAC3312. Engineering analysis and computation; engineering applications of numerical methods, including curve fitting, matrix operations, root finding, integration and plotting.

Goals: This course is designed to provide freshman and sophomore students with a background in the theory and applications of matrices, an introduction to numerical methods (with computer oriented analysis) and an understanding of the relationship between error and digits of significant.

Prerequisites: Understanding of deferential and integral calculus of one variable and familiarity with a high level language.

Topics:

- Error including absolute, relative errors, digits of precision and significance, round off error including inherent errors and error propagation, truncation error including Taylor series.
- One-dimensional root finding techniques including Bisection, False Position, Secant, Linear Iteration, and Newton-Raphson method. Included will be some discussions on accuracy and convergence.
- Review of vectors
- Introduction of matrices including operations, determinants inverse and transpose and proofs of important properties.
- Computer solutions to systems of linear equations including non-square systems using Gaussian elimination and Gauss-Jordan methods.
- Computer solutions to systems of nonlinear equations
- Computer calculations of determinants and inverse.
- Eigenvalues of matrices.
- Numerical integration
- Numerical differentiation.
- Basic curve fitting techniques including least squares.
- Basic interpolation techniques.
- Introduction to solutions to differential equations.

Policies

- Grading: All exams and quizzes are closed book. One sheet of notes permitted.

HW	10 %
Midterm	35 %
Final	55 %

- The grades are determined by the following breakdown:

90 to 100 receives an A.
80 to 89.9 receives a B
70 to 79.9 receives a C
60 to 69.9 receives a D
0 to 59.9 receives an F

- Note, regardless of where I draw the cut-off limit, there are always grades that fall very close to the boarder line (i.e. 79.5 %). Giving the students that are within a specified distance of the boarder the better grade is simply lowering the limit. There will still be grades that fall very close to the limit. This does not fix the problem. For example say a student earned a 79 % overall and says that he should get a B since he is within 1 %. If I give him the B then I must give all students in the range of 79 to 89.9 a B as well. I simple lowered the limit by 1 percent. Now a student with a grade of 78 will say that he is only within 1 % and I should give him a B. I therefore only shifted the problem. At some point I must stop moving the limit and simply be firm on the grades I give. I hope you understand the problem and do not ask me to give you the better grade with the justification that you are so close.

- I guarantee that the average grade for the class on all exams including quizzes will be no lower than 75%. If it is lower I will curve the grades to raise it to 75%. This does not include homework or labs.

- You must save a copy of all the homework and labs submitted in case that it gets lost.

- You may submit homework via email directly to the TA. Do not email it to me! Any homework emailed to me will be thrown away.

- The homework must contain the following as appropriate:
  1. program listing,
  2. program output,
  3. spreadsheet output
  4. answers to specific questions about results of an assignment
  5. cover sheet containing

- The cover sheet must contain:
  1. name,
  2. social security number and
  3. program (homework) number,
  4. description

- The description part must contain:
  1. the homework/program requirements (including a table of all input data),
  2. how you approached the problem (e.g., equations employed, structure chart), and
  3. what was actually acheived, including a table of all appropriate output values (substantiated by printed program output attached to the cover sheet) and a discussion of the results (NOTE: even if you think/know there is something wrong that you did not have time to correct, you must discuss your results; e.g., how do you know it's wrong?, what did you try to correct it?). If spreadsheet output is used, you must identify and underline the name of the spreadsheet software used at the top of your spreadsheet output.

- This description should be at least 150 words (you may handwrite any special characters, subscripts and algebraic expressions -- it's better to completely handwrite an expression than to type it partially and forget to handwrite the missing components) and at most one or two pages in length. If you wish, you may embed the entire cover sheet in comments at the beginning of your program, but use of a wordprocessing system is encouraged.

- You should write your cover sheet under the assumption that it might be the only portion of a homework assignment which is graded. In other words, although your program listing, program output, spreadsheet output and other materials (e.g., algebraic details of a derivation which is referred to on the cover sheet) must be attached to the cover sheet, the grader should NOT have to consult these attachments -- EVERYTHING important should be summarized and discussed on the cover sheet.