ME 581
Numerical Methods
Fall 2010, Tu/Th 12.00-1.15 PM

Dr. Dinesh A Shetty

Course Description

The objective of the present course is to provide a formal introduction to numerical methods in science and engineering, and their digital computer implementation for a practical problem. Only background in college level mathematics, e.g. calculus and linear algebra, and introductory computer programming, is required.

Textbook

"A Friendly Introduction to Numerical Analysis" by Brian Bradie, Prentice-Hall, 2006.

Course Topics:

- Introduction to Numerical Methods
- Introduction to Fortran90
- Root Finding
- Systems of equations
- Eigenvalues and eigenvectors
- Interpolation
- Differentiation and Integration
- Ordinary differential equations
- Partial differential equations

Course tools:

Students are expected to use following computational environment for assignments and projects.

- Programming language : FORTRAN90
- Compilers : Ifort, gfortran
- Post-processors: Tecplot, GNU plot, MATLAB

- Operating system: Linux
- Computers: Air, Wind, Water, Steam
- Typed report: Latex, Word

Homework, Computer Projects, and Reporting

Reading and homework assignments will be posted in the course website on every week. The amount of the programming tasks would increase with time period. Hence students are advised to learn/improve FORTRAN90 programming skills. Web searches and discussion among the students to learn more is encouraged. However, the final submitted work should be original. Plagiarism in any form will not be tolerated, and would entail punitive actions according to the university guidelines. Students are expected to test their codes using course tools listed above. Any code that does not run using above tools, or produces results that are different from the report, will be deemed to be wrong.

The typed reports of assignments/projects are expected to be in standard journal article format providing brief sections of *abstarct*, *introduction*, *numerical method*, *results*, *discussion* and *summary*. The *abstract* should describe what you did and what you found. The *introduction* should provide some background and motivation for the problem to be solved and some of the various numerical methods options available to solve the problem. The *numerical methods* section should provide specific details of the numerical methods being studied and the complete description of the algorithm employed to solve the problem. The *results* section should present the outcome of the numerical study. The *discussion* section discusses the results presented in the *results* section with regard to accuracy and efficiency and compares one method to the next. A parametric study is must when applicable. A comparison of what you have observed vis-a-vis what was expected, and analysis of the reasons for discrepancy if observed is a must to obtain full credit (After all " The purpose of computing is insight, not numbers"-Hamming). The summary section summarizes what you have done and draws conclusions about what you have found

Course Grade

Your course grade will be based on your homework, which will be fully or partially graded, for 50%, an in-class closed book/notes midterm for 25%, and a closed book/notes final exam (during final exam week) for 25%. A straight curve or better will be applied to convert your numerical grade to a letter grade.

Special Message

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. In order to get information about changes in this course please check the course website and your email inbox in case of an emergency. You can also contact me via my cell phone number at any time to talk to me directly.