

Mathematics 5310: Computational Methods in Applied Sciences I
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Syllabus, Fall 2008

Online syllabus: Throughout the entire semester, this syllabus will be online at the URL

<http://www.mgnet.org/~douglas/Classes/na-sc/2008f-notes/syllabus.pdf>

Course Description: First semester of a three-semester computational methods series. Review of iterative solutions of linear and nonlinear systems of equations, polynomial interpolation/approximation, numerical integration and differentiation, and basic ideas of Monte Carlo methods. Comparison of numerical techniques for programming time and space requirements, as well as convergence and stability.

Prerequisites: Math 3310 and COSC 1010. Identical to COSC 5310, CHE 5140, ME 5140, and CE 5140. (3 hours).

Classrooms: Ross Hall 247 (TR, 2:10-3:25)

Class web page: <http://www.mgnet.org/~douglas/Classes/na-sc/2008f-index.html>

TA: none

Office hours: Tuesday 11:00-12:00 and Wednesday 10:00-11:00. Please call 766-6580 before coming to Ross Hall 227. The times are subject to change by class consensus during the first lecture.

Textbook: George Em Karniadakis and Robert M. Kirby II, *Parallel Scientific Computing in C++ and MPI: A Seamless Approach to Parallel Algorithms and Their Implementation*, Cambridge University Press, 2003 (with a cdrom of software).

Suggested Readings:

- Eugene Issacson and Herbert Keller, *Analysis of Numerical Methods*, Dover Publications, 1994.
- John H. Mathews, *Numerical Methods for Mathematics, Science and Engineering*, Prentice-Hall, Englewood Cliffs, NJ (USA), 1992.
- R. S. Varga, *Matrix Iterative Analysis*, Prentice-Hall, Englewood Cliffs, NJ, 1962.
- B. Wendroff, *First Principles of Numerical Analysis*, Addison-Wesley, Reading, MA, 1969.

Homework: There will be homework from the textbook and simple (usually involving parallel computing) programming assignments related to the material. Each assignment is due at latest when stated on the class homework web page, which you are responsible for checking on Tuesdays and Thursdays at a minimum. Late work will be accepted by prior arrangement unless there are exception circumstances.

Exams/Projects: There will be two projects during the course that will correspond to exams. One will be during the week of October 20-24. The other will be due at the classes scheduled final time.

Grading: 100% of the grade will come from the exams/projects (50%) and the homework (50%).

Advice: It is a good idea to already know Matlab or Maple to prototype algorithms and a legacy programming language (e.g., C, C++, Java, or Fortran). The textbook will teach you the relevant parts of C++, but the programming assignments can be done in any legacy language as long as you can interface with the textbook's software.

Cheating Policy: Getting caught cheating or plagiarizing will result in a failing grade and possibly much worse, including expulsion from the university and legal proceedings against you. I have zero tolerance for cheaters. I will enforce whatever the latest university policy is. When in doubt, ask me first. Life is too short to experience the penalties of getting caught cheating.