

MATH 270C: Numerical Mathematics (4 units)

Spring Quarter 2001

MWF 10:10am–11:00am HSS 2305B

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CLASS WEBPAGE: http://scicomp.ucsd.edu/~mholst/teaching/ucsd/270c_F01/index.html

Many of the advances of modern science have been made possible only through the sophisticated use of computer modeling. The mathematical foundation of the computer modeling techniques now used in all areas of mathematics, engineering, and science is known as *numerical analysis* (sometimes referred to as *computational mathematics* or *scientific computing*). The Math 270ABC series at UCSD provides a graduate level overview of some of the foundation topics in numerical analysis.

Math 270C deals primarily with numerical approximation theory and the numerical solution of ordinary differential equations (ODEs). While our primary interest will be in solving ODEs numerically, we must first develop a set of tools for approximating functions.

Weeks 1-2 of the course will cover classical approximation theory (interpolation of functions by polynomials, numerical differentiation, quadrature). There is no textbook for this material. Weeks 3-6 will cover standard numerical methods for the solution of initial-value and boundary-value problems in ordinary differential equations. For this material we will follow some of Chapters 2-4 in:

Textbook: *Dynamical Systems and Numerical Analysis*, by Stuart & Humphries.

Weeks 7-10 will develop more advanced topics, including the study of numerical methods as discrete dynamical systems, global stability properties, and geometric integrators for Hamiltonian systems. For this material we will follow some of Chapters 5-8 in the text above.

Homework assignments will be a combination of theoretical and computer problems; this will *require* some computer programming, using a standard language such as C, FORTRAN, or MATLAB. The use of the interactive matrix package MATLAB is encouraged; MATLAB enables you to concentrate on the algorithms in 270C rather than the details of programming. The course will be graded on the homework assignments, two midterm examinations and a final examination, according to the following guidelines:

Written and Computer HW (approximately six homeworks):	30%
Midterm #1 (In class on Monday April 23):	15%
Midterm #2 (In class on Monday May 14):	15%
Final (Appointed time during finals week):	40%

1. All HW assignments will count towards the final grade (i.e., none can be dropped). Late HW will not be accepted.
2. In order to receive credit on a homework, you must at least attempt the computer parts of the homework assignments. *This rule will be strictly enforced.*
3. There will be no make-up exams. If you miss a midterm with an excused absence (i.e., illness with a note from a doctor), the other midterm and the final exam will be weighted accordingly.

Course information, such as homework assignments and exam dates, will be maintained on the class webpage. Therefore, CHECK THE WEBPAGE FREQUENTLY.