

## Syllabus

Term: Winter Quarter 2012

University Course Number: MEE 210B (cross-listed CS/ECE/MATH/ChemE/Geol)

Course Title: Numerical Simulation

Professor:

- Linda R. Petzold, Mechanical Engineering, and Computer Science
- Phone: (805) 893-5362
- FAX: (805) 893-5435
- Email: petzold@engineering.ucsb.edu
- Office: 5107 Harold Frank Hall
- Office hours: Fridays 1-3pm, or email for appointment

TA:

- Mike Lawson, BMSE
- Email: mlawson@lifesci.ucsb.edu
- Office: 5106 Harold Frank Hall
- Office hours: Tuesdays 1-3pm, or email for appointment

Class Web Site: All assignments and announcements will be posted on the class web site, including office hour or class cancellations beyond what is listed below, and any other changes to the regular schedule. You are responsible for looking there to find any news. The site is <http://www.cs.ucsb.edu/~cse>

Course Days/Times Meet on Campus: Monday and Wednesday 9-10:50

Text: *Computer Methods for Ordinary Differential Equations and Differential-Algebraic Equations*, U. M. Ascher and L. R. Petzold, SIAM, 1998.

### Course Description:

Development of modern numerical methods for ordinary differential equations including Runge-Kutta and multistep. Convergence, order and stability analysis. Sensitivity analysis. Concepts and capabilities of mathematical software.

### Expected Outcomes:

1. Understanding of fundamental concepts of numerical solution of ODEs, including sources and propagation of error, and stiffness
2. Experience with practical issues of software development including error control and stepsize selection
3. Capability of applying stability and accuracy concepts from numerical ODEs to numerical PDEs

### Grading Policy:

- Exams 50%
- Classroom participation 10%
- Homework 40%

### Course Schedule:

#### Holidays and Exams:

- Monday, January 16 - UCSB holiday
- TBD - Exam 1
- Monday, February 20 - UCSB holiday
- Wednesday, March 14 - Exam 2

Exams: Exams will be in-class, closed-book, no calculators. Bring paper to write on, and a stapler or fastener. Label all sheets of paper with your name. You are allowed and encouraged to bring one standard sheet of notebook paper with notes written on it (it is OK to write on both sides).

Homeworks: Homeworks are due at 9am (beginning of class). Hand them in directly to the TA. If you need to turn in a homework early, you can turn it in to the homework box (the box labelled CS211B, in Harold Frank Hall room 2108), by 8:30am on the day it is due. **Late homeworks will not be accepted**, because we will discuss the homework solutions in class on the day they are due. There will be programming homeworks, starting in week 2. Programming assignments should be done in Matlab. You are not allowed to use Matlab functions which would defeat the point of the exercise. (For example, if the exercise is to write an ODE solver, do not call one of Matlab's ODE solvers unless the exercise explicitly says to do it, or unless you are doing it to compare with and check the accuracy of the ODE solver you have just written. If you are in doubt about whether you can use one of Matlab's functions, ask me or the TA).

Classroom participation: At the beginning of each class period, we will review the most important concepts from the previous lecture. I may call upon you, by random selection, to review a given concept. I may give you a problem to work on the board, with the help of the class. During the class period, I may ask questions which anyone can volunteer to answer. For class periods where a homework was due, we will go over the homework problems in a similar manner. If you do a reasonably good job, you will get a +; if you are absent or if it is obvious that you don't know what you are talking about, then you will get a -; if you do an absolutely great job, you will get a ++. Your grade for classroom participation will be given by the average of these scores (since we cannot ensure that everyone gets an equal number of opportunities). There may also be other opportunities for classroom participation. We will bias the random distribution to ensure that everyone gets a chance to participate and that no-one is called upon too frequently. The purposes of classroom participation are to ensure that you are up to date on your reading and understanding of the course material so that you are able to get the most out of each lecture, to help you to prepare for oral exam situations, and to provide me with information about your level of understanding, so that I can adjust my lectures accordingly. If you consistently attend class and stay up

to date on the reading material (after each class, read over the text sections that we covered, and think about what are the most important concepts, and read the other assigned material on a timely basis), you should be able to get an A in classroom participation.

Feedback: You are encouraged to ask questions during the lecture if there is anything you don't understand. However, this will not count as classroom participation. You are welcomed and encouraged to send questions, comments or suggestions about the course to me or to the TA. You can do this by email or, if you prefer to do it anonymously, by putting it on paper, in the homework box.