Math 364 - Introduction to Scientific Computing

Prof. Claudia Rangel-Escareño

SYLLABUS

FALL 2009

• Course Description

This course is intended to help students develop a basic competence in scientific computing. Students will be given a high level introduction to computing in MATLAB and LaTeX as well as the creation, access and manipulation of databases. A broad collection of basic numerical techniques will be presented, including approximation methods, iterative methods for root finding, linear algebra applications solving matrix-vector problems and linear systems. The course is taught online and we use **Sakai** http://www.sakaiproject.org/ and **Elluminate Live** for virtual lectures, e-whiteboard and office hours.

Each student will have an account to access Sakai to drop off homework, see grades and get copies of the lecture notes among other features. Every Saturday the student will access Elluminate for the live lecture, interact with the professor and the other students in the class.

• Course Teaching Objectives

This course is designed to enable students to

1. Develop computing proficiency by learning and implementing the methods described above on the computer.
2. Develop problem-solving skills
3. Improve mathematical skills

• Course Learning Objectives

Students completing this module will be able to

1. Demonstrate a basic competence in scientific computing
2. Work on a mathematics clinic and other work in industrial applied mathematics
3. Design computer algorithms to solve mathematical problems.

• Prerequisites:

Graduate standing in the mathematics program, or permission of instructor. Concurrent enrollment in the mathematics clinic is welcomed. Students who already have credit for courses at CGU or the Claremont Colleges that make heavy use of MATLAB will not be allowed to enroll for credit. Also, *attendance to the kick off meeting is mandatory if you want to take this course*. This meeting will be held on Saturday September 5, 2009 from 10:00am until 1:00pm (room TBD). During this meeting the student will learn how to use sakai and to interact with the professor through Elluminate Live.

• **Textbook:**

Numerical Computing with MATLAB. Cleve Moler. Publisher SIAM.
ISBN: 0-89871-560-1 http://www.mathworks.com/moler/chapters.html

• **Evaluation:**

Grades will be based on homework (60%) a term project for final exam (40%). For the homework 3 parts will be equally graded: problem solution description, code, and explanation of the results. All homework assignments MUST be submitted in LaTeX. For the term project, students will be required to define and solve a challenging mathematics problem using computing in the MATLAB environment. A written report in LaTeX containing the project description, algorithms used, computer program listing, and sample outputs will be submitted, and students will deliver a brief oral presentation of their project. Students are allowed to work in group BUT homework should be turned in individually. **Problems with identical solution will worth 0 points and plagiarism will be highly penalized.** If plagiarism is proven it will be documented in file, two documented instances would lead to expulsion from CGU and failure of the course.

• Course Materials/Software:

Copies of MATLAB will be available for use on both of the math houses. Students wishing to use MATLAB on their home computers may purchase copies of the student edition of MATLAB from the Huntley Bookstore (price is $99.00 and the package includes two books), or by ordering from www.mathworks.com. Alternatively, the program "Octave" (open source version of MATLAB) and which is a near compatible version of MATLAB 4.2, is free for installation on your own computer (under General Public License), and available for Windows 95 and above at the web site http://members.localnet.com/ tomcw/

• The following texts are also recommended:

1) Brookshear J.G. Computer Science: an overview. Addison Wesley 7th Ed. ISBN 0- 201-78130-1

2) Griffiths, D.F. and Higham, D.J. Learning LaTeX. Philadelphia: SIAM.ISBN 0-89871-383-8

3) Higham, D.J. and Higham, N.J. MATLAB Guide. Philadelphia: SIAM. (For ordering information, see: http://www.siam.org/catalog/mcc06/ot75.htm)

4) Hornbeck, R.W. Numerical Methods. New Jersey: Prentice Hall/Quantum.

Reference number (3) of these serves as a reference for the MATLAB language and its capabilities. Reference (4) describes a broad array of numerical methods that will be discussed in the course.

1. Tentative Calendar

Lecture No.	Topic	Date	Textbook
1	Orientation Session	September 5	Lecture notes
	Introduction to MATLAB		Chapter 1
	Introduction to LaTeX		Notes
	Introduction to Databases		Notes
2	MATLAB and LaTeX	September 12	Chapter 1
3	Interpolation and Curve Fitting	September 19	Chapter 3
4	Zeros and Roots	September 26	Chapter 4
5	Numerical Differentiation	October 3	Chapter 9
6	Random Numbers	October 10	Chapter 9
7	Numerical Integration	October 17	Chapter
8	Introduction to Optimization	October 24	Notes
9	Databases and MySQL	October 31	Notes
10	MySQL	November 7	Notes
11	Data Mining	November 14	Notes
12	Data Analysis	November 21	—
13	Thanksgiving no lecture	November 28	—
14	3D Graphs	December 5	Notes
15	Final Exam	December 12	Due to submit
16	Grades ready	December 18	Course Ends