CMPSC/Math 456 – Introduction to Numerical Analysis II
Spring 2011

Course Description
The purpose of this course is to introduce students to some basic concepts in numerical analysis. Topics to be covered include: polynomial and piecewise polynomial approximation, matrix least squares problems, numerical solution of eigenvalue problems, and numerical solution of ordinary differential equations. (If time permits, we will also cover numerical optimization.) (If time permits, we will cover additional numerical analysis topics such as numerical optimization.) Analysis of numerical algorithms will be stressed. We will also discuss the design of numerical algorithms which are accurate, efficient, stable, and robust.

Course Meetings
MWF, 11:15am-12:05pm, 271 Willard Building (Section 1)

Instructor
Dr. Suzanne Shontz
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Office Hours: 2-3pm Mondays and Wednesdays; or by appt.*
* = *send e-mail to make an appointment*

Teaching Assistant
None

Required Text
Numerical Analysis
Author: Richard L. Burden and J. Douglas Faires (Ninth Edition)
Publisher: Brooks-Cole Publishing
ISBN: 0538733519
Note: Earlier editions will not work for the course.

Prerequisites
CMPSC/Math 455. Please talk with me if you are not sure as to whether or not your background is equivalent to this requirement.

Course Requirements
Lecture attendance is required, although attendance will not be recorded. The course requirements for CMPSC/Math 456 include six homework assignments, six quizzes, 1 midterm exam, and 1 final exam. The homework will require a combination of written exercises and programming. The exercises will involve the design and analysis of algorithms and will require mathematical proofs in many cases. The programming exercises will be done in Matlab, a high-level language for numerical computation. *Prior knowledge of Matlab is not a prerequisite for the course.*

Homework will be **due at the beginning of class** approximately one week after it is assigned. Start dates and due dates for the homework will be announced in class. **There will be a late penalty of 10% for homework handed in up to 24 hours late. No homework will be accepted more than 24 hours late.**

There will be one midterm exam scheduled on Monday, February 28 from 8:15-10:15pm. Please reserve this date on your calendar. The midterm will be held in **109 Walker Hall**. The midterm will be closed-book. A make-up midterm will be given to any student who is absent from this exam for a compelling reason and gets permission from the instructor.

There will be a final exam. The date, time, and location will be announced in class after it is scheduled by the university. It will be 2 hours long and **comprehensive** *with an emphasis on material covered after the second midterm*. A make-up final will be given to any student who is absent from the final for a compelling reason and gets permission from the instructor.

The exams will cover topics drawn from the lectures and homework, and from the underlying mathematics.

Grading
The homework assignments will count for 25% of the final grade. The first five homework assignments will be problem sets, whereas the sixth homework assignment will be a mini-project. The lowest scoring problem set be dropped. One of the problem sets may be skipped, in which case this is the one that will be dropped. **The mini-project will be weighted the same as two problem sets and may not be dropped.** The quizzes will count for a total of 20% of the final grade. The lowest scoring quiz also will be dropped. One of the quizzes may be skipped, in which case this is the one that will be dropped. The midterm exam will count for 25% of the final grade, and the final will count for 30%. **Students must earn an average score of at least 50% in each area (homeworks, quizzes, and exams) in order to pass the class.**

Class Schedule
The course calendar shows a week-by-week syllabus. The dates and order of topics are subject to change by the instructor. Any significant changes will be announced in class.

Course Website
There is a course website within ANGEL accessible via http://cms.psu.edu.

Computing Facilities
For programming assignments, students can use the Solaris machines located in 218 IST and 222 IST. You may also use Matlab on the Windows machines in any ITS Lab on campus.

Books on Reserve
The following books have been placed on reserved for this course at the Engineering Library: (1) Numerical Analysis by Burden and Faires; (2) Scientific Computing: An Introductory Survey by Michael T. Heath; (3) Elementary Numerical Analysis by Kendall E. Atkinson; (4) Numerical Mathematics and Computing by Ward Cheney and David Kincaid; (5) Numerical Analysis in Modern Scientific Computing by Peter Deuflhard and Andreas Hohmann; (6) Matlab Primer by Timothy A. Davis and Kermit Sigmon; and (7) A Guide to Matlab for Beginners and Experienced Users by Brian R. Hunt.

Academic Integrity
Students are allowed to collaborate on the homework assignments to the extent of formulating ideas as a group. Each student is expected to write up the homework by himself or herself. Students must not hand in homework that represents somebody else's ideas entirely. Students should do the coding for programming questions by themselves--no program code should be shared. No collaboration of any kind is allowed on the quizzes or exams.

Students are permitted to consult outside published material for the homework, although the homework will be fully based on lecture notes and the textbook. If a student consults a source other than the lecture notes and textbook, he or she must cite the source--failure to cite the source will be considered cheating.

The penalty for cheating will be an F for the course, following a hearing with the instructor as spelled out in the university's academic integrity policy. In extreme circumstances the instructor will in addition bring the case before the university's Academic Integrity Committee and/or the Office of Judicial Affairs.

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Week	***Lecture Topics***	***Notes***
1	**Jan. 10-14:** Polynomial and piecewise polynomial approximation (Chapter 8)	**Event:** None
2	**Jan. 17-21: No class on Jan. 17;** Polynomial and piecewise polynomial approximation (Chapter 8)	**Event: MLK Jr. Day (Jan. 17);** Quiz 1 on Jan. 21
3	**Jan. 24-28:** Polynomial and piecewise polynomial approximation (Chapter 8)	**Event:** None
4	**Jan. 31-Feb. 4:** Linear Least Squares Problems (reading from Heath)	**Event:** Quiz 2 on Feb. 4
5	**Feb. 7-11:** Linear Least Squares Problems (reading from Heath)	**Event:** None
6	**Feb. 14-18:** Linear Least Squares Problems (reading from Heath)	**Event:** Quiz 3 on Feb. 18
7	**Feb. 21-25:** Linear Least Squares Problems (reading from Heath)	**Event:** None
8	**Feb. 28-Mar. 4:** Eigenvalues (Chapter 9)	**Event: Midterm Exam on Monday, Feb. 28 from 8:15-10:15pm in 109 Walker**
X	**Mar. 7-11: No class**	**Event: Spring Break**
9	**Mar. 14-18:** Eigenvalues (Chapter 9)	**Event:** None
10	**Mar. 21-25:** Eigenvalues (Chapter 9)	**Event:** Quiz 4 on Mar. 25
11	**Mar. 28-Apr. 1:** Eigenvalues (Chapter 9)	**Event:** None
12	**Apr. 4-8:** Initial Value Problems (Chapter 5)	**Event:** Quiz 5 on Apr. 8
13	**Apr. 11-15:** Initial Value Problems (Chapter 5)	**Event:** None
14	**Apr. 18-22:** Initial Value Problems (Chapter 5)	**Event:** Quiz 6 on Apr. 22
15	**Apr. 25-29:** Initial Value Problems (Chapter 5)	**Event:** None
FINALS	**May 2-6: Comprehensive Final**	**Event: FINAL: Location/Time are TBD (1 hr., 50 mins.)**