MATH 5610/6860, Fall 2010
Introduction to Numerical Analysis I

Time and Place: MTWH 10:45-11:35 a.m., JTB 130

Instructor: Jingyi Zhu, LCB 335, 581-3236, zhu@math.utah.edu

Office Hours: MWH 1:00-2:00 p.m. or by appointment.

Text: Burden and Faires, *Numerical Analysis,* Eighth Edition, 2005, Thomson Brooks/Cole.

Prerequisites: Multivariate calculus (Math 2210), basic linear algebra (either Math 2250 or Math 2270), and some basic programming knowledge.

Programming: you are strongly encouraged to use the Matlab package to perform all the numerical experiments in this course. As an alternative, the open-source Matlab-compatible package Octave can be downloaded for free and used instead, to a somewhat inconvenient degree.

Description: This is the first half of a whole year introductory sequence course on numerical analysis for students with no background in serious computation. The contents for this semester include chapters 1 through 5, chapter 9 and part of chapter 10. A more detailed list of topics is given below. Programming is the essential aspect of this course, and we will use many examples included in the textbook to solve various problems. For this purpose we will often use Tuesdays for discussion and problem solving.

Topics to be Covered:

- Preliminaries: review of calculus, round-off errors and computer arithmetic (Chapter 1), and Matlab primers;
- Solutions of equations in one variable (Chapter 2);
- Interpolation and polynomial approximation (Chapter 3);
- Numerical differentiation and integration (Chapter 4);
- Initial-value problems for ordinary differential equations (Chapter 5);
- Approximation theory (Chapter 8);
- Numerical solution of nonlinear systems of equations and optimization (Chapter 10), but we will leave most of the linear algebra issues to Matlab as a black box.

Grading:

- Homework assignments (40%): from the textbook, given each week if there is no ongoing project;
- Programming projects (20%): various practical applications will be presented and discussed in class, and groups will be formed to tackle these problems over a period of two weeks for each project;

- Midterm (10%): a 50-minute in-class, open-book and open-note test to prepare you for the final exam;
- Final (30%): a two-hour in-class, open-book and open-note exam which must be taken to pass the course.

Final Exam: Tuesday, December 14, 2010, 10:30 am to 12:30 pm, in JTB 130.

For Students Registered for Math 6860: If you are a PhD student in a non-mathematics program, you may register at the 6000 level. However, you will be required to do extra work for the course which include: more theoretical exercises in homework assignments and exams, and more research oriented projects based on your particular disciplines. Grading curve for 6860 is separated from the rest of the class.

Other references:

- Atkinson, *An Introduction to Numerical Analysis,* Second Edition, Wiley.
- Stoer and Burlisch, *Introduction to Numerical Analysis,* Springer.
- Mathews, *Numerical Methods Using Matlab,* 4th Edition, Prentice Hall.

ADA Statement: The American with Disabilities Act requires that reasonable accommodations be provided for students with physical, sensory, cognitive, systemic, learning, and psychiatric disabilities. Please contact the instructor at the beginning of the semester to discuss any such accommodations you may require for this course.