MATH 437: Principles of Numerical Analysis

Instructor:	Prof. Wolfgang Bangerth Blocker Bldg., Room 507D bangerth@math.tamu.edu
Office hours:	Thursdays, 2–4pm
Lecture:	Tuesdays + Thursdays, 9:35–10:50am Blocker Bldg., Room 624
Lab hours:	Wednesdays, 8–8:50am Blocker Bldg., Room 12

Course Topics
This course will cover the following topics:

- Mathematical principles of numerical analysis and their application to the study of particular methods
- Fixed-point iteration, Newton's method
- Normed vector spaces and operators
- Linear systems, convergent matrices
- Schur decomposition
- Minimization methods, conjugate gradient method
- Polynomial interpolation of Lagrange and Hermite
- Best approximation, Bernstein and Weierstrass Theorems
- Numerical quadrature.

We will cover these topics in roughly one-week sections, but some may require more or less time. They may also be considered in a slightly different order than given above.

Textbook
L. R. Scott: *Numerical Analysis*. Princeton University Press.
The book will provide a guideline for this class, but you do not need to have it. In particular, I will not pose homework questions by referencing problems from the book.

Prerequisites
MATH 304, MATH 309, MATH 311, or MATH 323; MATH 308; MATH 409; ability to program; junior or senior classification.
Some of the homework assignments will require you to write small programs. In general, I leave the choice of programming language to you, but if your choice is somewhat exotic or outside the realm of what a TA can be expected to read, you will need to provide sufficient commentary to make the code understandable.

Webpage
Homework assignments and other course information will be posted at the course webpage
`http://www.math.tamu.edu/~wolfgang.bangerth/teaching.html`

Exams + Grading
Final grades will be determined based on the following components:

- Homework and programming assignments: 30%
- Midterm, October 17, 2013, 9:35–10:50am: 30%
- Final, December 6th, 2013, 12:30–2:30pm: 40%

Your minimum grade will be A, B, C, or D, for averages of 90%, 80%, 70%, and 60%, respectively.
Students must make arrangements in advance if they expect to miss an exam or quizz. Exam absences due to recognized University-related activities, religious holidays, verifiable illness, and family/medical emergencies will be dealt with on an individual basis. In all cases of absence from exams a written excuse is required. Ignorance of the time and place of an exam will not be accepted as an excuse for absence.

Learning Outcomes and Course Objectives
Numerical methods are the foundation of computer simulations in all fields of the sciences and engineering. The goal of this class is to (i) provide a basic level of literacy in numerical methods, as well as (ii) to learn about their analysis. At the end of the semester, students will be able to identify and understand what methods to use in what situations and how they will likely perform; and analyze these methods in terms of properties such as approximation quality or speed of convergence.

Policies
Academic integrity: The usual rules of academic intregrity apply. In particular, the Aggie Honor Code "An Aggie does not lie, cheat or steal, or tolerate those who do" should be selfevident, see

`http://aggiehonor.tamu.edu/`

Students may, and are encouraged to, work together and discuss homework problems with each other. However, copying work done by others is an act of scholastic dishonesty and will be persecuted to the full extent allowed by University policy.

Disabilities: If you have a disability and need special assistance, please contact me so we can make accomodations. The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accomodation of their disabilities. If you believe you have a disability requiring an accomodation, please also contact Services for Students with Disabilities, Cain Hall, Room B118, 845-1637.

For other policies and other information, please read

`http://www.math.tamu.edu/courses/`