Syllabus

Day/Time and Room: MWF, 11:00-11:50am, ECCR 155

Instructor: Michael Sprague, ECOT 322, 303-492-2646

E-mail: Michael.Sprague@Colorado.edu

Office Hours: MW 2:00 - 3:30 (You're welcome to try other times on MWF; Tuesday and Thursday are bad days for Mike)

Course Description (from 2003-2004 catalog): Focuses on numerical solution of nonlinear equations, interpolation, methods in numerical integration, numerical solution of linear systems, and matrix eigenvalue problems. Stresses significant computer applications and software.

Prerequisites: Calculus 3 (APPM 2350 or MATH 2400), linear algebra (APPM 3310 or MATH 3130), and **computer programming experience**.

Text: R. Burden and J. Faires, *Numerical Analysis*, 7th ed., Brooks/Cole, 2001.

Course Web Page: Most course materials will be available on the the following web page:

http://amath.colorado.edu/courses/4650/

Grading: The final grade will be computed as follows:

1. Homework: 50%
2. Midterm Exams: 30%
3. Final Exam: 20%

While class participation is not a requirement, it is encouraged, and it may influence grades in borderline cases.

Homework:

- The homework will consist of theoretical problems, programming exercises, and essay questions.
- Homework will be distributed on Wednesday and is due by 5:00 pm on the following Wednesday (in-class or in box outside Mike's office). Late homework turned in before 5:00 pm on Thursday will be subject to a 25% penalty. Homework turned in before 5:00 pm on Friday will be subject to a 50% penalty. Homework will not be accepted after 5:00 pm on Friday.
- You are allowed and encouraged to work together on homework. However, you must write up your own solutions and write your own code. Any code in your programs must be *typed* in by you alone; no cutting and pasting code from another.
- Please show and adequately explain your work. Writing that is difficult to read will NOT be graded.
- All assignments will be weighted equally and one assignment will be dropped. Note that some assignments will take considerably more time than others.
- Attention to detail matters! Check and double check your work.

Programming:

- All programming will be done in MATLAB. Learning MATLAB is a goal of the course, not a prerequisite. The MATLAB language is more natural and higher-level than C or Fortran, which makes it easier to write an algorithm directly from its mathematical description. The textbook uses "pseudocode" to describe most of the algorithms we cover. It is easy to translate these into MATLAB code.
- MATLAB can be found on the PCs in ECCR 143 as well as on various PCs and Macs around campus.
- If you are uncomfortable with computer programming, please consider taking APPM 3050.

Schedule

Date	Topics	Reading
M Aug 23	Motivation and Calculus Review	1.1
W Aug 25	Computer Arithmetic and Roundoff Errors	1.2
F Aug 27	Algorithms and Convergence	1.3
M Aug 30	The Bisection Method	2.1
W Sep 1	Fixed-Point Iteration	2.2
F Sep 3	Newton's Method	2.3
M Sep 6	NO CLASS - LABOR DAY	
W Sep 8	Error Analysis for Iterative Methods	2.4
F Sep 10	Accelerating Convergence	2.5
M Sep 13	Roots of Polynomials	2.6
W Sep 15	Interpolation and the Lagrange Polynomial	3.1
F Sep 17	Divided Differences	3.2
M Sep 20	Hermite Interpolation	3.3
W Sep 22	Cubic Spline Interpolation	3.4
F Sep 24	Parametric Curves	3.5
M Sep 27	REVIEW	
W Sep 29	**MIDTERM EXAM 1**	
F Oct 1	NO CLASS - FALL BREAK	
M Oct 4	Numerical Differentiation	4.1
W Oct 6	Richardson's Extrapolation	4.2
F Oct 8	Elements of Numerical Integration	4.3
M Oct 11	Composite Numerical Integration	4.4
W Oct 13	Romberg Integration	4.5
F Oct 15	Adaptive Quadrature Methods	4.6
M Oct 18	Gaussian Quadrature	4.7
W Oct 20	Multiple Integrals	4.8
F Oct 22	Improper Integrals	4.9
M Oct 25	Gaussian Elimination	6.1
W Oct 27	Pivoting Strategies	6.2
F Oct 29	Linear Algebra and Matrix Inversion	6.3
M Nov 1	The Determinant of a Matrix	6.4
W Nov 3	Matrix Factorization	6.5
F Nov 5	Special Types of Matrices	6.6
M Nov 8	REVIEW	
W Nov 10	**MIDTERM EXAM 2**	
F Nov 12	Norms of Vectors and Matrices	7.1
M Nov 15	Eigenvalues and Eigenvectors	7.2
W Nov 17	Iterative Techniques	7.3
F Nov 19	Error Bounds and Iterative Refinement	7.4
M Nov 22	The Conjugate Gradient Method	7.5
W Nov 24	Linear Algebra and Eigenvalues	9.1
W Nov 26	NO CLASS - THANKSGIVING BREAK	
M Nov 29	The Power Method	9.2
W Dec 1	Householder's Method	9.3
F Dec 3	The QR Algorithm	9.4
M Dec 6	REVIEW	
W Dec 8	REVIEW	
F Dec 10	NO CLASS - FINAL EXAMS BEGIN	
M Dec 13	**FINAL EXAM (1:30pm - 4:00pm)**	