

Fall 2011
Foundations of Computational Mathematics 1
MAD 5403

Details

- Time and Place : MWF 10:10 AM – 11:00 AM , 201 Love Building
- Instructor: K. A. Gallivan (5-0306, 318 Love Building, gallivan@math.fsu.edu)
- Office Hours: 8:00 AM – 9:00 AM and 11:00 AM – 1:00 PM, MWF and meetings by appointment
- Prerequisites: programming proficiency, linear algebra or consent of instructor
- Text: A. Quarteroni, R. Sacco, and F. Saleri, Numerical Mathematics, Springer Texts in Applied Mathematics 37, Second Edition.
- Grades: Programs 25%, Exam 1 20% , Exam 2 20% and comprehensive final 35 %.
- The final exam will be held at the officially appointed time.
- Homework: Homework will consist of written exercises assigned approximately weekly and programming assignments. The written exercises are to assist you in understanding the material and preparing for the exams. They do not contribute to your grade and you are not required to turn in solutions. It is strongly recommended however that you do all assigned problems and consult the detailed solutions that will be provided approximately one week after assignment. The programming assignments will be graded and contribute to your grade. They and are due at the time specified in the assignment. Programs will be accepted after the due date only with prior approval or with documentation of an excused absence.
- No makeup exams will be given without prior approval or, if not possible, without documentation of an excused absence.
- University Attendance Policy: Excused absences include documented illness, deaths in the family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse. Consideration will also be given to students whose dependent children experience serious illness.
- Class Attendance Policy: With the exception of the first class meeting, attendance is not required but is strongly advised. A student absent from class bears the full responsibility for all subject matter and procedural information discussed in class.
- Class Information: Class notes, homework, programming assignments and announcements will be posted on the class website (follow the teaching link from <http://www.math.fsu.edu/~gallivan>).

Content

This course covers mathematics and methods that form the basis of the techniques of scientific computation. It is the first course of a sequence of two meant to prepare beginning graduate students for advanced courses in numerical methods and to be able to solve basic problems on a computer. Although many of the methods have existed for a long time (consider the origins of Newton's Method; and Gauss Quadrature), today these methods are typically implemented on computers. When someone talks about solving science or engineering problems on computers, such as automobile or aircraft design, weather prediction or financial modeling, they are referring to programs that approximate and solve the equations that model the system under study. In the two semesters we will study the basic methods for solving equations, optimizing cost functions, approximating functions and using the approximations to evaluate key components of computational mathematical problems and applications. solving those approximations.

FCM 1 will cover the following topic areas:

1. Vector spaces, norms, inner products, and matrices
2. Factorization methods for solving linear systems
3. Conditioning and stability of numerical methods
4. Floating point arithmetic
5. Numerical Stability of Gaussian elimination
6. Basic iterative methods for solving linear systems
7. Solving linear least squares
8. Solving nonlinear equations
9. Systems of nonlinear equations
10. Unconstrained optimization

Objectives

The class covers tools that have been developed to solve problems numerically, generally on a computer. Thus, you will be expected to be able to implement the techniques and to solve problems with them. In addition, you will be expected to know how the methods were derived and when they are and are not appropriate to use.

Syllabus Changes

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.

Honor Code

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ... be honest and truthful and ... [to] strive for personal and institutional integrity at Florida State University. (Florida State University Academic Honor Policy, found at <http://dof.fsu.edu/honorpolicy.htm>.)

Americans with Disabilities Act

Students with disabilities needing academic accommodation should:

1. register with and provide documentation to the Student Disability Resource Center;
2. bring a letter to the instructor indicating the need for accommodation and what type.

This should be done during the first week of class.

This syllabus and other class materials are available in an alternative format upon request.

For more information about services available to FSU students with disabilities, contact the :

Student Disability Resource Center
874 Traditions Way
108 Student Services Building
Tallahassee FL, 32306-4167
644-9566 (voice), 644-8504 (TDD)
sdrc@admin.fsu.edu
<http://www.disabilitycenter.fsu.edu>.