Learning Outcomes

Students will learn basic concepts, problems and methods used in numerical computing. They will develop an ability to apply knowledge of mathematics, science, and engineering, and an ability to apply mathematical foundations, algorithmic principles, and computer science theory in modeling and design of computer based systems in a way that demonstrates comprehension of the trade-offs involved in design choices. Specifically students will be able to:

1. estimate computed errors;
2. select/propose methods that yield small errors (if possible);
3. understand important properties for a number of basic methods (e.g., Gaussian elimination, Lagrange and spline interpolation, Trapezoidal and Simpson’s quadratures, Newton’s iteration, Runge-Kutta methods);
4. modify problems for better algorithm performance;
5. analyze results computed in fl-arithmetic.


SELECTED TOPICS:
1. Floating-point representation and errors.
2. Locating roots of equations.
3. Interpolation and numerical differentiation.
6. Approximation by spline functions.
7. Smoothing of data and least-squares.

PREREQUISITE: MA 213 and CS 221 or equivalent. A knowledge of some high level programming language such as FORTRAN, C, or MATLAB is required to complete certain programming assignments.

HOMEWORK: Homeworks assigned in paper sheets will be collected within one week, will consist of theoretical problems or computer projects. Altogether there will be around 6
collected homework assignments. Late submissions will not be accepted. Homework assignments are to be worked out independently.

EXAMINATIONS: Two mini-exams during the semester and a final exam. In case of legitimate reasons (see Student Rights and Responsibilities), students must inform the instructor in advance to schedule an exam that will take place before the exam for the whole class. Make-up exams after that will only be given in cases of unforeseen (legitimate) reasons and documented evidences for such reasons are required.

CHEATING: Students have to do the assignment work and the exams by themselves. They can help each other with general concepts; however, direct assistance with a particular solution will be considered as cheating. Please refer to Student Rights and Responsibilities for more details concerning cheating; let me only remind that the minimum penalty for cheating is an E-grade.

GRADE COMPOSITION: Homework, including some programming assignments, 35%, Miniexam I (Tuesday, October 20) 20%, Miniexam II (Tuesday, November 24) 20%, Final (8:00AM, Wednesday, December 16) 25%

FINAL GRADE: Assigned according to the following scale
   A=90–100%, B=80–89%, C=70–79%, D=60–69%, E=0–59%