MthSc 460/660 Introduction to Numerical Analysis

Syllabus

Instructor: Dr. Hyesuk Lee, Martin O 206, 656-5235, hklee@clemson.edu

Meeting Time and Place: 11:00 - 12:15 TTh in Martin M-305

Office Hours: 10:00 - 11:00 on MW, 1:30 - 2:30 on T or by appointment


Prerequisites: MthSc 206 and 360 or computer programming

Objective: The objective of the class is to develop the understanding of basic numerical methods and their implementations that are necessary for solving fundamental mathematical problems by numerical means.

Grading Policy: Your grade will be determined as follows:

- Homework: 40%
  Two tests: 40%
  Final Exam: 20%

- A: 90 - 100
  B: 80 - 89
  C: 70 - 79
  D: 60 - 69
  F: 0 - 59

- Requirements for MthSc660 will be above and beyond MthSc460 level.

- For excused absences only, your final exam score will be counted as the missed test score. Excused absences consist of medical problems or emergencies approved by the instructor before the test is given. Unexcused absences will result in a zero score.

- Homework problems will consist of programming assignments and written exercises. Your are encouraged to discuss exercises with other members of the class, however the homework you turn in to be graded should be your work alone. Late work will not be accepted.

Course Homepage: www.math.clemson.edu/~hklee/mthsc460/mthsc460.html
Class notes, homework assignments and Matlab codes will be posted.
References:

- Matlab manuals (online and bound) will be useful for addressing programming difficulties.

Attendance: Regular attendance is necessary for each student to obtain maximum benefits for instruction. Each student is responsible for all the work including test and written work in all classes.

Students are expected to wait 15 minutes before leaving if the instructor is not present at the scheduled start time of the class.

Academic Integrity: As members of the Clemson University community, we have inherited Thomas Green Clemson’s vision of this institution as a "high seminary of learning". Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form.

Students with Disabilities: It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities. Students are encouraged to contact Student Disability Services to discuss their individual needs for accommodation.
Course Content: The following is a tentative outline.

1. Error Analysis
   - Floating point number system
   - Floating point arithmetic
   - Errors

2. Systems of Linear Equations
   - Back solving and forward solving
   - Gauss transformation
   - LU decomposition
   - Cholesky decomposition
   - Band matrix
   - Sensitivity of a solution of a linear system

3. Nonlinear equations
   - Rate of convergence
   - Bisecting method
   - Regular falsi method
   - Fixed point iteration
   - Newton’s method
   - Secant method

4. Interpolation
   - Polynomial interpolation
     - Method of undetermined coefficients
     - Lagrange interpolation
     - Neville’s algorithm
     - Divided differences
     - Error analysis
   - Piecewise polynomial interpolation
     - Hermite cubic interpolation
     - Cubic spline interpolation

5. Numerical Integration
   - Newton-Cotes quadrature
   - Gaussian quadrature
   - Composite and adaptive quadrature
   - Richardson’s extrapolation
   - Romberg integration

6. If time permits, numerical methods for initial value problems will be discussed.