

Math/CS 465, Topics: NUMERICAL ANALYSIS
Rhodes College
Fall Semester, 1998

Logistics

Meeting time and place: M hour, 9:40 – 11:10 TT: 207 Kennedy
Texts: R.L. Burden & J.D. Faires, *Numerical Analysis*, 6th edition.

Instructor: Tom Barr
Ohlendorf

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Office hours: 2- 3 MW
1:30 – 3 TT
2-3 Fri by appt

Web page: <http://www.mathcs.rhodes.edu/~barr/math105>. Office Phone: 843-3722
Academic Volume: Faculty folders: A-F: tombarr: MathCS465

Purpose and Goals: The purpose of this course is to acquaint the student with the potentialities of mathematics and computers in solving numerical problems which arise in the sciences. We will deal with mathematical questions of how to generate solutions to such problems and with questions of implementing these methods on the computer. Topics to be included in this course are: FORTRAN programming, floating-point arithmetic, approximation of roots of equations, interpolation and polynomial approximation, numerical differentiation and integration and solutions of systems of linear equations. Other topics such as least-squares approximation of initial-value problems for ordinary differential equations may be included as time permits.

Tentative Outline of the Course:

1. Preliminaries
Software: Introduction to FORTRAN 77, Review of Mathematica Number representation, floating point arithmetic, truncation, round-off error, etc.
2. Approximating the roots of equations
Bisection algorithm
Fixed-point iteration
Newton's method
Systems of equations and the method of steepest descent
3. Approximation of functions
Polynomial interpolation
Spline approximation
Least squares
4. Approximation of Calculus Operations
Numerical differentiation

- Numerical Integration
 - Trapezoid rule
 - Simpson's rule
 - Romberg's algorithm
 - Gaussian Quadrature
- 5. Approximate solutions for initial value problems
 - Euler's Method
 - The Runge-Kutta method
- 6. Approximation in linear algebra
 - Gaussian elimination with scaled partial pivoting
 - Special systems
 - Eigenvalues and Eigenvectors
- 7. Other topics as time permits

Activities: Regular homework assignments, mostly problems from the textbook and programs, will be graded. The two tests are tentatively scheduled for

Tuesday, 13 October
Tuesday, 24 November

They will be approximately 1-1/2 hour in duration, taken in class without books or notes, unless otherwise noted. The term projects will take the form of an expository paper and a class presentation based on that paper. Schedule a meeting with me on or near 22 October to finalize your topic, and schedule another meeting with me on or near 19 November to make a brief (1/2 hour) presentation on a portion of what you will be covering in your paper and class presentation. I will distribute a list of possible topics and resources; you are certainly encouraged to investigate your own as well.

Grading:

2 Tests @ 20% each	40%
Homework	20%
Paper and Presentation	15%
Final Exam	25%

The Honor Code: By writing your name on work which is submitted to be graded you assert that you have not received aid in completing the work from any other individual, verbally or in writing. By the same token you are obliged to report to the instructor or the Honor Council any transgression of the Honor Code which you witness.