MA/CS 321:001 MWF 11:00-11:50 FB 213 Fall 2004 Instructor: Russell Brown Office: POT741 Phone: 257-3951 rbrown@ms.uky.edu Office hours: MWF 10:00–10:50 and by appointment.

*Grading:* Grades will be based on homework (100 points), two midterm exams (200 points) and a final (150 points). I expect that an A will correspond to roughly 90%, a B to 80%, a C to 70%, and a D to 60%. Scores may be curved by making small adjustments to these gradelines.

*Text: Numerical mathematics and computing, fifth edition,* Ward Cheney and David Kincaid

This course will discuss procedures for computing numerical solutions to problems in mathematics and some of the difficulties that arise in these computations. This study will consider a number of issues: Does the method produce an accurate answer? What are the sources of error and how can they be managed? Are the methods efficient? We will answer these questions by proving careful mathematical statements and carrying out computations to see if these results arise in practice.

*Homework:* There will be regular homework assignments which include programming. Students will be asked to use Matlab in their programming assignments and I will provide some assistance and examples to help you get started. Matlab is available in the in CB 313 as well as in labs in the Engineering college. Matlab is likely not the most efficient programming environment. However, it provides easy access to plots and a rich variety of functions which will be useful in our study.

*Exams:* We will have two midterms and a final. The approximate dates of the midterms are given below.

Topics:

- §1.1 Preliminaries.
- §1.2 Review of taylor series.
- §2.1 Representation of numbers in different bases
- §2.2 Floating point representation.
- §2.3 Loss of significance.
- §3.1 Locating roots of equations, the bisection method.
- §3.2 Newton's method.
- Exam 1. 1 October 2004.
- §4.1 Polynomial interpolation.

- §4.2 Errors in polynomial interpolation.
- §4.3 Estimating derivatives and Richardson extrapolation.
- §5.1 Numerical integration. The definite integral.
- §5.2 Trapezoid rule.
- Exam 2. 29 October 2004.
- §7.1 Naive Gaussian Elimination.
- §7.2 Gaussian Elimination with scaled partial pivoting
- §7.3 Tridiagonal and banded systems.
- §8.1 Matrix factorizations.
- §9.1 First-degree and second-degree splines
- §9.2 Natural cubic splines.
- Final exam: 10:30–12:30 am, Monday, 13 December 2004.