

Course Outline: Winter 2012

University of Saskatchewan
Department of Mathematics and Statistics

NUMERICAL ANALYSIS I (MATH 211)

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Course Website: <http://www.cs.usask.ca/~spiteri/m211.html>

Prerequisites: MATH 110 (Calculus I) and MATH 116 (Calculus II).

Text: Michael Heath, *Scientific Computing, An Introductory Survey*, 2nd ed. McGraw-Hill, 2002.

Lecture Notes: Lecture notes are provided on the course website; however, they are not a substitute for attending class.

Overview: This course is about numerical computing using MATLAB. Numerical computing is primarily concerned with the computer solution of mathematically formulated problems. MATLAB is a *problem-solving environment* that allows students to enhance important problem-solving and computer skills that form the basis for a state-of-the-art training in science or engineering. These are essential skills for those seeking careers in academia or high-tech industry. Note: Experience with MATLAB is a marketable skill (i.e., you can put it on your resume!) that is often required by companies in their job ads.

Lecture Topics:

1. Introduction to MATLAB and Numerical Computing
 - (a) MATLAB basics
 - (b) Floating-point arithmetic
2. Solving Systems of Linear Equations
 - (a) Gaussian elimination, LU decomposition, pivoting; effects of round-off error
 - (b) Norms and condition numbers; accuracy and stability of numerical algorithms
3. Interpolation
 - (a) Polynomial interpolation
 - (b) Piecewise polynomial (spline) interpolation
4. Solving Nonlinear Equations
 - (a) Methods for solving single nonlinear equations
 - (b) Methods for solving systems of nonlinear equations
5. Numerical Integration
 - (a) Quadrature (numerical solution of definite integrals); adaptive quadrature
 - (b) Numerical solution of initial-value problems for ordinary differential equations; stiffness

Method of Evaluation: Assigned Course Work and Relative Marking Weights:

- Assignments (5): 20 % (due every 2-3 weeks; short written answers and some MATLAB programming)
- Mid-term Test: 25 % (Tuesday, February 14, 2012, in class)
- Final Exam: 55 %

Rules and Regulations:

- All students must be properly registered in order to attend lectures and receive credit for this course.
- Failure to complete the assigned course work or to write the final examination will result in a failing grade for the course.
- Failure to obtain a mark of at least 40% on the final examination will result in a failing grade for the course.
- The course website lists other regulations regarding examinations, assignments, and academic honesty.