

MATH 2200
MATHEMATICAL COMPUTING 1

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1.0

1.1 Course description: This is a first course in mathematical computing. It covers the basic elements of scientific programming in both a computer algebra system and a high-level programming language. Explored are implementation issues, problem description, model building, method development, and solution assessment.

1.2 For whom course is intended: Primarily designed for mathematics majors, but also of interest to science and engineering majors.

1.3 Prerequisite: MATH 1950.

1.4 Unusual circumstances of the course: None.

2.0 Objectives

2.1 Students will learn the fundamental components of computational problem solving by exploring level-appropriate scientific programming problems. They will learn how to build the models, solution methods, and actual programs to solve the problems. Basic aspects of both Maple and C will be taught.

3.0 Content and Organization

3.1 Topics:

1. Computational problem solving process
2. Rational vs. floating point numbers
 - a. Population density
 - b. Center of gravity
 - c. Uncertain physical measurements, determination of earth's circumference
3. Variables and assignments
 - a. Determination of earth's circumference
4. Programmer-defined functions
 - a. Pythagorean Theorem
 - b. Population growth prediction
 - c. Simple, compound, and continuous interest
5. Program conditionals
 - a. Projectile trajectory
 - b. Triangle bisection
6. C programmer-defined functions
 - a. Motion on an inclined plane
7. Repetition
 - a. Single integral approximation
8. C arrays
 - a. Heat transfer
9. Integrating Maple and C code

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4.0 Teaching Methodology

- 4.1 **Methods of Instruction:** This course will be presented by lecture and class discussions. Some classes may be held in the computer lab to facilitate hands-on learning.
- 4.2 **Student role in the course:** Students must attend and participate in class and must complete the course requirements.
- 4.3 **Contact Hours:** 3 hours/week

5.0 Evaluation

- 5.1 Evaluation will be based on student performance on programming assignments and two exams.
- 5.2 Programming assignments will comprise approximately 60% of the final grade with the two exams comprising the remaining 40%.
- 5.3 **Grading Scale:**

97-100: A+	93-96: A	90-92: A-	
87-89: B+	83-86: B	80-82: B-	
77-79: C+	73-76: C	70-72: C-	
67-69: D+	63-66: D	60-62: D-	0-59: F

6.0 Resource Material

6.1 Possible Texts:

- 1) *Introduction to Scientific Programming*, by Zachary, Springer-Verlag, 1996.

6.2 Other suggested readings:

- 1) *Maple V Programming Guide* by Monagan, Geddes, Labahn, Vorkoetter; Springer, 1996.

6.3 Other sources

- 1) www.maplesoft.com
- 2) www.mapleapps.com

6.4 Current bibliography of resources for student's information:

- 1) *C Programming Language* By Kernighan, Ritchie, and Ritchie, Prentice-Hall, 1998.
- 2) *Absolute Beginner's Guide to C* by Perry, Sams, 1994.
- 3) *C: A Reference Manual* by Harbison and Steele, Prentice-Hall, 2002.
- 4) *An Introduction to Computational Science and Mathematics* by Van Loan, Jones and Barlett, 1996.
- 5) *Maple: An Introduction and Reference* by Kofler, Addison-Wesley, 1997.
- 6) *The Maple Book* by Garvan, Chapman & Hall, 2001
- 7) *Introduction to Maple* by Schwartz, Prentice Hall, 1999.
- 8) *Mathematical Computing*, by Betounes and Redfern, Springer-Verlag, 2002.