

MATHEMATICAL COMPUTING II

MATH 3200

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1.0

1.1 Course Description:

This course is a second course in mathematical computing. It covers the design and development of algorithms and the elements of programming in a mathematical context. The computer algebra system Maple will be used. The programming assignments are primarily based on calculus concepts and designed to reinforce and deepen the understanding of these concepts.

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 1970 and at least one of the following: MATH 2200, CIST 1400, equivalent programming experience.

1.4 Unusual circumstances of the course:

None

1.0

Objectives

2.1

Students will become proficient in using a computer algebra system to develop algorithms and programming solutions to mathematically oriented problems. Students will also deepen their understanding of the mathematical concepts involved in the programming problems.

2.0

Content and Organization

3.1 Topics:

1. Basic aspects of Maple
2. Looping and repetition
 - a. Newton's method
 - b. Riemann sums
 - c. Series convergence
 - d. Approximating lengths of curves
3. Program conditionals
 - a. Double integral approximation
 - b. Computational geometry
4. Procedures
 - a. Optimizing functions of two variables
 - b. More computational geometry
5. Graphics programming and animation
 - a. Approximating solids of revolution
6. Recursion
 - a. Recurrence relations
 - b. Sorting
 - c. Base N representations of numbers
7. Project
 - a. Fractals (crystal growth)
 - b. Inscribed polygons
 - c. Random walks

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3.0 Teaching Methodology

4.1 Methods of Instruction:

This course will be presented by lecture and class discussions. Some classes will 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

4.0 Evaluation

5.1 Evaluations will be based on student performance on programming assignments and a programming project, which will include a presentation to the class.

5.2 Programming assignments will comprise approximately 75% of the final grade with the programming project comprising the remaining 25%.

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		

5.0 Resource Material

6.1 Possible Texts:

1) *Mathematical computing*, by Betounes and Redfern, Springer-Verlag, 2002.

6.2 Other Suggested Readings:

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

6.3 Other Sources:

3) www.maplesoft.com

4) www.mapleapps.com

6.4 Current Bibliography of resources for student's information:

1) *Computing With Maple* by Francis Wright' Chapman & Hall / CRC Mathematics Series, 2001.

2) *Experimental Mathematics with Maple* by F. Vivaldi' Chapman & Hall / CRC Mathematics Series, 2001.

3) *Introduction to Scientific Computation* by R. Crandall' Telos / Springer-Verlag, 1994.

4) *Essential Maple 7: An Introduction for Scientific Programmers*, by Corless, Springer-Verlag, 2002.

5) *The Maple Book* by Garvan, Chapman & Hall, 2001.

6) *Mathematical modeling* by Meerschaert, Academic Press, 1998.