

MA513A – Differential Equations

Fall 2003

Instructor: Dr. Stefan Ehrlich

Office Hours: Monday 5:15 – 7:45PM

Tuesday 3:00 – 4:00, 5:15 – 6:30PM

Thursday 3:00 – 4:00, 5:15 – 6:30PM

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Text: Differential Equations, Blandchard, Devaney. Hall, 2002
Brooks/Cole, 2th Edition

Syllabus

Brief Course Description:

Differential Equations, has become increasingly important as the computer age has advanced. The digital computer has sparked renewed interest and numerous advancements in many fields of applied mathematics.

This course is organized from the viewpoint of the applied mathematician whose interest in differential equations may be both highly theoretical and intensely practical. The emphasis is therefore placed on a sound and accurate exposition of the material on methods of analytic and numeric solutions that have important applications in disciplines such as: engineering, chemistry, biology, environmental studies, and economics, et. al.

Particular care is used to develop and show interrelations among various aspects of the material, to explain why a particular technique is appropriate for a given class of problems, and to show how analytic and numeric techniques can be integrated in solving differential equations.

Course Objectives:

To provide a basic working knowledge of the mathematical tools, language, and thought processes used by applied mathematicians. For computer science majors, the course will provide an opportunity to expand your skills in an allied field. One of many you might find employment in after graduation. For mathematics/computer scientist students, it will make you aware of the need of precise vocabulary and the rigors of mathematical thinking.

Classroom Policies:

Students are expected to attend and participate in all classes. Attendance is taken at the beginning of each period. Please notify the instructor in advance of any anticipated absence whenever possible. It is your responsibility to make up any material missed whenever you are absent from class. Assignments are taken from exercises in the text. The homework problems are always covered in a timely fashion and questions about the problems should be raised at the next class meeting. The study of mathematics/computer science requires regular work and plenty of practice. Postponed homework usually results in poor comprehension and performance.

Teaching Strategies:

Lecture format, built around the textbook readings with numerous examples chosen to illustrate theoretical concepts. Lots of drill with emphasis on practice, practice, and more practice. Questions are encouraged and discussion of material stressed.

Course Requirements and Grading Policies:

Students will be evaluated based on a midterm and a final exam as follows:

Midterm – 40% final - 60%

All tests are closed book and the final is comprehensive. Extra credit problems will be available. The results will be converted to a letter grade in keeping with grading policies of the college.

Material Covered:

- 1- Introduction to Differential Equations and their solutions
Classification of Differential Equations
Explicit and Implicit Solutions
Initial and Boundary Value Problems
Existence and Uniqueness of Solutions

- 2- Analytic Solutions of First Order Equations
Exact Equations
Separable Equations
Linear and Bernoulli Equations
Integrating factors
Transformations (optional)

- 3- Explicit Methods of Higher-Order Linear Differential Equations
Homogeneous Linear Equations with Constant Coefficients
Method of Undetermined Coefficients
Variation of parameters

- 4- Series Solution of Linear Differential Equations (optional)
Power Series Solution about an Ordinary Point and Solutions about Singular points

- 5- LaPlace Transform (optional)

- 6- Numerical Methods w/wo Maple
Euler's method, Runge-Kutta, Adams-Bashforth, et. al.