

M242 - DIFFERENTIAL EQUATIONS

Fall 2008

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Text: DIFFERENTIAL EQUATIONS IN SCIENCE AND ENGINEERING,
V. W. Noonburg & R. Decker

Prerequisites: M144 and M145.

Course Summary: This is an introductory course in Differential Equations. It assumes that you have had the first two semesters of Calculus. Since an introduction to differential equations is done at the end of M145, you should have seen much of the material covered in the first two chapters of the text. In particular, the solution of first-order differential equations by the method of separation of variables should be a review. If you did not take Calc II at the University of Hartford, it will be necessary to read Chapters 1 and 2 of the text *very carefully* to make sure you know this material well before the first exam. The general topics to be covered are: first-order differential equations, second-order linear differential equations, systems of first-order d.e.s (including an introduction to matrix methods), phase plane analysis of linear systems, applications to nonlinear systems, and Laplace transforms.

Grading:

Webwork & Homework	15%	Midterm Exams	50%
Labs	15%	Final Exam	20%

Homework: Problems from the text and/or Webwork will be assigned during each class period. You will be given a chance to ask questions about these problems at the beginning of each class. Some homework will be collected and graded, and the Hour Exams will contain questions similar to the homework problems.

Computer Projects (Labs): There will be 2 or 3 projects which involve putting together some of the concepts studied in the course. You will definitely need a TI-89 calculator. The computer software MAPLE can also be used for the projects. It is available in the computer lab in Dana. You will be shown the instructions necessary to do whatever is required. **NO LATE LABS WILL BE ACCEPTED.**

Assessment: Math majors (and others) taking this course will be expected to substantially increase their ability to model real-world problems using mathematics. This skill will be evaluated in the homework and exams, and especially in the Labs.

Date	Sections	Material to be Covered
Sep. 3	1.1, 1.2, 2.1	Introduction to differential equations, separable equations
8	2.2	Slope fields
10	2.3,2.4	Linear d.e.s, Existence & uniqueness
15	2.5	Numerical methods
17	2.6	Autonomous d.e.s, phase line, bifurcation
22	2.7	Applications, review
24		EXAM 1 (Chap. 1 and 2.1-2.5)
29	3.1	Second-order d.e.s
Oct. 1	3.2	Mass-spring equation
6	3.3	Nonhomogeneous second order d.e.s
8	3.4	Driven mass-spring systems, resonance
13		Applications
15	3.6	Phase planes, review
20		Resonance and beats
22		EXAM 2 (2.6-2.7, 3.1-3.4)
27	4.1	Introduction to Laplace Transforms
29	4.2	Computation of transforms, theorems
Nov. 4.3		Heaviside and delta functions
5	4.4	Convolution, examples
10	4.5	Applications, review
12		EXAM 3 (3.6, Chap. 5)
17	5.1,5.2	Introduction to systems, matrix algebra
19		Thanksgiving Vacation
24	5.3	Eigenvalues and eigenvectors
26		Analytic solutions of linear systems
Dec. 1		Trace-determinant plane
3	6.1	Phase planes for systems
8	6.2	Linearization of nonlinear systems
10		Review

FINAL EXAM