

Ordinary Differential Equations

Math 250 Section 003, Spring 2004

Meeting time and place: 112 Osmond, MWF 11:15-12:05

Instructor: Maria Emelianenko

Office hours: 407 McAllister, Tue 1:30-2:30, Th 4-5 and by appt (may change)

Email: emeliane@math.psu.edu

Course webpage: <http://www.math.psu.edu/emeliane/math250>

Prerequisite: Math 141, or equivalent courses.

Text: *Elementary Differential Equations and Boundary Value Problems* by W.E. Boyce - R.C. DiPrima, 7th Edition, 2000, John Wiley & Sons, Inc.

If you have the 6th edition book from previous years, you can also use that. Lectures will generally follow the discussion in the text, but will sometimes alter in presentation and worked examples. Some additional material will be handed out in class and posted on the course website.

Calculators: Calculators may be used (but are not required) on homework assignments. **Calculators are not allowed for quizzes or exams.**

Examinations: There will be two 75-minute midterm examinations. The first will be held on Thursday, February 26th at 6:30p.m. The second will be held on Monday, March 29th at 6:30p.m. The final exam will be given during the finals week. **(Students should not make arrangements to leave University Park before May 8, 2004.)** Students must bring their picture student identification cards to all examinations. Exam performance is the most important factor in determining your grade in this course.

Makeup/Conflict Midterm Exams: Only students with official University conflicts, or a valid, documented excuse, such as illness, will be permitted to schedule conflict or late make-up examinations. Students are responsible for requesting permission from the instructor at least three days before the regularly scheduled examination, except in emergency circumstances.

Conflict Final Exam: Students may file for conflict final examinations at the Registrar's office, between February 23 and March 5. No conflict examination request will be accepted after March 5.

Attendance: Class attendance is not required, but is highly recommended. Although a lot of material including brief lecture notes is going to be available

online on the course website and ANGEL, some class information will not be duplicated. In case you have to miss a lecture, feel free to ask me for help with covered material.

Homeworks and Quizzes: Homeworks will be given daily and collected in class on Fridays. Late homeworks will only be accepted with a valid excuse and no later than Wednesday the following week. There are going to be about 14 weekly quizzes. Quiz solutions will be available immediately, so no makeup is possible. Two lowest homeworks and quizzes will be dropped at the end of the semester. Extra credit opportunities include one take-home group project.

Grades: Grades will be assigned on the basis of 450 points distributed as follows:

100 points homework/quizzes

100 points midterm examination I **Thr. Feb. 26, 6:30 p.m.**

100 points midterm examination II **Mon. March 29, 6:30 p.m.**

150 points final examination **May 3 - May 7**

Standard cutoff scheme will be used as a guideline for grading, however, course cutoffs will not be finalized until the end of the semester.

Academic Integrity Statement

All Penn State policies regarding ethics and honorable behavior apply to this course. Academic integrity is the pursuit of scholarly activity free from fraud and deception and is an educational objective of this institution. All University policies regarding academic integrity apply to this course. Academic dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating of information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. For any material or ideas obtained from other sources, such as the text or things you see on the web, in the library, etc., a source reference must be given. Direct quotes from any source must be identified as such. All exam answers must be your own, and you must not provide any assistance to other students during exams. Any instances of academic dishonesty WILL be pursued under the University and Eberly College of Science regulations concerning academic integrity.

Schedule of Lectures (subject to change):

INTRODUCTION

- 1.1 Direction fields
- 1.2 Solutions of Some DE's
- 1.3 Classification of DE's

FIRST ORDER DE's

- 2.1 Linear Equations with Variable Coefficients
- 2.2 Separable Equations
- 2.4 Differences Between Linear and Nonlinear Equations
- 2.5 Autonomous Equations and Population Dynamics
- 2.6 Exact Equations
- 2.7 Numerical Approximations: Euler's Method
- 2.8 Existence and Uniqueness Theorem

SECOND ORDER LINEAR EQNS

- 3.1 Homogeneous Equations with Constant Coefficients
- 3.2 Fundamental Solutions of Linear Homogeneous Equations
- 3.3 Linear Independence and the Wronskian
- 3.4 Complex Roots of the Characteristic Equations
- 3.5 Repeated Roots; Reduction of Order
- 3.6 Nonhomogeneous Equations; Method of Undetermined Coefficients
- 3.7 Variation of parameters
- 3.8 Mechanical Vibrations
- 3.9 Forced Vibrations

HIGHER ORDER LINEAR EQNS

- 4.1 General Theory
- 4.2 Homogeneous Equations with Constant Coefficients
- 4.3 Method of Undetermined Coefficients
- 4.4 Variation of Parameters

THE LAPLACE TRANSFORM

- 6.1 Definition of the Laplace Transform
- 6.2 Solution of Initial Value Problems
- 6.4 Differential Equations with Discontinuous Forcing Functions
- 6.5 Impulse Functions
- 6.6 Convolution Integral

SYSTEMS OF FIRST ORDER LINEAR EQUATIONS

- 7.1 Introduction to Systems of Differential Equations
- 7.5-9 Classification of critical points and sketching