Applied Analysis
Math 81, Spring 2006

Course Web Page: http://zimmer.csufresno.edu/∼doreendl/81.06s

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Office hours: To be determined. Office hours will be posted on course web page.

Text (required): *Differential Equations and Linear Algebra*, 2nd edition, by C. Henry Edwards and David E. Penney, Prentice Hall (2005).

Units: 3.

Prerequisites: Math 77.

Please note that you will want to review the material from your calculus classes, focusing on trigonometric functions and their identities, exponential and logarithmic functions and their relationship, derivatives, and integration techniques.

Meeting Time and Location: Section 3: MWF 9-9:50 in S2 206

Course Description

This course is designed to:

- provide an introduction to basic techniques for solving ordinary linear differential equations and linear systems of ordinary differential equations, including solution using the Laplace transform;
- provide an introduction to linear algebra, including techniques for solving linear systems of equations and the concepts of basis and dimension; and
- explore the relationships between linear algebra and differential equations.

Course Objectives

To learn relationships between linear algebra and differential equations. Also, to continue learning how to understand, construct, verbalize, write, and use mathematical arguments and reasoning in areas to which they apply (including, but not limited to, course work), and how to evaluate the validity of an argument or of an approach to solving a problem.

In terms of specific skills, to learn:

- some basic techniques for solving ordinary differential equations;

- to identify a differential equation and the technique(s) that can be applied to solve it;
- the basic principles and uses of the Laplace transform;
- some basic matrix operations;
- Gaussian and Gauss-Jordan elimination and their applications;
- the concepts of linear independence and linear dependence, basis, and dimension; and
- introductory eigenvalue theory and its application to solving linear systems of differential equations.

Learning Outcomes

Upon completion of this course, students should be able to:

- identify and apply the best technique to solve an arbitrary linear differential equation or a linear system of differential equations;
- determine the dimension of, and a basis for, the solution space of a system of equations;
- determine the eigenvalues and corresponding eigenvectors of a matrix; and
- apply concepts from linear algebra to differential equations.

Grading

Your grade will be based on the following percentage weights: 10% for the homework, 10% for the quizzes (take-home), 15% for each of the three midterms, and 35% for the final. Grades on each individual homework assignment and exam will be given as a total number of points out of a specified maximum. Your final grade in the class will be computed from your weighted average, scaled to a maximum of 100 points.

A short warm-up problem frequently will be given at the beginning of class. Although volunteering to work out these problems on the board do not contribute numerically towards your grade, such efforts may be considered when determining your final grade if your scaled weighted average is at the borderline.

The tentative breakdown of points for the final grade is as follows:

Grade	**Points, p**
A	$p \geq 90$
B	$80 \leq p < 90$
C	$70 \leq p < 80$
D	$60 \leq p < 70$
F	$p < 60$

Attendance

Although attendance is not required, it is **strongly suggested** so that you may have the opportunity to (i) work on the warm-up problem of the day, and (ii) ask questions regarding material presented in class, in the homework, and/or in the text. The class time devoted to discussing homework problems will be limited, however, due to time constraints.

NOTE: You are responsible for checking the class web page **every** day for announcements.

Warm-up Problems

Warm-up problems will be given at the beginning of many of the lectures. They are short problems designed to take approximately five minutes. Warm-up problems are not meant to represent exam-level problems. Their goal is to reinforce the concepts taught in the preceding lecture(s). You will get the most benefit from the warm-up problems if you review your notes and the examples therein prior to coming to each class and doing the warm-up problem of the day.

Homework

Homework will consist of WeBWork problems, which will be assigned every Thursday on the web and due the following Thursday. WeBWorK problems are individualized problems that are done over the web. WeBWorK provides instant feedback as to whether or not you have done a problem correctly. When you have done a WeBWorK problem correctly, that fact is immediately recorded. You can access the WeBWorK login page from the course web page. Your login name is the part of your CSUF e-mail address before the "@" symbol (e.g., my e-mail address is `doreendl@csufresno.edu`, so my login name is `doreendl`). Your intial password is your CSUF student ID number. If you have any problems with the system, please let me know as soon as possible.

No late homework will be accepted.

You are encouraged to discuss aspects of the course with other students, and you may discuss the homework assignments in general terms with others. You are also encouraged to consult the instructor for help in completing the assignments or for any other course-related questions.

Quizzes

Take-home quizzes will be given approximately every one to two weeks. Each quiz will be due at the begiining of the class period (i.e., 11:00 a.m.) immediately following the day the quiz is given. The due date will be clearly marked on each quiz. These quizzes should represent your own individual, independent work. As such, you should not discuss the problems or the content of your answers with other students.

More problems will be given on each quiz than will be graded. The problems that will be graded will be chosen by the instructor, but will not be announced in advance. Quizzes will be handed out in class; if you miss the class at which a quiz is handout out, you must see the instructor in her office to obtain a copy.

Exams

There will be three midterms and one final exam. The tentative schedule for these exams is

- Midterm 1: Thursday, February 23, 2006.
- Midterm 2: Thursday, March 30, 2006.
- Midterm 3: Thursday, May 4, 2006.
- Final exam: Tuesday, May 16, 2006, 11:00-1:00 p.m.

Each midterm will be returned in the lecture following the exam, and the exam will be discussed at that time. If you wish to request a regrade, you must submit a signed written request and return your exam to the instructor before leaving that lecture. No regrades will be allowed after you leave class, with the exception of mistakes in totaling scores. Permission in advance is required to miss a midterm, in which case the final exam will count an additional 15%. A missed exam is graded as a score of 0 unless prior arrangements are made with the instructor.

The final exam must be taken at the time listed above unless you receive permission from the instructor by the end of the second week of classes. In order to pass the class, you **must** take the final exam.

General Course Outline

A tentative schedule of the topics to be covered and the sections of the textbook in which these subjects can be found follows. However, each section listed below may not be covered in its entirety. In addition, material may be added or removed, depending on time constraints. Reading assignments for each class will be announced in class and posted on the course web page.

Lecture	Topic	Reading in Text
1	Introduction to Differential Equations and Mathematical Models	Sections 1.1-1.2
2	Separable Equations and Applications	Section 1.4
3	Linear First Order Equations	Section 1.5
4	Substitution Methods; Bernoulli Equations	Section 1.6 to p. 69
5	Exact Differential Equations	Finish Section 1.6
6	Chapter 1 Review Problem Session	
7	Introduction to Matrices and Matrix Operations	Section 3.4
8	Matrices and Gaussian Elimination	Section 3.2
9	Reduced Row Echelon Matrices; Gauus-Jordan Elimination; Inverse of a Matrix	Sections 3.3, 3.5
10	Introduction to Matrix Determinants	Section 3.6
11-12	Introduction to Vector Spaces	Sections 4.1-4.2
13-14	Linear Combinations and Independence of Vectors; Basis and Dimension	Sections 4.3-4.4
15	Review for Midterm 1	
16	Midterm 1	
17	Review of Midterm 1	
18	Higher Order Linear Differential Equations	Sections 5.1-5.2
19-20	Homogeneous Equations with Constant Coefficients	Section 5.3
21	Applications: Oscillations	Section 5.4
22-23	Nonhomogeneous Equations – Undetermined Coefficients and Variation of Parameters	Section 5.5
24	Applications: Forced Oscillations and Resonance	Section 5.6
25	Eigenvalues and Eigenvectors	Section 6.1
26	First Order Systems of Differential Equations	Section 7.1
27	Review for Midterm 2	
28	Midterm 2	
29	Review of Midterm 2	
30-31	The Eigenvalue Method for Linear Systems – Distinct Real and Complex Conjugate Eigenvalues	Section 7.3
32	The Eigenvalue Method for Linear Systems – Repeated Eigenvalues	Section 7.5
33-34	Laplace Transform and Inverse Transforms	Section 10.1
35-36	Transformation of Initial Value Problems	Section 10.2
37	Translation and Partial Fractions	Section 10.3
38	Products of Transforms	Section 10.4 to mid-p. 601
39	Differentiation and Integration of Transforms	Finish Section 10.4
40	Review for Midterm 3	
41	Midterm 3	
42	Review of Midterm 3	
43	Periodic and Piecewise Continuous Functions	Section 10.5
44	Review for Final Exam	

Classroom Behavior

Talking, whispering, or any other student conduct which disrupts the learning process will not be tolerated and may lead to removal from class and/or other disciplinary action. University policies on disruptive behavior are followed and enforced in every instance.

Academic Dishonesty

Academic dishonesty will not be tolerated in any form. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

Students with Disabilities

University student disability policies are followed. Contact the Disabled Student Services office (located in the Madden Library) for specific arrangements and information.

Computers

At California State University, Fresno, computers and communication links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (http://www/csufresno.edu/ITS/) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources.

Copyright Policy

For the required syllabus statements referring to copyright policy, please see the Required Syllabus Policy Statements page
(http://academicaffairs.csufresno.edu/assocprovost/RequiredSyllabusPolicyStatements.htm).