Syllabus for MA214 Calculus IV/Ordinary Differential Equations

University of Kentucky, Fall 2008

Time and place:
Section 004: MWF 2:00-2:50 p.m., CB337

Course instructor and contact information:
Instructor: Dr. Alan Demlow, Assistant Professor of Mathematics
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Office hours: Office hours will be held in POT 775, Tuesdays 9:45-10:45, Wednesdays and Fridays 10:30-11:30, or by appointment. You are also welcome to drop by my office any time the door is open.

Course website: The course website will be linked to from http://www.ms.uky.edu/~demlow/.

Textbook: *Elementary Differential Equations and Boundary Value Problems* (8th Edition), by William E. Boyce and Richard C. DiPrima.

Course overview: Ordinary differential equations (ODE) have long been a fundamental part of the mathematical vocabulary used to describe natural phenomena. ODE have been studied using a wide range of tools and techniques. These include:

1. Classical attempts to find exact solution formulas;
2. Numerical methods which yield precise but approximate quantitative information about solutions;
3. Qualitative methods which provide a less precise, but very rich, geometric understanding of ODE.

Most of this course will emphasize exact solution techniques, and we may briefly consider qualitative and numerical methods as time allows. Material to be covered includes most of Chapter 1 (Introduction), Chapter 2 (First-order differential equations), Chapter 3 (Second-order linear equations), and Chapter 6 (The Laplace transform), along with selected sections from Chapter 7 (Systems of first-order linear equations).

Homework: Homework assignments will be posted on the course website prior to or directly after lectures, and will be due by 4 p.m. each Friday. I will select a few of the assigned problems to grade each week (roughly one for each section in the book), but you are required to complete all assigned problems. You are encouraged to work with others while solving homework problems, but you must write up your own solutions. Late homework will not be accepted. However, your two lowest homework scores will be dropped. Homework will be worth 20% of your final grade.

Exams: There will be two one-hour in-class preliminary exams during the course of the semester (each worth 20% of your final grade) and a final exam (worth 40% of your final grade). The tentative exam schedule with an approximate breakdown (subject to change!) of material covered on each is:

Prelim 1:	Oct. 10	Chapter 1, Sections 2.1-2.6, and 3.1-3.3
Prelim 2:	Nov. 24	Sections 3.4-3.9 and 6.1-6.5.
Final Exam:	Dec. 19, 8 a.m.	All previous material plus 7.2-7.6.

Please note that the final exam will be comprehensive, covering all material from the course.

Grading: Your final grade will be determined by your composite homework score for the semester (25%), your 2 prelims (40% of your grade, or 20% for each prelim), and your final exam (40%). I will use a standard grading scale (90-100% A, 80-89% B, etc.). Individual grade components and overall course grades may be curved up (but not down) to ensure a fair distribution of grades.

Software: There are many software options available for solving ODEs. Some packages are able to give exact solutions to many classes of problems symbolically (Maple and Mathematica), while others are able to display approximate numerical solutions graphically or in table form (Matlab, many graphing calculators, and the ODE Toolkit provided with your text). As you do your homework during the course of the semester, you are encouraged to explore these software options and use them to check your pencil-and-paper answers, and you may occasionally be assigned homework problems which require you to use one of them. However, no electronic aids (computers or graphing calculators) will be allowed on exams.

Attendance: You are responsible for all lecture material and announcements made in class. Attendance will not be recorded, however.

Academic integrity: All violations of academic integrity will be taken seriously and dealt with according to university regulations.

Sample Schedule

Class		Sections in Boyce and DiPrima, 8th ed.	
1	Aug-27	1.1,1.2,1.3: Introduction	
2	Aug-29	1.1,1.2,1.3: introduction	
3	3-Sep	2.1: Linear equations, method of integrating factors	
4	5-Sep	Homework questions, etc.	
5	8-Sep	2.2: Separable equations	
6	10-Sep	2.3: Modeling with first order equations	
7	12-Sep	Homework questions, etc.	
8	15-Sep	2.4: differences between linear and nonlinear equations	
9	17-Sep	2.5: Autonomous equations and population dynamics	
10	19-Sep	Homework questions, etc.	
11	22-Sep	2.6: Exact equations and integrating factors	
12	24-Sep	3.1: Homogeneous equations with constant coefficients	
13	26-Sep	Homework questions, etc.	
14	29-Sep	3.2: Fundamental solutions of linear equations	
15	1-Oct	3.3: Linear independence and the Wronskian	
16	3-Oct	Homework questions, etc.	
17	6-Oct	3.4: Complex roots of the characteristic equation	
18	8-Oct	Review	
19	10-Oct	Prelim 1 (through Section 3.3)	
20	13-Oct	3.5: Repeated roots: Reduction of order	
21	15-Oct	3.6: Nonhomogeneous equations: Method of undetermined coefficients	
22	17-Oct	Homework questions, etc.	
23	20-Oct	3.7: Variation of parameters	MIDTERM
24	22-Oct	3.8: Mechanical and electrical vibrations	
25	24-Oct	Finish 3.8; homework questions	
26	27-Oct	3.9: Forced vibrations	
27	29-Oct	6.1 Definition of the Laplace transform	
28	31-Oct	Homework questions, etc.	
29	3-Nov	6.2 Solution of the initial value problem	
30	5-Nov	6.3 Step functions	
31	7-Nov	Homework questions, etc.	
32	10-Nov	6.4 Differential equations with discontinuous forcing functions	
33	12-Nov	6.5 Impulse functions	
34	14-Nov	Homework questions, etc.	
35	17-Nov	Introduction to systems (lead model)	
36	19-Nov	7.2 Review of matrices	
37	21-Nov	Review	
38	24-Nov	Prelim 2 (Sections 3.4 through 6.5)	
39	1-Dec	Return exams	
40	3-Dec	7.3 Linear equations, linear independence, and eigenvalues	
41	5-Dec	7.4 Basic theory of systems of first order linear equations	
42	8-Dec	7.5 Homogeneous linear systems with constant coefficients	
43	10-Dec	Final review	
44	12-Dec	Final review	