SYLLABUS

Engineering Differential Equations

92.236 Spring 2011

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COURSE DESCRIPTION:

Many physical systems can be described mathematically by one or more differential equations. Examples include mechanical oscillators, electrical circuits, and chemical reactions, to name just three. In this course you will learn what a differential equation is, and you will learn techniques for solving some common types of equations. You will also learn techniques for obtaining information about the solutions of equations which cannot be solved analytically. Finally, you will learn how differential equations can be used to describe physical phenomena, and you will use your knowledge of differential equations to analyze these phenomena. These skills will be useful to you in your other engineering courses and in your career.

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COURSE GOALS AND OBJECTIVES:

My goals for this course are for you to

- develop a qualitative understanding of the nature of differential equations, their solutions, and their applications;
- learn qualitative techniques for obtaining information about solutions to differential equations;
- learn analytical techniques for solving commonly occurring differential equations;
- learn numerical methods for finding approximate solutions to differential equations that cannot be solved analytically;
- apply your knowledge of differential equations to problems in engineering; and
- develop an understanding of the mathematical modeling process.

COURSE PREREQUISITES AND ATTENDANCE POLICY:

Prerequisites: Calculus I and II (92-131 and 92-132) . Note you must know all of your integration techniques. Many times I will reduce a problem to finding a "simple" integral -- if it is not simple for you then you must review the necessary calculus material. Note that I will also need some material from Calc III (differentiating functions of several variables). Another prerequisite (it saddens me that I must say this) is you must be able manipulate fractions, exponents, square roots and logarithms; i.e., without proper algebra skills you will not succeed.

Class attendance is required. In almost each class we will correct a problem from the previous assignment(s). If you are not present you will not get a grade - your presence (noted by the homework you hand in that day) determines half of your homework grade, the remaining half is based on your grade in the assignment problem corrected. You are responsible for all information (course material, assignments, changes in exam dates, etc.) presented in class, whether you attend or not.

Note that late homework will not be accepted without prior approval. You cannot fall behind and expect to do well on the course. It requires daily homework. You can do very well, because the course involves learning a series of techniques to solve DE's; however in order to apply these and to know which technique requires experience (which can only be gained by doing many many examples). If you want to do well you must work at it every day. Do not wait until the end of the semester to ask me what you can do to improve your grade. That question needs to be asked at the beginning of the semester - your answer to the question will determine your grade.

TEXTBOOKS:

Edwards & Penney, *Differential Equations and Boundary Value Problems; Computing and Modeling*, 4th ed., Prentice-Hall, 2003.   All homework problems will come form the textbook. For students taking the evening course 92.234, there is no lab component. You do not need to buy *ODE Architect* if you take the evening course.

Lab reports (for Engineering DE class only). All day students are expected to purchase a copy of *ODE Architect,* written by CODEE (Consortium for ODE Experiments). The workbook has a CD-Rom with ODE-Architect Tool, a numerical ODE solver and graphics package, that you will use to solve the problems in the companion worksheets. Note that this does not presume any knowledge of MATLAB or MAPLE. ODE-Architect be used in my sections only. In the case that you have forgotten your ODE Architect text, here is a PDF file which has most of the text in it (note that pages 16 - 47 are out of order and are at the end of the PDF file - there are other pages out of order; you must navigate using bookmarks).   The lab class will meet on Tuesdays in Southwick317   - which has only 27 computers - if you have a laptop, you can ease the computer shortage by bringing it to class.   Lab reports must be written in English (simply submitting a series of graphs and equations will not suffice). Your report should be written so that your Uncle who knows no DE's and does not have ODEA can understand what the question was and how you arrived at your conclusions. There are sample labs posted elsewhere on the course pages.

GRADING POLICY:

Course grades for 92.236 (day students) will be based on homework, lab reports, 3 exams, and a comprehensive final exam. The final exam will count for 24% of your course average. Each of the other 5 scores (Homework Ave, Lab reports Ave, Test 1, Test 2, Test 3) will count for 17% of your course average except for the lowest of the 5, which will count for 8%.

For the evening students, (92.234) the final exam counts for 25% of your average, and each of the four scores (homework, 3 exams) counts for 22% except for the lowest of the four which will count for 9%.

Your letter grade for the course will be determined from your course average according to the following table:

Average	[93, 100)	[90, 93)	[87, 90)	[83, 87)	[80, 83)	
Grade	A	A-	B+	B	B-	
Average	[73, 77)	[70, 73)	[67, 70)	[60, 67)	[0, 60)	
Grade	C	C-	D+	D	F	

Tentative **exam dates (day classes)** : **2/23 (Mon), 4/6 (Wed), 4/29 (Fri). Note that these dates are tentative and will depend on our coverage of the material. You must come to class to be sure when exams will occur.**

The **Final Exam (92.236 day class)** will be celebrated on May , in

In order for you to understand the material in this course, it is extremely important that you do the assigned homework problems. Working with your classmates can be a great help, and I strongly encourage it. I also urge you to ask questions about any problems that give you trouble. Note that the solutions manual for odd-numbered problems is available in the links section (unfortunately it's for the second edition of the text). **Merely copying the solutions will not earn you any points** (in fact it will harm you more than you can know) **-- I provide the manual as a study aid. Copying someone else's (and that includes the solutions manual as well) work is also unacceptable. Do any of these and we will not get along well. Repeated acts of copying will result in your being reported to the Dean of Students for formal sanctions.**

Homework problems are due the class after we finish covering the material. I will use your homework as evidence of your attendance in that class. For that reason, late homework will not be accepted after the due date -- if I didn't collect your homework, it means that you do not get the attendance portion of your homework grade. **If you miss 4 consecutive homework assignments your name will be dropped from my roster - if you are unable to attend you must contact me in advance of absences, so that I do not remove your name from the class roster.** Your homework grade will be based on the percentage of times you turned in homework on time and on the correctness of your solutions to one or two randomly selected problems (see previous section) per homework turned in.

Do not ask me at the end of the term if there is anything you can do to improve your grade. If you want a good grade you must distribute the work over the whole term. And today is the day

to do more to improve your grade (tomorrow will be too late)

EXAM POLICY:

It is important that everyone take the same exams under the same conditions for maximum fairness and reliability of testing. For that reason, I do not give makeup exams unless you have a valid reason for missing the scheduled exam (for example, illness or religious holiday), and I do not allow extra time on exams unless you have a note from Disability Services. **If you have to miss a scheduled exam, please let me know ahead of time if at all possible.** I am much more likely to be understanding if you call me the morning of the exam and say "I have the flu and can't take the exam" than if you come in two days after the exam and say "I missed the exam. When can I take a makeup?"

Finally as a courtesy to other students: no gum chewing or gum snapping in class; clicking your ball point pens is not allowed; turn off your cell phones - **if you so much as look at your cell phone during class, you will be asked to leave the room**.

Tips on Preparing for Exams

- Start studying for an exam at least one week ahead of time. Focus your studying on the items given on the list of specific objectives for each section.
- Begin by reviewing the homework problems for the sections that will be covered on the exam. Make sure you know how to solve each problem without looking at the solution manual. If you cannot solve a particular problem, make a note of the problem number and move on to the next problem.
- Ask me or someone else for help on any homework problem that gave you trouble, then try to solve a similar problem from the textbook.
- Two days before the exam, try taking a practice exam. Take the practice exam under actual exam conditions: use only your calculator and the integral tables, do not look at the answers, and give yourself only 50 minutes.
- Ask me or someone else for help on any practice exam problem that gave you trouble, then try to solve a similar problem from the textbook.
- Get a good night's sleep the night before the exam. You will perform better if you are fresh and able to think clearly.

Tips on Taking Exams

- Read every question on the exam before you start working. This will give you a feel for how long the exam is and how you should pace yourself. It will also give your subconscious mind a chance to start working on the questions.

- If you are not sure what a question means, please ask me. I am trying to see how well you know the material, not to trick you with ambiguous wording.
- Look at the point value of each question. Obviously, it is more important to do well on the questions that count the most than the ones that count the least.
- It is generally best to do the easiest problem first, then the next easiest, and so on. You do not have to do the problems in the order they appear on the exam.
- If you get stuck on one question, move on to the next. Come back later to the question that is giving you trouble.
- Be aware of how much time you have left. Do not spend too much time on a single question. It is generally better to get partial credit on every question than full credit on a single question.

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CONTACTING THE INSTRUCTOR:

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Phone number: (978) 934-2711
 To check whether the university has been closed because of weather, call (978) 934-2121.

Office: Olney Hall, Room OH 428Q
Office Hours: Monday 10:00-10:50; Tuesday: 2:00 - 2:30, 5:15- 5:45; Friday 10:00- 10:50 pm; and by appointment. At these times I may also be in the department tutoring center in OH407.

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