MATH 520 – Ordinary Differential Equations

Instructor Professor Doug Meade
Office Hours: MWF 10:00AM – 11:00AM, and by *prior* appointment
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Course Website `http://www.math.sc.edu/~meade/math520-S08/`

Meeting Times Lecture: MWF 11:15AM– 12:05PM, LC 405

Text Ledder, *Differential Equations: A Modeling Approach*, McGraw–Hill, 2005.

Prerequisite Completion of MATH 526 or 544 with a grade of C or better.

Course Content Differential equations is the language of science. Many basic scientific laws express the change in one quantity in terms of the values of other quantities. These laws can be combined to create a mathematical model for the physical situation. Once the model is found the challenge is to understand the "solution" to the model — often without actually having explicit formulas.

The primary focus of this course is the mathematical analysis of differential equations. We will learn a few special techniques to find explicit solutions to differential equations and we will do some modeling to understand how differential equations are used to answer real-world questions. But, most of the time will be spent on questions such as:

- Does this equation have a solution for all *initial conditions*?
- Does the solution exist for all *time*, or does it *blow up* in finite time?
- What happens to the solution for large time? Does it converge to a fixed point? Is it periodic?
- How do these answers depend on the initial conditions, or other parameters in the problem?

A large class of differential equations are *linear*. For these equations the solutions form a vector space. This brings linear algebra into the picture. Linear algebra is also applied when talking about systems of differential equations. In most of these situations it is impractical to find explicit solutions. Qualitative information can be obtained using our knowledge of linear algebra.

The computer algebra system `Maple` will be used to create graphical representations of differential equations and their solutions. We will also turn to `Maple` to help with some of the more involved (symbolic) manipulations and (numerical) computations.

Study Hints Reading the textbook **in advance** of the lecture is strongly encouraged. Benefits of this preparation include obtaining a familiarity with the terminology and concepts that will be encountered (so you can distinguish major points from side issues), being able to formulate questions about the parts of the presentation that you do not understand, and having a chance to review the skills and techniques that will be needed to apply the new concepts.

Grading Your grade in this course will be based on your performance on (weekly) homework, (weekly) labs, three (3) mid-term exams, and a final exam. The weights assigned to each of these components will be:

Homework/Quizzes	10%(highest 10 scores)
Mid-term exams (3)	60%
Final exam	30%

Course grades will be determined according to the following scale:

A	90 –100
B	80 – 89
C	70 – 79
D	60 – 69
F	0 – 59

The deadline to drop this course with a grade of W is Monday, February 25, 2008.

Exams *Tentative* dates for the mid-term exams are:

Friday, February 8	Chapters 1– 2
Friday, March 7	Chapters 3– 4
Friday, April 18	Chapters 4– 6

Make-up exams will be given only for documented reasons of illness, family emergency or participation in a University sponsored event. Excuses such as oversleeping, forgetting the time or location of the exam, and lack of studying are explicitly noted as unacceptable grounds for a make-up exam.
A comprehensive final will be given at 9:00A.M. on Wednesday, April 30, 2008.

Homework Problems will be assigned for each section. You are expected to work all of these problems. Selected problems will be collected weekly (generally on Friday). Some assignments might be accepted electronically. Details about this will be given as appropriate. Some weeks we might have a short quiz instead of turning in homework problems. This will always be announced in advanced.
Your homework grade will be based on your ten (10) highest homework and/or quiz scores.

Graduate Credit Graduate students enrolled in this course will be expected to work additional problems assigned throughout the semester. Students taking the course for undergraduate credit can work these problems for extra credit.

Attendance Attendance at every class meeting is important – and expected. Students missing more than 10% of the class meetings (4 days) can have their grade lowered.

Academic Honesty Cheating and plagiarism will not be tolerated. You may discuss homework problems with others, but do not copy work from another student or from a book. Violations of this policy will be dealt with in accordance with the USC Honor Code and other University guidelines.