Math 264 - Differential Equations With Linear Algebra - Section 3 - Spring 2016

An introductory course in ordinary differential equations including techniques of elementary linear algebra. Emphasis is on first-order equations, and higher-order linear equations and systems of equations. Topics include qualitative analysis of differential equations, analytical and numerical solutions, Laplace transforms, existence and uniqueness of solutions, and elemental models in science and engineering. The student work in this course is in full compliance with the federal definition of a four credit hour course. Please see the Lafayette College Compliance webpage for the full policy and practice statement.

Instructor information

Jonathan Dahl
Office: 210 Pardee Hall
Office hours: MWF 11–11:50, W 8:30–9:20, or by appointment
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Basic course information

Meeting times: MWF 2:45–3:50 (Hugel 225)
Grading:
WeBWorK/homework (10%), quizzes/worksheets (15%), three midterm exams (15% each), final exam (30%).
In-class exams:
Monday, February 22,
Monday, April 4,
Friday, April 29.
Final exam: TBA (Don’t make travel plans before we get the exam schedule!)
Calculators: You will be asked on occasion to use a scientific calculator or something similar while working through a problem. In the unlikely scenario you do not already have such a calculator, you should be able to simply use a computer or smartphone connected to the internet. I plan to have us in the computer lab whenever you would need this in class. Calculators, computers, phones, and similar electronic devices are prohibited for use on quizzes and exams.
Math 264 introduces the methods and theory for ordinary differential equations. You’ve already learned how to use antiderivatives/integrals to solve basic initial value problems. In 264, we’ll learn how to work with mathematical models that involve derivatives in a more complicated manner. For equations involving derivatives of higher order, we’ll see connections to systems of equations and develop the related algebra needed to find solutions. We’ll learn how to use the Laplace transform to convert differential equations to algebraic equations. We’ll also learn qualitative and numerical techniques that can be used even when explicit solutions elude us.

Meetings: We will meet for 65 minutes three times a week. In order to help you get the most out of this time, I will update you regularly on future topics. I strongly encourage you to read the corresponding section of the textbook before we work on material in class. Students often only discover their points of confusion and useful questions after a second (or third or fourth...) encounter with a topic, so it helps to schedule such that I am around then.

WeBWorK and homework problems: We will use the WeBWorK online homework system. This allows for instant feedback on your work and gives you the opportunity to revise and correct your work until the posted deadline. The WeBWorK problems will generally be due Friday mornings.

I will also assign selected problems from the textbook to turn in. These will generally be due Mondays in class. Clear communication of your work is vital in mathematics. The textbook problems will be graded as such, providing feedback on your exposition in advance of quizzes and exams.

Finally, I will list suggested additional textbook problems for you to work out. These problems will not be collected, but will give you direction in additional practice. In general, I expect the WeBWorK and collected textbook problems will not be enough practice to master the material. You are encouraged to discuss all of these homework problems with me and with each other.

Attendance, worksheets, quizzes: You are expected to attend all class meetings. Please let me know if you can’t make it to class, with prior notice where appropriate. An absence will be excused if it is caused by illness properly reported, by an emergency properly reported, or by participation in a recognized collegiate activity. Proper reporting includes advance notice, whenever possible. An unexcused absence will result in a 0 for missed work.

Learning outcomes:
1. Students will be able to perform the fundamental computational techniques in the field of ODEs.
2. Students will understand the basic concepts and vocabulary of differential equations.
3. Students will learn to use symbolic, graphical and numerical methods in an integrated way to investigate and solve problems in various contexts.
4. Students will learn to formulate problems in mathematical terms.
5. Students will develop their ability to learn mathematics.

Ideas to be discussed and skills to be acquired:
1. Solutions of first-order ODEs, including separable equations and the use of integrating factors.
2. Linear ODE theory: existence, uniqueness, and linearity of solution space.
4. The method of undetermined coefficients.
5. Spring-mass systems.
6. Systems of ODEs and their basic theory.
7. Introductory linear algebra: matrix notation, row reduction, eigenvalues and eigenvectors, etc.
8. The eigenvalue method for homogeneous systems.
9. The Laplace transform and its use in solving ODEs.
10. Qualitative and numerical techniques for ODEs.

**Academic honesty:** I expect all students in this course to be honest in all of their academic work. Your further participation in this course is a tacit agreement to commit to acting in an honorable fashion in this academic community and signifies your understanding that your failure to comply with this commitment may result in disciplinary action. I am required to report every suspected case of academic dishonesty to the Dean of the College. Penalties for academic dishonesty are often quite severe.

Homework and in-class group work are collaborative exercises. You should confer with other students and with the instructor while working on these assignments. However, it is expected that in all cases the final product handed in for evaluation of your work will be your own. You may not copy or paraphrase the work of another student, nor should you use another student’s work as a model for your own.

During examinations and quizzes, you must not confer with other students, look at their papers, or use any unauthorized sources of information. Additionally, you may not allow another student access to your work. It is also dishonest to seek information about an examination from another student before taking a make-up examination.

See the Student Handbook for a complete statement of the College’s Policy on Academic Honesty.

**Special arrangements:** If you need disability-related accommodations in this class, if you have emergency medical information you wish to share with me, or if you need special arrangements in case the building must be evacuated, please inform me immediately. Please see me privately after class or at my office.

**Help**

**Office hours:** My office hours are MWF 11–11:50, W 8:30–9:20, or by appointment. Please do not hesitate to take advantage of this time. I want everyone to succeed and a stitch in time saves nine. My office is 210 Pardee Hall.

You may also email me questions (dahlj@lafayette.edu), although discussing mathematics via email can be tricky at times. I will try to answer quickly if it seems reasonable to, but sometimes we will just have to schedule time in front of a chalkboard.

Finally, feel free to ask me questions if you see me in my office or around campus.

In addition, the ATTIC provides help with study skills and time management and may be able to arrange an individual tutor for you if you feel that would be helpful. They will ask if you have sought my help, so you must first take advantage of office hours.