

Math 326: Differential Equations

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Textbook: *Elementary Differential Equations, by William Trench.*

Course Info: Topics include first-order differential equations, linear differential equations, power series solutions, Laplace transforms, linear systems of differential equations, and various applications. If time permits, we may be able to study some higher-order, nonlinear systems. We will take a multifaceted approach, including both analytical and numerical solution methods, as well as qualitative methods that enable us to discover properties of solutions without actually having a formula. Topics are subject to change depending on the progress of the class, and various topics may be skipped due to time constraints.

Reading the textbook is a good idea. You should read the sections of the textbook that correspond to the material covered during the lectures. It is in your best interest to stay ahead in your reading. If you read about a topic *before* we discuss it in class, it will enable you to answer my questions and ask your own focused questions during the lecture. Whether you choose to read a section before or after we cover it in class, the reading will help you better understand the material. Furthermore, definitions are extremely important in this course. Be prepared to memorize a lot of them. Besides demonstrating competence in learning definitions, theorems, and problem-solving techniques of elementary linear algebra, you will also be required to demonstrate the ability to do **simple proofs** on homework and exams.

We will find that matrix algebra will be a useful tool, and we will cover the parts of that subject which will be necessary for our use. The program MATLAB (or an equivalent program) may be an extremely helpful resource throughout the course, both as a computational tool and as a remarkable aid to visualization.

We are embarking on a systematic study of ordinary differential equations and will be taking calculus to a new and exciting level. This topic represents the completion of the calculus of functions in a single variable. This calculus is initiated by the study of derivatives in an attempt to solve the tangent problem and to determine the rate of change of some fluctuating quantity. One then moves on to the integral in an attempt to solve the area problem. Then these two seemingly unrelated notions are finally connected via the amazing Fundamental Theorem of Calculus. Now, finally, we begin the final chapter of this story. The use of differential equations will make available to us the full power of the calculus of single variable functions. Differential equations stand on the frontier of human knowledge and have a far-reaching impact beyond the realm of mathematics. The notions of ordinary differential equations are fundamental in almost all areas of science, engineering, and economics. Differential equations are widely used to model phenomena that arise in these areas, including populations, circuits, flames, springs, bird flight, ocean waves, spread of disease, and many, many more.

Upon successful completion of this course, a student will be able to:

- Solve differential equations of first order using graphical, numerical, and analytical methods,
- Solve and apply linear differential equations of second order (and higher),
- Solve linear differential equations using the Laplace transform technique,
- Find power series solutions of differential equations, and
- Develop the ability to apply differential equations to significant applied and/or theoretical problems.

Grading: There will be regular homework assignments, two midterm exams, and a final exam. Your overall grade will be determined as shown below. [More details and exam dates can be found on the course website.](#)

Exams will be given during class. Exams are closed book, closed notes, closed friends, and open brain. Phones and other electronic devices will NOT be permitted in exams. Whether or not calculators are allowed on an exam will be determined at a later time. Unannounced **quizzes** may be given from time to time and will be based on material from homework and previous lectures. **Class participation** will be based on your willingness to **ASK and ANSWER questions** in class.

In all written work, you must show your work neatly and legibly in order to receive credit. You should clearly show the process and reasoning you went through in order to solve the problem. The problems I work for you in class will provide good examples of how your homework and exam problems should be written up. All assessment

will be based on your ability to communicate a correct solution and explain your reasoning. It is absolutely essential to write clearly and completely. It is your responsibility to write in a way that tells me that you understand the problem and its solution.

Homework, Quizzes, Class Participation ----- 16%			
Exam 1 -----28%			
Exam 2 -----28%			
Final Exam ----- 28%			
<i>* See course website for exact exam dates.</i>			
	B+...87-89	C+...77-79	D...60-69
A...93-100	B...83-86	C...73-76	F...Below 60
A-...90-92	B-...80-82	C-...70-72	

Homework: Most homework will be done through the internet-based homework system called [WeBWorK](#). However, there may occasionally be problems you must write out and hand in to me. All assignments must be completed by the given due date. To receive credit, assignments must be completed on time. **WeBWorK extensions will NOT be given without a legitimate excuse.** Complete as much of the assignment as you can by the deadline to receive partial credit. If you have a legitimate conflict, you must tell me ahead of time.

Each student is responsible for completing his or her own WeBWorK assignment and any written assignments. However, **you are strongly encouraged to discuss the homework and to work together on the problems with your classmates.** Please be careful that you are actively participating in the process: many students find that they can understand a problem while they are watching a classmate work through it and explain it, and then conclude that they understand the material well enough. This leads to an unpleasant surprise at test time, when students who "thought they understood" the material find they are unable to work the problems on their own. Please be careful that you are able to work all of the problems on your own before the exam time arrives, with no coaching from a friend. Please use whatever resources aid you in learning the material, including computer assistance, office hours, other students, professors, other math books, etc.

Moreover, while it is not required that you complete a handwritten version of WeBWorK assignments, it is strongly encouraged. Writing a problem out by hand, showing all calculation steps, and keeping them collected in a notebook will greatly assist you as you prepare for exams.

Extra Help: There are many ways for you to get some help in this class. I am willing to spend a few minutes in class answering questions about homework problems. However, if you have many questions, I recommend taking advantage of my office hours. I will say it again...**USE MY OFFICE HOURS!** My job is to help you -- come to office hours even if you have just a small question. Do not wait until you get too far behind. If my office hours are not convenient for you, make an appointment by sending an email or asking after class. Please come see me as soon as you feel lost -- it is important that I know how you are doing so I can adjust the level of the class if necessary. I **WANT** to help you, and I **WANT** everyone to do well. There may also be help available in the Math Learning Center (South Hall 332) but do not expect it.

Do not let yourself get too far behind! I would be happy to see you if you feel you need some assistance. Come and get your questions cleared up right away.

Accommodations: SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. Accommodations will be made for medical conditions related to pregnancy or parenting. Requests for accommodations including letters or review of existing accommodations should be directed to the Office of Disability Services in Erwin Hall 22 or disabilityservices@geneseo.edu or 585-245-5112. Students with letters of accommodations should submit a letter to each faculty member at the beginning of the semester and discuss specific arrangements. Additional information on the Office of Disability Services is available at www.geneseo.edu/dean_office/disability_services.