

**Course Syllabus**  
MATH 2250, Section 007, Spring 2021  
Differential Equations and Linear Algebra

**Instructor:** Emily Smith  
Pronouns: she/her  
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**Lecture Hours:**  
MWF 1:25 - 2:45 pm, Virtual Classroom via Zoom

Students are expected to be computer literate and Canvas and Zoom navigation skills are expected. Knowledge and navigation of Canvas and Zoom is critical to access all features and resources of this course. A strong internet connection and adequate bandwidth is required for the synchronous online classroom. Logging in to Zoom with audio and video enabled is strongly recommended, but not required. Exams will be proctored using Zoom with video enabled.

**Lab Instructor and Hours:**

To be determined, lab will take place in the Virtual Classroom via Zoom

**Office Hours: To be determined during the first day of class**

I will also try to be available for five to ten minutes before and after class every day to answer questions. You can also send me an email to set up an appointment.

**Textbook:** *Differential Equations and Linear Algebra* 4th Edition, by C. Henry Edwards, David E. Penney, and David Calvis. For information on purchasing the textbook, go to <https://www.math.utah.edu/schedule/bookInfo/M2250TextInclusiveAccess-1.pdf>

- ISBN 13: 978-0134497181

We will be using the textbook for homework problems and to guide the lectures. You can purchase the textbook at the bookstore or online. There is also an inclusive access option, which is the cheapest option. There is a 3rd edition of this textbook which *may* suffice for this course. However, it is the student's responsibility to ensure that the problems are the same.

**Important Note:** By registering for the class, **your tuition is being charged for textbook access through Canvas**. If you do NOT want textbook access through canvas, you will need to **opt out** by the end of the second week of classes.

**Technology:** Numerical evaluation of differential equations using computer software is one of the most important techniques for solving differential equations in practice. You are not expected to have prior programming experience, but will be required to run portions of code that will be provided in lecture and lab. The code will use the following programs: MATLAB, Maple, and Mathematica. These programs are great resources to check homework assignments prior to submitting them for evaluation. I encourage you to review your work before instructor evaluation.

**Prerequisites:** At least a "C" or better in (MATH 2210 OR MATH 1260 OR MATH 1280 OR MATH 1321 OR MATH 1320 OR ((MATH 1220 OR MATH 1250 OR MATH 1270 OR MATH 1311 OR AP Calculus BC score of 5) AND PHYS 2210 OR PHYS 3210)).

**Canvas:** Canvas will be used for posting course announcements, homework assignments, grades, files and any relevant supplementary material. Class notes will also be posted on Canvas. You are also welcome to make use of the Canvas discussion board to discuss course problems or topics. You can access the Canvas page through CIS or by logging in at [utah.instructure.com](http://utah.instructure.com). Students should check the Canvas page regularly for course information and resources. Email notifications and correspondence will be sent to the student's UMail address ([u-number]@utah.edu); this email account must be checked regularly.

**Online Etiquette:** Respectful participation in all aspects of the course will make our time together productive and engaging. Zoom lectures, discussion threads, emails and canvas are all considered equivalent to classrooms and student behavior within those environments shall conform to the student code. Specifically:

- In general, please treat your instructor, teaching team and classmates with respect in email or any other communication.
- Posting photos or comments that would be off-topic in a classroom are still off-topic in an online posting.
- Disrespectful language and photos are never appropriate.
- Using angry or abusive language is not acceptable, and will be dealt with according to the Student Code.
- Be careful with personal information (both yours and others).
- The instructor may remove any online postings that are inappropriate.
- Please do not use ALL CAPS, except for titles.
- Course e-mails, e-journals, and other online course communications are part of the classroom and as such, are University property and subject to the Student Code. Privacy regarding these communications between correspondents must not be assumed and should be mutually agreed upon in advance, in writing.

**Grading Policy:** Your grade will be based on:

Homework	15%
Quizzes	10%
Weekly Labs	20%
Exam 1	10%
Exam 2	10%
Exam 3	10%
Final Exam	25%

The two lowest quiz scores will be dropped. The two lowest homework scores will be dropped. The instructor retains the right to modify this grading scheme during the course of the semester; students will, of course, be notified of any adjustments.

**Homework:** Weekly homework will be due on Wednesdays of each week. The assignments will be posted on Canvas and homework will cover material up to and including the previous Friday.

- Your lowest two homework scores will be dropped to create a buffer for any and all types of problems throughout the semester. Completing the homework is very important to your success in the class, so please talk to me if you are having trouble completing the homework on time.
- Homework is due before midnight Mountain Time that Wednesday.
- **Each homework *section* will be worth 10 points, with one problem graded for completion (out of 5 points) and 5 points for completion. Each homework assignment will be comprised of multiple homework sections.**

**Quizzes:** There will be a total of approximately 10 weekly quizzes on Fridays, which means there will be a quiz every week of classes except test weeks. Quizzes will be available through Canvas on Fridays, and are open book and open note. The weekly quiz will be 15-20 minutes and cover the material presented that week in class. The two lowest quiz scores will be dropped. There are no “make-up” quizzes. Students who miss a quiz will receive a score of 0 on the missed quiz.

**Weekly Labs:** Attendance to the lab section is **required**, and will count for 5% of a student’s total grade. The remaining 15% of the lab grade will be determined by the lab submissions that will be graded.

- The policies, grading criteria, and expectations of the lab will be communicated by the lab instructor during the first week.
- Questions about the content or grading of the lab should be directed toward the lab instructor.
- Please refer to the lab syllabus for more details.

**Exams:** There will be three in-class midterm exams. There will be no “make-up” exams. Except under unusual circumstances, you must inform me in advance if you are going to miss the exam date. If you do let me know in advance, then I can make arrangements for you to take the exam. Students who miss an exam will receive a score of 0 on the missed exam. The dates for these exams are fixed, and will be during normal class time in our normal virtual classroom, proctored via Zoom.

Exams will be **open book and open note**, but you will not be allowed to discuss the problems with other people during the exam.

**Final Exam:** The comprehensive final exam is on **Tuesday December 8 from 10:30am to 12:30pm** in our virtual classroom. The same rules for midterm exams apply to the final exam. In particular, the final exam will be **open book and open note**. You will not be allowed to discuss the problems with other people during the exam.

**Grades (Evaluation and criteria):** Final letter grades will be determined by overall percentage as follows:

A	93% – 100%	B-	80% – 82.9%	D+	68% – 69.9%
A-	90% – 92.9%	C+	78% – 79.9%	D	63% – 67.9%
B+	88% – 89.9%	C	73% – 77.9%	D-	60% – 62.9%
B	83% – 87.9%	C-	70% – 72.9%	E	below 60%

**Course information and expected outcomes:** Math 2250 is a 4-credit semester course where students will master the basic tools and problem solving techniques important in differential equations and linear algebra. Techniques and tools learned in class will be demonstrated in the weekly lab sections. Upon successful completion of this course, a student should be able to:

- Be able to model dynamical systems that arise in science and engineering, by using general principles to derive the governing differential equations or systems of differential equations. These principles include linearization, compartmental analysis, Newton’s laws, conservation of energy, and Kirchoff’s law.
- Learn solution techniques for first order separable and linear differential equations. Solve initial value problems in these cases, with applications to problems in science and engineering. Understand how to approximate solutions even when exact formulas do not exist. Visualize solution graphs and numerical approximations to initial value problems via slope fields.
- Become fluent in matrix algebra techniques, in order to be able to compute the solution space to linear systems and understand its structure; by hand for small problems, and with technology for large problems.
- Manage to utilize the basic concepts of linear algebra such as linear combinations, span, independence, basis and dimension, to understand the solution space to linear equations, linear differential equations, and linear systems of differential equations.
- Understand the natural initial value problems for first order systems of differential equations, how they encompass the natural initial value problems for higher order differential equations, and general systems of differential equations.
- Learn how to solve constant coefficient linear differential equations via superposition, particular solutions, and homogeneous solutions found via characteristic equation analysis. Apply these techniques to understand the solutions to the basic unforced and forced mechanical and electrical oscillation problems.
- Learn how to utilize Laplace transform techniques to solve linear differential equations, with an emphasis on the initial value problems of mechanical systems, electrical circuits, and related problems.
- Be able to find eigenvalues and eigenvectors for square matrices. Apply these matrix algebra concepts to find the general solution space to first and second order constant coefficient homogeneous linear systems of differential equations, especially those arising from compartmental analysis and mechanical systems.
- Understand and be able to use linearization as a technique to understand the behavior of nonlinear autonomous dynamical systems near equilibrium solutions. Apply these techniques to non-linear mechanical oscillation problems and other systems of two first order differential equations, including interacting populations. Relate the phase portraits of non-linear systems near equilibria to the linearized data, in particular to understand stability.

- Develop your ability to communicate modeling and mathematical explanations and solutions, using technology and software such as Maple, MATLAB or internet-based tools as appropriate.

### Problem solving fluency:

- Students will be able to read and understand problem descriptions, then be able to formulate equations modeling the problem usually by applying geometric or physical principles. Solving a problem often requires a series of transformations that include utilizing the methods of calculus. Students will be able to select the appropriate calculus operations to apply to a given problem, execute them accurately, and interpret the results using numerical and graphical computational aids.
- Students will gain experience with problem solving in groups. Students should be able to effectively transform problem objectives into appropriate problem solving methods through collaborative discussion. Students will also learn how to articulate questions effectively with both the instructor and TA, and be able to effectively articulate how problem solutions meet the problem objectives.

### Some important dates for this class:

Tuesday January 19	First day of classes
Friday January 22	Last day to waitlist or add without a permission code
Friday January 29	Last day to add or drop (delete)
Monday February 15	President's Day (no class)
<b>Friday February 19</b>	<b>First midterm exam (in class)</b>
Friday March 5	Non-instructional day
Friday March 12	Last day to withdraw from classes
<b>Friday March 19</b>	<b>Second midterm exam (in class)</b>
Monday April 5	Non-instructional day
<b>Friday April 16</b>	<b>Second midterm exam (in class)</b>
Tuesday April 27	Last day of classes
<b>Tuesday May 4</b>	<b>Final exam - 1:00 pm to 3:00 pm</b>

**ADA Statement:** The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability and Access, 200 S. Central Campus Dr., Rm. 162. CDA will work with you and the instructor to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to the Center for Disability and Access.

**Veterans' Center:** If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: <http://veteranscenter.utah.edu/>. Please also let me know if you need any additional support in this class for any reason.

**Tutoring:** The Rushing Math Center offers free drop-in tutoring, a computer lab, and study areas for undergraduates. The Rushing Student Center is adjacent to the LCB and JWB. The hours for the Spring semester are: 8 am – 8 pm Monday to Thursday and 8 am – 6 pm on Friday. The tutoring center will open the second week of classes.

**Nondiscrimination & Accessibility Statement:** The University of Utah does not discriminate on the basis of race, color, religion, national origin, sex, age, status as a disabled individual, sexual orientation, gender identity/expression, genetic information or protected veteran's status, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Additionally, the University endeavors to provide reasonable accommodations and to ensure equal access to qualified persons with disabilities. Inquiries concerning perceived discrimination or requests for disability accommodations may be referred to the University's Title IX/ADA/Section 504 Coordinator at the Office of Equal Opportunity and Affirmative Action, 801-581-8365

**Student Wellness:** Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at [www.wellness.utah.edu](http://www.wellness.utah.edu)

**University Counseling Center:** The University Counseling Center (UCC) provides developmental, preventive, and therapeutic services and programs that promote the intellectual, emotional, cultural, and social development of University of Utah students. They advocate a philosophy of acceptance, compassion, and support for those they serve, as well as for each other. They aspire to respect cultural, individual and role differences as they continually work toward creating a safe and affirming climate for individuals of all ages, cultures, ethnicities, genders, gender identities, languages, mental and physical abilities, national origins, races, religions, sexual orientations, sizes and socioeconomic statuses.

**Office of the Dean of Students:** The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability. It serves as a support for students facing challenges to their success as students, and assists with the interpretation of University policy and regulations. Please consider reaching out to the Office of Dean of Students for any questions, issues and concerns. 200 South Central Campus Dr., Suite 270. Monday- Friday 8 am-5 pm.

**Student responsibilities:** All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, indicated in the Student Handbook. You have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies prescribed conduct (Article XI) that involves cheating on tests, collusion, fraud, theft, etc. Students should read the Code carefully and understand you are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, beginning with verbal warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee. <http://regulations.utah.edu/academics/6-400.php>

**Classroom Social Equity:** I strive to be kind, ethical, fair, inclusive and respectful in my classroom and expect students to behave likewise. In this regard, I have these requests of you, as my students:

- Please inform me of whichever pronouns you want to be called. I will put great effort into honoring your request and ask that you correct me if I happen to make a mistake.
- Please tell me, discreetly, if you have any sort of anxiety disorder, TBI, PTSD, or any other challenge that would cause psychological harm to you by me calling on you in class. I want students to feel stretched and challenged during class, while working on problems as a large group, but I do not want to cause harm to any human being. Please let me know if that is the case for you and I will confidentially accommodate your request.
- If your preferred name is different than your legal first name (the preferred name you chose does indeed show up in CIS on my roll sheet, but not yet in Canvas), please log into Canvas and go to Account (on far left), click on Settings and change your Display Name to be the name you prefer to be addressed by. This will help me to address you correctly.

**Class policies:**

- I reserve the right to modify the class structure and syllabus at any time but I will notify you if and when any changes are made
- If you are repeatedly disrupting the learning environment, you will be asked to leave.
- If an emergency arises that prevents you from making it to an exam or turning in a homework it is your responsibility to communicate that information to me as soon as possible. I will do my best to accommodate any situation that comes up. In general, I allow exams to be taken early, but not late.
- If you are struggling with a concept please come talk to me or visit the tutoring center as soon as possible. I am more than happy to meet with you outside of my office hours if my schedule permits it.
- I encourage you to work with others on the homework but anything that you turn in must be your own work. Again, cheating is student misconduct and will be dealt with seriously. If you cheat on any homework, quiz, lab, or exam, I will automatically give you a zero for that grade. Depending on the severity of the cheating, I may decide to fail you from the class.