Course Syllabus
MATH 2250, Section 001, Summer 2019
Differential Equations and Linear Algebra

Instructor: Loren Santana
Pronouns: She/her/hers
E-mail: santana@math.utah.edu

Lecture Hours:
MTWHF 7:30 AM - 8:30 AM, LCB 219

Office Hours: Mondays and Thursdays, 8:30 AM - 9:30 AM or by appointment
Location: LCB 218

Email Communication: I am happy to answer any questions through email. However, I do not check my email on the weekends and the latest I check my email during the week is 5:30 pm. Keep this in mind, specially if emailing about homework.

Text: *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

The textbook is a custom edition designed for the University of Utah, and we will be using the textbook for homework. 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 problem numbers are the same.

Technology: Calculators will not be allowed on exams. They may be used on homework, but you should still write out the details of your computation. It is in your best interest not to become too dependent on your calculator since they will not be allowed on exams. Students 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. 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.

Homework: Weekly homework will be due on Tuesdays 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. There will be no exceptions to this rule! No late homework will be accepted.
- Homework must be stapled and is due at the beginning of class, no exceptions. The assignments will be posted on Canvas.
- **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 8 weekly quizzes on Tuesdays, which means there will be a quiz every week of classes except the first week and test weeks. The weekly quiz will be 15-20 minutes and cover the material presented the previous week in class. You must be in attendance to take the quiz, however the two lowest quiz scores will be dropped. There are no "make-up" quizzes. Students who miss a quiz will receive a "0" on the missed quiz.

Weekly Labs: On Thursdays, we will mainly focus on worksheets (usually called "labs"). This is an opportunity for you to collaborate with other students and work on additional problems. The worksheets are completed and submitted every Thursday. There will be no "make-up" labs.

Exams: You will have two midterm exams (60 minutes each). There are no "make-up" exams. Students who miss an exam will receive a "0" on the missed exam. Absence from an exam will be excused only if you can provide verifiable and convincing evidence that you have a significant illness or serious family crisis that will prevent you from attending. Except under extremely unusual circumstances, you must inform me in advance of the missed test. The dates for these exams are fixed, and will be during normal class time in our normal classroom.

Final Exam: The comprehensive final exam is on **Thursday, August 1st, 7:30 AM – 9:30 AM** in our classroom, LCB 219.

Grading Policy: Your grade will be based on:

Homework	10%
Quizzes	15%
Weekly Labs	20%
Exam 1	15%
Exam 2	15%
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.

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:

Monday, May 13	First day of classes
Friday, May 22	Last day to add, drop (delete), elect CR/NC classes
Monday, May 27	Memorial Day holiday (no class)
Friday, June 14	**First midterm exam**
Friday, June 21	Last day to withdraw from classes
Thursday, July 4	Independence Day holiday (no class)
Friday, July 12	**Second midterm exam**
Wednesday, July 24	Pioneer Day holiday (no class)
Wednesday, July 31	Last day of class
Thursday, August 1	**Final exam: 7:30 AM - 9:30 AM**

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 summer 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

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 prefer me to use for you. 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), then 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
- Please silence your technology at the start of class. 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. Please note that the use (or even just pulling it out of your pocket) of a cell phone or any other electronic device during any in-class exam is considered cheating and cause for receiving an automatic zero.
- Please refrain from using laptops during class. If you must be on a laptop, please sit in the back of the classroom.
- Regrade requests can only be made the class period after the homework/quiz/exam was returned and in writing with an explanation why more credit is due.