

DEPARTMENT OF MATHEMATICS, UNIVERSITY OF UTAH
Differential Equations and Linear Algebra
MATH 2250 – Section 04 – Fall 2019
Course Information and Syllabus
Updated November 5, 2019

Instructor: Akil Narayan
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Office hours: MW 10am-11:30am
Office hours location: WEB 4666

Class time and location:

Lectures: MTWF, 8:35am-9:25am, JWB 335 (MWF) and JFB 103 (Tu).

Lab sections: Thursdays at various times (1-hour duration), and various locations.

Course webpage: <http://www.sci.utah.edu/~akil/math2250>

Note: Scores for graded assignments will be posted on Canvas.

Course Information: This is a 4-credit course.

Summary of course logistics: Lectures are MTWF, and lab sections are on Thursdays. Homework will be collected every Thursday during the lab section. Lab assignments are assigned on Thursdays in the section and are due the following week. There are three in-class midterms and one final exam (see the course calendar at the end for exact dates).

Learning objectives: Upon successful completion of this course, a student should be able to:

- model various physical phenomena via differential equations
- understand and apply a high-level taxonomy of differential equations
- compute explicit analytic solutions to some types of differential equations
- provide physical interpretations of mathematical solutions to differential equations
- explain basic concepts in linear algebra and matrix analysis
- apply linear algebra concepts to the solution to differential equations

Prerequisites: 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)).

Course description: This is a hybrid course which teaches the allied subjects of linear algebra and differential equations. These topics underpin the mathematics required for most students in the Colleges of Science, Engineering, Mines & Earth Science.

Text: H. C. Edwards and D. E. Penney and D. Calvis, *Differential Equations and Linear Algebra* (4th edition), Pearson (2017), ISBN-13: 978-0-13-449718-1, ISBN-10: 0-13-449718-X. If you do nothing, you will be charged \$76 for access to this textbook via the Inclusive Access program on Canvas. If you wish to exercise your right to gain access to the book in a different way, you need to opt-out of the Inclusive Access program. Please see either the Canvas or the course website for details on how to opt out.

Class lectures will be *heavily* based on textbook material. The textbook provides additional details and alternative interpretations that cannot be covered in class due to time constraints. Homework will be assigned from problems in the textbook. Access to the textbook is mandatory for success in this class.

Homework: Homework sets will be assigned and collected weekly during lab sections throughout the semester. These assignments will be posted on the course website and announced in-class. Late assignments of any form will *not* be accepted without **prior** approval from the instructor. Only paper (hard) copies of assignments will be accepted; electronic copies will *not* be accepted.

Homework will be graded for completeness and correctness: 50% of each homework grade will be awarded based on completeness of the assignment, and 50% will be awarded based on correctness for a random subset of problems.

You are welcome to work on homework assignments in groups, but each student is required to submit his/her own individually-composed, written, and submitted assignment.

Over the course of the semester, your lowest homework score will be dropped in the computation of a final grade.

Lab sections: Every Thursday a Teaching Assistant-directed lab section will be held. These lab sections will have smaller class sizes, consisting of working on lab worksheet-reports. The lab worksheet-reports will tend to cover longer, more in-depth problems than that found in homeworks and exams, and will sometimes require use of instructor-supplied Maple or Matlab software to complete. The Assistants will be there to help guide students through the problems. Completion of worksheet-reports will require work outside of the lab hour. The lab work serves the the goal of learning complete problem solving fluency, where students will develop skills to solve problems involving multiple coordinated skills, including interpretation and identification of relevant variables and unknowns, operationalization of the question into a series of executable methods, and interpretation and communication of results.

Exams: This course will have 3 in-class midterm exams, and 1 final exam. The midterm exams will be held in class on Fridays September 6, October 4, and November 8.

The final exam is a cumulative exam in the same format as the midterm exams. The final exam will be held on Wednesday, December 11 from 8am-10am in the normal class meeting room, JWB 335.

Unless otherwise specified, **neither calculators nor notes of any kind are allowed on any of the exams.**

Attendance: I do *not* take attendance; attendance at lectures is not a factor in your grade. However, you are responsible for your own awareness of any course policies and practices that are announced in class.

Grading: Your course grade will be computed as follows.

- Homework20%
- Midterm exams30%
- Lab assignments20%
- Final exam30%

Final letter grades will be assigned based on the following scheme:

- 92% - 100% — A
- 90% - 91% — A–
- 88% - 89% — B+
- 82% - 87% — B

- 80% - 81% — B–
- 78% - 79% — C+
- 72% - 77% — C
- 70% - 71% — C–
- 68% - 69% — D+
- 62% - 67% — D
- 60% - 61% — D–
- 0% - 59% — E

Important dates:

Aug 30	Last day to add, drop (delete), elect CR/NC, or audit classes
Sep 6	Midterm 1
Oct 4	Midterm 2
Oct 18	Last day to withdraw from classes
Nov 8	Midterm 3
Nov 27	Last day to reverse CR/NC option
Dec 6	Reading Day
Dec 11 8:00am	Final exam

Class communication: An email list is set up with which I shall send out information not communicated during class. This email list will also be used to communicate class information in the case of unusual circumstances affecting the the logistics of the class. If you are not officially registered for the class but wish to be on the roster, please discuss it with me.

If you are registered for the course, but do not receive the course email announcements to your University of Utah email address, please notify me immediately. It is not possible for me to arrange delivery of these emails to a non-UUtah account.

The section website will also be used to communicate more technical matter of the class (e.g. homework sets, lecture summaries, etc.).

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to change that may be necessitated by a revised semester calendar or other circumstances. The above two methods, in addition to the coursewide website, are reliable means of getting information about changes to the course.

Student responsibilities and integrity: All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, and I will do so, beginning with verbal warnings and progressing to dismissal from and 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>

The Americans with Disabilities Act: 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 Services, 162 Olpin Union Building, 801-581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

Addressing Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender (which Includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677 (COPS).

Inclusivity: It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

Undocumented Student Support: Immigration is a complex phenomenon with broad impact—those who are directly affected by it, as well as those who are indirectly affected by their relationships with family members, friends, and loved ones. If your immigration status presents obstacles to engaging in specific activities or fulfilling specific course criteria, confidential arrangements may be requested from the Dream Center. Arrangements with the Dream Center will not jeopardize your student status, your financial aid, or any other part of your residence. The Dream Center offers a wide range of resources to support undocumented students (with and without DACA) as well as students from mixed-status families. To learn more, please contact the Dream Center at 801-213-3697 or visit dream.utah.edu.

Veterans: If you are a student veteran, the University 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/>.

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 or 801-581-7776.

Semester lecture calendar

(Subject to change!)

NOTE: Lab sections are held on Thursdays every week!

DAY	DATE	TEXT SECTION(S)	TOPIC
Monday	August 19, 2019		Hello
Tuesday	August 20, 2019	1.1-1.2	Differential equation and models
Wednesday	August 21, 2019	1.3	Slope fields
Friday	August 23, 2019	1.4	Separable differential equations
Monday	August 26, 2019	1.4	Separable differential equations
Tuesday	August 27, 2019	1.5	Linear differential equations
Wednesday	August 28, 2019	2.1	Applications: mixtures and populations
Friday	August 30, 2019	2.2	Equilibrium solutions
Monday	September 2, 2019		<u>NO CLASS:</u> Labor Day
Tuesday	September 3, 2019	2.2	Equilibrium solutions
Wednesday	September 4, 2019		Review
Friday	September 6, 2019		<u>MIDTERM EXAM 1</u>
Monday	September 9, 2019	2.3	Acceleration-velocity models
Tuesday	September 10, 2019	2.4	Numerical solutions
Wednesday	September 11, 2019	2.5	Numerical solutions
Friday	September 13, 2019	3.1	Linear systems and matrices
Monday	September 16, 2019	3.2	Gaussian elimination
Tuesday	September 17, 2019	3.3	Reduced matrix forms
Wednesday	September 18, 2019	3.4	Matrix operation rules
Friday	September 20, 2019	3.5	Matrix inverses
Monday	September 23, 2019	3.6	Matrix determinants
Tuesday	September 24, 2019	4.1	Vector spaces
Wednesday	September 25, 2019	4.2	Linear span and independence
Friday	September 27, 2019	4.3	Linear subspaces
Monday	September 30, 2019	4.4	Basis and dimension
Tuesday	October 1, 2019		Review
Wednesday	October 2, 2019		Review
Friday	October 4, 2019		<u>MIDTERM EXAM 2</u>
Monday	October 7, 2019		<u>NO CLASS:</u> Fall break
Tuesday	October 8, 2019		<u>NO CLASS:</u> Fall break
Wednesday	October 9, 2019		<u>NO CLASS:</u> Fall break
Friday	October 11, 2019		<u>NO CLASS:</u> Fall break

DAY	DATE	TEXT SECTION(S)	TOPIC
Monday	October 14, 2019	5.1	Second-order linear equations
Tuesday	October 15, 2019	5.2	Superposition and general solutions
Wednesday	October 16, 2019	5.3	Homogeneity and constant coefficients
Friday	October 18, 2019	5.3	Homogeneity and constant coefficients
Monday	October 21, 2019	5.4	Mechanical vibrations and pendulums
Tuesday	October 22, 2019	5.5	Particular solutions
Wednesday	October 23, 2019	5.5	Particular solutions
Friday	October 25, 2019	5.6	Forcing and resonance
Monday	October 28, 2019	10.1	Laplace transforms
Tuesday	October 29, 2019	10.2	Laplace transform properties
Wednesday	October 30, 2019		<u>NO CLASS</u>
Friday	November 1, 2019	10.3	Solving differential equations
Monday	November 4, 2019	10.3	Solving differential equations
Tuesday	November 5, 2019	10.3	Solving differential equations
Wednesday	November 6, 2019		Review
Friday	November 8, 2019		<u>MIDTERM EXAM 3</u>
Monday	November 11, 2019	10.4	Step functions
Tuesday	November 12, 2019	10.5	Convolutions
Wednesday	November 13, 2019	10.5	Convolutions
Friday	November 15, 2019	6.1	Eigenvalues and eigenvectors
Monday	November 18, 2019	6.2	Diagonalization
Tuesday	November 19, 2019	7.1	First-order systems of ODEs
Wednesday	November 20, 2019	7.2	Matrix systems
Friday	November 22, 2019	7.2	Matrix systems
Monday	November 25, 2019	7.3	Eigenvalue methods
Tuesday	November 26, 2019	7.4	Forced undamped systems
Wednesday	November 27, 2019		<u>NO CLASS</u>
Friday	November 29, 2019		<u>NO CLASS:</u> Thanksgiving
Monday	December 2, 2019	9.1	Nonlinear equations and stability
Tuesday	December 3, 2019	9.1	Nonlinear equations and stability
Wednesday	December 4, 2019		Review
Friday	December 6, 2019		<u>NO CLASS:</u> Reading day
Wednesday	December 11, 2019		<u>FINAL EXAM:</u> 8:00am, JWB 335