

Syllabus for Math 2280-001  
Introduction to Differential Equations  
Summer 2019

**General Course Information:**

**Course:** Introduction to Differential Equations (Math 2280).

**Instructor:** Keyvan Yaghmayi.

**Office:** JWB 121.

**Phone:** 801-581-6208.

**Email:** yaghmayi@math.utah.edu.

**Class Location:** LCB 215.

**Class Time:** Monday - Thursday 10:00am - 11:00am.

**Office Hours:** After class Monday - Thursday 11:00am - 12:00pm or by appointment.

**Course Website:** I will use the Canvas: <https://gate.acs.utah.edu/>. To log in, use the same student ID and password that you use for Campus Information System.

**Textbook:** Differential Equations and Boundary Value Problems: Computing and Modeling, By Edwards, Penney, and Calvis, 5<sup>th</sup> Edition. ISBN-13: 978-0-321-79698-1 and ISBN-10: 0-321-79698-5.

**Important Dates:** Classes begin Monday, May 13. The last day to add, drop (delete), elect CR/NC, or audit the class is Wednesday, May 22. The last day to withdraw is Friday, June 21. *Final Exam* is on Thursday, August 1, 10:00am - 12:00pm, in our classroom LCB 215.

**Essential Course Information:**

**Prerequisites:** A grade of at least a “C” in Math 2270, Linear Algebra.

**Course Description:** Linear and non-linear differential equations and systems of equations, with applications. Matrix exponential, fundamental solution matrix, phase-space and portraits, stability, initial- and boundary-value problems, introduction to partial differential equations. Requires familiarity with linear algebra. Includes theoretical and computer lab components.

**Course Content:** This is an introductory course in differential equations, together with some applications in the sciences (particularly physics and biology). We will start off with first order equations, slope fields, analytic and numerical solutions. We then study higher order linear equations, with applications to mechanical vibrations. This will use linear algebra

developed in 2270. Next will be a study of linear systems of differential equations with more applications to vibrations. This involves the use of eigenvalues and eigenvectors of certain matrices. After this, we will study the qualitative behavior of nonlinear first order systems in the plane, together with applications to biological models of competing species, and predator/prey. Finally, there will an introduction to PDE's (partial differential equations) and the topic of Fourier series used to study them. If there is time, we will study Laplace transforms.

**Course Roadmap Week-by-Week:** Below is an outline and rough schedule of the sections and topics that we will cover in this course:

- Week 1:* 1.1 Differential Equations and Mathematical Models, 1.2 Integrals as General and Particular Solutions, 1.3 Slope Fields and Solution Curves, 1.4 Separable Equations and Applications.
- Week 2:* 1.5 Linear First-Order Equations, 2.1 Population Models, 2.2 Equilibrium Solutions and Stability. **Note:** Wednesday, May 22 is the last day to drop.
- Week 3:* Continue Stability, 2.3 Acceleration-Velocity Models, 2.4 Numerical Approximation: Euler's Method. **Monday, May 27 is Memorial Day Holiday.**
- Week 4:* 3.1 Introduction to Second-Order Linear Equations, 3.2 General Solutions of Linear Equations, 3.3 Homogeneous Equations with Constant Coefficients.
- Week 5:* 3.4 Mechanical Vibrations, 3.5 Non-homogeneous Equations and Undetermined Coefficients, Review for Midterm 1. **Note:** Midterm 1 is on Thursday, June 13.
- Week 6:* 3.6 Forced Oscillations and Resonance, 4.1 First-Order Systems and Applications, 5.1 Matrices and Linear Systems.
- Week 7:* 5.2 The Eigenvalue Method for Homogeneous Systems, 5.3 A Gallery of Solution Curves of Linear Systems, 5.4 Second-Order Systems and Mechanical Applications.
- Week 8:* 5.7 Non-homogeneous Linear Systems, 6.1 Stability and the Phase Plane. **Thursday, July 4 is Independence Day Holiday.**
- Week 9:* 6.2 Linear and Almost Linear Systems, 6.3 Ecological Models: Predators and Competitors, Review for Midterm 2. **Note:** Midterm 2 is on Thursday, July 11.
- Week 10:* 6.4 Nonlinear Mechanical Systems, General Fourier Series, and Convergence, Fourier Sine and Cosine Series, Separation of Variables and Heat Equation (Sections 9.2, 9.3, and 9.5; we may not cover all the details).
- Week 11:* 9.6 Vibrating Strings and the One-Dimensional Wave Equation, 9.7 Steady-State Temperature and Laplace's Equation (We may not cover all the details), 7.1 Laplace Transforms and Inverse Transforms. **Wednesday, July 24 is Pioneer Day holiday.**
- Week 12:* On Monday we cover 7.2 Laplace Transformation of Initial Value Problems. On Tuesday and Wednesday we Review for the Final Exam. **Note:** Final Exam is on Thursday, August 1, 10:00am - 12:00pm.

## Homework:

Homework problems and due dates will be posted on Canvas regularly. I encourage you to discuss your homework problems with one another, ask help from tutors in the *math center*, or stop by at office hours. Late assignments will not be accepted and if you will be absent the day that an assignment is due you must turn it in to me before the class in which it is due. Your lowest homework score will be dropped and will not count toward your overall grade. Homework assignments will be graded and returned to you.

## Quizzes:

We will have (group) quizzes on the material that already has been taught and covered by homework assignments. It should take approximately 15 minutes to complete the quiz. I will upload the solutions and grades on canvas. Quizzes will not be excused due to absences or lateness so please be prompt and present.

You are encouraged to work together on quizzes by making small groups of 3 or 4 with friends and neighbors and discussing your possible solutions within the group. You should write your answer based on your own understanding and in your own words. It is totally fine if someone likes to work individually.

## Tests:

There will be two midterms along with a “comprehensive” final exam. All of them are in the scheduled classroom (LCB 215) and at the class time.

**Midterm One:** Thursday, June 13

**Midterm Two:** Thursday, July 11

**Final Exam:** Thursday, August 1, 10:00am - 12:00pm

It is essential that you show all your work. Credit will not be given without the proper work and partial credit will be awarded if you show correct steps even if you do not obtain the final correct number.

## Grading:

The grades will be calculated as follows:

Homework 15%

Quizzes 15%

Midterm 20%

Midterm 20%

Final Exam 30%

The grade scale will be the usual: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D+ (67-69), D (63-66), D- (60-62), E (0-59). If

I need to curve the grades, I will simply shift your overall percentage up by a few points (whatever is necessary).

## Some Policies/Comments:

- Please staple your homework. Otherwise, I am not responsible for lost papers.
- You are allowed to use “scientific calculators” in quizzes and exams. Any other type of electronic devices (including graphing/programmable calculators, cell phones, and music players) are not allowed during the exam. I will make tests and quizzes to evaluate your mathematical skills and not your calculator skills.
- Cheating will not be tolerated at any time during this course. Any student found cheating will receive a zero for the assignment or test on which the cheating occurred.
- If there is something that I want to inform you, I will reach you by your email. That is usually your default UMail address (uNID@utah.edu) that you have in the CIS. If you are using other emails more frequently than your UMail, then you can set your UMail to forward to your preferred email address. Also the fastest way to reach me is my email: yaghmayi@math.utah.edu.
- 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 greatly to know students’ names, and to address you correctly when responding to Canvas comments.
- If you have any thoughts, ideas, or suggestion, please feel free to contact me. I promise to do everything in my power to help.

## Tutoring and Extra Help:

- **Tutoring Lab:** The math tutoring center is available free of charge to all university students. It is located in room 155 of the T. Benny Rushing Mathematics Center (adjacent to the LCB and JWB). The tutoring center is open Monday-Thursday 8:00am-8:00pm, and Friday 8:00am-6:00pm. Please take advantage of the tutoring center as needed throughout the semester. They are also offering group tutoring sessions. If you’re interested, check out <http://www.math.utah.edu/ugrad/tutoring.html>
- **ASUU Tutoring Center:** University Tutoring Services, 330 SSB. They offer inexpensive tutoring, please see their website: <http://tutoringcenter.utah.edu>

- **Khan Academy:** It is a non-profit, free, educational organization for anyone, anywhere. They have some amazing videos in the Youtube. Check them out: <https://www.khanacademy.org/>

**Summer Warning:** This class is pretty intense, meaning over a shortened schedule of 11-12 weeks, rather than 15 (and we will miss three classes due to Holidays). We still have to cover all the same material. That being said, we have to perform accordingly. I recommend you to spend 2-3 hours per day (or 5-6 hours every other day) outside of class time to succeed in the class.

**Student Responsibilities:** All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. You 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, collusion, fraud, theft, etc. Students should read the Code carefully and know 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>

**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, veterans 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).

**Student Names and Personal Pronouns:** Class rosters are provided to the instructor with the students legal name as well as preferred first name (if previously entered by you in the Student Profile section of your CIS account). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class, on papers, exams, group projects, etc. Please advise me of any name or pronoun changes (and update CIS) so I can help create a learning environment in which you, your name, and your pronoun will be respected. If you need assistance getting your preferred name on your U-ID card, please visit the LGBT Resource Center Room 409 in the Olpin Union Building, or email [bpeacock@sa.utah.edu](mailto:bpeacock@sa.utah.edu) to schedule a time to drop by. The LGBT Resource Center hours are M-F 8am-5pm, and 8am-6pm on Tuesdays.

**LGBT Resource Center:** The LGBT Resource Center provides a comprehensive range of education, information and advocacy services, and works to create and maintain an open,

safe, and supportive environment for LGBT students, staff, faculty, alumni, and the entire campus community. Here is their website: <http://lgbt.utah.edu/>

**Wellness Statement:** 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) or 801-581-7776.

**Center for Disability & Access:** is dedicated to students with disabilities by providing the opportunity for success and equal access at the University of Utah. They are committed to providing reasonable accommodations as outlined by Federal and State law. The Center for Disability & Access (CDA) also strive to create an inclusive, safe and respectful environment. By promoting awareness, knowledge and equity, they aspire to impact positive change within individuals and the campus community. Please visit <http://disability.utah.edu/> for the latest information.

**A.D.A. 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 & Access, 162 Olpin Union Building, 801-581-5020. CDA 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 & Access.

**Veterans Support Center:** The Center is staffed by student Veterans who are committed to providing their fellow Veterans with the most useful and current information available. The Mission of the Veteran Support Center is to improve and enhance the success of student Veterans; to help them receive the benefits they deserve; to serve as a liaison between the Veteran student community and the University; and to increase their academic success. Additionally to provide an opportunity to continue the relationships built through the service in civilian life. Please see <http://veteranscenter.utah.edu/>

**Women's Resource Center:** The Womens Resource Center (WRC) at the University of Utah serves as the central resource for educational and support services for women. Honoring the complexities of womens identities, the WRC facilitates choices and changes through programs, counseling, and training grounded in a commitment to advance social justice and equality. <http://womenscenter.utah.edu/>

**Disclaimer:** All information on this syllabus is subject to change. If any changes on this syllabus, course policies or course outline arise throughout the semester, then I will announce it in class and send the change in email.

Good Luck!