

## **MATH 0290 SEC 1050 Introduction to Differential Equations**

**Class Location: Virtually via Zoom (meeting ID info by email/Canvas Announcement)**

**Instructor:** Dr. Andrea Welsh (she/her)

**Email:** [andrea.welsh@pitt.edu](mailto:andrea.welsh@pitt.edu)

**Virtual Office:** Zoom

**Virtual Office Hours:** Tues 1:30pm-2:30pm, Thursday 4:00-5:00pm, or by appointment,

**TA:** Zhen Yao

**Email:**

### **Overview:**

Differential equations represent an important branch of mathematics. Many of their properties have been understood mathematically and they have a history of being successfully applied to important problems in all areas of science and engineering. This course will introduce primarily linear, first-order, and second-order differential equations. Solution techniques for separable equations and homogeneous and inhomogeneous equations as well as a range of modeling-based applications arising in the context of engineering, physics and chemistry will be presented. The application of Laplace transforms to differential equations, systems of linear differential equations, linearization of nonlinear systems, and phase plane methods will be covered. Fourier series, a useful tool in signal processing, will also be introduced, and we will discuss how the Fourier series arises in solving the famous heat equation by separation of variables. The idea of approximating and visualizing solutions using a computer, such as with Matlab, will be introduced early in the term and students are expected to use Matlab as a resource in their work for this course.

### **Course Delivery**

The University has adopted the [Flex@Pitt](#) teaching model for this semester, and instruction will vary in form depending on the University's current operational posture. The bullet points below outline how this strategy will typically be implemented in this course, but your instructor may choose to tailor the plan to fit your section, so consult your instructor's specific directions on Canvas.

- In the [Elevated Risk](#) and [High Risk](#) postures, all instruction will be conducted remotely, and there will be no in-person class meetings. Typically, this means your instructor will hold virtual class meetings through Zoom at the scheduled class time, and the links to join these synchronous meetings will be posted in Canvas. The class meetings will be recorded, uploaded to Panopto, and made available for viewing through Canvas.
- In the [Guarded Risk](#) posture, students will have the option to participate remotely or attend in-person class meetings in their section's assigned classroom at the scheduled class time. However, some sections may not have been assigned a classroom and will only be forced to meet remotely instead. Other sections may be assigned a classroom whose capacity with social distancing will permit only a portion of the students to attend

on any given day. In that case, your instructor will divide the class into student cohorts, and each cohort will be assigned days that it is permitted to attend the class in person. No student will be required to attend the in-person meetings. Your instructor may choose to teach in-person, in which case the classroom will be recorded and connected to Zoom so that students participating remotely will be able to join the class meeting synchronously or watch the recorded session at a later time. Your instructor may also choose to teach remotely, in which case they will be connected to the classroom through Zoom, and students will be able to attend the class in-person (on their cohort's assigned days) or remotely. Your instructor will communicate the details of their plan through Canvas.

During the week of August 19, 2020, all instruction will be conducted remotely, regardless of the University's operational posture.

### **Textbooks & Useful Technology:**

1. Polking, Boggess and Arnold, *Differential Equations with Boundary Value Problems*, second edition, Pearson Prentice-Hall
  - This book can be accessed in Canvas under **RedShelf Inclusive Access**
  - After accepting the terms and confirming you are over the age of 13, it will take you to the subscription of the textbook where you can read it in the eReader.
  - This purchases the electronic version of the textbook and adds it onto your tuition statement if you do not 'opt out'. This purchase offers more than what is necessary. Students may choose to use the first edition of the text or a used second edition, which may be available at a lower cost. If you wish to do that, you should choose the 'opt out' option prior to the add/drop deadline and visit <http://calculus.math.pitt.edu> and click the **Textbook information link**.
2. Matlab can be downloaded from <https://www.technology.pitt.edu/services/software-download-service-my-pitt>
  - If you are for some reason unable to download Matlab or need to use it quickly, an online version of Matlab can be found here: <https://www.mathworks.com/products/matlab-online.html>
3. Zoom can be downloaded from <https://www.technology.pitt.edu/services/zoom-video-conferencing>
  - You do not need to download Zoom and can always connect from a web browser, but it may run better as a downloaded program

### **Grades:**

Homework 20%, Two midterm exams 30% (15% each), Project 10%, Final exam 40%.

### **Assessments:**

- (1) Weekly homework assignments submitted on Canvas by midnight Fridays
- (2) There are two virtual Midterm Exams. The second midterm will not be cumulative to the first.
- (3) There is 1 project that you can work on in a group. This will involve free response questions and calculations.
- (4) The cumulative Final Exam will take place at a time to be determined by the University.

**Grading scale:**

A/A±: 90-100%, B/B±: 80-89%, C/C±: 70-79%, D/D±: 60-69%, F:<60%

**Matlab:**

Computers are often used to study solutions to differential equations in physics, biology, chemistry, and engineering. Right from the outset, we will discuss how Matlab can help us to visualize the behavior of solutions of differential equations and to approximate these solutions and we will give an introduction to numerical solution techniques. Matlab will not be available on quizzes/exams, however, and will not factor heavily into statements of homework problems; mostly, it is a tool that can help you understand the material better and check your solutions.

**Classroom Policies:**

Attendance is not mandatory and won't factor into your grade, but I hope that attending the lectures will be helpful to you. Lectures will be recorded and posted online in Canvas under "Files→ Lecture Videos." Lectures and office hours will be held over Zoom unless otherwise stated. While on Zoom, Canvas, & Slack:

**Video**

- It is your choice to turn on the camera. I will not ask you to do it. If somehow it is affecting the connection speed, or is distracting to others, I may ask you to turn it off.
  - If you have limited internet bandwidth or no webcam, it is ok to not use video.
  - If you're unable to find an environment without a lot of visual distractions, it is also ok to turn off your video.
- Keep it clean. Make sure to be fully dressed.
- This class is a professional university environment, as such please be aware of any items in your surroundings that might be on camera. Rude, unprofessional, or political items will not be tolerated and may result in the instructor turning your video off.

**Audio**

- Mute your microphone when you are not talking. This helps eliminate background noise.
- Be in a quiet place when possible. Find a quiet, distraction-free spot to log in. Turn off any music, videos, etc. in the background.

**Chat**

- During Zoom calls, stay on topic. Use the Zoom chat window for questions and comments that are relevant to class. The chat window is not a place for socializing or posting comments that distract from the course activities. If you fill it up with random comments, I will be unable to sort through the information quickly to address students' questions/concerns about the course. I will download the chat to make sure I do not miss questions.
- In each of the Slack channels, stay on topic for the material in that channel with your questions and comments. Except for specifically designated channels, Slack is not intended to be a place for socializing.
- No disrespect or hate speech. Respectful behavior is expected. Consider Zoom and Slack professional environments.

- On Slack, you have the ability to private message other people in the group. If you have concerns about your grade, harassment, or other issues that you don't wish to disclose publicly, please message the instructor or the TA privately. Please keep questions about the homework in the main channels for the assignments so that your fellow students can learn alongside you.

### **How to do well in this class:**

I encourage you to work together on homework. The class-associated Slack will have a general area for questions and interactions with other students, the instructor, and the teaching assistant. There will be space for group interaction there. However, make sure that you are able to do the homework questions yourself without aid (either by working with others or looking at the solutions) so that you can ensure you can do the calculations yourselves on exams. Try to turn in assignments in a timely manner.

### **Homework Policies:**

Students are required to complete the homework problems. Students are welcome to work together on homework. However, each student must turn in their own assignments, and no copying from another student's work is permitted. If code is submitted, it should be different from other students' code unless it is the group project. Homework will be submitted by Canvas by the deadline. Please see the "Uploading Assignments to Canvas Assignments" page for directions on how to upload your files. Please feel free to come ask the instructor or TA questions about homework and other course material during office hours or by appointments. Your questions are always welcome.

### **Late Homework Policy:**

Each student is allowed to submit three (3) homework assignments up to one week late, no-questions-asked without a grade reduction. **The student must tell the instructor that they will be submitting it late before the homework is due.**\* Students who miss this deadline, who turn in assignments more than one week late, or who have used their three late assignments will incur a reduction in the final grade of the homework by 10% of your grade per day for that assignment.

If there are other concerns that come up, please reach out to me.

\* The reason for this policy is to give students flexibility on homework while allowing the instructor and TA return graded assignments to all students in the class in a timely manner.

### **Instructor Availability:**

I try to maintain a healthy work-life balance and place reasonable limits on the times and days when I work. Specifically, I typically do not check emails after 11pm or before 8am on weekdays and I often do not check on the weekends or campus holidays. If you send an email during these times, I will try to respond as soon as I see it. Otherwise, I will reply to your emails as quickly as possible during the next business day.

### **Tutoring:**

The Mathematics Department offers a free tutoring service, no appointments are needed. The [Math Assistance Center](#) (MAC) is located on the second floor of the O'Hara Student Center.

Tutoring services and tutoring hours will be posted outside the MAC as well as on the web at [MAC](#). If there is a particular teaching assistant you prefer to work with, their hours are listed in the schedules online. However, all graduate teaching assistants present at any time have the capacity to aid in any undergraduate mathematics course. Undergraduate teaching assistants are there to provide assistance in sub-calculus classes. \*\*\*During COVID-19 you can contact your TA and determine the best way of getting help\*\*\*

<http://www.mathematics.pitt.edu/undergraduate/math-assistance-centerposvar-computing-lab>

### **Midterm exams:**

These will be take-home exams that you will have a 48 hour time period to complete. The problems will be uploaded as individual assignments through Canvas. The Canvas Assignment for the exam questions will close at the designated deadline. You will not be able to upload after the close date and time as the submission will be locked. I will not accept exams by email after this time so please make sure you start to upload them in a timely manner before the designated deadline in case there is an issue. If you do experience an issue before the close time, please contact me ASAP.

The only exception to this policy is as follows: if you have a legitimate medical or academic conflict that will prevent you from being in class for a midterm, then contact me well ahead of time to discuss alternative arrangements.

More details can be found on the “Uploading Documents to Canvas Assignments” file.

### **Final Exam Policy:**

All students must take the departmental Final Exam at the time and place scheduled by the registrar.

### **Departmental Final Grade Policy:**

Your final grade will not exceed your Final Exam grade by more than one letter grade.

\*\*\* Since many assessments will be administered online, proctoring will be done via ZOOM and a video connection will be required. \*\*\*

### **Academic Integrity:**

The University of Pittsburgh Academic Integrity Code is available at <https://www.provost.pitt.edu/faculty/academic-integrity-freedom/academic-integrity-guidelines>. The code states that "[A student has an obligation to exhibit honesty and to respect the ethical standards of the academy in carrying out his or her academic assignments.](#)" The website lists examples of actions that violate this code. Students are expected to adhere to the Academic Integrity Code, and violations of the code will be dealt with seriously.

On homework, you may work with other students or use library resources, but each student must write up his or her solutions independently. Copying solutions from other students will be considered cheating and handled accordingly.

\*\*\* This is especially notable during this Flex period. Cheating/plagiarism will not be tolerated. Students suspected of violating the University of Pittsburgh Policy on Academic Integrity will incur a minimum sanction of a zero score for the quiz, exam or paper in question. Additional sanctions may be imposed, depending on the severity of the infraction. \*\*\*

### **Health and Safety**

In the midst of this pandemic, it is extremely important that you abide by public health regulations and University of Pittsburgh health standards and guidelines. While in class, at a minimum this means that you must wear a face covering and comply with physical distancing requirements; other requirements may be added by the University during the semester. These rules have been developed to protect the health and safety of all community members. Failure to comply with these requirements will result in you not being permitted to attend class in person and could result in a Student Conduct violation. For the most up-to-date information and guidance, please visit [coronavirus.pitt.edu](http://coronavirus.pitt.edu) and check your Pitt email for updates before each class.

### **Disability Resource Services:**

If you require special accommodations or classroom modifications, please notify both the instructor and Disability Resources and Services in a timely manner. For students who need testing accommodations, please be aware that office of Disability Resources and Services needs time to coordinate the accommodations and may not be able to provide the accommodations if they are contacted last minute. Accommodations are not retroactive, and students must request them prior to exams in order for them to be effective.

The office of Disability Resources and Services is located in 140 William Pitt Union (412-648-7890 [voice or TDD]), and their website is at: [<http://www.drs.pitt.edu>]. If you have a physical, learning, or emotional disability, please let me know as early as you can so that I can accommodate you.

### **Diversity & Inclusion Statement:**

I hope to make this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, veteran status, ability – and other visible and nonvisible differences or other factors as stated in the University's [Title IX policy](#). The University is committed to taking prompt action to end a hostile environment that interferes with the University's mission. For more information about policies, procedures, and practices, see: <https://www.diversity.pitt.edu/civil-rights-title-ix-compliance/policies-procedures-and-practices>. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class in all classroom related activities. For resources at Pitt, please check out this growing list:

- [Africana Studies](#): department at the University of Pittsburgh to advance the study, research, interpretation, production, and dissemination of knowledge pertaining to the experiences of people of African descent in Africa and the Diaspora.
- [Antiracism Libguide](#): Resource guides, readings, podcasts, and steps to become Anti-racist from the library.

- [Center on Race and Social Problems](#): The University of Pittsburgh's Center on Race and Social Problems conducts applied social science research on race, color, ethnicity and their influence on the quality of life for all Americans
- [Office of Diversity & Inclusion Hispanic/Latinx Resources](#):
- [Office of Diversity & Inclusion Individuals with Disabilities](#):
- [Office of Diversity & Inclusion LGBTQIA+ Resources](#): the Office of Diversity and Inclusion's LGBTQIA+ webpage features guidelines for inclusion relating to gender transition, information on the LGBTQIA+ Faculty and Staff Affinity Group, resources in the community, and more.
- Office of Diversity & Inclusion Religious Resources:
- [Pride Health](#): LGBTQIA+ affinity group that exists to serve and support our faculty, staff, students, residents, fellows, and providers.
- [Student Affairs LGBTQIA+ Resources](#): sponsored by the Division of Student Affairs, this site houses information on student groups on campus, courses focused on gender and sexuality, information on single occupancy restrooms, and more.
- [Student Health Services LGBTQIA Resources](#): the University of Pittsburgh Student Health Service describes their commitment to providing a safe and friendly environment for LGBTQIA+ students.

### **Name & Pronouns:**

I will address you with the name and pronouns you would like. If this happens to change at some point through the semester, please let me know as you feel comfortable.

### **Student Wellness:**

College can be very stressful especially now. You may experience any challenges that interfere with learning such as strained relationships, increased anxiety, substance abuse, feeling depressed, difficulty concentrating, and/or lack of motivation. If you feel like anything like this is affecting your academic ability and reducing your ability to participate in course activities, there are services available. University of Pittsburgh University Counseling Center offers a range of mental health services to help you. You can learn more about these services at <https://www.studentaffairs.pitt.edu/cc/services/> or by calling 412-648-7930. Crisis services available are: 24/7 412-648-7930 x1.

### **A few non-university crisis services:**

- [re:solve Crisis Network](#) is the Allegheny County crisis agency staffed with professional mental health clinicians 24/7. Call them at 1-888-796-8226 or visit their facility at 333 North Braddock Ave, Pittsburgh, PA 15208.
- [The National Suicide Prevention Lifeline](#) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24/7. Call 1-800-273-8255. (TTY – Dial 800-799-4889; Voice/Caption Phone – Dial 800-273-8255)
- The Crisis Text Line is a free and confidential text message service for people in crisis 24/7. Text HOME to 741741.
- [Trans Lifeline](#) is trans-led organization that connects trans people to the community, support, and resources they need to survive and thrive. 877-565-8860

### **Statement on Classroom Recording:**

The lectures are being recorded for students who are unable to attend class synchronously. Since the instructor is recording and uploading lectures, students should not record these meetings. Furthermore, students may not record office hours or meetings with other students without the advance, written permission of the instructor. Any such recordings that are properly approved in advance are to be utilized solely for the student's own private use.

As lectures will be recorded by the instructor, this may include student participation. Students are not required to participate in the recorded conversation. The recorded lecture may be used by the faculty member and the registered students only for internal class purposes and only during the term in which the course is being offered. Recorded lectures will be uploaded and shared with students through Canvas.