

## Course Information

Course Number:	Math 308
Course Title:	Differential Equations
Sections:	527, 516
Time:	527 - TR, 8:00-9:15AM 516 - TR, 9:45-11:00AM
Location:	527 - HELD 100 (also available over Zoom: link in Canvas) 516 - HECC 105 (also available over Zoom: link in Canvas)
Credit Hours:	3 hours

## Instructor Details

Instructor:	David Manuel
Office:	Blocker 328E
Phone:	Math Department: 979-845-3261 <i>(There is no phone in my office, so email is a better way to reach me.)</i>
E-Mail:	dmanuel@tamu.edu
Office Hours:	(Online) MW 11:00AM-12NN; R 2:00-4:00PM (same Zoom link as class), or by appointment (as arranged via email)
Course Webpage:	Material will be posted in Canvas: <a href="https://canvas.tamu.edu">canvas.tamu.edu</a> . Check regularly for important information, as well as for lecture notes, and other helpful links. Also, see the <a href="#">math department course page</a> .

## Course Description

Math 308: This is a course in differential equations. Topics include linear ordinary differential equations and systems of linear differential equations, second order linear equations, solutions using Laplace transforms, solutions by power series, and elements of nonlinear systems.

## Course Prerequisites

MATH 221, MATH 251, or MATH 253 or concurrent enrollment; knowledge of computer algebra system.

## Course Objectives

We will cover much of chapters 1-3, 5, 6-7 and some of chapter 8 from the textbook. This course is to provide students with quantitative and problem-solving skills of differential equations. At the conclusion of this course, students should be able to:

- Solve basic first order ODEs
- Solve higher order linear ODE and systems of linear ODEs
- Construct simple ODE models (linear and non-linear)
- Conduct qualitative analysis of ODE models.

## Course Learning Outcomes

Upon successful completion of this course, students will:

- Use differential equations to model mechanical and electrical systems.
- Visualize solutions to first order differential equations and  $2 \times 2$  systems of first order linear differential equations using direction fields and phase planes.
- Solve basic first order differential equations and initial-value problems.
- State the conditions required for a first order differential equation to have a unique solution.

- Find the equilibrium points of an autonomous differential equation and determine their stability.
- Solve homogenous second order linear differential equations and initial value problems with constant coefficients.
- Use the methods of Undetermined Coefficients and Variation of Parameters to find solutions to nonhomogenous second order linear differential equations and initial value problems with constant coefficients.
- Use Laplace Transforms to solve basic initial value problems.
- Determine the mathematical and practical effect of step functions and impulse functions on second order linear initial value problems with constant coefficients.
- Use Power Series to solve second order linear differential equations.
- Write a higher order differential equation as a system of first order differential equations.
- Solve homogenous systems of first order linear differential equations.
- Conduct qualitative analysis of  $2 \times 2$  systems of linear first order differential equations with constant coefficients.
- Understand methods of numerically approximating solutions to first order initial value problems.

### Textbook and/or Resource Materials

- Textbook: *Elementary Differential Equations and Boundary Value Problems* by Boyce, DiPrima, and Meade, 11th Edition. (ISBN #9781119381655 for ePub and ISBN #9781119443766) Earlier editions may be used for the purpose of studying the materials, but suggested homework problems and page references in the notes are from the 11th edition.
- EdFinity Access: Homework assignments will be completed inside the online homework platform, EdFinity. You will need to purchase access to the course for a nominal fee. A link to the course will be provided to you in Canvas.
- Calculator: No calculator is allowed on in-class quizzes or exams. Calculators may be used on homework or take-home assignments.
- Texas A&M Student ID: You must have a picture ID for exams.
- Exams will be administered entirely online. In order to do this, the following technical requirements are needed:
  - Appropriate hardware (laptop or desktop computer, a second device such as a mobile phone, high-speed internet connection)
  - Appropriate software (PDF reader, Zoom on phone and computer, the latest update on an internet browser-Chrome or Firefox are recommended)

### Grading Policy

The course grading will be based on the results of the following:

- **Online Homework:** All online homework will be done using EdFinity. Directions on how to access the course and other important information will be provided to you inside Canvas. These assignments will be due every Monday at 11:55pm (all times CDT/CST) over the previous week's sections. Extensions will only be granted for excused absences for the duration of the assignment (Friday through Monday), though I will be dropping the lowest three grades (out of 26). In addition, suggested homework is posted on the department webpage. These problems are for practice and will not be handed in; however, quiz and exam questions may be similar to suggested homework problems

- **Quizzes:** Roughly every other Tuesday (7 total), you will receive a take-home quiz in Canvas due at **11:59pm** Thursday. Solutions must be scanned and uploaded to Gradescope. Quizzes may be submitted up to 11:59pm the following Sunday for no penalty (if you have an excused absence for Wednesday AND Thursday) or for a 30% penalty (all other cases).
- **Prep Assignments:** This class will be very interactive; you will be asked to preview each section BEFORE it is discussed in lecture. To motivate this, I will post “Prep Assignments” in Canvas for you to complete. These assignments will be discussed in class for 5-10 minutes at the next lecture and must be submitted in Canvas at that time to receive credit. Most of these assignments will be graded on legitimate attempt only. If you are unable to attend class that day, you should still submit the assignment in Canvas by the beginning of class. I will be dropping four lowest grades (out of 28).
- **Computer Assignments:** There will be four computer assignments throughout the semester, using Python. Details of each assignment will be given in Canvas; in addition, I will post Python solutions to each example from the notes when applicable. Assignments must be converted to PDF and uploaded to Canvas. Assignments may be submitted up to 11:59pm the following Sunday for a 30% penalty (unless you have an excused absence).
- **Exams:** There will be two in-class exams during the semester. You will be expected to show all of your work on all problems for full credit. The exams will be proctored through Zoom. During each exam, you will be required to set up a streaming video camera (cell phone or USB webcam) in such a way that the proctor will be able to view your workspace during the exam. The proctoring sessions may be recorded. In order to receive credit for this course, you must consent to be proctored in this manner.
- **Final Exam:** The final exam is comprehensive and will also be proctored through Zoom.
- **Final Grades:** The course grading will be based on the tables below. At the end of the semester you will receive the grade you earned, according to the grade breakdown and grading scale given. Due to FERPA privacy issues, I cannot discuss grades over email or phone. If you have a question about your grade, please schedule a one-on-one Zoom meeting with me.

### *Grade Breakdown*

Activity	Date	Percentage
Homework	Weekly	10%
Quizzes	Biweekly	10%
Prep Assignments	Daily	5%
Computer Assignments	See calendar	5%
Exam I	4 Mar	20%
Exam II	8 Apr	20%
Final Exam	See below	30%
<b>Total</b>		<b>100%</b>

### *Grading Scale*

Range	Grade
$90 \leq \text{Average} \leq 100$	A
$80 \leq \text{Average} < 90$	B
$70 \leq \text{Average} < 80$	C
$60 \leq \text{Average} < 70$	D
Average < 60	F

**Grading Appeal Policy** – Students have until the Monday the week after assignments and exams are released to notify the instructor of any inaccuracies in their graded work. After this, the grade will stand. Students have 1 week from the day grades are posted in the Canvas gradebook to bring any inaccuracies to the instructor’s attention. Students should bring all grade disputes to the instructor in a one-on-one Zoom meeting. Due to FERPA privacy issues, grade disputes will not be discussed over email or in the classroom.

**Exam Schedule** –The tentative exam schedule is as follows:

**Exam I: Thursday, 4 Mar, 2021.**

**Exam II: Thursday, 8 Apr, 2021.**

**Final Exam** –The final exam schedules are as follows:

**Section 527: Wednesday, 5 May, 05:00 - 07:30PM**

**Section 516: Wednesday, 5 May, 08:00 - 10:30AM**

(The day and time of the final exam is determined by the university registrar, and may be found at <http://registrar.tamu.edu/Courses.-Registration.-Scheduling/Final-Examination-Schedules>)

## Course Schedule

Week	Topic	Sections
Week1: 1/19, 21	Direction Fields; Solutions of Differential Equations; Classification of Differential Equations; Linear Equations	1.1, 1.2, 1.3, 2.1
Week2: 1/26, 28	Separable Equations; Applications; Linear vs Nonlinear Equations	2.2, 2.3, 2.4
Week3: 2/2, 4	Autonomous Equations; Exact Equations; Homogenous Equations with Constant Coefficients	2.5, 2.6; 3.1
Week4: 2/9, 11	Solving Homogenous Equations; Complex Roots of the Characteristic Equation; Repeated Roots; Reduction of Order	3.2, 3.3, 3.4
Week5: 2/23, 25	Method of Undetermined Coefficients; Variation of Parameters	3.5, 3.6
Week6: 3/2, 4	Mechanical and Electrical Vibrations (recorded); Review; <b>Exam 1 Thurs 4 Mar (1.1-3.5)</b>	3.7-3.8
Week7: 3/9, 11	Laplace Transforms; Solutions of IVP with Laplace Transforms; Step Functions	6.1, 6.2, 6.3
Week8: 3/16, <del>18</del>	Differential Equations with Discontinuous Forcing Functions;	6.4
Week9: 3/23, 25	Impulse Functions; Convolution Integrals, Series Solutions, part I	6.5, 6.6, 5.2
Week10: 3/30, 4/1	Series Solutions, part I (ctd) and II; Systems of First Order Linear Equations	5.2, 5.3, 7.1/7.4
Week11: 4/6, 8	Homogeneous Linear Systems; <b>Exam II Thurs 1 Apr (3.6, 5.1-5.3, 6.1-6.6)</b>	7.5
Week12: 4/13, 15	Homogeneous Linear Systems (ctd), Complex Eigenvalues; Repeated Eigenvalues;	7.5, 7.6, 7.8
Week13: 4/20, 22	Nonhomogeneous Linear Systems; Euler Method	7.9, 8.1
Week14: 4/27, 29	Improved Euler Method; Runge Kutta Method; Review	8.2, 8.3
Week15	<b>Final Exam Wed 5 May (comprehensive)</b>	

Technology Support –

- For issues with Edfinity, go to [www.edfinity.com/help](http://www.edfinity.com/help)
- For issues with Canvas, go to [lms.tamu.edu](https://lms.tamu.edu) or email [aihelp@tamu.edu](mailto:aihelp@tamu.edu) . Make sure you submit assignments WELL before the deadline to avoid last-minute technical issues resulting in late work!

### Learning Resources –

- *Office Hours:* As stated on the first page, I have office hours MW 11:00AM-12NN; R 2:00-4:00PM where you can ask questions about the material or just work on homework and get help when needed. I am available at other times via appointment for help or discussion of your performance in class; email me to arrange a Zoom appointment for any of these.
- The **Math Learning Center (MLC)** offers various forms of support for Math 308, both online and face-to-face, including drop-in [Help Sessions](#), [Tutoring by Appointment](#), [Week-in-Review](#) sessions and other activities. Additionally, the MLC hosts an archive of [Supplemental Material](#), such as Python tutorial videos and recorded review sessions.

## University Policies

### Attendance Policy

Attendance is essential to complete this course successfully.

**Excused Absences** – University student rules concerning excused and unexcused absences, as well as makeups, can be found at [Student Rule 7](#) in its entirety for information about excused absences, including definitions, and related documentation and timelines. In particular, make-up exams or late homework will NOT be allowed unless a University approved reason is given to me in writing/email. Notification before the absence is required when possible. Otherwise (e.g. accident, or emergency), you must notify me within 2 working days of the missed exam or assignment to arrange a makeup. I will not accept the “University Explanatory Statement for Absence from Class” form. Further, an absence due to a non-acute medical service or appointment (such as a regular checkup) is not an excused absence.

(INSTRUCTOR’S ADDENDUM) In the current environment, I will NOT require doctor’s notes for excused absences; however, I WILL require that all requests for makeups be prefaced with the AGGIE CODE OF HONOR: “An Aggie does not lie, cheat, or steal or tolerate those who do. On my honor as an Aggie, I certify that (*insert reason for excused absence*).” Note that your reason must still fall in the excused absence category described above!

### Zoom Etiquette

**Class Attendees** – When joining class remotely via ZOOM, please join with your audio off. You may ask questions by unmuting yourself and politely interrupting me OR by typing your question in the Zoom chat window (which will only post to the Host), and I will pause and respond to your question. It is important to me that the students are involved in the class discussion, but it is best if we do this in an organized way.

**Office Hour Attendees** – When joining office hours via ZOOM, please join with your audio off. Everyone attending office hours will be joining one room, so if you would like to ask a question during office hours, please “raise your hand” and wait to be called on. If you need to speak to me privately, it is best to set up a Zoom appointment as my office hours tend to be very busy.

### Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to [Student Rule 7](#) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor" ([Student Rule 7, Section 7.4.1](#)).

"The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" ([Student Rule 7, Section 7.4.2](#)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See [Student Rule 24](#).)

If you foresee the need to miss an exam due to an excused absence, you must notify me in advance if possible. As stated previously, take-home quizzes and computer assignments may be submitted in Canvas up to 11:59pm the following Sunday for no penalty for an excused absence or for a 30% penalty for any other reason.

### Academic Integrity Statement and Policy

"An Aggie does not lie, cheat or steal, or tolerate those who do."

"Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case" ([Section 20.1.2.3, Student Rule 20](#)).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at [aggiehonor.tamu.edu](http://aggiehonor.tamu.edu).

### Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit [disability.tamu.edu](http://disability.tamu.edu). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

### Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University’s goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services](#) (CAPS).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University’s [Title IX webpage](#).

### Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student’s academic success and overall wellbeing. Students are encouraged to engage in healthy self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at [suicidepreventionlifeline.org](https://www.suicidepreventionlifeline.org).