MATH 3305 – Ordinary Differential Equations

Spring 2022

Professor: Dr. Kassie Archer
Office: RBN 4008
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Office Hours: TBD

Scheduled lecture:

Section 029
MWF, 9:05 A.M. – 10:00 A.M.
Location: RBN 3021

Course Information

Course Webpage: All course information and documents will be available on Canvas.

Textbook: The required textbook for this course is the following:

- *Differential Equations: From Calculus to Dynamical Systems* (Second Edition) by Virginia W. Noonburg. (ISBN: 978-1-4704-4400-6)

Prerequisites: A grade of C or better in Calculus II (MATH 2414 or equivalent).

Course Description

Study of ordinary differential equations. Emphasis is given to equations of the first order, linear equations, and solution by series.

Student Learning Outcomes

Upon completion of this course, students should be able to do the following:

- Understand and use abstract mathematical concepts. (Critical Thinking)
- Determine order, type, and linearity of differential equations.
- Determine if a particular function is a solution to a differential equation.
- Find general solutions to first order differential equations.
- Find general solutions to linear differential equations with constant coefficients.
- Use the Laplace transform to solve differential equations.
- Solve systems of differential equations.
- Model a variety of physical situations using differential equations.
- Accurately interpret solutions to differential equations in the context of physical applications.

Assignments and Grading

Homework, Quizzes, Participation

Homework will be posted on Canvas. Homework will not be turned in but it is important for you to do it to learn and understand the material. There will be weekly quizzes and occasionally other assignments (sometimes in-class, sometimes take-home). You should attend class and participate when appropriate.

Exams

There will be three exams during the semester, as well as a comprehensive final exam. All exams will be held in class with no books, notes, or calculators allowed. The tentative dates are:

- Exam 1: February 4
- Exam 2: March 4
- Exam 3: April 8
- Final Exam: April 29

Grading

Your grade will be computed as follows:

Assignment	Total %
Quizzes/Participation	14
Exams	$18\% \times 3 = 54$
Final exam	32
Total	100

Numerical	Letter
90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
Below 60	F

Course Policies

Canvas

You must activate your Canvas account and check it regularly. You can activate your account and log in at `https://www.uttyler.edu/canvas`. If you are registered for the course, then you should already have access to the Canvas page. All announcements and important documents will be posted there.

Attendance and Make-Up Policy

Attendance is very important for doing well in the course. However, if you are sick and/or are experiencing any COVID-19 symptoms, please stay home. Send me an email if this happens and we will figure out make-ups, note sharing, etc.

For absences not related to COVID-19 (such as official UT Tyler activities), let me know beforehand that you will be missing class so we can plan around it.

Cell Phones, Calculators, and Electronic Devices

When class is about to begin, place any electronic devices (e.g., cell phones) in silent mode and put them out of sight. You may use a laptop or tablet to take notes or consult the textbook (if you have the electronic version). If you are using these devices for other purposes, I will ask you to put them away. No calculators of any kind are allowed on exams.

Changes to Syllabus

I reserve the right to make changes to the syllabus during the semester. Any changes to course policies will be announced in class, and an updated version of the syllabus will be posted to Canvas.

Important Dates.

January 10: First day of class
January 17: Martin Luther King Jr. Day holiday. No class.
January 24: Census date. Last day to change schedule or file for grade replacement.
March 7–11: Spring Break. No class.
March 28: Last day to withdraw.

University Policies

Information on University policies concerning the following topics:

- UT Tyler Honor Code
- Students Rights and Responsibilities
- Campus Carry
- UT Tyler Tobacco-Free Policy
- Grade Replacement/Forgiveness and Census Date
- State-Mandated Course Drop Policy
- Student Accessibility and Resources
- Student Absence due to Religious Observance
- Student Absence for University-Sponsored Events and Activities
- Social Security and FERPA Statement
- Emergency Exits and Evacuation
- Student Standards of Academic Conduct
- UT Tyler Resources for Students

can be found at

`http://www.uttyler.edu/academicaffairs/files/syllabuspolicy.pdf`

Tentative Daily Schedule

This schedule is subject to change as we move through the semester, though we should follow it pretty closely (barring any unforeseen circumstances). Topics marked with an asterisk (*) are optional and may be skipped or postponed as the schedule permits.

Week	Date	Topics covered
1	1/10	§1.1–1.3 – Introduction to differential equations and mathematical models.
	1/12	§2.1 – Separable first-order equations.
	1/14	§2.2 – Introduction to qualitative methods – slope fields.
2	1/17	MLK Jr. Day – no class.
	1/19	§2.3 – Linear first-order ODEs – the method of integrating factors.
	1/21	§2.4 – Existence and uniqueness of solutions to ODEs.
3	1/24	§2.5 – Exact differential equations.
	1/26	§2.5 – Bernoulli equations and other analytic methods.
	1/28	§2.6 – Numerical methods.*
4	1/31	§2.7 – More qualitative analysis: Autonomous ODEs.
	2/2	§2.7 – More qualitative analysis: Equations with parameters and bifurcations.
	2/4	**Exam 1**
5	2/7	§3.1, 3.2 – Homogeneous linear ODEs.
	2/9	§3.2 – Solving higher-order homogeneous linear ODEs.
	2/11	§3.3 – Spring-mass systems.
6	2/14	§3.4 – Nonhomogeneous equations: the Method of Undetermined Coefficients.
	2/16	§3.4 – Nonhomogeneous equations: Variation of Parameters.
	2/18	§3.5 – Forced spring-mass systems.
7	2/21	§3.6 – Equations with non-constant coefficients.
	2/23	§3.6 – Series solutions.
	2/25	§3.7 – Qualitative analysis of second-order autonomous equations.*
8	2/28	§4.1 – Introduction to systems of linear differential equations.
	3/2	§4.2 – Matrix algebra.
	3/4	**Exam 2**
9	3/7 – 11	Spring Break – no class.
10	3/14	§4.3 – Eigenvalues and eigenvectors.
	3/16	§4.4 – Solving linear systems of ODEs.
	3/18	§4.4 – Linear systems of ODEs (continued).
11	3/21	§4.4 – Applications of linear systems of ODEs.
	3/23	§4.5 – Nonhomogeneous systems and matrix exponentials.*
	3/25	§5.1 – Geometric and qualitative analysis for systems of ODEs.

12	3/28	§5.2 – Phase planes for various kinds of linear systems.
	3/30	§5.3, 5.4 – Nonlinear systems and bifurcations.*
	4/1	§6.1 – Introduction to the Laplace transform.
13	4/4	§6.1 – Properties of the Laplace transform.
	4/6	§6.2 – Solving ODEs and the inverse Laplace transform.
	4/8	**Exam 3**
14	4/11	§6.3 – More Laplace transforms.
	4/13	§6.3 – Solving systems of ODEs with Laplace transforms.
	4/15	§6.4 – The unit step function.
15	4/18	§6.5 – Convolution and impulse functions.
	4/20	Special topic – Fourier series.
	4/22	Special topic – partial differential equations.
16	4/25	Study day.
	4/27	
	4/29	**Final Exam**