MATH 3305 Ordinary Differential Equations

The University of Texas at Tyler, Summer 2025

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Website: All materials will be posted on Canvas

Time and Place:

- MoTuWeThFr 9:00 am - 10:40 am at RBN 2011.

Office Hours: MoTuWeThFr 11:00 pm - 12:00 pm, or request an appointment by email (at least one day in advance).

Preferred method of communication: My preferred method of communication is by email. Please start your emails with a greeting, followed by your full name, course and section.

Textbook: I will provide my own lecture notes, but most of the material can also be found on the following freely available sources:

- Elementary Differential Equations with Boundary Value Problems by William F. Trench, Trinity University. Which can be found at https://digitalcommons.trinity.edu/mono/9/.
- Differential Equations: From Calculus to Dynamical Systems, Second Edition, by Virginia W. Noonburg. Which can be found at https://ebookcentral.proquest.com/lib/uttyler/detail.action?docID=5683564.

Additional reference:

- A First Course in Differential Equations with Modeling Applications by Dennis G. Zill, 10th Edition.

Course description: This course provides an introduction to the theory, solution methods, and applications of ordinary differential equations. Topics include first-order differential equations, linear differential equations of higher order, systems of linear equations, and Laplace transforms. Emphasis is placed on analytical techniques, with additional exposure to modeling physical systems and interpreting solutions in applied contexts. The course is foundational for further study in mathematics, physics, engineering, and the life sciences.

Course prerequisites: A grade of C or better in Calculus II is required to take this course.

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

- 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.

Grading procedure:

- Four midterm exams 60% (15% each)
- Final exam (cumulative) 25%
- Homework 15%

Grading scale: A:90-100%, B: 80-89%, C: 70-79%, D: 60−69%, F:<60%.

Homework: The homework in this course is a **learning tool**. Its primary purpose is to give you the opportunity to practice important methods and **to learn**. Very few students can master this material without plenty of practice. If you look up solutions online without first giving yourself the chance to think and struggle with each question, you may earn the homework points, but you will miss out on the opportunity to truly learn and understand the topics covered in the homework. Please **feel free to come ask me questions about homework** and other course material during office hours or to contact me to schedule alternative appointments. **Your questions are always welcome**.

Homework will be **assigned via the online platform WeBWorK**. Information on logging into and using WeBWorK will be available on Canvas. A new homework assignment will become available on WeBWorK after each class. It is your responsibility to be aware of the due date, which will be posted in Canvas and on WeBWorK. The WeBWorK system provides you with instant feedback on your answers, as well as a number of attempts to complete most problems. You are required to successfully complete all assigned problems on WeBWorK. **Late homework will NOT be accepted and there will be no extensions or additional attempts. If you are having issues with a particular problem, make sure to visit my office hours before you exhaust all your attempts**.

Make-up policy: Make-ups for documented absences that are required as part of a UT Tyler obligation (e.g. athletes participating in an event, students participating in a debate contest, etc.) or for religious observation will be granted. **For all make-ups of this type, prior notification of at least one week and documentation are required. Other make-ups are granted only in extreme cases and at the sole discretion of the instructor. Valid documentation, such as a medical note from a health professional (dated within 72 hours of the missed evaluation) must be provided to be eligible for the make-up evaluation**. Consider visiting the Health Clinic on Campus for such a request. To make an appointment call (903) 939-7870. It is the responsibility of the student to communicate with me promptly and regularly until arrangements for the missed work have been established. If this criterion is not met, make-up evaluation won't be granted. Leaving early for a break is NOT grounds for a make-up, so please make your travel plans accordingly.

Attendance: Attendance is **mandatory**. You are expected to attend to class on time and prepared. Students are responsible for all announcements made during lecture.

Student Resources:

- **Canvas 101**: To learn how to use Canvas visit: https://www.uttyler.edu/canvas/
- **The Mathematics Learning Center (MLC)**, RBN 4021, is an open access computer lab for math students. There are tutors on duty for several hours each day to assist students who are enrolled in early-career courses. For more information about the MLC including the tutoring schedule visit: https://www.uttyler.edu/academics/colleges-schools/arts-sciences/departments/mathematics/math-learning-center.
- **Upswing** (Online Tutoring Service) Online tutoring for undergraduate UT Tyler courses is available 24 hours per day, 7 days per week. Through Upswing, an online tutoring platform, students can connect with professional tutors without having to be present on campus. Upswing services are free to currently enrolled, undergraduate UT Tyler students. For more information about Upswing visit https://www.uttyler.edu/academics/success-services/tutoring/online/

Calculators: The use of **calculators** and other electronic devices, including **cell phones**, during exams or quizzes is strictly **prohibited**, so study accordingly.

Cellphones and Electronic Devices: Cellphones are not permitted during class. They must be silenced and put away at all times. Electronic devices such as smartwatches, smart glasses, earbuds, headphones, and similar items are not permitted during evaluations.

Artificial Intelligence Statement: UT Tyler is committed to exploring and using artificial intelligence (AI) tools as appropriate for the discipline and task undertaken. We encourage discussing AI tools' ethical, societal, philosophical, and disciplinary implications. All uses of AI should be acknowledged as this aligns with our commitment to honor and integrity, as noted in UT Tyler's Honor Code. Faculty and students must not use protected information, data, or copyrighted materials when using any AI tool. Additionally, users should be aware that AI tools rely on predictive models to generate content that may appear correct but is sometimes shown to be incomplete, inaccurate, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the quality and content of the information you submit. Misusing AI tools that violate the guidelines specified for this course (see below) is considered a breach of academic integrity. The student will be subject to disciplinary actions as outlined in UT Tyler's Academic Integrity Policy.

For this course, **the use of AI tools is permitted for homework assignments only, but it is important to understand that you do so at your own risk**. While AI may provide correct answers, relying solely on these tools can **defeat the purpose of homework as a learning tool**. Homework is designed to help you understand and apply the material, which is essential for your success in this course. If you merely copy answers from AI without fully engaging with the problems, **you may find yourself unprepared for in-class evaluations, where NO electronic devices, including AI tools, will be allowed**. Ultimately, this approach could negatively impact your performance on exams and your overall understanding of the subject.

UT Tyler a Tobacco-Free University: All forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors. Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), electronic cigarettes (vaping), smokeless tobacco, snuff, chewing tobacco, and all other tobacco products. There are several cessation programs available to students looking to quit smoking, including counseling, quitlines, and group

support. For more information on cessation programs please visit https://www.uttyler.edu/offices/human-resources/wellness/tobacco-cessation/.

Academic Integrity: Your work must be your own. Violations will be processed according to the established guidelines of the department, college, and university. Violations of academic integrity include, but are not limited to, cheating, fabrication, or plagiarizing. A range of academic sanctions may be taken against a student who engages in academic dishonesty.

Accessibility: The Department of Mathematics at UT Tyler offers accommodations to students with learning, physical, and/or psychological disabilities. If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Student Accessibility and Resources (SAR) as early as possible in the term. SAR will verify your disability and determine reasonable accommodations for this course. You can find more information in their website https://www.uttyler.edu/academics/success-services/disability-services/.
Take into account that once an application and supporting documentation is received, the SAR registration process may take 5-7 business days to complete. It is the student's responsibility to apply for and obtain accommodations in a reasonable time frame within the semester. No accommodation reviews will be completed during the final three weeks of the current semester unless the condition is temporary or newly diagnosed.

Policies: See https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information.pdf for these and other important University policies including: UT Tyler Honor code, student rights and responsibilities, campus carry, UT Tyler a tobacco-free university, grade replacement and forgiveness, state-mandated course drop policy, student accessibility and resources, student absence for university-sponsored events, social security and FERPA, emergency exits and evacuation, and student standards of academic conduct.

Important Dates: To find these and other important dates visit the University academic calendar at: https://www.uttyler.edu/schedule/files/2024-2025/academic-calendar-2024-2025-main-20241212.pdf.

- July 10th. Census date: Date to withdraw without penalty, grade replacement deadline.
- July 29th. Last day to withdraw from one or more courses with a W.
- Midterm 1: Monday July 14th.
- Midterm 2: Monday July 21st.
- Midterm 3: Monday July 28th.
- Midterm 4: Monday August 4th.
- Final Exam: Monday August 9th.

Topics: The following are the topics that will be covered during the term:

- First Order Differential Equations.
  - Linear differential equations.
  - Separable differential equations.
  - Homogeneous and reducible to homogeneous differential equations.
  - Exact and reducible to exact differential equations.
  - Solutions by substitution.

- Modeling with first-order differential equations.
  - Linear models
  - Nonlinear models
  - Models with systems of first-order odes.
- Higher-order differential equations.
  - Reduction of order.
  - Homogeneous linear equations with constant coefficients.
  - Undetermined coefficients.
  - Variation of parameters.
- Modeling with higher-order differential equations.
  - Spring/Mass systems.
  - Circuits.
- The Laplace transform.
  - Inverse transforms and transforms of derivatives.
  - Operational properties.
  - The Dirac Delta dunction.
  - Systems of differential equations.
- Systems of linear first-order differential equations.
  - Homogeneous linear systems.
    - Distinct real eigenvalues.
    - Repeated eigenvalues.
    - Complex eigenvalues.
  - Nonhomogenoeus linear systems.
    - Undetermined coefficients.
    - Variation of Parameters.