

Math 37a: Differential Equations

Spring 2025

Instructor: Yangyang Wang (yangyangwang@brandeis.edu)

Time: Tuesday and Friday, 12:45 PM - 2:05 PM

Class Location: Gerstenzang 122

Student Hours: Tuesday 2:10-3:10 pm and Thursday 9-10 am

Office location: Goldsmith 302

Course Description

Introduction:

This is a first course in ordinary differential equations (ODEs) focusing on the study of general techniques with a view to solving ODEs and applications.

Course Prerequisite(s):

MATH 15a or 22a and MATH 20a or 22b. Students should have familiarity with single variable calculus, multi-variable calculus, and linear algebra.

Recommended Textbook & Related Material:

Elementary Differential Equations and Boundary Value Problems, W.E. Boyce and R.C. DiPrima, 10th edition

Differential Equations, P. Blanchard, R. Devanney, and G. Hall, 4th edition

Learning Goals:

1. Key concepts including existence and uniqueness, equilibria, and phase planes
2. Appropriate formulations, i.e. boundary value vs. initial value problems
3. Linear equations: techniques and representative problems
4. Nonlinear equations: qualitative and numerical method

Course Work and Grading

- Homework problems (weekly): 20% of total grade.

- In-class Quizzes (15 min long, bi-weekly): 10% of total grade.
- Two in-class midterms: 40% of total grade.
- Final exam: 30% of total grade.

Tentative Exam dates:

- In-class Midterm 1: Friday 2/14 during the course hours in the lecture classroom
- In-class Midterm 2: Friday 3/28 during the course hours in the lecture classroom
- Final exam: To be announced

Course Policy:

- **Late Homework Policy:** Homeworks are due weekly. The lowest TWO HW scores will be automatically dropped. Unless under exceptional circumstances (e.g. medical emergency), late assignments will **NOT** be accepted.
- **Student Collaboration:** Student collaboration is only permitted on homework, NOT permitted on quizzes and exams. You must write up your own solutions for homework. Homework showing duplication will be considered as the result of academic dishonesty. Any attempt to collaborate during exams will result in a 0 score on that test.
- **Exam Policy:** Taking all exams (midterms and final) is mandatory. You are expected to show all of your work in an organized and coherent fashion. In the long problems, all work must be shown, and giving only a final solution will not earn full credit. If you have a time conflict with any of the exams, discuss your situation with your lecturer as soon as possible, ideally at least one week prior to the exam.
- **No make-up quizzes:** The lowest quiz grade will be dropped.

Instructor's Note:

I reserve the right to change any policy and/or schedule, as I deem appropriate

Tentative Schedule

Week 1: Introduction to differential equations: examples and basic concepts (Ch1 of Boyce and DiPrima)

Week 2-4: First-order differential equations (Ch2)

- (a) General techniques
- (b) Existence and uniqueness
- (c) Equilibria and stability
- (d) Modeling and applications

Week 5: Midterm 1

Week 6: February break

Week 7-10: Second (Higher)-order equations (Ch 3, 4)

- (a) Characteristic equation
- (b) Forcing and resonance
- (c) Applications to mechanical and electrical vibrations

Week 11: Midterm 2

Week 12-13: Laplace transforms (Ch 6)

- (a) Discontinuous functions
- (b) Delta functions and impulse forcing
- (c) Convolutions

Week 14: Passover

Week 15-16: Linear and Nonlinear systems (Ch7, 9)

- (a) General solution via eigenvalue decomposition
- (b) Equilibrium point analysis
- (c) Qualitative methods
- (d) Stability

Learning Expectations and Resources

This course will be conducted in-person. However, in the event of campus closures such as snow days or other disruptions, it may transition to remote instruction through Zoom. In-person attendance is expected (unless accommodations have been cleared with me beforehand).

Success in this 4 credit-hour course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (homework, preparation for quizzes and exams, etc).

Undergraduate students from SAS with financial need should contact Student Financial Services to discuss options available to purchase equipment and other technology and supply needs. GSAS students should contact Monique Howell in GSAS.

Accommodations

Brandeis seeks to create a learning environment that is welcoming and inclusive of all students, and I want to support you in your learning.

If you think you may require disability accommodations, you will need to work with Student Accessibility Support (SAS) (781-736-3470, access@brandeis.edu). You can find helpful student FAQs and other resources on the [SAS website](#), including guidance on how to know whether you might be eligible for support from SAS. If you already have an accommodation letter from SAS, please provide me with a copy as soon as you can so that I can ensure effective implementation of accommodations for this class. In order to coordinate exam accommodations, ideally you should provide the accommodation letter at least 48 hours before an exam.

Important Policies and Resources

Academic Integrity

Every member of the University community is expected to maintain the highest standards of academic integrity. A student shall not submit work that is falsified or is not the result of the student's own effort. Infringement of academic integrity by a student subjects that student to serious penalties, which may include failure on the assignment, failure in the course, suspension from the University or other sanctions. Please consult [Brandeis University Rights and Responsibilities](#) for all policies and procedures related to academic integrity. Students may be required to submit work via TurnItIn.com or similar software to verify originality. A student who is in doubt regarding standards of academic integrity as they apply to a specific course or assignment should consult the faculty member responsible for that course or assignment before submitting the work. Allegations of alleged academic dishonesty will be forwarded to the Department of Student Rights and Community Standards. Citation and research assistance can be found at [Brandeis Library Guides - Citing Sources](#).

Breaks

Class meetings of 90 minutes include a 10-minute break, while class meetings of 180 minutes include two breaks, at the instructor's discretion.

Classroom Health and Safety

- Register for the [Brandeis Emergency Notification System](#). Students who receive an emergency notification while attending class should notify their instructor immediately. In the case of a life-threatening emergency, call 911. As a precaution, review [this active shooter information sheet](#).
- Brandeis provides [this shuttle service](#) for traveling across campus or to downtown Waltham, Cambridge and Boston.
- On the Brandeis campus, all students, faculty, staff and guests are required to observe the university's policies on physical distancing and mask-wearing to support the health and safety of all classroom participants. Review up to date [COVID-related health and safety policies](#) regularly.

Course Materials/Books/Apps/Equipment

If you are having difficulty purchasing course materials, please make an appointment with your Student Financial Services or Academic Services advisor to discuss possible funding options, including vouchers for purchases made at the Brandeis Bookstore.

Library

[The Brandeis Library](#) collections and staff offer resources and services to support Brandeis students, faculty and staff. Librarians and Specialists from Research & Instructional Services, Public Services, Archives & Special

Collections, Sound & Image Media Studios, MakerLab, AutomationLab, and Digital Scholarship Lab are available to help you through consultations and workshops.

Privacy

To protect your privacy in any case where this course involves online student work outside of Brandeis password-protected spaces, you may choose to use a pseudonym/alias. You must share the pseudonym/alias with me and any teaching assistants as needed. Alternatively, with prior consultation, you may submit such work directly to me.

Student Support

Brandeis University is committed to supporting all our students so they can thrive. If a student, faculty, or staff member wants to learn more about support resources, the [Support at Brandeis](#) webpage offers a comprehensive list that includes these staff colleagues you can consult, along with other support resources:

- The [Care Team](#)
- [Academic Services](#) (undergraduate)
- [Graduate Student Affairs](#)
- Directors of Graduate Studies in each department, School of Arts & Sciences
- Program Administrators for the Heller School and International Business School
- [University Ombuds](#)
- [Office of Equal Opportunity](#).