BOSTON UNIVERSITY

Department of Mathematics & Statistics

Math 231: Honors Differential Equations
Fall 2024

Instructor:	C. Eugene Wayne	**E-mail:**	cew@bu.edu
Lectures:	MWF 12:20-1:10pm	**Room:**	SOC B53
Discussion:	W 10:10-11:00am	**Room:**	MCS B29
Office Hours:	M 1:25-2:15pm	**Room:**	CDS 545
	W 2:30-3:20pm	**Room:**	CDS 545
	F 10:10-11:00am	**Room:**	CDS 545

Course description: Ordinary differential equations with applications to mechanics, biology, and physics. First- and second-order equations, linear and nonlinear systems, Sturm-Louiville problems, vibrating strings, special functions, power series solutions, regular singular points, Laplace transforms, calculus of variations, isoperimetric problems, and Hamilton's principle. (Cannot be taken for credit in addition to CAS MA 226.) Effective Fall 2020, this course fulfills a single unit in the following BU Hub area: Critical Thinking.

Textbook: Differential Equations; 4th edition by Blanchard, Devaney and Hall. We will cover most of the textbook this semester – see below for a more detailed outline. I may also supplement the material in the BDH book with other books which I will place on reserve in the Science and Engineering Library.

Office Hours: I encourage you to come to my office hours if you have **any** questions about the course. If you want to speak with me, but are unable to come to see me at any of my regular office hours, please let me know and we can schedule a mutually convenient time.

Examinations: There will two midterm exams. These exams will be in-class and I will announce their dates at least two weeks before they take place. The comprehensive final exam will be on Thursday, December 19 at 12:00pm-2:00pm. **DO NOT ARRANGE TO LEAVE CAMPUS BEFORE THE FINAL EXAM!**

Projects: The will be two projects this semester. These projects will involve more in depth study of some application of differential equations and will also require an extensive and careful write-up.

Grading: In addition to the examinations and projects above, I will assign homework which will be due about every 7-10 days. Your final grade will be determined by the following procedure:

Homework: 15 %
Each Project 11 %
Each Midterm: 19 %
Final Exam: 25 %

On the exams I will, of course, expect you to work alone and without outside assistance. However, I encourage you to work together on the homework assignments as I feel that discussing this material with other students is an excellent way of learning this subject.

To reiterate, while you are encouraged to work together on the homework (or even to consult with online sources) you are to rely only on your own ideas and knowledge on the midterms and final exam. For the projects, you may discuss your classmates, but your write-ups must be your own. (In particular, you may not use Chat-GPT or other similar AI tools to write your projects.)

On the exams, the use of another individual's work, however it is communicated, is not permitted. Your work in this course is governed by BU's Academic Conduct Code:
`https://www.bu.edu/academics/policies/academic-conduct-code/`
which you are expected to be familiar with and abide by.

Tentative Outline

Week 1: Sections 1.1-1.3
Week 2: Sections 1.4-1.5 plus Sections 7.1-7.3
Week 3: Sections 1.6-1.9
Week 4: Sections 2.1-2.3
Week 5: Midterm 1 plus Sections 2.5, 3.1 and 3.2
Week 6: Sections 3.3-3.5
Week 7: Section 3.6-3.7 plus extra material on linear algebra
Week 8: Solving general linear systems of differential equations plus Sections 4.1-4.2
Week 9: Section 4.3-4.5 5.1
Week 10: Section 5.2-5.4
Week 11: Sections 5.5-5.6 and Midterm 2
Week 12: Sections 6.1-6.3
Week 13: Sections 6.4-6.5
Week 14: Calculus of Variations