Syllabus

Math 23 Differential Equations (Winter 2023) Section 02

Instructor : Bosu Choi

Class : MWF 2:10 - 3:15 PM (Location: Kemeny 108)

X-hour : Th 1:20 - 2:10 PM (will be announced in advance when there is a class during X-hour)

Contact : bo.su.choi@dartmouth.edu

Office hours : Kemeny 212: (Time: TBD)

TA : (TBD)

General Information

Please see Lecture Plan for detailed information.

Lectures
All lectures will be held in person. Lecture notes will be available on CANVAS after each lecture.

Office hour
Office hours will be held in person.

Math 23 tutorial sessions

Tu Th Su from 7 - 9 pm (Location: Kemeny 108)

Grading

The course grade will be based upon on weekly homework (total 120 points), exam 1 (100 points), exam 2 (120 points), exam 3 (160 points). Total points possible: 500.

Violations of the Academic Honor Principle will be referred to the Committee on Standards. In particular please be aware of rules regarding plagiarism and collusion.

Exams 380 points

- Exam 1: 100 points, Friday, January 27, 4:30 – 6:30 pm
- Exam 2: 120 points, Friday, February 17, 4:30 – 6:30 pm
- Exam 3(cumulative final): 160 points, Wednesday, March 13, 3 – 6 pm

There are some old past exams given in previous terms. Please note that these are only meant to be used as practice problems. You should not draw any conclusions about the topics, problem structure, or level of difficulty from them. Working on the problems at the end of each section and carefully reviewing your class notes is a great way to prepare for exams.

Homework 120 points
Homework reinforces concepts and skills while challenging students to extend what they have learned to other types of problems. Because it is important for students to have this experience, instructors will not solve assigned homework problems during office hours before the due date. We will of course answer questions you may have in approaching problems that give you difficulty. It is therefore essential to begin homework sets early so that you may get help if difficulties do arise. As all homework is posted well in advance, no late homework will be accepted.

Homework grading policy: The goal of homework is to learn to work through problems. Therefore each problem set will be assigned a grade on a 15 point scale as submitted through gradescope.

Honor Principle

We will strictly enforce Dartmouth's Academic Honor Principle.

On Exams: Giving and/or receiving assistance during an examination violates the Academic Honor Principle.

On Homework: Collaboration is both permitted and encouraged, but it is a violation of the honor code for someone to provide the answers for you.

Textbook

Elementary Differential Equations and Boundary Value Problems (11th Edition) by Boyce & DiPrima, Wiley 2017. It is fine to use the 9th, 10th or 12th edition. The problems may differ at the end of each section, but the content is primarily the same. You may find online versions of some older editions.

ORC Course description

This course is a survey of important types of differential equations, both linear and nonlinear. Topics include the study of systems of ordinary differential equations using eigenvectors and eigenvalues, numerical solutions of first and second order equations and of systems, and the solution of elementary partial differential equations using Fourier series.

Prerequisite:

Mathematics 13 (Calculus of Vector-valued Functions)

Disabilities

Students with learning, physical, or psychiatric disabilities enrolled in this course that may need disability-related classroom accommodations are encouraged to make an office appointment to see their instructor before the end of the second week of the term. All discussions will remain confidential, although the Student Accessibility Services office may be consulted to discuss the appropriate implementation of any accommodation requested. At such a meeting please provide your instructor with a copy of a disability registration form, which lists the accommodations recommended for the student by Student Accessibility Services within the Academic Skills Center. The person you might want to contact at the Academic Skills center is Ward Newmeyer, Director of Student Accessibility Services 205 Collis Center - (603) 646-9900.

Student Religious Observances

Some students may wish to take part in religious observances that fall during this academic term. Should you have a religious observance that conflicts with your participation in the course, please come speak with your instructor before the end of the second week of the term to discuss appropriate accommodations.

Tentative Lecture Plan

Lectures	Sections in Text	Description	Tentative homework (Text 11th edition)
Wednesday January 4	1.1	What are differential equations?	1.1: #5, 6, 8, 18, 20
Friday January 6	1.2, 1.3	Classification and linear first-order ODEs	1.2: #5, 10(Hint: do (b) first), 11 1.3: (TBD)
Monday January 9	2.1, 2.2	Separable equations and existence-uniqueness theorems	2.1: #9, 12, 20, 23 2.2: #6,15, 20
Wednesday January 11	2.4, 2.3	Modeling with differential equations	2.4: #8, 10, 18, 21, 24, 27 2.3: #2, 6(Hint: solve 6(c) numerically), 11
Friday January 13	2.5	Autonomous equations and population dynamics	2.5: #3, 8, 15
Wednesday January 18	2.6	Exact equations	2.6: #2, 10, 12
Thursday January 19	3.1, 3.2	Second-order constant coefficient equations with distinct roots; the Wronskian	3.1: #11, 16, 17, 20 3.2: #8, 15, 17,21, 27
Friday January 20	3.3	Complex conjugate roots	3.3: #4, 8, 14, 26
Monday January 23	3.4	Repeated roots and reduction of order	3.4: #5, 9, 22
Wednesday January 25	3.5, 3.6	Nonhomogeneous equations: Method of underdetermined coefficients and variation of parameters	3.5: #7, 10, 11, 22 3.6: #9, 12
Friday January 27	Midterm exam 1 (4:30-6:30pm)	Material through 3.3	Review
Monday January 30	7.1, 7.2	Review of matrices	7.1: #6,12 7.2: #2, 12, 16
Wednesday Feburary 1	7.3, 7.4	Systems of ODEs; Existence and uniqueness of solutions of systems of ODEs	7.3: #9, 19 7.4: #8(only (a,b,c)), 11, 12(only (a,b))
Friday	7.5	Constant coefficient systems with	7.5: #6, 12, 18, 21

Feburary 3		distinct real eigenvalues	
Monday Feburary 6	7.6, 7.7	Constant coefficient systems with complex conjugate eigenvalues Fundamental solutions	7.6: #8, 9, 23 7.7: (TBD)
Wednesday Feburary 8	7.8	Repeated eigenvalues	7.8: #8, 13, 17(only (a,b,c,d))
Friday Feburary 10	7.9	Nonhomogeneous linear systems	7.9: # 2, 3, 7, 10(only verify the general solution of the corresponding homogeneous part)
Monday Feburary 13	9.1	The phase plane	9.1: #15, 17, 18
Wednesday Feburary 15	9.2	Autonomous systems and stability	9.2: #3, 7(only (a,b,c)), 19
Friday Feburary 17	Midterm exam 2 (4:30-6:30pm)	Material from 3.4 through 7.9	Review
Monday Feburary 20	9.3	Locally linear systems	9.3: #3, 7, 17, 24
Wednesday Feburary 22	9.4	Completing species	9.4: #3, 6
Friday Feburary 24	9.5	Predator-prey equations	9.5: #4, 12
Monday Feburary 27	6.1, 6.2	Laplace transform and the IVP	6.1: #2, 11, 18 6.2: #12, 18, 21, 24
Wednesday March 1	6.3	Step functions	6.3: #12, 14, 17
Friday March 3	6.4, 6.5	Discontinuous forcing functions, impulse functions	6.4: #5, 12 6.5: #6, 10, 14
Monday March 6	6.6	The convolution integral	6.6: #1, 2, 13, 16
Wednesday March 13	Final exam (3-6pm)	Exam covers material from the whole course	