MA30300 Differential Equations and Partial Differential Equations for Engineering and the Sciences

Term: Spring 2023

- Class Start Date: Jan 10, 2023
- Class End Date: May 6, 2023
- For other important dates see *Purdue 2022-2023 Academic Calendar*.

Section: 377

Instructor: Alexandre Eremenko, Office MATH 600, email *eremenko@purdue.edu*

Course Description: This is a second-semester course in differential equations. The main topics covered are linear and nonlinear systems of differential equations, Laplace transform, and an introduction to Fourier series and partial differential equations.

Learning Outcomes: In this course you well learn to:

1. Classify homogeneous first order linear systems of differential equations by their phase portraits and solve them by using the eigenvalue method.
2. Analyze the behavior of nonlinear systems near critical points by their stability and type and apply this knowledge to study some ecological models and mechanical systems.
3. Use the method of Laplace transform to solve linear differential equations.
4. Use the Fourier series and the method of separation of variables to solve partial differential equations.
5. Use the eigenfunction expansion method to solve Sturm-Liouville problems.

Textbook: Edwards, Penney, and Calvis, *Differential Equations and Boundary Value Problems: Computing and Modeling*, 6th Edition, ISBN:9780137540129.

- You are not required to have a physical copy of the textbook. The access code to *MyLab Math* for online homework (required) will also include an electronic version of the textbook (Pearson eText).

In this course, we will cover most of chapters 5, 6, 7, 9 and the beginning of chapter 10.

Course Webpage: We will use *Brightspace* (`purdue.brightspace.com`) as the learning management system, but we will also rely on the following platforms for assignments and other activities:

- *MyLab Math* (`pearsonmylabandmastering.com`) for online homework and exams

All these platforms are accessible through *Brightspace*.

Online Homework: The primary way to submit homework will be through *MyLab Math*. You are required to have access to *MyLab Math*, which also includes an electronic copy of the textbook (Pearson eText). This can be purchased directly from Pearson (once you log in). Alternatively, you can purchase the loose-leaf or hardcover editions with 18-week access card (see *Textbook* information above)

Online homework normally will be due every Tuesday at 11:00 am, for the previous week's material. The first online homework (Sections 5.1 and 5.2) is due January 17.

Handwritten Homework: There will also be handwritten homework to be scanned and uploaded to Brightspace, on Tuesdays before 11 a.m., for the previous week's material. The first handwritten homework (Section 5.2 #26) is due on Tuesday Jan 17. Note that answers to all problems are provided at the end of the book, thus you should always show your work to receive credits. No points will be given if you only write the final answer.

Office Hours: TTh 1:30-2:30am (Eastern Time). The time is subject to change.

Exams: There will be one Midterm Exam, tentatively in Week 7 (Febr 16) and a Final Exam in the Finals Week (May 1-6).

Grading: Your grade will be determined from the total score, whose components have the following maximum values:

Category	Max Value
Online Homework	150
Handwritten Homework	50
Midterm Exam	100
Final Exam	200
Total	500

The letter grade cutoffs will be based on the historical grade distribution. This semester, we will also apply the following rule: students who get at least 97% of the total points are guaranteed an A+, 93% guarantees an A, 90% an A-, 87% a B+, 83% a B, 80% a B-, 77% a C+, 73% a C, 70% a C-, 67% a D+, 63% a D, and 60% a D-. Please note, these are not the actual cutoffs, but rather upper bounds on those. The actual cutoffs will be determined after the final exam, and can be lower but not higher than the ones above.

Course Schedule: The tentative course schedule is as follows

Week	Start Date	Sections in the book
1	Jan 9	5.1, 5.2
2	Jan 16	5.5, 5.3
3	Jan 23	6.1, 6.2
4	Jan 30	6.3, 6.4
5	Febr 6	7.1, 7.2
6	Febr 13	7.3, 7.4
7	Febr 16	Review and Midterm 1
8	Febr 27	7.5, 7.6
9	March 6	9.1, 9.2
10	March 20	9.3, 9.4
11	March 27	9.5
12	April 3	9.6
13	April 10	9.7
14	April 17	10.1
15	April 24	Review
16	May 1	Fnal Exam Week

Schedule is subject to change. Any changes will be posted in *Brightspace*.

Course and University Policies

Late homework: The lowest two online homework scores and the lowest two handwritten homework scores will be dropped, but in return, late homework will not be accepted. In the event that an assignment is missed for reasons that are serious, unavoidable, and beyond the student's control, the situation will be handled on an individual basis. Documentation may be required in such cases.

Makeup policy: Student needs to inform the instructor of any conflict that can be anticipated and will affect the submission of an assignment or the ability to take an exam. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflict, when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email or by phone. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor's department because of circumstances beyond the student's control, and in cases of bereavement, quarantine, or isolation, the student or the student's representative should contact the Office of the Dean of Students via email or phone at 765-494-1747. Our course *Brightspace* includes a link on Attendance and Grief Absence policies under the University Policies menu.

Academic integrity: Academic integrity is expected for all students at all times in this

course. You are free (even encouraged) to work with other students to solve the homework problems. However, you are required to complete online homework yourself and write up solutions for handwritten homework using your own words and explanations. Of course, you are required to do your own work on each exam (although you can prepare with others).

Nondiscrimination statement: Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. More details are available on our course *Brightspace* table of contents, under University Policies.

Students with disabilities: Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are encouraged to contact the Disability Resource Center at: `drc@purdue.edu` or by phone: 765-494-1247.

In this mathematics course accommodations are managed between the instructor, the student and DRC Testing Center. If you have been certified by the Disability Resource Center (DRC) as eligible for accommodations, you should contact your instructor to discuss your accommodations as soon as possible. Here are instructions for sending your Course Accessibility Letter to your instructor: `https://www.purdue.edu/drc/students/course-accessibility-letter.php`

Emergency preparation: In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your `@purdue.edu` email on a frequent basis.

Other important policies can be found in *Brightspace* under the University Policies menu.