Math 3440: Differential Equations Fall 2021
MW 2:30–3:45pm
Zoom: 995 2187 5983, password 3440

Instructor:	Youngmin Park
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Office Hours:	We 1:30 – 2:30pm, Fri 4-5pm

Course Description This course presents an introduction to the theory of differential equations from an applied perspective. Topics include solution methods to linear and nonlinear ordinary differential equations (ODEs), and qualitative studies of systems of ODEs.

Textbook (Required) Polking, Boggess, Arnold *Differential Equations with Boundary Value Problems*, second edition. ISBN 9780131862364. Download here https://drive.google.com/file/d/1hriC1Ds-aZj7MTwt6bMBYv-fpwuEi26w/view?usp=sharing

Grading, quizzes, and midterms We will have weekly quizzes and two midterms. All quiz, midterm, and final grades will be posted to courseweb. Notify me as early as possible if you will miss a quiz or midterm. If you notify me after the quiz or exam date **you will not be allowed to make up quizzes or exams without a valid medical reason**. Since unexpected events happen, I will drop 3 of your lowest quiz scores.
Your course grade is structured as follows:

- Two midterm exams: 30% (15% each)

- Final exam: 40%

- Quizzes: 30%

See the class schedule for the dates of the quizzes and exams. There will be no written homework assignments.

Excellent performance on midterm 1 and/or midterm 2 will grant exemption from solving the corresponding problems on the final. For example, receiving a high score on midterm 1 will allow skipping problems related to quizzes 1-4 with no penalty (problems and corresponding sections will be clearly labeled). Cutoffs for exemption will be determined after grading each midterm.

Each midterm and quiz is closed-book, closed-notes.

Disability 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 Services (SAS), 520 UMSU University Centre 204-474-7423 as early as possible in the term. See https://umanitoba.ca/student-supports/accessibility.

Academic Integrity Cheating/plagiarism will not be tolerated. Students suspected of violating the University of Manitoba Policy on Academic Integrity

will incur a minimum sanction of a zero score for the quiz, exam or paper in question. Additional sanctions may be imposed, depending on the severity of the infraction.

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WEEK 1:
Practice problems: 1.1: 1,3; 2.1: 3,13,15; 2.2: 9,11,17,23
Wed 8 Sept: 1.1 Differential equation models, 2.1 Differential equations and solutions. 2.2 Solutions to separable equations

WEEK 2:
Mon 13 Sept: 2.3 models of motion, 2.4 Linear equations
Wed 15 Sept: 2.5 mixing problems, 2.7 Existence and uniqueness of solutions

WEEK 3:
Practice problems: 2.3: 8 (you may use section 2.3 equations 3.5-3.7),11; 2.4: 3,15,39; 2.5: 5;2.7: 3,7
Mon 20 Sept: 3.1 Modeling population growth, 3.3 Personal finance, 3.4 Electrical circuits
Wed 22 Sept: Quiz 1 on sections 2.2, 2.3, 2.4, 2.5, 2.7, 4.1 Second order equations

WEEK 4:
Practice problems: 3.1: 10,13; 3.3: 3,5; 3.4: 4,12,21
Mon 27 Sept: 4.2 Second order equations and systems, 4.3 Linear, homogeneous equations with constant coefficients, 4.4 Harmonic motion
Wed 29 Sept: Quiz 2 on sections 3.1, 3.3, 3.4, 4.5 Method of undetermined coefficients

WEEK 5:
Practice problems: 4.3: 1,10,18; 4.4: 7,11,13,20(a); 4.5: 1,2,19,21
Mon 4 Oct: 4.6 Variation of parameters, 4.7 Forced harmonic motion
Wed 6 Oct: Quiz 3 on sections 4.3, 4.4, 4.5

WEEK 6:
Mon 11 Oct: Holiday, no class.
Wed 13 Oct: Review day

WEEK 7:
Mon 18 Oct: Midterm 1 on topics from quizzes 1–3 (sections 1.1–4.5)
Wed 20 Oct: 5.1 Laplace transform, 5.2 Properties of the Laplace transform

WEEK 8:
Practice problems: 4.6: 3,5,7; 4.7: 3
Mon 25 Oct: 5.3 Inverse Laplace transform 5.4 Solving ODEs with the Laplace transform, 5.5 Discontinuous forcing terms, 5.6 Delta function, 5.7 Convolutions
Wed 27 Oct: Quiz 4 on sections 4.6, 4.7, Chapter 7 matrix algebra boot camp

WEEK 9:

Mon 1 Nov: 8.1 Introduction to systems, 8.2 Geometric interpretation of systems.
Wed 3 Nov: Canceled
WEEK 10:
Mon 8 Nov: No class, Fall Break.
Wed 10 Nov: No class, Fall Break.

WEEK 11:
Practice problems: 5.1: 5,8,25,29; 5.2: 6,7; 5.3: 11,19; 5.4: 1,19,21; 5.5: 6,10,27; 5.6: 3,5; 5.7: 7,9
Mon 15 Nov: 9.1 Linear systems of constant coefficients
Wed 17 Nov Quiz 5 on sections 5.1, 5.2, 5.3, 5.4

WEEK 12:
Mon 22 Nov: Midterm 2 review
Wed 24 Nov: Midterm 2 on topics from quizzes 4-6 (sections 4.6–4.7, 5.1–5.7),

WEEK 13:
Practice problems: 8.1: 1,3,11,13; 8.2: 21,23,25; 8.3: 3,5; 9.1: 1,16,17; 9.2: 1,7,17; 9.3: 16,20
Mon 29 Nov: 9.2 Planar systems, 9.3 Phase plane portraits
Wed 1 Dec: Quiz 6 on sections 8.1,8.2,8.3,9.1,9.2,9.3

WEEK 14:
Mon 6 Dec: Review day 1
Wed 8 Dec: Review day 2