Math 333, Fall 2020 Syllabus

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1 Course Information

Course Number: MATH 333

Course Title: Differential Equations With Matrix Theory

Catalog Statement: Use of differential equations to model phenomena in sciences and engineering. Solution of differential equations via analytic, qualitative and numerical techniques. Linear and nonlinear systems of differential equations. Introduction to matrix algebra, determinants, eigenvalues, and solutions of linear systems. Laplace transforms.

Prerequisite: MATH 175

1.1 Instructor

Instructor: Zach Teitler

Email: zteitler@boisestate.edu

Website: https://sites.google.com/site/zteitler/home

Office: MB 233A

Office Phone: 208-426-1086

1.2 Section

Section Number: 003

Meeting Times: MoWeFr 10:30-11:45

Meeting Remotely: We will meet remotely using Zoom. Zoom sessions may be recorded for students who are not able to attend.

Zoom meeting ID: Posted in BlackBoard

2 Course Learning Outcomes

By the end of this course, students will be able to:

1. Demonstrate familiarity with the notation, vocabulary, and some applications of first order, systems of first order, and second order ordinary differential equations (ODEs).
2. Solve a variety of first order ODEs using various methods.
3. Analyze behavior of solutions to first order ODEs by looking at slope fields and equilibrium solutions.
4. Demonstrate familiarity with matrix algebra basics including elementary row operations, determinants, linear independence of rows/columns, and finding eigenvalues and eigenvectors.
5. Solve linear systems of first order ODEs using the eigenvalue/eigenvector method.
6. Solve both homogeneous and nonhomogeneous linear second order ODEs with constant coefficients.
7. Solve initial value problems using the Laplace transform method.

3 Course Text

3.1 Primary Text

Our primary course text will be course notes by Jaimos Skriletz:

- https://zeno.boisestate.edu/notes/333/index.html

A notable feature of these notes is the early emphasis on *systems of equations*. The notes are freely available at the above webpage. You do not have to purchase any text for this class.

3.2 Optional Texts

The following texts may serve as optional additional references which are close to the course notes:

- *The Ordinary Differential Equations Project*[1] by Thomas Judson. This text is very close to the notes we will follow.
- *Notes on Diffy Qs: Differential Equations for Engineers*[2] by Jiří Lebl. This is a two-semester text, so it has several extra topics and gets more technical than the Judson or Skriletz texts.

There are many, many other free texts and resources. Some links will be posted in BlackBoard.

[1] http://faculty.sfasu.edu/judsontw/ode/
[2] https://www.jirka.org/diffyqs/

4 Equipment

4.1 Required Equipment

The following items are required for this course:

Laptop/Tablet: A laptop or tablet is required for participation in remote class meetings, and for completing WeBWorK problems during and outside of class.

4.2 Optional Equipment

The following items are optional, but recommended for this course:

Writing Tablet: Either a tablet computer, or a peripheral attached to your computer; either way, with a stylus that you can use to write on the screen. This will be extremely useful for working together on problems during class and for remote studying with other students, so that you will be able to write on the screen and share your work.

Calculator: You can use a calculator (that cannot connect to the internet) on exams. Your calculator can solve equations, compute antiderivatives, compute integrals, and find partial fraction decomposition. A Ti-89, Ti-Nspire, or similar is recommended but not required.

5 Grading

5.1 Components of course grade

Graded student work will consist of homework, quizzes, and exams. The homework and quizzes are intended to improve the quality of learning, help you in the learning process through regular work, and increase and consolidate your knowledge. The exams are intended to be a tool for your learning, give you feedback on your learning progress, show you what you have mastered, and help you plan your study efforts.

Homework Daily homework assignments completed in WeBWorK. WeBWorK is a free online homework system. A link to the Boise State WeBWorKs server will be posted in BlackBoard.

Quizzes Most weeks will have a quiz. Each quiz will be either an in-class quiz, a take-home quiz, or a combination of both. In-class quizzes must be taken during the scheduled class time.

Exams There will be three (3) midterm exams and a final exam. Midterm exams will be taken in-class during the scheduled class time. The final exam will be taken in-class (remotely, through Zoom) during the scheduled final exam time (Wednesday, December 16, 12:00 p.m.-2:00 p.m.). The midterm and final exams may also have take-home components.

Exam dates are:

Exam 1: End of week 5

Exam 2: End of week 9

Exam 3: End of week 14

Final Exam: Wednesday, December 16, 12:00 p.m.-2:00 p.m.

Taking the final exam is required to pass the course.

The components of the course grade are weighted as shown in the following table.

Table 5.1

Component	Weight
Homework	20%
Quizzes	20%
Exams	60%

5.2 Attendance and Participation

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5.3 Makeup Work

Please pay close attention to the WeBWorK, quizzes and exam due dates. In general the makeup policy is no makeups, except in cases of emergencies such as family or medical emergencies. Contact me *before* a missed due date if possible, or else as soon as possible after the missed due date.

Midterm exams and the final exam are extremely difficult to makeup. Makeup exams will only be allowed in the most serious emergencies.

If you will miss a quiz class day, you should email me a copy of the quiz before the due date, if possible.

WeBWorK assignments have two due dates. The first due date, called a Reduced Scoring Date, is the date the assignment must be completed by to get full credit. The Reduced Scoring Date is often the start of the next class. The second due date is the final due date and is set to exam days. After that date the assignment can no longer be completed for partial credit.

5.4 Preparation and Participation

Preparation for class includes reading relevant course notes before class, being ready to learn about that topic in class, reviewing previous class material, and knowing what questions you are planning to ask about homework or previous class material.

It's okay if reading the course notes before class isn't enough to understand the material. Rather, the point is to read the section in order to be ready to learn about it in class. Class discussion of the topic should answer many questions and clarify the reading. Following class, please re-read the course notes to fill in details.

Constructive participation includes answering or attempting to answer questions in class, contributing constructively to in-class group work, asking good questions, and being respectful of others.

Lack of preparation and participation causes distractions and degrades the course experience *for other students in the course*. Therefore failure to meet expectations may result in a penalty of up to 10% in your overall course grade (at instructor's discretion).

6 Help

6.1 Learning Assistant

The Learning Assistant for this class will hold study sessions and help you learn.

6.2 Allowed resources

For homework assignments, you are encouraged (in fact, expected) to collaborate with your classmates and to ask me questions. Other resources (books, online sources, people outside the class) are highly recommended for clarifying class topics or for enrichment (but *not* for getting solutions to problems).

You are allowed to use things that you learn from a book, online source, or person outside the class that *help you and your classmates to find your own solution* for a problem. However, if you read a full solution, so that there's little or nothing left for you and your classmates to figure out, then you *may not turn in that solution for credit.*

The Mathematics Stack Exchange[1] is a very useful question-and-answer site for undergraduate/graduate level mathematics. You are welcome to browse the Mathematics Stack Exchange and even post questions there. Hopefully it will help you learn and understand the material! However please remember that if you use that site to get a solution to a problem, then you can't turn that solution in for credit. Other helpful websites for basic information include Wikipedia and MathWorld[2].

You are *not* required to use any extra resources. If you participate in class and study the class notes, that is sufficient. You are welcome to use extra resources if you want to, and if you find some that work for you. But you don't have to.

6.3 University Resources

Boise State University's *The Basics*[3] web page has links to many forms of support, ranging from academic resources to family, living, and food resources.

You may reach out to me at any time if there's anything I can help with or if there's anything you think I should know.

[1] https://math.stackexchange.com
[2] https://mathworld.wolfram.com
[3] https://www.boisestate.edu/student-life/basics/

7 Important Dates

Table 7.1

Monday	8/24	First day of classes.
Friday	9/4	Last day to register/add or to drop without a W.
Monday	9/7	Labor Day. No classes.
	10/12-16	Midterm exam.
Friday	10/30	Last day to drop with a W or completely withdraw.
	10/12-16	Midterm exam.
	11/23-11/29	Thanksgiving Holiday. No classes.
	10/12-16	Midterm exam.
Friday	12/11	Last day of instruction for regular classes.
Wednesday	12/16	Final Exam (scheduled), 12:00-2:00.
Tuesday	12/22	Grades due. (You will be able to see your grade by this date.)

8 Other

Respect for Diversity: Students from all backgrounds and with all perspectives are welcome in this course. It is my intent that all students be well served by this course, that students's learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength, and benefit. It is my intent to maintain a classroom atmosphere that is welcoming and respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups.

ADA Policy Statement: Students with disabilities needing accommodations to fully participate in this class should contact the EAC. All accommodations must be approved through the EAC prior to being implemented. To learn more about the accommodation process, visit the EAC's website at `https://www.boisestate.edu/eac/new-students/`.

Email: In accordance with Boise State University Policy #2280[1], it is expected that you will receive and read emails sent to your `boisestate.edu` email address.

Communication: Additional information and updates may be announced in class, sent by email, and/or posted on BlackBoard[2]).

Academic Integrity: Getting answers to homework or exam problems from unauthorized sources is a very serious form of academic misconduct. For this class, *all online sources* are unauthorized for this purpose. You are allowed to *learn and increase your understanding* from online sources or other textbooks; you are *not* allowed to use those sources to find answers to homework or exam problems.

Behavioral Expectations: Every student has the right to a respectful learning environment. In order to provide this right to all students, students must take individual responsibility to conduct themselves in a mature

[1] `https://boisestate.edu/policy/policy-title-student-e-mail-communications/`
[2] `https://blackboard.boisestate.edu/`

and appropriate manner and will be held accountable for their behavior in accordance with Boise State University Policy #2050[3].

[3] https://boisestate.edu/policy/student-affairs/maintaining-order