MA36600 Spring 2025 COURSE SYLLABUS

Course Information

1. **MA 36600 - Ordinary Differential Equations**

2. Credit Hours: 4.00. An introduction to ordinary differential equations with emphasis on problem solving and applications. The one-hour computer lab will give students an opportunity for hands-on experience with both the theory and applications of the subject.

3. Prerequisites: Undergraduate level MA 35100 Minimum Grade of C- [may be taken concurrently] or Undergraduate level MA 26500 Minimum Grade of C- [may be taken concurrently]

4. All lectures and labs will be in person. Lectures will be BoilerCast for the convenience of the students and for reviewing, but there will be no online instruction in MA366 during the Fall 2024 semester. **THIS IS NOT AN ONLINE COURSE.**

5. Course Brightspace page. There are different Brightspace pages for each individual section of this course.

Instructor Contact Information

- **Johnny Brown**

Learning Resources, Technology & Texts

- Required text: **Elementary Differential Equations and Boundary Value Problems**, by William E. Boyce, Richard C. DiPrima, and Douglas B. Meade, (12th edition)
- Homework is handwritten and submitted via **GRADESCOPE**.
- Students can find **qualified tutors** through the Mathematics Department Home page.

Learning Outcomes

- Learn the statement of the theorem of existence and uniqueness of solutions of first order differential equations and standard methods of solving linear, and some special non-linear, differential equations of first order.
- Interpret solutions qualitatively.
- Learn how to construct mathematical models.
- Learn the standard methods of solving linear homogenous differential equations of constant coefficients of arbitrary order.
- Learn methods to solve nonhomogeneous differential equations of constant coefficients of arbitrary order.
- Learn basic numerical methods for solving differential equations.
- Learn about the applications of differential equations to mechanical, physical, and biological models.
- Learn the theory of eigenvalues and eigenvectors and how they apply to systems of linear differential equations.
- Learn how to analyze systems of nonlinear differential equations.
- Introduction to Laplace transforms and their applications to differential equations.

Assignments

Category	Due	Weight
Handwritten Homework Assignments	Weekly	**20 %**
Two evening midterm exams	February 20 and April 10	**40 %**
Computer Lab Assignments	Weekly	**10 %**
FINAL EXAM	Set by the University	**30 %**

Handwritten Homework

- There will typically be weekly handwritten homework assignments with their due dates posted on section webpage and on **GRADESCOPE**.
- Assignments will be handwritten and submitted through **GRADESCOPE**. Instructions on homework submissions may be found here**:** **How to submit via GRADESCOPE**
- Students may consult their textbook and use calculators on homeworks, but use of resources like Chegg and ChatGPT are prohibited. Students may collaborate on homeworks but all submitted work must be entirely their own. Violations will result in a zero for that assignment and will be reported to the Office of the Dean of Students.
- No late homework will be accepted unless there is a good reason.
- No homework scores will be dropped.
- Students who need to appeal a homework score due to possible computer error or other unforeseen circumstances should contact their grader.

Computer Lab

- Lab instructors will lead computer labs and grade all lab assignments
- Students should check their schedules for their particular lab session time and lab instructor.
- There is a Help Room in WTHR 212 held each Thursday 7pm-9pm for computer lab help.
- The Computer Labs (labs and expectations) may be found here: **Computer Labs List**

Exams

- There will be two evening midterm exams and one final exam, all in person.
- All exams will be a combination of short answer and multiple-choice questions. All exams will be hand-graded.
- **Exam 1**: Thursday, February 20 (6:30pm-7:30pm)
- **Exam 2**: Thursday, April 10 (6:30pm-7:30pm)
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- Students who are entitled to special accommodations will get the appropriate time and conditions for exams from the DRC. See more details in section Accessibility below.
- **Final Exam** (date TBA). The comprehensive final exam will cover the entire course.
- No exam grades will be dropped.

Grading Scale

Following the Department of Mathematics policy, students in this course whose course averages are:

at least **97%** are guaranteed a course grade of **A+**
at least **93%** are guaranteed a course grade of **A**
at least **90%** are guaranteed a course grade of **A-**
at least **87%** are guaranteed a course grade of **B+**
at least **83%** are guaranteed a course grade of **B**
at least **80%** are guaranteed a course grade of **B-**
at least **77%** are guaranteed a course grade of **C+**
at least **73%** are guaranteed a course grade of **C**
at least **70%** are guaranteed a course grade of **C-**
at least **67%** are guaranteed a course grade of **D+**
at least **63%** are guaranteed a course grade of **D**

It is possible that these percentages may be lowered at the end of the semester. Borderline cases will be considered on a case-by-case basis.

Course Outline

The following outline will be covered this semester

- **TEXTBOOK**: **Elementary Differential Equations and Boundary Value Problems**, by William E. Boyce, Richard C. DiPrima, and Douglas B. Meade, (12th edition)
- **HOMEWORK:** Handwritten homework submitted via **GRADESCOPE**

Course Topics

1.1 – Some Basic Mathematical Models; Direction Fields

1.2 – Solutions of Some Differential Equations

1.3 – Classification of Differential Equations

2.1 – Linear Differential Equations; Method of Integrating Factors

2.2 – Separable Differential Equations

2.3 – Modeling with First-Order Differential Equations

2.4 – Differences Between Linear and Nonlinear Differential Equations

2.5 – Autonomous Differential Equations and Population Dynamics

2.6 – Exact Differential Equations and Integrating Factors

2.7 – Numerical Approximations: Euler's Method

3.1 – Homogeneous Differential Equations with Constant Coefficients

3.2 – Solutions of Linear Homogeneous Equations; the Wronskian

3.3 – Complex Roots of the Characteristic Equation

3.4 – Repeated Roots; Reduction of Order

3.5 – Nonhomogeneous Equations; Method of Undetermined Coefficients

3.6 – Variation of Parameters

3.7 – Mechanical and Electrical Vibrations

3.8 – Forced Periodic Vibrations

4.1 – General Theory of n^{th} Order Linear Differential Equations

4.2 – Homogeneous Differential Equations with Constant Coefficients

4.3 – The Method of Undetermined Coefficients

4.4 – The Method of Variation of Parameters

6.1 – Definition of the Laplace Transform

6.2 – Solution of Initial Value Problems

6.3 – Step Functions

6.4 – Discontinuous Forcing Functions

6.5 – Impulse Functions

6.6 – Convolutions

7.1 – Introduction

7.2 – Matrices

7.3 – Systems of Linear Algebraic Equations; Linear Independence, Eigenvalues, Eigenvectors

7.4 – Basic Theory of Systems of First-Order Linear Equations

7.5 – Homogeneous Linear Systems with Constant Coefficients

7.6 – Complex-Valued Eigenvalues

7.7 – Fundamental Matrices

7.8 – Repeated Eigenvalues

7.9 – Nonhomogeneous Linear Systems

9.1 – The Phase Plane: Linear Systems

9.2 – Autonomous Systems and Stability

9.3 – Locally Linear Systems

9.4 – Competing Species

9.5 – Predator – Prey Equations

Grade check during the semester

All scores are posted on Brightspace. Students can use those scores to approximate their percentage they have obtained at any given time during of the semester to see where they would be at the end of the semester given the above criteria and provided they continue performing at the same level.

Attendance

1. **Attendance is strongly encouraged, though not required, to gain the full experience of this particular course - watching videos is not sufficient.**
2. Anticipated absences: When conflicts or absences 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.
3. For other absences such as Grief/Bereavement, Military Service, Jury Duty and Parenting Leave, please consult Purdue's attendance policy
4. **Medically Excused Absence Policy for Students (MEAPS).** Students will be excused, and no penalty will be applied to a student's absence for situations involving hospitalization, emergency department or urgent care visit and be given the opportunity to make up coursework as defined in the course syllabus. Students experiencing hospitalization, emergency department or urgent care visits can provide documentation to ODOS who will then assess the student's request for a Medical Excused Absence, and issue notification of the start and end of the absence to the student's instructors. The student should then follow up with the instructor to seek arrangements as per the policy. Consult Purdue's attendance policy for more details.

Important Dates

Students should consult the **Academic Calendar** to find information about important dates, such as the last day to withdraw from the course, etc. Important dates include:

1. Classes begin Monday, January 13.
2. No classes **MLK Day**, Monday, January 20.
3. Last date to drop a course with **W** (Advisor approval required)**:** Friday, April 18 (5pm).
4. **Midterm Exam 1: February 20**
5. **Spring Break**: March 17–22.
6. **Midterm Exam 2: April 10**
7. **Quiet Period**: Monday-Saturday, April 28 – May 3.
8. Classes end Saturday, May 3.
9. **Final Exam Week**: Monday - Saturday, May 5–10.
10. Grades due by 5 p.m. Tuesday, May 13.

Academic Guidance in the Event Students are Quarantined/Isolated

If you become quarantined or isolated at any point in time during the semester, in addition to support from the Protect Purdue Health Center, you will also have access to an Academic Case Manager who can provide you academic support during this time. Your Academic Case Manager can be reached at acmq@purdue.edu and will provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify your professor and TA via email or Brightspace. They will make arrangements based on your particular situation. The Office of the Dean of Students odos@purdue.edu is also available to support you should this situation occur.

Academic Integrity

- The handwritten homework will be submitted individually using **Brightspace**.
- Students may discuss homework problems with other students, but submit their own work. They may consult their textbook and use calculators while they do their homework. **ChatGPT or other AI are definitely NOT allowed**, nor are any other such websites.

The two evening midterms and the final exam will all be in person:

- The exams are a combination of handwritten and multiple-choice questions and will all be hand graded.
- Students are not allowed to discuss exam problems with other students, or anyone else, during exams. If they have a question, they can only ask their professor or the proctor.
- Students are not allowed to use calculators during exams.
- Students are not allowed to use any electronic devices during exams.

Students caught cheating on homework or on computer labs will get a zero on that assignment. Students caught cheating on an exam will get a zero on the exam and may get F in the course. **All cases of cheating will be reported to the Office of the Dean of Students**. Students can report anonymously any issues of academic integrity that they observe through the OSRR by calling 765-494-8778 or emailing integrity@purdue.edu.

Accessibility

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 at 765-494-1247.

If you have been certified by the Disability Resource Center (DRC) as eligible for accommodations, you should contact your TA to discuss your testing accommodations as soon as possible. For all in-class accommodations please contact your TA and your professor as soon as possible. You should make sure you send your Course Accessibility Letter to your TA and to the professor. Instructions for how to do this can be found at: https://www.purdue.edu/drc/students/course-accessibility-letter.php

Course and Instructor Evaluations

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s) through online course evaluations. On Monday of the 14th week of classes, you will receive an official email from evaluation administrators with a link to the online site. You will have two weeks to complete this evaluation. Your participation in this evaluation is an integral part of this course. Your feedback is vital to improving education at Purdue University. We strongly urge you to participate in the evaluation system.

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.

Mental Health Statement

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try WellTrack. Sign in and find information and tools at your fingertips, available to you at any time.

If you need support and information about options and resources, please contact or see the Office of the Dean of Students. Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc. sign up for free one-on-one virtual or in-person sessions with a Purdue Wellness Coach at RecWell. Student

coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at evans240@purdue.edu.

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

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 on 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 account on a frequent basis.

Related Considerations and Guidelines

1. Keep your cell phone on to receive a Purdue ALERT text message.
2. Emergency preparedness is your personal responsibility. Purdue University is actively preparing for natural disasters or human-caused incidents with the ultimate goal of maintaining a safe and secure campus. Let's review the following procedure
    - For any emergency text or call 911.
    - There are more than 300 Emergency Telephones (aka blue lights) throughout campus that connect directly to the Purdue Police Department (PUPD). If you feel threatened or need help, push the button and you will be connected right away.
    - If we hear a fire alarm, we will immediately evacuate the building. Do not use the elevator. Go over the evacuation route (see specific Building Emergency Plan).
    - If we are notified of a Shelter in Place requirement for a tornado warning we will stop classroom or research activities and shelter in the lowest level of this building away from windows and doors.
    - If we are notified of a Shelter in Place requirement for a hazardous materials release, we will shelter in our classroom shutting any open doors and windows.
    - If we are notified of a Shelter in Place requirement for an active threat such as a shooting, we will shelter in a room that is securable preferably without windows.
    - **(NOTE: Each building will have different evacuation & shelter locations. The specific Building Emergency Plan will provide specific locations and procedures)**