

WORCESTER POLYTECHNIC INSTITUTE

MA2051, Ordinary Differential Equations – C Term, 2023
Section CL01 with conferences CD01, CD02, CD03, CD04, and CD05

Syllabus

Instructors

Professor

Francesca Bernardi (*she/her/hers*) Email: fbernardi@wpi.edu

TAs/PLAs

CD01	TA - Derek Drumm	Email:	dadrumm@wpi.edu
CD02	PLA - Geneva Isaacson (<i>she/her/hers</i>)	Email:	gcisaacson@wpi.edu
CD03	TA - Derek Drumm	Email:	dadrumm@wpi.edu
CD04	PLA - Elizabeth Bowman (<i>she/her/hers</i>)	Email:	ekbowman@wpi.edu
CD05	PLA - Natalie Tierney (<i>she/her/hers</i>)	Email:	ntierney@wpi.edu

Office Hours

Professor

In Person Th, 3:00PM-5:00PM in Stratton Hall 309
Virtual M, 12:00PM-1:00PM and T, 1:00PM-2:00PM
on Zoom: <https://wpi.zoom.us/j/99323493502>

TAs/PLAs

CD01 - Derek Drumm	Friday, 10:00 AM-12:00 PM On zoom https://wpi.zoom.us/j/3032972553
CD02 - Geneva Isaacson	Friday, 12:00-1:00 PM in person across from Stratton Hall 014
CD03 - Derek Drumm	Friday, 10:00 AM-12:00 PM On zoom https://wpi.zoom.us/j/3032972553
CD04 - Elizabeth Bowman	Thursday, 10:00-11:00 AM in person in FI 234
CD05 - Natalie Tierney	Wednesday, 2:00-3:00 PM in person in UH 247

WORCESTER POLYTECHNIC INSTITUTE

All students are welcome at all office hours regardless of section. Students are encouraged to attend office hours as frequently as possible to ask questions and receive feedback on problems and assignments. [What are office hours?](#)

Textbook

An Introduction to Differential Equations and Their Applications by Stanley J. Farlow, Dover Publications. This book is available online for free through the George C. Gordon Library.

Class Structure

Lecture (CL01)

M, Tu, Th, F 2:00-2:50 PM
In person in Atwater Kent 116

Instructor: Professor Francesca Bernardi

Discussions

CD01: Tu 8:00-8:50 AM
In person in Stratton Hall 304

TA: Derek Drumm

CD02: Tu 12:00-12:50 PM
In person in Stratton Hall 304

PLA: Geneva Isaacson

CD03: Tu 9:00-9:50 AM
In person in Stratton Hall 202

TA: Derek Drumm

CD04: Tu 10:00-10:50 AM
In person in Stratton Hall 309

PLA: Elizabeth Bowman

CD05: Tu 11:00-11:50 AM
In person in Stratton Hall 106

PLA: Natalie Tierney

Course Description

This course provides an introduction to ordinary differential equations. MA 2051 – Ordinary Differential Equations is a category I course, i.e. it is offered at least once a year every year at WPI. The recommended background is MA 1024 – Calculus IV. Although the course may make use of computers, no programming experience is needed or assumed.

WORCESTER POLYTECHNIC INSTITUTE

Technology needed for this course: internet connection, computer access, access to Canvas, smartphone to take photos, and PDF file converter.

Severe Weather Impact: lectures, discussions, and office hours will be held virtually in case of severe weather events.

Course Content

The course outline is as follows (numbers in parentheses refer to book sections).

Part I: First Order Differential Equations

1. Basic definitions and concepts (1.1)
2. Some basic theory (1.2)
3. First order linear equations (2.1)
4. Separable equations (2.2)
5. Modeling with first order equations (2.3-2.6)

Part II: Homogeneous Second Order Differential Equations

6. Introduction to second order linear equations (3.1)
7. Fundamental solutions of the homogeneous equations (3.2)
8. Homogeneous equations with constant coefficients: Real roots (3.4)
9. Homogeneous equations with constant coefficients: Complex roots (3.5)
10. Reduction of order (3.3)

Part III: Nonhomogeneous Second Order Differential Equations

11. Nonhomogeneous equations (3.6)
12. Solving nonhomogeneous equations: Method of undetermined coefficients (3.7)
13. Solving nonhomogeneous equations: Method of variation of parameters (3.8)
14. Mechanical systems and simple harmonic motion (3.9)
15. Unforced damped vibrations (3.10)
16. Forced vibrations (3.11)

Part IV: The Laplace Transform

17. Definition of the Laplace transform (5.1)
18. Properties of the Laplace transform (5.2)
19. The inverse Laplace transform (5.3)
20. Initial-Value Problems (5.4)

WORCESTER POLYTECHNIC INSTITUTE

21. Step functions and delayed functions (5.5)
22. Differential equations with discontinuous forcing functions (5.6)
23. The convolution integral (5.8)

The [class schedule](#) linked in the *Welcome and Key Files* module shows important dates and which book sections will be covered in each lecture.

Grading

There will be weekly group quizzes, weekly written assignments, one midterm exam, and one final exam. The course grade will be determined with the following breakdown:

Group Quizzes	15%
Written Assignments	25%
Midterm Exam + Final Exam	60%
60% = 40% highest scoring Exam + 20% lowest scoring Exam	

Final letter grades will be assigned as follows:

A	90.0 – 100
B	80.0 – 89.0
C	70.0 – 79.0
NR	0 – 69.0

Rounding will be applied following the half up tie-breaking rules https://en.wikipedia.org/wiki/Rounding#Round_half_up. No scaling/curving will be applied in this course but there will be plenty of opportunities for extra credit.

A grade of I (incomplete) is available for students who encounter special medical issues or other challenges during the term. Reach out to the instructor as soon as possible if you are facing particular difficulties and want to discuss this grading option.

Homework

All homework assignments will be administered, submitted, and graded through Canvas. Each assignment should be submitted as a single PDF file with the problems solved in the correct order.

WORCESTER POLYTECHNIC INSTITUTE

If you are not sure how to convert your homework into a PDF, check out the page titled [PDF Upload Information \(for Assignment Submissions\)](#) on Canvas under the *Resources and Support* module.

Weekly written assignments (WA) will be due each Thursday at 11:59 PM. There will be no written WAs due on January 12th, February 2nd, and February 23rd, for a total of 5 assignments. Submissions should be neat and readable. A selection of the submitted problems will be graded each week. Written assignments are worth 25% of your class grade.

Each student is allowed one (1) extension on written assignments, no questions asked. To use your allotted extension, please submit this Qualtrics form ahead of the WA deadline: https://wpi.qualtrics.com/jfe/form/SV_1XkzJ2LA2zDWogS. Alternatively, use the QR code on the Canvas page [Written Assignment Extension Request Form](#). **No extensions are allowed on WA5 due on 03/02.**

All other late written assignments will be graded for up to 50% of the points as long as they are submitted before solutions are posted. The lowest written assignment score will be dropped. Written assignments will be graded for correctness. Students experiencing extenuating circumstances should contact their instructor as soon as possible.

Quizzes

Weekly group quizzes (GQ) will be taken in class in groups on Monday's, 2:00-2:15 PM. The first GQ will be on January 23rd; there will be no group quizzes on January 16th and January 30th, for a total of 5 group quizzes. Each student will be responsible for their own submission but problems will be solved in groups. Groups will be shuffled every week. Group quizzes are worth 15% of your class grade.

The lowest group quiz score will be dropped. Please review the [How Will Group Quizzes Work?](#) page in the *Welcome and Key Files* module on Canvas for important information about exams. Students with academic accommodations on exams who are concerned about completing the assignment in class within the allotted time should contact the instructor.

Exam Policies

The two exams for this course are scheduled as follows:

WORCESTER POLYTECHNIC INSTITUTE

Midterm Exam: Monday, January 30th, 2:00-2:50 PM -- **In person, AK 116**

Final Exam: Friday, March 3rd, 2:00-2:50P PM -- **In person, AK 116**

Please review the [How Will Exams Be Administered?](#) page in the *Welcome and Key Files* module on Canvas for important information about exams. Students must contact their instructor as soon as possible if they have scheduling conflicts on either of the exam dates. If possible, a make-up exam will be offered.

Inclusive Classroom Environment

You deserve to be addressed in the manner you prefer. To guarantee that I address you properly, you are welcome to tell me your pronoun(s) and/or preferred name at any time, either in person or via email. I will not ask students directly in class to avoid putting anyone on the spot.

We embrace diversity of gender, gender expression, sex, sexual orientation, race, ethnicity, national origin, age, religion, disability status, family status, socioeconomic background, and other visible and non-visible categories. I do not tolerate discrimination.

You deserve a community free from discrimination, sexual harassment, a hostile environment, sexual assault, domestic violence, dating violence, and stalking. If you experience or know of a Title IX violation, you can find many options for support and/or reporting at <https://www.wpi.edu/offices/title-ix>.

Accessibility Services

Students with approved academic accommodations should plan to submit their accommodation letters through the [Office of Accessibility Services Student Portal](#) as soon as possible. Should you have any questions about how accommodations can be implemented in this particular course, please contact Prof B as soon as possible.

Students who are not currently registered with the Office of Accessibility Services (OAS) but who would like to find out more information about requesting accommodations, documentation guidelines, and what the accommodated interactive process entails should plan to contact OAS either by email AccessibilityServices@wpi.edu, by phone (508) 831-4908, or by stopping by the office on the 5th floor of Unity Hall.

Academic Integrity

WORCESTER POLYTECHNIC INSTITUTE

The honor code is a cornerstone of our learning community and of this course. It is your responsibility to know and follow academic integrity policies available on the WPI website at <https://www.wpi.edu/about/policies/academic-integrity>. I will gladly answer any questions you have.

Additional Resources

WPI has some available resources to support you in this class and beyond. Here are some to check out:

Academic Resources Center, <https://arc.wpi.edu/>

IT Service & Support, <https://www.wpi.edu/offices/services-support>

Student Development and Counseling Center,

<https://www.wpi.edu/offices/student-development-counseling-center>

Office of Accessibility Services, <https://www.wpi.edu/offices/office-accessibility-services>

Health Services,

<https://www.wpi.edu/student-experience/health-counseling/health-services>

Office of Diversity, Inclusion, and Multicultural Education,

<https://www.wpi.edu/offices/office-diversity-inclusion-and-multicultural-education-odime>

LGBTQ+ Support, <https://www.wpi.edu/student-experience/resources/lgbtq-support>

International House, <https://www.wpi.edu/offices/international-house>

Syllabus Change Policy

Except for changes that substantially affect grading policies, this syllabus is a guide for the course and is subject to change. All changes will be communicated by the instructor in writing with advance notice.