

Ordinary Differential Equation Syllabus

MTH-321 Section B
Fall 2023
University of Portland
Alex John Quijano

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About the Class

Course Information

- Title: MTH 321: Ordinary Differential Equation
- Section: B

Instructor Information

- Instructor: Dr. Alex John Quijano
- Office: Buckley Center 279
- Email: quijano@up.edu

Prerequisites

MTH 202 with a grade of C- or higher or permission of instructor.

Lectures and Discussions

In-person lectures and discussions will occur synchronously during their scheduled time on Tuesday, and Thursday. Our lectures will typically consist of traditional lectures in the first 20 to 30 minutes of class, then followed by a mini-activities in a form of group work, discussions, or worksheets.

We will cover new course material on Tuesdays. Most Thursdays class times will be for in-class activities.

The course schedule and location is:

- TuTh 9:45 AM - 11:10 AM, Franz Hall 222

Class Website

The syllabus, tentative topics schedule, assignments, and all other class materials are posted on the course website.

You can access the course website at [mth-321b-fa23](https://mth-321b-fa23.github.io). The website can also be viewed in Teams.

Microsoft Teams

We will be using Teams as the main real-time communication tool for general announcements, assignment submissions, question-answering discussions, and direct messages. I added you to the Teams page already, so you just need to log in using your UP credentials. If not, then send a request when you log in. Let me know if you need any assistance.

The Teams for this course is [MTH-321B-fa23](#). If you need the Teams code, use **enn1e1s**.

Computational Tools

We will be using these two computational tools in some assignments. These tools are free and open-source.

- **Geobra**

We will be using Geobra as our online graphing calculator for in-class activities, out-class activities, and for some assignments.

Geobra lesson links will be provided ad hoc.

- **Programming Languages**

In some activities and assignments, we will be using a numerical software for computations. Depending on your preference, you can use either R or Python.

R or Python instructions and materials will be provided ad hoc.

Email

My UP email is quijano@up.edu.

If you prefer communicating through email, note that I have set up an email filter for this course, and you must put the “MTH 321” keyword in your subject line.

It is easy for me to get notice of your email if you put the keyword in the subject line. Concise and specific messages are helpful, so I know how I can best help you.

Learning Goals

Description

This course introduces the basic concepts of ordinary differential equations (ODEs) and their applications. Topics covered include: first- and second-order linear equations, systems of linear equations, laplace transforms, applications of ODEs to modeling physical processes, qualitative analysis of ODEs, including direction fields and phase portraits, and Numerical methods for solving ODEs. This course is intended for students who are interested in learning the basic theory and applications of ODEs. It is a valuable course for students who plan to major in mathematics, engineering, physics, or other science and engineering disciplines.

Learning Objectives

By the end of the semester, you will be able to:

- Understand the basic concepts of ordinary differential equations (ODEs), such as order, degree, linearity, and initial value problems.
- Solve first- and second-order linear ODEs using various methods, such as separation of variables, integrating factors, and Laplace transforms.
- Analyze the qualitative behavior of ODEs using direction fields and phase portraits.
- Use numerical methods to solve ODEs.
- Apply ODEs to model physical phenomena, such as population growth, Newton’s second law of motion, and exponential decay.

Learning Outcomes

Upon completion of the course, you will be able to:

- Define ordinary differential equations (ODEs) and their basic concepts, such as order, degree, linearity, and initial value problems.
- Solve first-order linear ODEs using various methods, such as separation of variables, integrating factors, and Laplace transforms, and basic numerical methods.
- Analyze the qualitative behavior of ODEs using direction fields and phase portraits.
- Apply ODEs to model physical phenomena, such as population growth, Newton's second law of motion, and exponential decay.
- Write clear and concise mathematical solutions to ODE problems.
- Communicate effectively about ODEs with other students, instructors, and professionals.
- Work independently and as part of a team to solve ODE problems.

Academic Support

Help Hours

Dr. Alex John Quijano

- Walk-in TuTh at 2:00 PM - 3:25 PM, Buckley Center 279
- [One-to-One, Buckley Center 279 or in Teams](#) *Click on the link to sign-up for a 15-minute session.*

My walk-in help hours start week 2. Note that you can bring a fellow student with you when you sign-up for a session. Just click the "Add Guests" link when you sign-up, and add in your fellow student's UP email. If you need more than 15 minutes, you can book at least two consecutive sessions.

The Learning Commons

Students can get academic assistance through Learning Commons tutoring services and workshops. The Co-Pilot peer tutoring program provides students with opportunities to work with other students to get help in writing, math, group projects, and other courses. Schedule an appointment to meet with a Co-Pilot (tutor) by visiting the [Learning Commons](#) website. Students can also meet with a Co-Pilot during drop-in hours. Check the Learning Commons website or drop by the Learning Commons in BC 163 to learn more about their services. Find a tutor at the Learning Commons to get support on your academic journey.

Math Resource Center

Appointment-based tutoring accepts appointments starting week 1 and sessions start week 2. Visit the [Math Resource Center](#) website to sign-up for an appointment. Drop-in tutoring is Monday to Thursday, 3:00 PM - 6:30 PM in BC 163 and starts week 2. Check the Math Resource Center website or drop by the center for more information.

Help Hours Guidelines

It is strongly recommended that you attend the walk-in help hours or set up a one-to-one meeting with the me if you feel like you are falling behind during our in-person class activities, or if you just need to clarify concepts discussed in class. In order to be more productive during a one-to-one meeting (or the walk-in help hours), these are three recommendations before you come in:

- List all gaps in knowledge you have (missed concepts) or list all concepts that were unclear to you during class. We will address them one by one.
- Prepare questions you want answered and be ready to show relevant materials.
- Regarding assignments, prepare to show (a) what are the steps you have tried and (b) what are the errors you encountered and the strategies you have tried.

Note that these are recommendations so that you can get the most out of the help hours allocated for you. If you just want to come in and chat about something else, feel free to do so. If the dedicated time for one-to-one meeting does not work for you, send me a message to set up an appointment.

Collaboration Policy

I expect you to participate in the class through lectures, discussion, labs, and other engagements. I also expect you to make use of opportunities to get help outside of class (help hours, Teams, email, tutoring) if you need help. Concise and specific messages are the most helpful so I know how I can best help you.

Students are encouraged to participate in discussions with their peers (or each other) regarding homework and other assignments. However, each student must take responsibility and ownership of their work and submit their work individually.

Assessment

Assessment Disclosure Statement

Student work products for this course may be used by the University for educational quality assurance purposes.

Standards-Based Grading

Learning mathematics takes hard work, thinking what you have learned, making changes to your understanding. Students will be assessed on their proficiency in mathematics, and they will have opportunities to demonstrate their proficiency, revise their work and reflect on their learning.

This course follows the standards-based grading system which focuses on the mastery of specific learning standards. It is more accurate and motivating than traditional grading systems, and can help to create a more equitable learning environment. Here are some of the key features of this type of grading:

- Focuses on mastery of specific learning standards
- Uses a variety of assessment methods
- Provides feedback to students on their progress
- Helps students to set goals and track their progress

Grading

Each assignment will be graded according to the general grading guide detailed below. Each student will be given feedback on their assignment and learning process to improve their performance. Note that each assignment has its own rubric guided by these general guidelines and the assignment's learning objectives.

Grade	Rubric Description
Outstanding (O)	Student's work has demonstrated a full understanding of the material. They are able to explain the concepts clearly and concisely, and they are able to apply the concepts to solve problems correctly and efficiently. They may also be able to extend the concepts to new situations.
Excellent (E)	Student's work has shown an approximate understanding of the material. They may have made a few minor errors, but they are able to correct them and explain their reasoning. They are able to solve problems correctly, but they may need more time or practice to do so efficiently.

Grade	Rubric Description
Acceptable (A)	Student's work has shown some understanding of the material, but they have made some errors. They are able to solve some problems, but they may need help with more difficult problems. They may also need to work on their problem-solving skills and their ability to explain their reasoning.
Needs Improvement (NI)	Student's work has shown some potential, but they need more work. They may have made a lot of errors, or they may not have been able to solve any problems. They need to work on their understanding of the material and their problem-solving skills.
Needs Major Improvement (NMI)	Student's work has not shown much understanding of the material. They have made a lot of errors, and they have not been able to solve any problems. They need to work on their understanding of the material from the ground up.
Incomplete (I)	Student's work has not answered any questions completely or has not submitted anything. They need to review the material and try again.

Note that these are categorical grades (not scores)

Final Grades

Assignment	Rank	Grade	A	B	C	D
Exams	1	O	70%	-	-	-
		E	-	60%	-	-
		A	-	-	50%	-
Homeworks	2	O	100%	-	-	-
		E	-	90%	-	-
		A	-	-	80%	-
Worksheets	3	Completed	90%	80%	70%	60%

The above table shows the percent of given assignments. These percentages are minimum requirements for each letter grade. The rank determines the importance of each assignment where 1 means high rank and 3 means low rank.

The percentages in the table are not set in stone. I will evaluate your overall performance, including your self-assessments, when making decisions. I will never raise the standards outlined in the table, but I may round down the minimum percentages to help you succeed.

Decisions about +/- cutoffs will be based on two things: your performance on the final assessment and your overall achievements.

Assignments

Submission Guidelines

- You can submit your assignments physically or online.
- If you decide to submit online, your work can be hand-written or typed, but must be uploaded as a single pdf file. If you had handwritten your answers/solutions on a physical paper, make sure to label it

properly and please scan your document using a scanner app for convenience. Suggestions: (1) “Tiny Scanner” for Android or (2) “Scanner App” for iOS.

Worksheets

There will be a worksheet for each non-exam week. The purpose of the worksheets is for in-class group work and activities. The group must submit their completed worksheet by end-of-class or end-of-day. Worksheets are graded mostly on completion, and partially on correctness. Your name must exist in your group worksheet submission.

Homeworks

Homework is assigned every week and due every Friday by end-of-day. You must do and submit your homework individually. Homework is graded mostly on correctness and completion.

Homework Revisions

You can revise your homework for an up-grade, meaning - for example - a grade of “NI” can be up-graded to “A”.

Here are the qualifications and requirements for homework revisions:

- A homework grade of “NI”, “A”, or “E”.
- You must submit homework on time.
- The homework to be revised must be completed, meaning all parts should have your full written solutions. Incomplete homework is disqualified for revisions, but you can still use them as practice.
- The original copy of the parts with errors in your homework.
- A complete written revisions of the parts with errors in your homework.

Here are the rules for homework revisions:

- Homework revisions are accepted within one week of the homework being returned to you, otherwise the grade is set.
- Late revisions are not accepted unless the instructor allows.

Exams

Exams are given in two parts which are in written and oral forms. Below are the description of each part of the exams.

Written The written part of the exam allows you demonstrate your understanding of the material in written form. This part will be evaluated on the details of your computations and solutions.

Written exams will be graded on 3 components:

- *Methodology*: The method should be sound and well-founded. It should be based on a solid understanding of the underlying principles. The method should be applied correctly and consistently.
- *Reasoning*: The solution method should be explained in a clear and logical way. The steps of the method should be justified and explained. The reasonableness of the solution should be justified.
- *Writing*: The solution process should be written in a clear and concise way. The steps of the method should be easy to follow. The graphs/diagrams/equations should be clear and helpful. The mathematical notation should be used clearly and correctly.

Here are the rules for the written part of the exams:

- Written exams are take-home exam and given 24 hours before exam days.
- Written exams are due on exam days.
- Late submissions are not accepted unless the instructor allows.

Oral The oral part of the exam allows you to demonstrate your understanding of the material verbally. It is administered mostly in dialog style during exam days. The oral exam is only ten to fifteen minutes and it consists of one problem similar to the written exam with added questions from me. This part will be evaluated on your ability to explain key concepts and navigate through different ways to solve problems, rather than detailed solutions.

Oral exams will be graded on 3 components:

- *Knowledge:* This includes the student's ability to recall and apply mathematical concepts and procedures. The student should be able to answer questions about the material in a clear and concise way, and they should be able to solve problems using a variety of methods.
- *Communication:* This includes the student's ability to explain their thinking clearly, concisely, and timely. The student should be able to use mathematical language fluently, and they should be able to communicate their ideas in a way that is understandable.
- *Problem-solving:* This includes the student's ability to identify and solve mathematical problems. The student should be able to think critically about problems, and they should be able to develop and implement strategies for solving them.

Here are the rules for the oral part of the exams:

- You must sign-up for a time slot on exam days 24 hours in advance.
- You must submit your written exam at the beginning of the oral exam.
- You may have all other resources with you during the oral exam, that includes books and online resources.
- You may not communicate with others during the exam except to me.
- You may not ask conceptual questions to the examiner except for clarifying questions about the problem, and minor computations.

The grade you will receive for exams are a breakdown of your written and oral exam results with detailed feedback.

Here is how you can sign-up for the exam (oral part):

- [ODE Exam \(Oral Part\) Sign-Up](#) Click on the link to sign-up for a 30-minute session.

Exam Retakes

Your exams can be revised and you can retake both written and oral parts. Exam retakes allows you to have your exams up-graded at most twice, meaning - for example - a grade of "NMI" can be up-graded to "A".

Exam retake procedure are similar to the original exam. There are three possible kinds of exam retakes you can choose depending on your exam grade.

- *Written only:* you just need to revise your written exam and submit your retake written exam.
- *Oral only:* you just need to take an oral exam retake.
- *Both:* The written part is your revised exam and the oral part is explaining your revisions.

Here are the qualifications for exam retakes:

- An exam grade of "NMI", "NI", "A", or "E".
- The written or oral exam to be revised must be completed, meaning all parts should have your full written solutions. Incomplete work is disqualified for revisions and retakes.
- The original copy of the parts with errors in your written or oral exam.
- A complete written revisions of the parts with errors in your exam. This rule applies only to written only retake exam.

Here are the rules for exam retakes:

- Exam retakes must be done within one week of the exam being returned to you, otherwise the grade is set.

- If you need to retake an exam more than one week of the exam being returned to you, let me know for a discussion.
- The same written and oral exam part rules apply for exam retakes.

Here is how you can sign-up for the exam (oral part) retakes:

- [ODE Exam \(Oral Part\) Retakes](#) *Click on the link to sign-up for a 15-minute session.*

Make-up Exams

You can make-up exams due to extenuating circumstances. Please let me know if you can't make it to an exam day. If you missed an exam day, please let me know as soon as possible to discuss the next steps.

Here are the rules of make-up exams:

- A missed exam day means that you will automatically receive a grade of "I" for that particular exam.
- Make-up exams by appointment must be scheduled 24 hours in advance.
- Make-up exams must be done within two weeks of the original exam day.

Here is how you can sign-up for the exam (oral part) make-ups:

- [ODE Exam \(Oral Part\) Make-Ups](#) *Click on the link to sign-up for a 15-minute session.*

Final Exam

The final exam includes the written and oral parts. This exam will be cumulative. Makeup exams are not allowed during finals week. The same written and oral exam part rules apply for the final exam, except that retakes are no longer allowed.

The final exam is on December 12, Tu 1:30 PM - 3:30 PM, Franz Hall 222.

Expectations

Cancellation Policies

Help Hours You can cancel your scheduled help hours before the event, but it is strongly recommended that you cancel 12 hours before your scheduled time so that other students can schedule when a spot opens. You can reschedule for a different day and time if you need to.

Please try to show-up to your scheduled help hours. If for any reason that you can't make-it, please let me know as soon as possible.

Exams You can cancel your scheduled exam (oral part) before the event, but it is strongly recommended that you cancel 12 hours before your scheduled time so that other students can schedule when a spot opens. You can reschedule for a different time slot if you need to.

Note that canceling an exam (oral part) makes you are disqualified for exam revisions or retakes. If you have extenuating circumstances, please let me know as soon as possible to discuss next steps.

Please try to show-up to your scheduled oral exam. If you have extenuating circumstances, please let me know as soon as possible to discuss next steps.

Make-ups You can cancel your scheduled make-up before the event, but it is strongly recommended that you cancel 24 hours before your scheduled time so that other students can schedule when a spot opens. You can reschedule for a different day and time if you need to.

Please try to show-up to your scheduled make-up. If you have extenuating circumstances, please let me know as soon as possible to discuss next steps.

Attendance and Participation

You are expected to actively participate in this classroom community. Participation includes coming to class on time, being prepared, being willing to ask questions and share ideas, setting up study groups outside of class, attending tutoring sessions, posting helpful resources online, and contributing to the Teams discussion channels. Group and individual presentations of ideas is a suggested component of participation.

Late Assignments and Incompletes

You are expected to turn in all completed assignments on time. Circumstances that may disallow you to turn in your work on time - such as a medical reason - are understandable. Please let the instructor know if you are unable to submit your work and have missed the deadline way beyond its original posted date. Because every assignment is an important aspect of your learning in this class, we will discuss when you will turn in the assignment as well as decide upon an acceptable consequence for your turning it in late. I am committed to successfully helping you learn from this course.

Classroom Norms

- Follow assignment submission guidelines.
- Give your undivided attention to the class discussions.
- If you don't agree with what someone else has to say, you are encouraged to express your point of view, but do so respectfully, and support your claims with textual evidence.
- Everyone has the right to be heard. Maintain confidentiality if a person decides to share a personal experience.
- No name calling and respect each person's identity.
- One person speaks at a time. Give chances for other people to speak.
- Maintain the highest standards of excellence for both you and others.
- Possess the humility to understand that you are not an expert in everything and that everyone has room for improvement.
- Realize that each person will start with a distinct set of skills.
- Take care of yourself. If you need to step out of the classroom to have a moment to yourself - or go the bathroom - feel free to do so.

Inclusion and Diversity

The natural and mathematical sciences are often viewed as objective disciplines. Science is a method for us to understand how the world works. However, it is historically built from a small set of privileged populations that often ignores the biases. I acknowledge that there may be some parts in this course that have overt and covert biases. Science is a human endeavor, and the pursuit of knowledge and skill must incorporate a diverse set of experiences.

I value all students regardless of their background, country of origin, race, religion, ethnicity, sexual orientation, disability status, etc. I am committed to providing a climate of excellence and inclusiveness within all aspects of this course. If you have any concerns, issues, or challenges, you are encouraged to discuss with the instructor (set up a meeting by email or a direct message in Teams) with the assurance of full confidentiality except for academic integrity code violations or sexual harassment (which I am obligated by law to report).

In our classroom, diversity and individual differences are respected, appreciated, and recognized as a source of strength. I support the use of mathematics as an analytic tool to challenge power, privilege, and oppression. It is our collective responsibility to create a welcoming space where ideas can be challenged while individuals are respected. I ask you to support one another as you develop as mathematicians and analytic thinkers.

Accessibility Statement

The University of Portland strives to make its courses and services fully accessible to all students. Students are encouraged to discuss with their instructors what might be most helpful in enabling them to meet the learning goals of the course. Students who experience a disability are also encouraged to use the services of the Office for Accessible Education Services (AES), located in the Shepard Academic Resource Center (503-943-8985). If you have an AES Accommodation Plan, you should meet with your instructor to discuss how to implement your plan in this class. Requests for alternate location for exams and/or extended exam time should, where possible, be made two weeks in advance of an exam, and must be made at least one week in advance of an exam. Also, if applicable, you should meet with your instructor to discuss emergency medical information or how best to ensure your safe evacuation from the building in case of fire or other emergency. All information that students provide regarding disability or accommodation is confidential. All students are responsible for completing the required coursework and are held to the same evaluation standards specified in the course syllabus.

Referencing and Citation Guidelines

In your written work for this course, you must cite all sources of information that you use, whether they are direct quotes, paraphrases, or summaries. The style of citation that you use should be consistent throughout your paper. The citation styles for this course are APA and CSE.

- APA style is used in the social sciences and psychology. It is characterized by parenthetical citations that include the author's last name and the year of publication. For example, "According to Smith (2023), the average height of a man in the United States is 5'10".
- CSE style is used in the natural sciences and engineering. It is characterized by numbered citations that are listed at the end of the paper. For example, "[1] Smith, J. (2023). The average height of a man in the United States. *Journal of Human Biology*, 55(2), 123-132."

If you are unsure which citation style to use, please consult with your instructor. You can also find more information about APA and CSE style in the Clark Library citation guidelines: libguides.up.edu/cite

Here are some additional tips for citing sources:

- Always cite the original source, even if you are quoting from a secondary source.
- Be sure to include all relevant information in your citations, such as the author's name, the year of publication, and the title of the source.
- List your references in alphabetical order at the end of your paper.

Plagiarism is the act of using someone else's work without giving them credit. It is a serious academic offense that can result in a failing grade or even expulsion from school. By following these guidelines, you can help to avoid plagiarism and ensure that your work is properly cited.

Code of Academic Integrity

The University of Portland is a diverse academic community of learners and scholars who are dedicated to freely sharing ideas and engaging in respectful discussion of those ideas to discover truth. Such pursuits require each person, whether student or faculty, to present truthfully our own ideas and give credit to others for the ideas that they generate. Thus, cheating on exams, copying another student's assignment, including homework, or using the work of others without proper citation are some examples of violating academic integrity.

Especially for written and oral assignments, students have an ethical responsibility to properly cite the authors of any books, articles, or other sources that they use. Students should expect to submit assignments to Turnitin, a database that ensures assignments are original work of the student submitting. Each discipline has guidelines for how to give appropriate credit, and instructors will communicate the specific guidelines for their discipline.

The use of artificial intelligence (AI) tools such as ChatGPT without attribution also constitutes plagiarism. Students must cite any AI-generated text and ideas and disclose any activities (e.g. brainstorming, editing,

translating, etc.) for which AI was employed. Students are expected to demonstrate sound judgment in discerning when and how to utilize AI ethically across their academic work, upholding standards of citation, originality, and integrity. The misuse of AI to shortcut academic requirements will be considered a breach of academic integrity. Students who have questions about when and how to use AI should talk with their instructor.

Mental Health Statement

Anyone may sometimes experience problems with their mental health that interfere with academic experiences and negatively impact daily life. If you or someone you know experiences mental health challenges at UP, please contact the University of Portland Wellness Center in the lower level of Orrico Hall (down the hill from Franz Hall and near Mehling Hall) at 503-943-7134 or wellness@up.edu. Their services are free and confidential. In addition, confidential phone counseling is available at the Pilot Helpline by calling 503-943-7134 and pressing 3. The University of Portland Campus Safety Department (503-943-4444) also has personnel trained to respond sensitively to mental health emergencies at all hours. Remember that getting help is a smart and courageous thing to do - for yourself, for those you care about, and for those who care about you.

Physical Health Statement

Generally, students are expected to attend all class sessions according to the instructor's direction. Students who feel unwell should NOT attend class in person. These students should inform their instructor as soon as possible.

Should the instructor need to miss class, the course may be temporarily conducted remotely. Should the instructor be unable to teach for an extended period of time, the respective department or unit will find a substitute to continue the course.

Students who must be in isolation due to COVID-19 symptoms or a positive test should also contact their instructor as soon as possible to work out details for keeping up with the course material while in isolation.

Following current guidance from our county and state health authorities, face coverings are highly recommended in the classroom and all indoor spaces. As we move through the semester, however, classroom rules and procedures may change. All students and instructors must follow any University-wide COVID-19 rules and procedures that might be in put place at any given time during the semester for classrooms, labs, and all common areas of academic buildings. Such rules and procedures may include required face coverings, suggested distancing protocols and directions, and limitations on eating and drinking in the classroom, among other things. Failure to follow any of the COVID-19 classroom rules in place at the time could result in a student's removal from the course and/or a report filed with the Office of Student Conduct.

Non-Violence Statement

The University of Portland is committed to fostering a safe and respectful community free from all forms of violence. Violence of any kind, and in particular acts of power-based personal violence, are inconsistent with our mission. Together, all UP community members must take a stand against violence. Learn more about what interpersonal violence looks like, campus and community resources, UP's prevention strategy, and what we as individuals can do to assist on the Green Dot website, www.up.edu/greendot. Further information and reporting options may be found on the Title IX website, www.up.edu/titleix.

Ethics of Information

The University of Portland is a community dedicated to the investigation and discovery of processes for thinking ethically and encouraging the development of ethical reasoning in the formation of the whole person. Using information ethically, as an element in open and honest scholarly endeavors, involves moral reasoning to determine the right way to access, create, distribute, and employ information, including: considerations of intellectual property rights, fair use, information bias, censorship, and privacy. More information can be found in the Clark Library's guide to the Ethical Use of Information at libguides.up.edu/ethicaluse.