

# MATH 353A: Ordinary & Partial Differential Equations

## Summer 2 2022, Costa Rica

---

Class website: <https://sakai.duke.edu/portal/site/math.353a.01.2su22>

M - Th 1:30 - 4:30 pm, CRLA Center

Class Zoom link (as needed): <https://duke.zoom.us/j/8643735589>

**Instructor:** Dr. Margaret (Maggie) Regan ([mregan@math.duke.edu](mailto:mregan@math.duke.edu), [www.margaretregan.com](http://www.margaretregan.com))

**Contact Method:** Please contact me by email with questions, comments, concerns, or requests for meetings or help. I will do my best to respond within 24 hours.

**Office Hours:** Monday through Thursday 1:00 - 3:00 pm, 4:30 - 5:00 pm, or by appointment.

**TA:** Rebecca Lau ([becca.lau@duke.edu](mailto:becca.lau@duke.edu))

**Books:** *Elementary Differential Equations and Boundary Value Problems* 11th Edition, by William E. Boyce, Richard C. DiPrima, Douglas B. Meade, ISBN 13: 978-1119443766.

**Description:** First and second order ordinary differential equations with applications, Laplace transforms, series solutions and qualitative behavior, Fourier series, partial differential equations, boundary value problems, Sturm-Liouville theory. Intended primarily for engineering and science students. Study-abroad version of Math 353. Prerequisite: (Mathematics 202, 202D, 212, 219, or 222) and (Mathematics 216, 218-1, 218-2, or 221). Not open to students who have taken Mathematics 356.

**Class Structure:** Generally, class will run as approximately 1 hour of active lecture, 10 minute break, 50 additional minutes of lecture, and then 1 hour of collaborative work on homework/lab.

**Climate Goals:** *Axiom 1.* Mathematical potential is distributed equally among different groups, irrespective of geographic, demographic, and economic boundaries.

*Axiom 2.* Everyone can have joyful, meaningful, and empowering mathematical experiences.

*Axiom 3.* Mathematics is a powerful, malleable tool that can be shaped and used differently by various communities to serve their needs.

*Axiom 4.* Every student deserves to be treated with dignity and respect.

**Attendance:** Students are expected to *actively* attend every class lecture in person. In the online learning environment, “attendance” is measured by your *presence* on the site and your *contributions* to the site. If a student is in quarantine or has a significant timezone misalignment, contact me and we will discuss attendance and class participation accommodations. Excessive unexplained absence may be reported to the student’s dean.

**Sakai:** Our class website on Sakai will also be the location for all announcements, solutions, tutorials and any changes to class, assignments, or exams. Additionally, we will use the platform Piazza within Sakai to ask/answer questions outside of class. I have found that oftentimes when you have a question, there are many students who have the same question so it should be a useful resource to consult when you are completing homework assignments. Your participation on the site (either asking/answering questions) WILL be factored into the participation grade for the course.

**Electronics:** Please respect your fellow students and prevent your electronics from disrupting class. When entering a Zoom meeting, make sure to mute your audio. I encourage you to attend the Zoom meetings with your camera on as it helps us all communicate better.

**Topics:** As time permits, we will cover the following topics:

- Solving first and second order differential equations
- Solving systems of first order differential equations
- Classical and numerical (utilizing MATLAB) solution strategies

**Objectives:** As time permits, the students will achieve the following objectives:

1. Students will be able to effectively use definitions, examples, theory, and algorithms from the topics outlined above.
2. Students will be able to recognize and write valid, rigorous proofs.
3. Students will be able to effectively code numerical algorithms.
4. Students will be able to discuss mathematics, including: presenting solutions via zoom, generating examples for illustration as appropriate, seeking and finding holes in proposed proofs, code algorithms for numerically solving problems.

**Software** Implementation of algorithms is essential for labs in this course. Students need to download MATLAB prior to arrival in Costa Rica (available for free to students from [Duke OIT](#)).

**Collaboration and Honor Code:** Students are permitted and encouraged to work together when doing homework, but copying work is not allowed. Include the names of any collaborators at the top of your homework submission. Examinations and homework are conducted under the [Duke Community Standard](#).

**Absences and Makeup Work:** Students are expected to arrive on time, stay the entire class, and contribute to the class discussion and group work. Excused absences and makeup exams will be handled according to [University policy](#). Please notify the instructor in writing (email message is acceptable) prior to the date of absence when this is feasible. In cases where advance notification is not feasible (e.g., accident or emergency), the student should notify me as soon as possible.

**Grading:** The grading scheme will be the following:

Participation + 2 Blog Posts	5%
Homework	20%
Lab Assignments	20%
Quizzes	10%
Midterm Exam	20%
Final Exam	25%

Each component of the above grade is calculated based on percentages. The final grades will follow the breakdown below:

A+ ≥ 97%	B+ ≥ 87%	C+ ≥ 77%	D+ ≥ 67%	F < 60%
A ≥ 93%	B ≥ 83%	C ≥ 73%	D ≥ 63%	
A- ≥ 90%	B- ≥ 80%	C- ≥ 70%	D- ≥ 60%	

Homework/labs will be submitted either at the end of class or at the beginning of the next class unless otherwise specified. These will be done primarily during the collaborative work period from approximately 3:30 - 4:30 pm daily. However, anything not completed during that time will need to be done on your own. *Late homework will not be accepted.* Homework will be graded via the following 3 point scale:

- 3 points = fully correct, all work present
- 2 points = mostly correct, possibly missing work
- 1 points = mostly incorrect, missing most work
- 0 points = no solution

Lab grading will be made clear on each assignment handout.

Participation can take many forms — Sakai, interaction and answering/asking questions during lecture, or actively participating in collaborative work time. Two [blog posts](#) about your experiences in Costa Rica, either in or outside of class as a way to document our adventure. Additional blog entries are encouraged.

Quizzes will be conducted weekly (unless it is an exam week). The quiz will be 15-20 minutes and cover the material presented that week in class.

### Exam Dates

Midterm Exam: Thursday, July 21 @ CRLA Center

Final Exam: Saturday, August 6 @ CRLA Center

**Appeal:** All appeals related to homework and exam grades must be submitted within 1 week after they are graded. To appeal, the student must request a regrade through Gradescope with an appropriate description of the issue. I will review each appeal and make appropriate changes.

**Disabilities:** Reasonable accommodations will be made for students who are registered with the [Student Disability Access Office](#). Such students should speak with me as soon as possible.

**Inclusivity:** Duke University's Office for Institutional Equity provides resources, events, and information about current initiatives at Duke to support equality for all members of the Duke community. I hope that you will communicate with me if you experience anything in this course that does not support an inclusive environment, and you can also report any incidents you may witness or experience on campus to the [Office for Institutional Equity](#).

**Mental Health and Wellness:** If your mental health concerns and/or stressful events negatively affect your daily emotional state, academic performance, or ability to participate in your daily activities, many resources are available to you, including ones listed below. Duke encourages all students to access these resources, particularly as we navigate the transition and emotions associated with this time. Duke Student Government has worked with DukeReach and student advocates to create the "[Two-Click Support](#)" Form, and DukeReach has expanded its drop in hours as well. Other resources available are the following:

- **DukeReach.** Provides comprehensive outreach services to identify and support students in managing all aspects of wellbeing. Learn more [here](#).
- **Counseling and Psychological Services (CAPS).** CAPS services include individual

group, and couples counseling services, health coaching, psychiatric services, and workshops and discussions. (919) 660-1000

- **Blue Devils Care.** A convenient and cost-effective way for Duke students to receive 24/7 mental health support through TalkNow. Learn more [here](#).

In addition, managing daily stress and self-care are also important to well-being. Duke offers several resources for students to both seek assistance on coursework and improve overall wellness, some of which are listed below. Learn more [here](#).

- **The Academic Resource Center (ARC).** (919) 684-5917, [theARC@duke.edu](mailto:theARC@duke.edu)
- **DuWell.** (919) 681-8421, [duwell@studentaffairs.duke.edu](mailto:duwell@studentaffairs.duke.edu)
- **WellTrack.**