USC University of Southern California

Math 245 Syllabus
Mathematics of Physics and Engineering I
Lecture 39602D (Leslie)

COURSE INFORMATION AT-A-GLANCE

Math 245: Mathematics of Physics and Engineering I (4.0 Units), Fall 2021

Official Course Description

First-order differential equations; second-order linear differential equations; determinants and matrices; systems of linear differential equations; Laplace transforms.

Prerequisite(s)

1 from (MATH 226 or MATH 227 or MATH 229)

Required Textbook and Software

Polking, Boggess, and Arnold. *Differential Equations*, Second Edition (Classic Version) ISBN: 9780134689586
MATLAB installation (free through USC: `https://software.usc.edu/matlab/`)

Meeting Times, Locations, Instructor

Lecture

12:00pm–12:50pm MWF (Section 39602D), IN PERSON, Social Sciences Building (SOS) room B4
Instructor: Trevor Leslie (Assistant Professor (RTPC) of Mathematics)

Discussion Sections

8:00–8:50am TR (Section 39603R), IN PERSON, Grace Ford Salvatori Hall (GFS) room 105.
Instructor: Kaiheng Zou.

9:00–9:50am TR (Section 39604R), IN PERSON, Grace Ford Salvatori Hall (GFS) room 105.
Instructor: Xinzhou Su.

Exam Dates

Midterm Exam #1: Wednesday, Sep 29, during class (subject to change)
Midterm Exam #2: Friday, Nov 5, during class (subject to change)
Final Exam: Friday, December 10, 11am–1pm.

CONTACT INFORMATION

Trevor Leslie	Lead Instructor, Section 39602D	lesliet@usc.edu	Kaprielian Hall (KAP) 416F
Kaiheng Zou	TA, Section 39603R	kaihengz@usc.edu	
Xinzhou Su	TA, Section 39604R	xinzhous@usc.edu	
Shuqi Zhang	TA, Section 39599R and 39600R	shuqizha@usc.edu	
Xilu Zhu	TA, Section 39607R and 39608R	xiluzhu@usc.edu	

Office Hours will be posted under the 'Contacts' tab on Blackboard and will be updated as needed throughout the semester. Xinzhou and Kaiheng are the TA's for my lecture; Shuqi and Xilu are TA's for Prof. Sheikhhassani's lectures. You can ask any of the TA's for help during their office hours.

COURSE FORMAT AND INSTRUCTIONAL MODE

In accordance with university requirements, all components of this course will be run IN PERSON. The instructional mode is subject to change according to university directives and instructor health.

University administration has communicated that **instructors at Dornsife are not required to accommodate students who wish to take the class fully remotely**, unless "the student has filed for and received medical accommodation requiring that student to have a fully remote experience." If you believe you meet this requirement, please email me.

On the other hand, we are of course in the middle of a global pandemic, which warrants some flexibility in the mode of participation available to the students. For the benefit of those who cannot attend lecture on a given day, the MWF lectures will have a remote participation option, and the lectures will be recorded. This is, however, subject to technological difficulties (see more below). I will also make my lecture notes available to students.

Lecture Notes

I will provide the class with the lecture notes that I prepare before teaching. What I write down on the board will be very similar to the content of these notes. Whether you are attending in person or remotely (but especially remotely), it is recommended that you keep these notes in front of you, to clarify what I've written if you cannot read the board. Lecture notes will be available on Blackboard: Click on 'Content' in the left pane, then navigate to the 'Course Notes' folder.

Attendance

In-person attendance is strongly recommended, *provided* that you are not sick, that you have no symptoms of any illness, and that you do not have a medical reason to be absent. Attendance on any given day is *not required*; however, if your attendance over the course of the semester is so sparse that I don't know who you are by December, I reserve the right to impose a small grade penalty (A to A–, B– to C+, etc.).

Online Participation

USC has installed audio-visual equipment in the lecture room, which I will use to attempt to accommodate students who are not in attendance on a given lecture day. Please be aware that the technology is subject to problems, including, but not limited to the following:

- The camera's resolution is such that it takes some effort to read the board, regardless of how far it is zoomed in or out.
- The camera occasionally freezes and stops recording.

I cannot be responsible for the malfunctioning of the equipment. I am providing my lecture notes as a fall-back option for students in case of a malfunction. However, there is a real possibility that some lecture content may not be available online.

You can access and participate in the Zoom lectures by clicking on 'USC Zoom Pro Meeting' in the left navigation pane on Blackboard. More detailed instructions, including meeting ID's and passcodes, will be provided in a separate document, which will be updated from week to week.

Other Online Components

- Blackboard. Lecture notes and Zoom meeting links will be available through Blackboard. Blackboard access is available through `my.usc.edu`.
- Gradescope. You will submit homework assignments through Gradescope. You will receive an email notification when I add you to the Gradescope roster for this course.
- Campuswire. We will use Campuswire as a discussion board for questions on homework, as well as course logistics. You will be sent an email invitation to join the Campuswire roster.

COURSE CONTENT

This course is about understanding mathematical models that govern the world around us—specifically, those which are formulated as differential equations. Engineers and scientists should be able to understand, construct, solve, and interpret differential equations using contemporary analytical and numerical methods. This course provides an introduction to some of these methods.

In this course, we will cover most of Chapters 1,2,4,5,7,8, and 9 of the course textbook, as well as part of Chapter 10, and several supplementary topics. A substantial portion of the course will involve simulations in MATLAB. An introduction regarding installation, activation and basic operations will be provided during the first two weeks of class.

Throughout the semester, I will be coordinating loosely with Prof. Ramtin Sheikhhassani, who has taught this course several times previously. Several course items I will give you will be based on (or taken from) Prof. Sheikhhassani's materials. If you would like a rough idea of the order and timing of various topics, you can refer to p. 6 of Prof. Sheikhhassani's syllabus here: `https://web-app.usc.edu/soc/syllabus/20213/39606.pdf`. I will very likely devote different amounts of time to several course topics, based on my personal preferences and tastes.

Learning Objectives

Students will be able to:

- Understand the concept of differential equations and their classification
- Develop, select and apply solutions for 1st order, 2nd order and higher order homogeneous and nonhomogeneous equations by manual and numerical-based methods
- Apply Laplace transforms to solve ordinary linear differential equations (ODEs)
- Find solutions to systems of differential equations using eigenvalues, matrix of exponents and diagonalization
- Solve and approximate non-linear ODEs using analytical and numerical methods
- Demonstrate proficiency in using MATLAB to solve, analyze and interpret ordinary differential equations.

ASSIGNMENTS AND ASSESSMENTS

Graded work will consist of written homework (traditional pencil-and-paper math problems), simulations (MATLAB assignments), quizzes, and exams. Details below are subject to change.

No late work will be accepted, and no make-up quizzes will be offered. Rather, some of these items will be automatically dropped; in exceptional circumstances (e.g., extended illness), I may allow a student a larger number of dropped assignments and/or quizzes.

Out-of-Class Assignments

Written Homework (5% of total grade): Roughly one assignment per week will be assigned and submitted via Gradescope. Your lowest two written homework grades will be dropped automatically.

Simulations (10% of total grade): Roughly 7–8 shorter MATLAB simulations and 2–3 MATLAB projects will be assigned throughout the semester. This is *separate* from the written homework. Your lowest non-project simulation grade will be dropped, but no project grades will be dropped.

Timed Assessments

Quizzes (20% of total grade): These will be administered weekly during discussion sections. Your lowest two scores will be dropped automatically.

Exams (65% of total grade): Two midterm exams will be administered in class. The final exam will be administered per the university's final exam schedule. See page 1 of this syllabus for the dates.

Breakdown of exam contribution toward final grade:

- Your best midterm score will count for 22% of your final grade
- Your second-best midterm score will count for 18% of your final grade.
- The final exam will count for 25% of your final grade.

The final examination will be comprehensive, covering all topics presented in the course. Extra emphasis will be placed on the material covered after the second midterm. Make-up exams will be allowed only under exceptional circumstances and will be dealt with on a case-by-case basis.

Grade Cutoffs

Assuming the average class grade (calculated in terms of GPA) is a B or better, the end-of-semester grades will be determined using the following table, which is based on USC guidelines.

		B+	88.00–89.99	C+	78.00–79.99	D+	68.00–69.99	
A	≥ 93.00	B	83.00–87.99	C	73.00–77.99	D	63.00–67.99	F <60.00
A–	90.00–92.99	B–	80.00–82.99	C–	70.00–72.99	D–	60.00–62.99	

If the class GPA is lower than a B, the grading scheme will be adjusted accordingly.

Grading Disputes

If you feel an assignment or assessment has been mis-graded, bring it to the attention of your TA and myself within two days of when it is returned to you. The appropriate person will re-grade the entire assignment or assessment—not just the problem in question. Therefore the overall score may go up or down. Grading grievances aired more than two days after they are returned may not be re-graded.

ADDITIONAL COURSE POLICIES

- DSP approved students should inform the instructor at the beginning of the semester for any requested accommodation.
- Work-related travel must be scheduled outside of the mid-term and final examinations periods. Accommodation to take exams on different dates will be made only for family emergencies, religious observance and documented illness or health-related emergencies.
- Final grades will depend entirely on course performance as outlined above. Financial support requirements (e.g., minimum grade requirement for tuition reimbursement) cannot and will not be taken into consideration.

STATEMENT ON ACADEMIC CONDUCT AND SUPPORT SYSTEMS

The information below applies university-wide and is available at
`https://dornsife.usc.edu/ase/statement-on-academic-conduct-and-support-systems/`

Academic Conduct

Plagiarism—presenting someone else's ideas as your own, either verbatim or recast in your own words—is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, `https://policy.usc.edu/scientific-misconduct`.

Support Systems

Counseling and Mental Health: (213) 740-9355, 24/7 on call.
`https://studenthealth.usc.edu/counseling`.

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline: 1(800) 273-8255, 24/7 on call.
`https://suicidepreventionlifeline.org`.
Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP): (213) 740-9355(WELL) (press "0" after hours), 24/7 on call.
`https://studenthealth.usc.edu/sexual-assault`.
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED): (213) 740-5086 / Title IX: (213) 821-8298.
`https://equity.usc.edu`, `https://titleix.usc.edu`.
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment: (213) 740-5086 or (213) 821-8298.
`usc-advocate.symplicity.com/care_report`
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity /Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs: (213) 740-0776.
`https://dsp.usc.edu`
Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention: (213) 821-4710.
`https://campussupport.usc.edu`
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC: (213) 740-2101.
`https://diversity.usc.edu`
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency. UPC: (213) 740-4321, HSC: (323) 442-1000. 24/7 on call
`https://dps.usc.edu`, `https://emergency.usc.edu`
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety. UPC: (213) 740-6000, HSC: (323) 442-120. 24/7 on call
`https://dps.usc.edu`
Non-emergency assistance or information.

Office of the Ombuds. (213) 821-9556 (UPC) / (323) 442-0382 (HSC)
`https://ombuds.usc.edu`
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.