## **MATH 225: Linear Algebra and Linear Differential Equations (Fall 2022, 4 units)**

## **Lectures**

## Section 39535: MWF 2-2:50 pm in CPA 156

## Instructor: Pranava C Jayanti

## Office Hours: MWF 11:30am-12:30 pm in KAP 416F

## Contact Info: pjayanti at usc dot edu

## 

## **Discussion sessions**

## TuTh in CPA 106 (12-12:50 pm for 39536 and 1-1:50 pm for 39537)

## Teaching Assistant: Vlad Roman

## Office Hours: TBD

## Contact Info: [vladroma@usc.edu](mailto:vladroma@usc.edu)

**Math Center**

Your TA will hold office hours in the [Math Center](https://dornsife.usc.edu/mathcenter/) (located at KAP 263), from the second week of classes. You may visit the Math Center at any operational hour (Mon-Thu 8am-7pm, Fri 8am-5pm) and there will likely be someone there to help you.

**Course Content**

## Most of this course is geared towards the study of matrices, vector spaces, eigenvalue/eigenvector problems and other fundamental topics in linear algebra. Towards the end of the course, we will also cover some linear differential equations, depending on how much time there is left. We will discuss most of chapters 2, 3, 4 and 6, and some parts of 7, 8 and 9 from the textbook (see below).

## 

## **Prerequisites**

## MATH 126 or MATH 127 or MATH 129.

**Learning Objectives**

This course will be a mix of various results/theorems and some of their proofs, with an emphasis on a more intuitive understanding of the concepts. The main idea behind discussing the proofs is so that you are better able to understand how and when to apply various techniques. By the end of the semester, you will be able to use and manipulate fundamental tools in linear algebra (matrices, determinants, vector spaces, eigenvalues/eigenvectors) and also utilize them to solve linear differential equations. This will pave the way for both abstract and advanced linear algebra, or the more applied classes that one would typically encounter in an engineering curriculum.

## 

## **Textbook**

The main source for the lectures is *Differential Equations & Linear Algebra* by Goode and Annin, 4th Edition. If any other reference material is used, it will be provided during the course.

It is recommended that you have a copy, either physical or digital, of the textbook as weekly homework problems will be assigned from the exercises sections of each chapter. It will also serve you well to keep reading through the book before and/or after every class to keep up with the inherently fast pace of the course.

## 

## **Course Notes**

## Notes from the classroom will be uploaded to Blackboard, approximately once a week.

## 

## **Communication**

## Announcements will be made in class and via Blackboard, so please check the latter regularly for notifications (or ensure that email notifications are switched on). The best way for you to contact me is via email or during the designated office hours.

## 

## **Technological Proficiency and Hardware/Software Required**

## No softwares will be used in this course, except Zoom, Blackboard and Gradescope. Students are expected to make use of only scientific calculators. Programmable/graphing calculators are not permitted during quizzes and exams. Below are some links that may be helpful.

## **USC Technology Support Links**

## [Zoom information for students](https://keepteaching.usc.edu/students/student-toolkit/classroom/zoom/)

[Blackboard help for students](https://keepteaching.usc.edu/students/student-toolkit/classroom/blackboard/)

[Software available to USC Campus](https://software.usc.edu/)

**Additional online resources**

* [Desmos](https://www.desmos.com/calculator): This is an online graphing calculator that you may find useful to visualize and manipulate functions.
* [Wolfram Alpha](https://www.wolframalpha.com/): This is an online computational engine that can perform various operations in calculus (and much more!).

## 

## **Homework assignments**

## Homework will be assigned every Wednesday (usually due Friday of the next week) on Blackboard/Gradescope, and will consist of 10-15 problems chosen from the textbook. The assignments will be graded by the TA and your score will be entered on Blackboard, typically within a week. Late work will not be tolerated unless there is a reasonable excuse (medical/religious/emergency). Here’s a tentative homework schedule (subject to change, if necessary):

| **Homework #** | **Date assigned** | **Date due** | **Sections covered** |
| --- | --- | --- | --- |
| 1 | 24th Aug | 2nd Sep | 2.1 - 2.4 |
| 2 | 31st Aug | 9th Sep | 2.5 - 2.6 |
| 3 | 7th Sep | 16th Sep | 2.8, 3.1 - 3.2 |
| 4 | 14th Sep | 23rd Sep | 3.2 - 3.3, 4.1 |
| 5 | 21st Sep | 7th Oct | 4.2 - 4.6 |
| 6 | 5th Oct | 17th Oct | 4.7 - 4.10 |
| 7 | 19th Oct | 28th Oct | 6.1 - 6.5 |
| 8 | 26th Oct | 7th Nov | 7.1 - 7.3 |
| 9 | 2nd Nov | 18th Nov | 7.4, 8.1 - 8.2, 8.5 |
| 10 | 16th Nov | 28th Nov | 9.1 - 9.3 |

## 

**Quizzes**

Quizzes will be conducted on Tuesdays in discussion sessions. Of 12 quizzes conducted, the lowest two scores will be dropped. Each quiz will last 10 minutes and will test your basic understanding of the concepts discussed in the week prior (and in the corresponding homework). You are permitted to refer to your own notes while taking the quizzes. They will be graded by the TA and the scores uploaded to Blackboard, usually within a week. There will be no quiz in the weeks of the midterm exams. If you miss a quiz, please contact the TA.

| **Quiz #** | **Date** | **Topics** |
| --- | --- | --- |
| 1 | 30th Aug | 2.1 - 2.3 |
| 2 | 6th Sep | 2.4 - 2.5 |
| 3 | 13th Sep | 2.6, 2.8 |
| 4 | 20th Sep | 3.2 - 3.3 |
| 5 | 4th Oct | 4.1 - 4.4 |
| 6 | 11th Oct | 4.5 - 4.8 |
| 7 | 18th Oct | 4.9 - 4.10, 6.1 |
| 8 | 25th Oct | 6.2 - 6.4 |
| 9 | 8th Nov | 6.5, 7.1 - 7.3 |
| 10 | 15th Nov | 7.4, 8.1 - 8.2 |
| 11 | 22nd Nov | 8.5, 9.1 - 9.2 |
| 12 | 29th Nov | 9.3 |

**Midterm exams**

There will be two in-class midterms (50 minutes each) conducted during the semester, tentatively on Monday, September 26th and Monday, October 31st. Both exams will be conducted during regular class hours, and their solutions will be discussed in the subsequent discussion session.

For the midterm exams, you will be allowed one sheet (front and back) of *handwritten* notes on a standard 8.5"x11" paper, and a scientific (non-programmable/non-graphing) calculator. If you need to miss the midterm exams due to any planned absence, please let me know at the beginning of the semester.

| Midterm - 1 | 26th Sep | Chapters 2, 3 |
| --- | --- | --- |
| Midterm - 2 | 31st Oct | Chapters 4, 6 |

**Final exam**

The end-of-semester exam will be conducted on **Friday, December 9th 2022 from 2 pm to 4 pm**. Please keep this date in mind. For the final exam, you will be allowed one sheet (front and back) of *handwritten* notes on a standard 8.5"x11" paper, and a scientific (non-programmable/non-graphing) calculator.

There are no makeups for the final exam. No student can take it earlier or later than the scheduled time, unless for religious reasons (in which case, it is your responsibility to inform me early in the semester). In certain situations, due to documented emergencies, students take an Incomplete (IN) grade. More information regarding policies for finals may be found [here](https://classes.usc.edu/term-20223/finals/).

## 

## **Grading Breakdown**

| **Mode of evaluation** | **Fraction of Grade** |
| --- | --- |
| Homework | 10% |
| Quizzes | 20% |
| Midterm 1 | 20% |
| Midterm 2 | 20% |
| Final exam | 30% |
| **Total** | **100%** |

## 

## **Grading Scale**

Letter grades will be assigned at the end of the semester, after grading “on a curve” to account for averages that are higher/lower than usual. These variations notwithstanding, a very rough estimate for the grades would be as follows – A for >90%, B for 80-90%, C for 70-80%, D for 60-70%, with pluses and minuses distributed appropriately.

**Important dates**

| **Task** | **Deadline** |
| --- | --- |
| Last day to add | Fri, Sep 9th 2022 |
| Last day to change to Pass/No Pass |
| Last day to drop without a mark of "W" and receive a refund |
| Last day to withdraw without a “W” on transcript or change pass/no pass to letter grade | Fri, Oct 7th 2022 |
| Last day to drop with a mark of “W” | Fri, Nov 11th 2022 |

## 

## **Attendance**

Attendance is not compulsory, but coming to lectures (and paying attention!) is very strongly advised. This course moves at a fast pace, so it is easy to feel lost if you miss a few classes. That being said, I will make every effort to help those with reasonable excuses. If you have to miss class due to religious observances during the semester, please let me know your schedule as early as possible in the semester, so that we can work to accommodate your absence. In case of medical reasons, please contact me via email as soon as it is possible for you to do so.

## 

## **Hybrid lectures and recording notice**

## Lectures will be delivered in-person, and will also be simultaneously streamed on Zoom. Recordings of the lectures will be available on Blackboard.

You can directly access the Zoom stream by logging into your Blackboard profile, going into the course page for Math 225 and clicking on **USC Zoom Pro Meeting**. This will redirect you to a login page, where you should use your USC credentials to sign in (see below). Alternatively, you can use the link at the end of this email.

But please note that, either way, **you have to log in to Zoom with your USC ID to access the stream**. To do this, when you open Zoom, click Sign In, and select "Sign in using SSO". Enter the domain name **usc.zoom.us**. Then use your USC credentials.

<https://usc.zoom.us/j/97074752015?pwd=U2NPb3NlU3pWREFlQ1dlc0pWdjNVZz09>

Meeting ID: 970 7475 2015 Passcode: 709445

Distribution or use of notes or recordings based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is a violation of the USC Student Conduct Code. This includes, but is not limited to, providing materials for distribution by services publishing class notes. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relation to the class, whether obtained in class, via email, on the Internet or via any other media.

## 

## **Zoom etiquette**

## In case you are attending the lecture via Zoom, please ensure that you use virtual background when appropriate, that you are seated in a place of minimal noise/distraction, and that your mic is turned off unless necessary. Unmute yourself to ask questions, and mute yourself again immediately thereafter.

## **Course evaluation**

## Course evaluations at the end of the semester are a great way for me to receive feedback from you – this will help me improve my teaching, making it a better experience for both me and the next batch of students. Of course, you don’t have to wait until the end of the semester for this. If you wish to contact me with any suggestions/requests during the semester, please do not hesitate to do so.

## **Course Schedule: A Weekly Breakdown**

A tentative course schedule is as follows. It is subject to change throughout the semester, so please check it regularly and look out for alerts on Blackboard.

|  | **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
| --- | --- | --- | --- | --- | --- |
| **Week 1** | 8/22: 2.1, 2.2 | 8/23: Discussion | 8/24: 2.2 | 8/25: Discussion | 8/26: 2.3, 2.4 |
|
| **Week 2** | 8/29: 2.4 | 8/30: Quiz-1 | 8/31: 2.5 | 9/1: Discussion | 9/2: 2.5, 2.6; HW-1 |
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| **Week 3** | 9/5: Labor Day | 9/6: Quiz-2 | 9/7: 2.6, 2.8 | 9/8: Discussion | 9/9: 3.3; HW-2 |
|
| **Week 4** | 9/12: 3.3 | 9/13: Quiz-3 | 9/14: 3.2 | 9/15: Discussion | 9/16: 3.2; HW-3 |
|
| **Week 5** | 9/19: 4.1, 4.2 | 9/20: Quiz-4 | 9/21: 4.2 | 9/22: Discussion | 9/23: 4.3; HW-4 |
|
| **Week 6** | **9/26: Midterm-1** | 9/27: Midterm discussion | 9/28: 4.4 | 9/29: Discussion | 9/30: 4.5 |
|
| **Week 7** | 10/3: 4.6 | 10/4: Quiz-5 | 10/5: 4.7 | 10/6: Discussion | 10/7: 4.8; HW-5 |
|
| **Week 8** | 10/10: 4.9, 4.10 | 10/11: Quiz-6 | 10/12: 6.1 | 10/13: Fall Recess | 10/14: Fall Recess |
|
| **Week 9** | 10/17: 6.2; HW-6 | 10/18: Quiz-7 | 10/19: 6.3 | 10/20: Discussion | 10/21: 6.4 |
|
| **Week 10** | 10/24: 6.5 | 10/25: Quiz-8 | 10/26: 7.1 | 10/27: Discussion | 10/28: 7.2; HW-7 |
|
| **Week 11** | **10/31: Midterm-2** | 11/1: Midterm-2 discussion | 11/2: 7.3 | 11/3: Discussion | 11/4: 7.4; HW-8 |
|
| **Week 12** | 11/7: 1.2, 8.1; HW-8 | 11/8: Quiz-9 | 11/9: 8.2 | 11/10: Discussion | 11/11: Veterans' Day |
|
| **Week 13** | 11/14: 8.5 | 11/15: Quiz-10 | 11/16: 9.1 | 11/17: Discussion | 11/18: 9.2; HW-9 |
|
| **Week 14** | 11/21: 9.3 | 11/22: Quiz-11 | 11/23: Thanksgiving | 11/24: Thanksgiving | 11/25: Thanksgiving |
|
| **Week 15** | 11/28: 9.4; HW-10 | 11/29: Quiz-12 | 11/30: Review | 12/1: Discussion | 12/2: Review |
|
| **Finals Week** |  |  |  |  | **12/9: Final Exam (2-4pm)** |
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## **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](https://policy.usc.edu/scampus-part-b/). Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on [Research and Scholarship Misconduct](https://policy.usc.edu/research-and-scholarship-misconduct/).

**Students and Disability Accommodations**

USC welcomes students with disabilities into all of the University’s educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at [osas.usc.edu](http://osas.usc.edu/). You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

**Support Systems**

* *Counseling and Mental Health - (213) 740-9355 – 24/7 on call*

[studenthealth.usc.edu/counseling](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*

[suicidepreventionlifeline.org](http://www.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*

[studenthealth.usc.edu/sexual-assault](https://studenthealth.usc.edu/sexual-assault/)

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

* *Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086*

[eeotix.usc.edu](https://eeotix.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](https://usc-advocate.symplicity.com/care_report/)

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

* *The Office of Student Accessibility Services (OSAS) - (213) 740-0776*

[osas.usc.edu](http://osas.usc.edu/)

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

* *USC Campus Support and Intervention - (213) 821-4710*

[campussupport.usc.edu](https://campussupport.usc.edu/)

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

* *Diversity, Equity and Inclusion - (213) 740-2101*

[diversity.usc.edu](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*

[dps.usc.edu](http://dps.usc.edu/), [emergency.usc.edu](http://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*

[dps.usc.edu](http://dps.usc.edu/)

Non-emergency assistance or information.

* *Office of the Ombuds* - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

[ombuds.usc.edu](http://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.

* *Occupational Therapy Faculty Practice - (323) 442-33*40 or [otfp@med.usc.edu](mailto:otfp@med.usc.edu)

[chan.usc.edu/otfp](http://chan.usc.edu/otfp)