MATH 225
Linear Algebra and Differential Equations

USC Dornsife
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Course webpage
Office: TBD
Office Hours: TBD

Note

This syllabus contains a rough outline of the course and may change in the future. If you have any questions, you should check with me.

Course Description

4 Units; 3 hours lecture, 2 hours discussion. Matrices, systems of linear equations, vector spaces, linear transformations, eigenvalues, systems of linear differential equations.

Prerequisite(s): MATH 126 or MATH 127 or MATH 129

Text: *Differential Equations and Linear Algebra*, 4rd Edition
Author: Stephen Goode & Scott Annin

Lectures and Discussions

Section	Type	Time	Location
39530	**Lecture**	MWF – 10:00am-10:50am	WPHB28
39531	*Discussion*	TTh – 08:00am-08:50am	DMC109
39532	*Discussion*	TTh – 09:00am-09:50am	DMC109
39550	**Lecture**	MWF – 12:00pm-12:50pm	DMC100
39551	*Discussion*	TTh – 12:00pm-12:50pm	DMC200
39552	*Discussion*	TTh – 01:00pm-01:50pm	DMC200

Grade Distribution:

Assignments	10%	
Quizzes	15%	
Midterm 1	20%	Feb 9
Midterm 2	20%	Mar 25
Final Exam	35%	

Letter Grade Distribution:

The minimum course score to guarantee you are assigned a given letter grade is determined by the following grading scale:

93%	A	75%	C
90%	A-	70%	C-
87%	B+	67%	D+
83%	B	64%	D
80%	B-	60%	D-
77%	C+	0%	F

Course Details:

- **Add/Drop/Withdraw dates**

  Please check here for the full list of academic calendar.

- **Lecture Notes and Extra Resources**

  Every Friday, I will publish a lecture note on Blackboard and the course website about the topics we covered in that week's lectures and discussions.

  We mainly follow our textbook in order to have consistency in USC math curriculum, however all students are encouraged to use external resources if they need extra info.

  For those who prefer video lectures while studying, I recommend one of the legends on that subject, Gilbert Strang's MIT Lecture series on Youtube.

  For other textbooks, the followings are nice:

  - "Linear Algebra and Its Applications" by David C. Lay
  - "Introduction to Linear Algebra" by Gilbert Strang
  - "Linear Algebra" by Serge Lang (for those who are interested in theory)
  - "Elementary Differential Equations and Boundary Value Problems" by William E. Boyce and Richard C. DiPrima

- **Exams:**

  Two midterm exams are scheduled for the Friday of Week 5 and the Monday of Week 12, during class hours. The final exam, which will take place during Finals Week, is comprehensive and will encompass all the course material, with a special focus on topics discussed post-second midterm.

  Make-up exams will be held only in cases that are urgent and for which you can provide proof. There will be no make-up exams for those who do not report their excuses before the exam.

- **Assignments**

  At least 10 homeworks, each worth 10 points, will be assigned. The list of problems is posted in Blackboard (and the course web-page) and will be updated with due dates throughout the semester. All written assignments will be handled through the Gradescope link in Blackboard (the course web-page). Gradescope will allow you to submit either individual JPEGs for each page, or a single document in PDF format. If for some reason you need to email us a document, it should always be in PDF format.

  Gradescope Entry Codes:

  RKBJ74 for Section 39530

  EJG8VE for Section 39550

On most Fridays we will collect a homework assignment for the week in Gradescope, due by 11pm PST. Any exercises submitted after their due date will receive half-credit, regardless of circumstances.

- **Discussions and Quizzes**

  It should be noted that there will not be a separate assistant for the course. During the discussion times on Tuesdays and Thursdays, depending on the progress of the students, there will be sample question solutions, additional topic explanations, or group studies. Starting from the first week, there will be a quiz in the last half of the Thursday classes. These quizzes will be handed in in class. At the end of the year, your lowest three quiz scores will not be included in the final grade calculation.

- **Attendance and Absences**

  Students' attendance in the class is not mandatory, but strongly recommended. Since there will be quizzes during discussion hours, those who do not participate will also miss the quizzes. Since both lectures and discussions cover the same content, you can attend the section at a time that is convenient for you, as long as the class capacity allows. However, for midterm exams, you must be in the class of the section you are registered for.

- **Office Hours**

  It is recommended to attend the office hours of the course instructor at the scheduled times. Since there is no separate assistant, those who need extra help can join the office hours of other 225 assistants at the MathCenter. You can access the general office calendar on the MathCenter website.

- **Additional Info**

  Students should not hesitate to consult the instructor about any matter related to the lesson or their education in general. It will also be beneficial for you to inform about important or special needs in advance. The various support channels provided by USC to students are shared at the end of this document.

  As a Muslim instructor, I need to cancel a discussion during the holiday at the end of Ramadan. Therefore, Tuesday, April 9th will be a holiday for the students as well. That week, I will be available during extra office hours to help students with any shortcomings they may have.

  Due to a chronic disease affecting my physical condition, it may not be possible to conduct some classes in-class at times. Although I will try to avoid this situation, I would like to mention the possibility that some of our classes may be online.

- **Academic Conduct**

  Plagiarism, which involves claiming another person's ideas as your own, whether by directly copying them or by paraphrasing them in your own language, is a significant violation of academic standards with serious repercussions. It is important that you acquaint yourself with the USC Student Handbook, especially focusing on Page 11, which details Academic Integrity. See here for USC recommended sanctions.

Learning Objectives and Outcomes:

This corresponds to Chapters 1-9 of our textbook. By the end of this course, students should be able to:

1. Understand and explain key concepts in linear algebra, including vectors, matrices, scalars, and vector spaces.
2. Perform fundamental operations on vectors and matrices, such as addition, subtraction, and multiplication.
3. Solve linear equations using methods like Gaussian elimination and matrix inversion.
4. Determine matrix properties like determinant and invertibility, and perform matrix inversions.
5. Grasp the concept of vector spaces, their properties, and whether a set of vectors forms a space.
6. Understand linear transformations, compute change-of-basis matrices, and analyze their properties.
7. Apply the Rank-Nullity Theorem and techniques for finding eigenvalues and eigenvectors.
8. Utilize diagonalization for simplifying complex systems and transformations.
9. Define and explain key concepts in differential equations and classify them.
10. Solve basic first-order equations and n-th order linear equations, both homogeneous and non-homogeneous.
11. Understand the vector space formed by solutions and discuss its dimension.
12. Discuss systems of first-order linear differential equations and convert higher-order equations to first-order systems.
13. Find general solutions to first-order linear systems using eigenvalues and eigenvectors.

Class dates with quizzes and tests are shown below. These dates are unlikely to change. The details of what will be covered during other classes will be filled out as the class progresses.

Tentative Schedule:

The weekly course schedule is listed below. In each class, the specified sections of the course book will be covered. Although the calendar is generally like this, there may be minor changes according to the progress.

Monday	Wednesday	Friday
Jan 8th **1** Section 2.1, 2.2	**10th** **2** Section 2.2	**12th** **3** Section 2.3
15th Martin Luther King's Birthday (No Class)	**17th** **4** Section 2.4	**19th** **5** Section 2.5

Monday	Wednesday	Friday
22nd **6** Section 2.6	**24th** **7** Section 2.7	**26th** **8** Section 2.8
29th **9** Section 3.1. 3.2 (briefly)	**31st** **10** Section 3.3	**Feb 2nd** **11** Section 3.3
5th **12** Section 3.4	**7th** **13** Review	**9th** **14** **Midterm 1**
12th **15** Section 4.1, 4.2	**14th** **16** Section 4.2, 4.3	**16th** **17** Section 4.3
19th President's Day (No Class)	**21st** **18** Section 4.4	**23rd** **19** Section 4.5
26th **20** Section 4.6	**28th** **21** Section 4.7	**Mar 1st** **22** Section 4.8, Section 4.9
4th **23** Section 4.10	**6th** **24** Section 6.1	**8th** **25** Section 6.2, 6.3
11th Spring Recess (No Class)	**13th** Spring Recess (No Class)	**15th** Spring Recess (No Class)
18th **26** Section 6.4	**20th** **27** Section 6.5	**22nd** **28** Review
25th **29** **Midterm 2**	**27th** **30** Section 7.1	**29th** **31** Section 7.1, 7.2
Apr 1st **32** Section 7.3	**3rd** **33** Section 7.4, 7.5	**5th** **34** Section 7.6
8th **35** Section 1.2	**10th** **36** Section 1.6	**12th** **37** Section 8.1
15th **38** Section 8.2	**17th** **39** Section 8.3	**19th** **40** Section 8.4
22nd **41** Section 9.1	**24th** **42** Section 9.2, 9.3	**26th** **43** Review

Important Links

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

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

- Office of Student Accessibility Services - (213) 740-0776

  osas.usc.edu

  Support and accommodations for students with disabilities. Services include assistance in providing readers/note-takers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

- Relationship & Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call

  studenthealth.usc.edu/sexual-assault

  Free & 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

  equity.usc.edu, 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.

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

  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

  diversity.usc.edu

  Info 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, 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

  Non-emergency assistance or information.