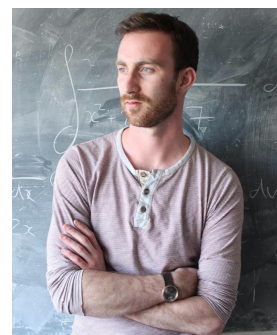# Alexander Paulin

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me │ research │ teaching │ CV

Linear Algebra and Differential Equations 54 (002 LEC) Spring 2018

Lectures: MWF, 11am-12pm, [Wheeler Hall Auditorium](#).
Office hours : MWF 2pm-4pm, TT 3pm-5pm, [796 Evans Hall](#).
Discussion sections: Three, one hour sessions each week on MWF. Here is a [link](#) with further details. You may only attend the discussion section for which you are enrolled. Here is a [link](#) to GSI office hours. You may attend any office hour your please.
Enrollment: For question about enrollment contact [Thomas Brown](#).

Announcements

(1/12)
Welcome to Math 54! This fantastic course is an introduction to linear algebra and its applications to differential equations. At first glance linear algebra is just about solving systems of linear equations. However, after digging a little deeper, we'll discover a rich new language which will be applicable across all mathematical disciplines. This is something of a watershed course, opening up a whole branch of mathematics. It's going to be great!

(1/12)
Everything related to the course will be on this website. We will not be using bCourses. There will be weekly homework (posted below) which will be due every Friday in discussion section. In addition to this there will be weekly quizzes. I have office hours everyday of the week so there should always be an opportunity to get my help if you need it. If you can't make any office hours, e-mail me and we'll find another time to meet. In addition to this I will be posting my own lecture notes on this website at the end of each week. You'll be able to link to them directly from the detailed syllabus below. There will also be video recordings of the lectures posted at the end of Monday, Wednesday and Friday. Again you'll be able to link to them directly from the syllabus below.

(1/12)
Discussion sections will begin on Wednesday the 17th of January.

(1/12)
Make sure to read the [course policy](#) and the detailed syllabus below.

(1/12)
The first homework assignment will be due on Friday of week 2. The first quiz will also be on Friday of week 2.

Textbook

Linear Algebra and Differential Equations (UC Berkeley Custom Edition), 3rd Edition, ISBN: 9781323720868.

This is a combination of two textbooks specifically for this course. These textbooks are

Linear Algebra and its Applications, Lay-Lay-Macdonald, 5th Edition.

Fundamentals of Differential Equations, Nagle-Saff-Snider, 9th Edition

I strongly advise you against buying these textbooks individually. They contain far more material than will be needed and will be substantially more expensive. We've negotiated a reduced price for the custom textbook if you buy it directly from the publisher. Here's the link:

Pearson Textbook Website Enter Username: algebra and Password: berkeley

You an also buy a copy from the Cal Student Store for $95 new.

Resources

The Student Learning Center provides support for this class, including an adjunct course, review sessions for exams, and drop-in tutoring. This is a fantastic resource, I definitely recommend you take advantage of it.

Grading and course policy

Homework	10%
Quizzes	10%
First Midterm	20%
Second Midterm	20%
Final Exam	40%

If the lowest (curved) midterm score is less than the (curved) final score, then it will be replaced by your final score. This grading policy allows you to miss one midterm without serious consequences. For example, if you scored 100% on everything except the second midterm, which you missed, then you would still get an overal score of 100%. You must, however, sit the final exam. **It is your responsibility to make sure you have no schedule conflicts in exam week.** Unless there are truly exceptional circumstances, there will be no make-up exams.

For more detailed information make sure to read the course policy.

Homework

Homework assignments are due on Friday each week in section. They will be posted here along with solutions. Your two lowest homework scores will be dropped. For more detailed information see the course policy.

Homework 1 and Solutions 1

Homework 2 and Solutions 2

Homework 3 and Solutions 3

Homework 4 and Solutions 4

Homework 5 and Solutions 5

Homework 6 and Solutions 6

Homework 7

Homework 8

Quizzes

Quizzes will take place roughly every week in the Friday discussion section. They will last about 15 minutes and be variations of homework questions for that week. Your two lowest scores will be dropped from your grade. Here is the quiz schedule:

Quiz	When
1	Week 2

2	Week 3
3	Week 6
4	Week 7
5	Week 8
6	Week 9
7	Week 13
8	Week 14
9	Week 15

For more detailed information see the [course policy](#)

Exams

There will be two midterms, the first on **Monday February 12** and the second on **Friday March 23** . The final exam will be on **Tuesday May 8 (7pm - 10pm)**.

For more detailed information see the [course policy](#)

[First Midterm (Practice 1)](#) and [solutions](#), [First Midterm (Practice 2)](#) and [solutions](#), [First Midterm (Practice 3)](#) and [solutions](#)

[Midterm 1 Solutions](#) and [statistics](#).

[Second Midterm (Practice 1)](#) and [solutions](#), [Second Midterm (Practice 2)](#) and [solutions](#), [Second Midterm (Practice 3)](#) and [solutions](#)

Syllabus and Schedule

Here is the lecture schedule for the course. Given the huge quantity of material we'll be covering, it may be subject to minor changes. This is where I will post links to my own lecture notes and videos.

When	What	Where
Week 1 (1/17 - 1/19)	[Systems of Linear Equations and Row Reduction](#) ([video](#))	1.1, 1.2
Week 2 (1/22 - 1/26)	[Vectors in Rn](#) ([video](#))	1.3
	[Vectors and Existence of Linear System Solutions](#) ([video](#))	1.4, 1.5
	[Vectors and Uniqueness of Linear System Solutions](#) ([video](#))	1.5, 1.7
Week 3 (1/29 - 2/2)	[Linear Transformations from Rn to Rm](#) ([video](#))	1.8, 1.9
	[Linear Transformations and Linear System Solutions](#)([video](#))	1.9
	[Matrix Algebra](#) ([video](#))	2.1
Week 4 (2/5 - 2/9)	[Invertible Matrices](#) ([video](#))	2.2, 2.3
	[Determinants](#) ([video](#))	3.1, 3.2
	[Midterm 1 Review](#) ([video](#))	
	[Vector Spaces and Linear Transformations](#) ([video](#))	4.1
Week 5 (2/12 - 2/16)	Midterm 1 (on 2/12, Up to Determinants)	
	[Subspaces, Kernels and Ranges](#) ([video](#))	4.1, 4.2
	[Spanning, Linear Independence and Dimension](#) ([video](#))	4.1, 4.3, 4.5
Week 6 (2/21 - 2/23)	[Rank and Nullity](#) ([video](#))	4.3, 4.5, 4.6
	[Bases and Coordinate Systems](#) ([video](#))	4.4, 4.7
Week 7 (2/26 - 3/2)	[Eigenvalues and Eigenvectors](#) ([video](#))	5.1, 5.2

	Diagonalization (video)	5.3
Week 8 (3/5 - 3/9)	Matrices and Abstract Linear Transformations (video, examples)	5.4
	Inner Products, Length and Orthogonality (video)	6.1
Week 9 (3/12 - 3/16)	Orthogonal Sets and Matrices (video)	6.2
	Orthogonal Projection (video)	6.3
	The Gram-Schmidt Process	6.4
Week 10 (3/19-3/23)	Inner Product Spaces	6.7
	Midterm 2 Review	
	Midterm 2 (on 3/23)	
Week 11 (3/26 - 3/30)	Spring Break!	
Week 12 (4/2 - 4/6)	Diagonalization of Symmetric Matrices	7.1
	The Singular-Value Decompostion	7.4
Week 13 (4/9 - 4/13)	Linear Second-Order ODEs	4.2, 4.3, 4.4, 4.5, 4.6
Week 14 (4/16 - 4/20)	Systems of Linear ODEs	9.1, 9.4, 9.5, 9.6, 9.7
Week 15 (4/23 - 4/27)	Fourier Series and Applications	10.3, 10.4, 10.5
Week 16 (4/30 - 5/4)	Review	
Week 17 (5/7 - 5/11)	Final Exam (7pm-10pm) on Tuesday 5/8	