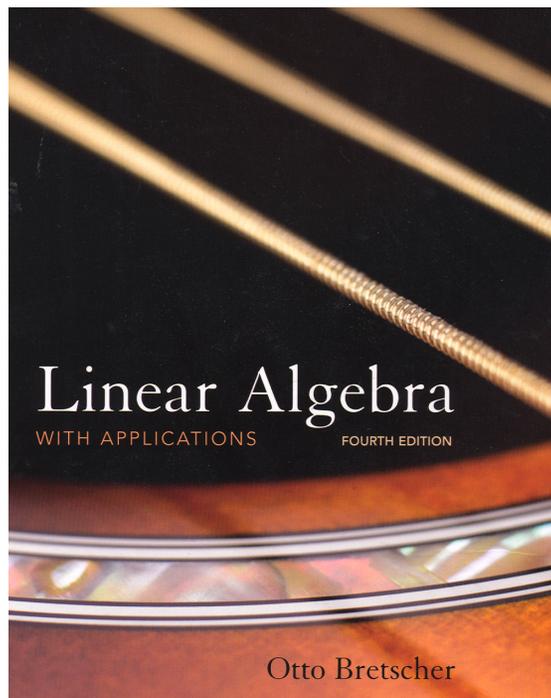




## TEXTBOOK



Book: **Otto Bretscher**, Linear Algebra with Applications, 4th edition 2009, ISBN-13:978-0-13-600926-9. You need the 4th edition for the homework. A student solution manual is optional.



## SECTIONS



Course lectures (except reviews and intro meetings) are taught in sections. Sections: MWF 10,11,12.



## MQC



Mathematics Question Center



## PROBLEM SESSIONS



Run by course assistants



## SECTIONING



START	END	SENT
MO JAN 25	WED JAN 27	FRI JAN 29
7 AM	12 PM	5 PM

More details:

<http://www.math.harvard.edu/sectioning>



## IMPORTANT DATES



INTRO	1.EXAM	2.EXAM
1. SEPT	7. OCT	4. NOV
8:30 AM	7 PM	7 PM
SCB	SCD	SCD



## GRADES



PART	GRADE 1	GRADE 2
1. HOURLY	20	20
2. HOURLY	20	20
HOMEWORK	20	20
LAB	5	
FINAL	35	40

# MATH21B

## SYLLABUS 2010

Linear Algebra and Differential Equations is an introduction to linear algebra, including linear transformations, determinants, eigenvectors, eigenvalues, inner products and linear spaces. As for applications, the course introduces discrete dynamical systems and provides a solid introduction to differential equations, Fourier series as well as some partial differential equations. Other highlights include applications in statistics like Markov chains and data fitting with arbitrary functions.



## PREREQUISITES



Single variable calculus.  
Multivariable like 21a is advantage.



## ORGANIZATION



Course Head: Oliver Knill

[knill@math.harvard.edu](mailto:knill@math.harvard.edu)

SC 434, Tel: (617) 495 5549

# CALENDAR

SU	MO	TU	WE	TH	FR	SA
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	15	16	17
19	20	21	22	23	24	25

# DAY TO DAY SYLLABUS

## 1. Week: Systems of linear equations

Lect 1 9/8 1.1 introduction to linear systems

Lect 2 9/10 1.2 matrices, Gauss-Jordan elimination

## 2. Week: Linear transformations

Lect 3 9/13 1.3 on solutions of linear systems

Lect 4 2/15 2.1 linear transformations and inverses

Lect 5 2/17 2.2 linear transformations in geometry

## 3. Week: Linear subspaces

Lect 6 9/20 2.3 matrix products

Lect 7 9/22 2.4 the inverse

Lect 8 2/24 3.1 image and kernel

## 4. Week: Dimension and coordinate change

Lect 9 9/27 3.2 bases and linear independence

Lect 10 2/29 3.3 dimension

Lect 11 10/1 3.4 change of coordinates

## 5. Week: Orthogonal projections

Lect 12 10/4 4.1 linear spaces

Lect 13 10/6 review for first midterm

Lect 14 10/8 5.1 orthonormal bases projections

## 6. Week: Orthogonality

**Columbus day**

Lect 15 10/13 5.2 Gram-Schmidt and QR

Lect 16 10/15 5.3 orthogonal transformations

## 7. Week: Determinants

Lect 17 10/18 5.4 least squares and data fitting

Lect 18 10/20 6.1 determinants 1

Lect 19 10/22 6.2 determinants 2

## 8. Week: Diagonalization

Lect 20 10/25 7.1-2 eigenvalues

Lect 21 10/27 7.3 eigenvectors

Lect 22 10/29 7.4 diagonalization

## 9. Week: Stability and symmetric matrices

Lect 23 11/1 7.5 complex eigenvalues

Lect 24 11/3 review for second midterm

Lect 25 11/5 7.6 stability

## 10. Week: Differential equations (ODE)

Lect 26 11/8 8.1 symmetric matrices

Lect 27 11/10 9.1 differential equations I

Lect 28 11/12 9.2 differential equations II

## 11. Week: Function spaces

Lect 29 11/15 9.4 nonlinear systems

Lect 30 11/17 4.2 trafos on function spaces

Lect 31 11/19 9.3 inhomogeneous ODE's I

## 12. Week: Inner product spaces

Lect 32 11/22 9.3 inhomogeneous ODE's II

Lect 33 11/24 5.5 inner product spaces

**Thanksgiving**

## 13. Week: Partial differential equations

Lect 34 11/29 Fourier theory I

Lect 35 12/1 Fourier II and PDE's

Lect 36 12/3 Partial differential equations

<http://www.courses.fas.harvard.edu/~math21b>