

MA2330: Introduction to Linear Algebra

(<http://www.math.mtu.edu/kreher/ABOUTME/syllabus/MA2330.html>)

Course description

An introduction to linear algebra and how it can be used, including basic mathematical proofs. Topics include systems of equations, vectors, matrices, orthogonality, subspaces, and the eigenvalue problem. Not open to students with credit in MA2320 or MA2321. Course prerequisite is any math class numbered MA1090 or higher.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring

Pre-Requisite(s): MA 1160 or MA 1161

Text

R.A. Beezer, *A First Course in Linear Algebra*, (Version 2.22)

This is a free electronic book available from Rob Beezer's website: <http://linear.ups.edu/adoption.html>.

It is huge, comprehensive and somewhat unusual in the way it is written but it contains all that we need and the price is right!

I suggest you download the PDF file labeled "For electronic viewing" with file name fcla-electric-2.22.pdf and keep it on your computers just occasionally printing out small portions as you need.

This download is: <http://linear.ups.edu/download/fcla-electric-2.22.pdf>

There are also other formats available for example for, Kindle and sony reader. See:

<http://linear.ups.edu/download.html>.

If you like this free electronic book please consider donating to R.A. Beezer's project:

<http://linear.ups.edu/donate.html>.

Tentative Schedule.

Solving systems of linear equations.

	Date	Topic	Homework	Due
M	Aug 30	SSLE Solving Systems of Linear Equations	Read section WILA: What is Linear Algebra? Read section SET: Sets	
W	Sep 01	Reduced Row-Echelon Form (RREF)	SSLE.C34,C50,M40,M70	Sep 08
F	Sep 03	Types of Solution Sets (TSS)	RREF.C10,C12,C14,T10,T11	Sep 08
M	Sep 06	Labor Day Recess		
W	Sep 08	Free variables (FV)	TSS.C21,C22,C24,C25, M51,M52,M53,M57	Sep 13
F	Sep 10	K-Day Recess		
M	Sep 13	Homogeneous Systems of Equations (HSE)	HSE.C21,C22,C25,C31,M50,M51	Sep 15
W	Sep 15	Nonsingular Matrices (NM)	NM.M51,M52,T10,T30	Sep 17
F	Sep 17	Review		
M	Sep 20	Exam 1		

Vectors, Matrices, Orthogonality and Data fitting.

	Date	Topic	Homework	Due
W	Sep 22	Vector Operations (VO) Linear Combinations (LC)	VO.C15,T5,T18 LC.M10,M11	Sep 24
F	Sep 24	Spanning Sets (SS)	SS.C23,C41,C42,C60,T20	Sep 27
M	Sep 27	Linear Independence (LI)	LI.C20,C32,T10,T12,T20	Sep 29
W	Sep 29	Orthogonality (O)	Handout t.b.a.	Oct 4
F	Oct 01	(O) continued		
M	Oct 04	Matrix Operations (MO) Matrix Multiplication (MM)	MO.C14,M21,M24,M25 MM.C30,C32,T40,T41	Oct 06
W	Oct 06	Matrix Inverses (MISLE,MINM)	MISLE.C16,C23,C42,T10 MINM.T10,T11	Oct 08
F	Oct 08	Data Fitting: Least Squares and Orthogonal Projections	Handout t.b.a.	Oct 13
M	Oct 11	Data Fitting continued		
W	Oct 13	Review		
F	Oct 15	Exam 2		

Vector spaces and dimension.

	Date	Topic	Homework	Due
M	Oct 18	Column and Row Spaces (CRS)	CRS.C20a,C31,T40,T41	Oct 20
W	Oct 20	Four Subsets (FS)	FS.C61,M50	Oct 22
F	Oct 22	Vector Spaces and Subspaces (VS,S)	VS.M12,M15,M20 S.C16,C20,C21,M20	Oct 27
M	Oct 25	(VS,S) continued		
W	Oct 27	Linear Independence and Spanning Sets (LISS)	LISS.C25,C26,C40,C41	Oct 29
F	Oct 29	Bases (B)	LISS.C25,C26,C40,C41 B.C11,C12,C13,C14	Nov 01
M	Nov 01	Dimension (D)	D.C21,C22,C23,C35,C36,M20	Nov 03
W	Nov 03	Finish (D) and Start (PD)		
F	Nov 05	Properties of Dimension (PD)	PD.T15,T20	Nov 08
M	Nov 08	Review		
W	Nov 10	Exam 3		

Eigenvalues and diagonalization

	Date	Topic	Homework	Due
M	Nov 12	Determinants (DM,PDM)	DM.C23,M15 PDM.M30,T20	Nov 15
M	Nov 15	Determinants (DM,PDM)	DM.C23,M15 PDM.M30,T20	Nov 18
W	Nov 18	Eigenvalues and Eigenvectors (EE)	EE.C19,C22,C23,C24,T10s (do first 3 problems by hand)	Nov 20
F	Nov 20	Properties of Eigenvalues and Eigenvectors (PEE)	PEE.T10,T22 (Hint: think about $\langle Uv, Uv \rangle$, where v is an eigenvector of U)	Nov 29
Thanksgiving Recess Nov 22 to Nov 26				
M	Nov 29	Similarity and Diagonalization (SD)	SD.C21,C22,T15,T16	Dec 01
W	Dec 01	Application 1: <i>Difference equations</i>	handout t.b.a.	Dec 02
F	Dec 02	Application 2: <i>Differential equations</i>	handout t.b.a.	Dec 05
M	Dec 05	Review		
W	Dec 08	Exam 4		

Finale.

F	Dec 10	Final Review		
W	Dec 15	Final Exam 3:00pm to 5:00pm		

You are responsible for all of the material in these sections even if it is not presented in class.

Grading

Your grade will be based on 3 out of 4 in class examinations (15% each, lowest exam score dropped) a 2 hour final (45%) and homework exercises (10%).

Some advice

This course in Linear Algebra will likely be your first introduction to abstract axiomatic mathematics. This approach may seem very unfamiliar at first and your performance will depend heavily on how much effort you put into understanding the concepts. At a minimum you should

- Attend all lectures.
- Review each lecture afterwards - aiming for understanding.
- Attempt all exercises by yourself.
- Work through exercise solutions with other students in the class.
- Read the course related material.