

Math 4242, Fall 2016: **Linear Algebra with Applications**

(4 credits)

– Syllabus –

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WARNING! You are reading the syllabus of a class that lies in the past. If you're looking for the current iteration of Math 4707, you are in the wrong place.

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Time & Place

Section 070: MW 14:30–15:45 [Lind Hall 302]

Section 080: MW 17:00–18:15 [Ford Hall B10]

Texts**required:**

I am planning to write lecture notes accompanying the classes:

<http://www.cip.ifi.lmu.de/~grinberg/t/16f/lina.pdf>

The notes will contain at least the (examinable) mathematical material (but probably no applications). Apart from these notes, there will be no required literature.

recommended:

- P. Olver & C. Shakiban, *Applied Linear Algebra*, Prentice Hall, 2006.
This might be the best place to learn about the applications.
- Jim Hefferon, *Linear Algebra*, 2016. (Scroll down to “The next edition” on <http://joshua.smcvt.edu/linearalgebra/>.)
Free text which does many things very well. The main drawback is that it lacks the theory of bilinear forms.
- Isaiah Lankham, Bruno Nachtergaele, Anne Schilling, *Linear Algebra As an Introduction to Abstract Mathematics*, 2016. (Download from https://www.math.ucdavis.edu/~anne/linear_algebra/mat67_course_notes.pdf.)
An introductory text that appears to do the abstract side (vector spaces, linear maps) early on and in some detail.
- Sergei Treil, *Linear Algebra Done Wrong*, 2015. (Download from <https://www.math.brown.edu/~treil/papers/LADW/book.pdf>.)
Another free text focussing on the more analytic side. This one requires some more mathematical maturity from the reader.

These are all fairly new sources, and some might be currently under revision. For any unclarities with and questions about these texts, consult me (dgrinber@umn.edu) or the authors (or both).

Office Hours (these have changed!)

Tuesday 13:00–16:00, in my office (Vincent Hall 203B).

Thursday 10:00–13:00, in my office (Vincent Hall 203B).

Contact

All material regarding the course (including homeworks) can be found on my homepage <http://www.cip.ifi.lmu.de/~grinberg/t/16f/>. Best way to reach me is email to dgrinber@umn.edu.

Schedule (EXTREMELY preliminary)

So far, this is mostly stolen from Arnd Scheel's Fall 2015 class. This will be reworked so heavily that I would suggest viewing it as a placeholder so far.

Sections are in Olver/Shakiban, although (as I said) the book is not actually required.

week	material	sections
7 Sep	\mathbb{Q} , \mathbb{R} , \mathbb{C} , $\overline{\mathbb{Q}}$, Gauss elimination	1.2–1.4
12 Sep	Inverses, linear systems, determinants	1.5–1.9 (no 1.7)
19 Sep	Vector spaces, span, bases, dimension	2.1–2.4
26 Sep	Kernel, range, solvability	2.5
3 Oct	Midterm I	
10 Oct	Bilinear forms, inner products, Cholesky	3.1–3.5 (no 3.3)
17 Oct	Quadratic optimization, least squares	4.2–4.3
24 Oct	Orthogonal bases and matrices, Gram-Schmidt	5.1–5.3
31 Oct	Orthogonal polynomials and projections	5.4–5.7
7 Nov	Midterm II	
14 Nov	Linear maps	7.1–7.3
21 Nov	Eigenvalues, diagonalization	8.1–8.3, 9.1
28 Nov	Symmetric matrices, singular values, Jordan form	8.4–8.6
5 Dec	Linear iteration, Markov chains, iterative solvers, QR	10.1, 10.4–10.6
12 Dec	Midterm III	

Workload and grading

The grade will be computed based on three midterms (totalling to 70% of the final grade) and between 9 and 12 homework sets (totalling to 30% of the final grade, but the two lowest scores will be dropped).

Collaboration on homework is allowed, as long as:

- you **write** up the solutions autonomously and in your own words (in particular, this means that you have to **understand** them), and

- you **list the names of your collaborators** (there will be no penalties for collaboration, so you don't lose anything doing this!).

On the midterms, of course, you have to work alone. You can bring a calculator, recommended books and notes (including your own notes) to the exam.

Homework should be submitted either in person during class, or by email to dgrinber@umn.edu. Calculators and computer algebra systems may be used, but are not necessary (and you are responsible for any errors they make, or you make at using them).

Exams can be missed in "force majeure" situations (illness, jury duty, etc.), but you should notify me of these as early as possible. Late homework is not accepted in any situation; instead, submit whatever you have done and keep in mind that the 2 lowest pset scores will be dropped.

See also the following university policies:

- <https://policy.umn.edu/education/gradingtranscripts>
- <https://policy.umn.edu/research/academicmisconduct>