

Math 369, Section 2, MWF 12:10, Room E104

Lecturer: Alexander Hulpke, Weber 217

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Textbooks: M369 is a course that has a wide audience, from pure mathematicians over physicists to engineers. The topics of the course cover both theory and practical applications. I still have to find a book that covers both aspects equally well and therefore have decided on two books (which in addition have the advantage of being very competitively priced):

- Sheldon Axler, *Linear Algebra done Right*, 2nd ed., Springer, 1997, ISBN 0387982582.
- Seymour Lipschutz, Marc Lipson: *Schaum's Outline of Linear Algebra*, McGraw-Hill, ISBN 0071362002

The first book contains the theory in compact and concise form. The second book is essentially a collection of worked out examples (though be aware that it does not excel in typos).

I do not require you to buy either book, but I suggest you have a look at both.

Topics and Prerequisites

The lectures will not follow either book slavishly, but I will during the lectures try to refer to the sections that correspond to the material covered. Below you find a list of topics I plan to cover with a rough correspondence to chapters in Axler's book.

The course assumes that you have taken M229 (or something equivalently). This means you can solve systems of linear equations, know matrix arithmetic and can calculate eigenvectors of a small matrix.

While the other section of M369 is likely to cover similar topics, the sections are not coordinated and there is no guarantee that both sections cover the same material at the same time.

Attendance and Workload

As you are grown up I don't want to start with issues such as taking attendance. However this does **not** mean that you can safely skip lectures. There will be material that differs from

(or is in addition to) the book(s). If you have to miss a lecture it is your responsibility to catch up with the material missed (such as copying notes from a friend).

You will likely need time to go through the material covered in the course – I would expect that in average you will spend 5-6 hours per week outside lectures to go through your notes and to do the homework problems.

email

The only email address of you that I have (and that might be used in case of a general announcement) is the one listed for you by the university. If you do not use email on Holly,Lamar etc. please update the address you use with the university. (This is also advisable as the university sends many documents by email only.)

Homework

Homework will be handed out every monday in the lecture, and is (usually) due at the start of the lecture of the wednesday of the following week. Not doing homework is the easiest way to fail the course. Start doing the homework problems on Thursday or Friday the week before, don't leave it till Tuesday afternoon.

Late homework will be accepted only if the delay is due to reasons beyond your control. If you know in advance that there will be difficulties, let me know **before** the due date.

Each ordinary homework problem is worth one point.

I encourage you to study and to discuss homework problems with fellow students. However you should strive to write up the solution on your own – only this is a confirmation that you understood the problem (and that you will be able to succeed in midterms and final).

Because of time restrictions, only few of the problems can be treated in class, but I'm happy to go through any problems during office hours.

Material handed out will be also posted on the course webpages and remaining sheets will be near my office door.

Exams

There will be two midterms on February 17 and April 5 at the usually class time, as well as a final on May 8, at 1:30pm. Exam problems will be of a similar style as homework problems. Let me know soon if there are collisions with exams in other courses.

You may use a calculator, but explanation of the steps will be a crucial part of a solution.

Grades

will be based on homework (40%), midterms (20% each) and final (20%). (This implies in particular, that it will be extremely hard to get a good grade if homework is not submitted regularly!) Grades will be given on a linear scale with about 50% corresponding to D and 90% to A. I will calculate actual grades only at the end of the course. If you want to estimate your grade during the semester you can use the following formula:

$$r = 40 \frac{\text{Your Homework points}}{\text{Total Homework points so far}} + 20 \frac{\text{Your Midterm 1 points}}{\text{Total Midterm 1 points}} \\ + 20 \frac{\text{Your Midterm 2 points}}{\text{Total Midterm 2 points}} + 20 \frac{\text{Your Final points}}{\text{Total Final points}}$$

r	-49	50 – 59	60 – 73	74 – 88	89 –
	<i>F</i>	<i>D</i>	<i>C</i>	<i>B</i>	<i>A</i>

The grades will be given with + and - (apart from C- and D+,F+).

I expect to see you regularly in class and to regularly hand in solutions to the homework problems.

For privacy reasons the university does not permit open posting of grade information. Because of this, grades for the final, as well as overall grades will be posted in WebCT. (Log into WebCT and select the M369 course.) WebCT will not be used for any other purposes, in particular the discussion/email tools in WebCT will not be used.

I wish you success with this course and all the best for the coming semester.

Topics

The following is a rough list of topics I plan to cover, together with corresponding sections in Axler's book. This list is not set in stone, relevant as exam topics is the material as covered in class.

Topic	Chapter in Axler
Vector Spaces and Subspaces	1.1
Examples	
Properties of Vector Spaces	1.3
Subspaces	1.4
Span and Linear Independence	2.1
Basis	2.2
Coefficients and Base Change	-
Dimension	2.3
Spaces associated to a Matrix / Rank	-
Linear Transformations	3.1
Midterm 1	
Matrix Representation	3.3
Similarity	-
Eigenvectors	5
Diagonalization	5.4
Invariant subspaces	5.1
Spring Break	
Inner Products	6.1
Orthogonality and Projections	6.4
LeastSquares	-
Orthonormality	6.3
Midterm 2	
Self-Adjoint and normal operators	7.1, 7.2
Singular Value Decomposition	7.6
Applications	-
Jordan Canonical Form	8.6
Applications: Differential Equations, Markov Chains, PageRank	-
Review	