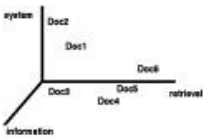
"Mathematics is 98% Linear Algebra"
– Jeff Fox, Ph.D., University of Colorado

Math 206: Linear Algebra



Spring, 2013
Monday, Wednesday, & Friday 8:15 – 9:20 a.m.
Bullock Science Center 112W

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Office: Buttrick 329
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"Office" Hours. Monday and Wednesday, 10:30-11:30 in this room, Tuesday, 11:00-12:00 in my office. If your schedule does not permit you to come at these times, we can set up an appointment.

Course Information

Text. *Linear Algebra and its Applications,* 3rd edition, by David C. Lay.

Course Content. Chapters 1-7 of the text. Topics include matrices, systems of linear equations, determinants, vectors, vector spaces, higher-dimensional geometry, linear transformations, inner product spaces, eigenvalues and eigenvectors, diagonalization, and applications.

What is "Linear Algebra"? It is exactly what the name suggests. Simply put, it is the algebra of systems of linear equations. While you could solve a system of, say, five linear equations and five unknowns, it might not take a finite amount of time. With linear algebra we develop techniques to solve *m* linear equations and *n* unknowns, or show when no solutions exist. We can even talk about situations where an infinite number of solutions exist, and describe them geometrically.

Big deal, you say? You'd be surprised. As the quote at the top of this syllabus explains, much of mathematics uses linear algebra, either directly or indirectly. For example, each of the following mathematics topics uses linear algebra to some degree:

- Abstract Algebra
- Algebra (the regular kind)
- Analytic Geometry
- Calculus
- Chaos Theory
- Cryptography
- Differential Equations
- Fractal Geometry
- Game Theory
- Graph Theory
- Linear Programming
- Operations Research

In addition, we also get to do some cool things, like do geometry in 4, 5, or even 31-dimensional space!

Aside from being useful to mathematicians, there are plenty of applications of linear algebra to other fields, for example aerodynamics, anatomy, business, chemistry, electrical engineering economics, forest management, genetics, image processing, physics, population dynamics, and robotics. Hey, those forests don't manage themselves…

Course Goals. By the end of the semester, you should:

- Perform linear algebra calculations.
- Develop an understanding of the philosophy behind higher dimensional mathematics.
- Have a working familiarity with and an appreciation of *Maple*.

Attendance. You are expected to attend every class. Missing class days does not have a direct impact on your grade; however it will have an indirect impact on your grade. Trust me. Also, you will not be penalized directly for tardiness, however you are expected to arrive to each class on time, and assignments are due *in class* at the start of the class.

Moodle. As you've already discovered, this class has a site on Moodle. Congratulations.

Course Evaluations. The completion of course evaluations is an expectation of students in this class. Near the end of the semester you will be notified by e- mail and provided with a link to follow to complete the evaluations on line outside of class. Your feedback on the course is extremely valuable. You are responsible for completing an evaluation of the course at the end of the semester.

Homework. Each night, there will be homework problems assigned from the sections covered during the lecture. They will consist (primarily) of odd problems from the book, so you can check your answers in the back. This homework will not be collected, but it is assumed that it will be completed by the start of the next class. You are encouraged to work with other people in the class to solve problems. F**ailure to do the daily problems will indirectly and significantly affect your grade.** I Promise.

Assessment

Here's how you'll be graded. A simple rule to remember is

every Wednesday you will earn a grade.

Each grade will be in the form of a problem assignment, a project, or an exam.

Assignments. These one-problem (often multi-part) assignments are designed to help you think more deeply about material. As a word of warning, the assignments do not fully cover the scope of the class, and you should not use them as a substitute for daily homework assignments. Assignments are due *in class* by the start of class on the day indicated at the top of the problem set. Late assignments will not be accepted. These problems are available on Moodle.

You are encouraged to discuss these assignments with the others in the class, but *your write-up must be your own*. If you have any questions about this policy, please let me know.

Projects. In addition, there will be three projects (and an additional worksheet) that use the computer algebra package *Maple*. *Maple* is a piece of software (installed on all of the school's public computers) that does a lot of the more tedious matrix calculations. You do not need to know how Maple works – yet. The purpose of these projects is to shift the focus from calculation to analysis. We will use Maple to do some nice applications of linear algebra. For the projects, you are allowed – and encouraged – to work with a classmate. You will turn in each project by upload it (once) to Moodle – no printouts will be accepted. Projects will also be returned via Moodle, leaving you free to waste paper on your own time.

Exams. You will have three in-class exams. They are scheduled for February 20, March 20, and April 24. The exams are closed-book and closed-notes; open-calculator is OK. The exams will cover material from the text, along with material presented in class. *While each exam is scheduled from 8:15-9:20, you may start taking it as early as 7:30 am if you feel that time will be an issue*[1].

Final Exam. The final exam is cumulative, although there will be more of the material since Exam #3 for obvious reasons. It will be self-scheduled, like most of the exams at Agnes Scott College. The same rules apply as with the other exams: you can use your calculator, pencil, exam, and the hand you use to write. Please refrain for experimenting with using your other hand to write. You do not need to take it on a Wednesday, although that would create awesome symmetry.

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[1] Please do not confuse this with "The current issue of Time®".

ACADEMIC HONESTY

The Agnes Scott College honor code embodies an ideal of character, conduct, and citizenship, and is an important part of the College's mission and core identity. This applies especially to academic honesty and integrity. Passing off someone else's work as your own represents intellectual fraud and theft, and violates the core values of our academic community. To be honorable, you should understand not only what counts as academic dishonesty, but also how to avoid engaging in these practices. You should:

- review this course syllabus for the professor's expectations regarding course work and class attendance.
- attribute all ideas taken from other sources; this shows respect for other scholars. Plagiarism can include portraying another's work or ideas as your own, buying a paper online and turning it in as if it were your own work, or not citing or improperly citing references on a reference page or within the text of a paper.
- not falsify or create data and resources or alter a graded work without the prior consent of your professor. This includes making up a reference for a works cited page or making up statistics or facts for academic work.
- not allow another party to do your work/exam, or submit the same or similar work in more than one course without permission from the course instructors. Cheating also includes taking an exam for another person, looking on another person's exam for answers, using exams from previous classes without permission, or bringing and using unauthorized notes or resources (i.e., electronic, written, or otherwise) during an exam.
- not facilitate cheating, which can happen when you help another student complete a take home exam, give answers to an exam, talk about an exam with a student who has not taken it, or collaborate with others on work that is supposed to be completed independently.
- be truthful about the submission of work, which includes the time of submission and the place of submission (e.g., e-mail, online, in a mailbox, to an office, etc.).

You should understand that penalties result from dishonest conduct, ranging from failure of the assignment to expulsion from the college. You should speak with me if you need clarification about any of these policies.

Grade Information

The assignments are worth 20% of your grade, as are the projects. The in-class exams are 40%, and the final exam is 20%. There will be no scaling.

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
92 - ∞	90 - 91	88 - 89	82 - 87	80 - 81	78 – 79	72 - 77	70 - 71	68 - 69	62 - 67	60 - 61	- ∞ - 59

Tentative Schedule

Intervals represent odd problems only, for example "1-21" = "1, 3, 5, …, 21".

Date	Section(s)	Exercises/Comments
Wed Jan 16	1.1	p. 11: 1-21, 25-33, 34
Fri Jan 18	1.2	p. 25: 1-19, 23-31
Mon Jan 21		**Martin Luther King, Jr. Day**
Wed Jan 23	1.3	p. 37: 1-21, 27, 29, 33
Fri Jan 25	1.4, 1.5	p. 47: 1-21, 25, 29, 33-39; p. 55: 1-13, 17-21, 25, 27, 33-39
Mon Jan 28	1.6	p. 63: 1-9
Wed Jan 30	1.7	p. 71: 1-19, 23, 27, 31, 39
Fri Feb 1	1.8, 1.9	p. 79: 1-19, 25-35; p. 83: 1-21, 25-31, 35
Mon Feb 4	1.10	p. 99: 1, 3, 9, 11
Wed Feb 6	2.1	p. 116: 1, 3, 7-11, 19, 23-27, 31
Fri Feb 8	2.2	p. 126: 1-7, 8, 11-19, 23, 24, 25, 29, 31
Mon Feb 11	2.3	p. 132: 1-7, 13, 15, 19-35
Wed Feb 13	2.6	p. 156: 1-9
Fri Feb 15	3.1	p. 190: 1-37
Mon Feb 18	3.2	p. 198: 1-25, 29-43
Wed Feb 20		**Exam 1: Chapters 1&2**
Fri Feb 22	4.1	p. 223: 1-21, 23-31
Mon Feb 25	4.2	p. 234: 1-23, 27, 31-35
Wed Feb 27	4.3	p. 243: 1-15, 19, 23-29, 33
Fri Mar 1	4.4	p. 253: 1-13, 17, 21, 23, 24, 25, 27-31
Mon Mar 4	4.5	p. 260: 1-17, 21-27
Wed Mar 6	4.6	p. 269: 1-15, 19-27
Fri Mar 8	4.7	p. 276: 1-9, 13
Mon Mar 11 ↓ Fri Mar 15		**Spring Break**
Mon Mar 18	5.1	p. 308: 1-19, 25, 29, 31, 35
Wed Mar 20		**Exam 2: Chapters 3 & 4**
Fri Mar 22	5.2	p. 317: 1-19
Mon Mar 25	5.3	p. 325: 1-19, 23-27, 31
Wed Mar 27	5.4	p. 333: 1-25, 29, 31
Fri Mar 29		**Easter Break**
Mon Apr 1	5.8	p. 368: 1-5, 11, 21
Wed Apr 3	6.1	p. 382: 1-17, 21-31
Fri Apr 5	6.2	p. 392: 1-21, 27-33
Mon Apr 8	6.3	p. 400: 1-19, 23
Wed Apr 10	6.4	p. 407: 1-15
Fri Apr 12	6.5	p. 416: 1-15, 23, 25
Mon Apr 15	6.6	p. 425: 1-5, 9
Wed Apr 17	6.7	p. 435: 1-15, 19-25
Fri Apr 19	6.8	p. 443: 1-13
Mon Apr 22	7.1	p. 454: 1-23, 27-31, 35
Wed Apr 24		**Exam 3: Chapters 5 & 6**
Fri Apr 26	7.2	p. 432: 1-13, 19, 23, 24, 27; p.470: 1-11
Mon Apr 29	7.3	p. 470: 1-11
Final Exam: May 2-7 (Seniors), May 3-8 (Rest of You)		