Math 253A: Linear Algebra
Olin 234   MWF 12 - 12:50
Colby College   Fall 2008

"Hating linear algebra is like hating air." – Daryl Cooper

Professor:	Scott Taylor
Office Hours:	MWF 1 – 3 PM
	And by appointment!
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Prerequisites:	Math 102, 121, 131, or 161 (i.e. Calculus I)
Text:	<u>Linear Algebra with Applications 3/e</u>
	by Otto Bretscher

Major Course Objectives:

- Develop ability to think algebraically and geometrically

- Develop ability to communicate mathematically

- Use matrix methods to solve systems of linear equations

- Add and multiply two matrices, invert a non-singular matrix, and calculate the determinant of a matrix.

- Know and use the definitions of *linear transformation*, *vector space*, *basis*, *orthogonal*, *eigenvector*, *eigenvalue*, *determinant*, *quadratic form*.

- Write down a matrix representation of a linear transformation with respect to a given basis.

- Compute the image and kernel of a linear transformation.

- Use the Gram-Schmidt process to find orthonormal bases for euclidean spaces.

- Determine if a linear transformation is invertible.

- Find eigenvalues and eigenvectors of a linear transformation and understand their geometric significance.

- Apply the techniques of linear algebra to solve a variety of applications modelled on real-world problems.

- Use Maple to solve linear algebra problems.

Attendance: I value your involvement in the class, therefore class attendance is mandatory. You are allowed 3 unexcused absences. Excused absences may be granted for official Colby activities, major religious holidays, illness (with a note from the doctor or health center), and personal tragedy (eg. death of a family member). You should, however, make every effort to attend class. Absence for official Colby activities requires prior approval. Absence for religious reasons will be considered "excused" if the policy in the college catalogue is followed. More than 3 unexcused absences will result in the reduction by 1/3 of the final course grade. Excessive tardiness or early departure may also result in such a reduction.

Calculators/Computers: You are encouraged to bring a calculator to class. Ideally, it would be a graphing calculator that can perform matrix computations, but this is not necessary. You may use such a calculator on homework (but you must still show all the important steps). On quizzes and exams you may not use a graphing calculator or computer – only a simple scientific calculator may be used to perform arithmetic. Occasionally, homework and in-class projects will require the use of Maple. There is no need to purchase a copy of Maple for yourself. It is installed on computers in several of the labs and you may obtain a free version for your personal use. More information will be given on this later.

Evaluation: The numerical course grade will be a weighted average of the cumulative grades with weightings as follows:

15% Homework	15% Exam 1
5% In-class projects	15% Exam 2
10% Final Project	20% Quizzes
	20% Final Exam

However, *earning fewer than 50% of the points on the final exam will result in a course grade of* "F".

Course letter grades will be assigned (subject to above caveat) according to the following scale. Any curve will be determined at the end of the course, according to the discretion of the instructor.

93 - 100 % A	73 - 77 % C
90 - 93 % A-	70 - 73 % C-
87 - 90 % B+	67 - 70 % D+
83 - 87 % B	63 - 67 % D
80 - 83 % B-	60 - 63 % D-
77 - 80 % C+	below 60 % F

Quizzes: A quiz will be given every Monday (except for holidays). Quizzes are an important component of your grade and you should consider them as an exam which is spread out over the course of the semester – in other words, study for them! Typically they will consist of one or two questions and should take about 10 minutes. If you miss a quiz because of either an excused or unexcused absence you may make it up the next time you attend class. It is your responsibility to let me know that you wish to make up the quiz. Your lowest quiz score will be dropped from the computation of your average quiz score at the end of the semester.

Homework: Homework is probably the most important part of this course – it's when you get to put into practice the concepts you've played with during class. Some of the homework questions may require you to read the chapter or to explore some topic which we didn't discuss in class. The purpose of such questions is to help you develop the ability to read and learn mathematics on your own. If you go into a mathematical or scientific career, there will undoubtedly be times when you need to teach yourself some mathematics. If, *however*, all the homework problems fall into this category, you should check to make sure that you are working on the correct assignment.

Homework will always be due on Fridays (barring special circumstances and except for the last homework) and will always be posted on the course webpage. You are responsible for checking the webpage. If no homework assignment is posted, you should refresh the webpage on your browser and, if that doesn't work, email me to let me know. In the special circumstance that there is no new homework the webpage will make note of that. If you will not be in class on the Friday that homework is due you should arrange to turn it in at my office or to have a friend bring it to class. Late homework may be penalized.

You should start the homework early, some problems will require multiple attempts and careful thought. If you are having substantial difficulty with a particular problem or the entire homework set you should email me or come to office hours. I am eager to help you!

You are encouraged to work with a partner on the homework, but **all work should be your own**. In other words, you may discuss particular problems but you may not copy someone else's solution. Doing so violates academic honesty. As the course progresses, the question of how much work to show will arise. I encourage you to use common sense. If the problem is testing your ability to row reduce a matrix, you need to show each row operation, but you don't need to show the arithmetic. If the problem is testing a more advanced concept you probably don't need to show the steps of row reduction. In general, **your work is your answer**. Ie. It is possible for someone to obtain a correct answer but to not receive full credit because their work is incorrect. Conversely, (almost entirely) correct work with an incorrect answer may receive full credit.

Homework must be very neat. This means: no messy scratchwork, no cramped writing, no huge eraser marks. Multiple pages should be stapled and the problems should be in order with section and problem number clearly indicated. If these guidelines are not followed you may be penalized. If you are incapable of writing neatly, you should type your solutions.

Exams: In addition to the quizzes, there will be two in-class exams and a final exam. Each exam is cumulative, although the final exam is "more cumulative". Exams will be designed to test your understanding of the course material, not just your computational abilities. You must understand, and communicate, the material. Graphing calculators, computers, textbooks, notes, and other people may not be used on the exam.

The final exam is during exam period 11 on **Saturday, December 13** at **12:30 PM**. It may not be rescheduled for personal convenience (including airline reservations).

Projects: There will be several in-class projects which will be completed in small groups. Additionally, there is a final project which also will be completed in a team of no more than 3 people and no fewer than 2 people. Teams may be assigned. The final project will allow you to explore either the application of linear algebra to some field outside mathematics or some more advanced ideas from linear algebra. More information will be distributed later.

Tentative Schedule:

Class	Day	Date	Section	Comments
1	Wed.	Sept. 3	1.1	
2	Fri.	Sept. 5	1.2	HW 1 due
3	Mon.	Sept. 8	1.3	Quiz 1
4	Wed.	Sept. 10		
5	Fri.	Sept. 12	2.1	HW 2 due
6	Mon.	Sept. 15	2.2	Quiz 2
7	Wed.	Sept. 17	2.3	
8	Fri.	Sept. 19	2.4	HW 3 due
9	Mon.	Sept. 22		Quiz 3
10	Wed.	Sept. 24	3.1	
11	Fri.	Sept. 26	3.2	HW 4 due
12	Mon.	Sept. 29		Quiz 4
13	Wed.	Oct. 1	3.3	
14	Fri.	Oct. 3	3.4	HW 5 due
15	Mon.	Oct. 6		
16	Wed.	Oct. 8		Quiz 5, Review for Exam 1
17	Fri.	Oct. 10		HW 6 due, **Exam 1**
	Mon.	Oct. 13		**Fall Break**
18	Wed.	Oct. 15	4.1	
19	Fri.	Oct. 17	4.2	HW 7 due
20	Mon.	Oct. 20		Quiz 6
21	Wed.	Oct. 22	4.3	
22	Fri.	Oct. 24		HW 8 due
23	Mon.	Oct. 27	5.1	Quiz 7
24	Wed.	Oct. 29	5.2	
25	Fri.	Oct. 31		HW 9 due
26	Mon.	Nov. 3	5.4	Quiz 8

27	Wed.	Nov. 5	6.1 and 6.2	
28	Fri.	Nov. 7		HW 10 due
29	Mon.	Nov. 10		Quiz 9, Review for Exam 2
30	Wed.	Nov. 12		**Exam 2**
31	Fri.	Nov. 14	7.1 – 7.2	HW 11 due
32	Mon.	Nov. 17	7.2 – 7.3	Quiz 10
33	Wed.	Nov. 19	7.4	
34	Fri.	Nov. 21		Project Presentations; HW 12 due
35	Mon.	Nov. 24		Project Presentations
	Wed.	Nov. 26		**Happy**
	Fri.	Nov. 28		**Thanksgiving!**
36	Mon.	Dec. 1		Quiz 12, **HW 12 due**
37	Wed.	Dec. 3		Review for Final Exam
38	Fri.	Dec. 5		Review for Final Exam
	Saturday	**Dec. 13**	**12:30 PM**	**Semester Exam**