Syllabus
Linear Methods
Math 107, section 1, CRN 10359
Spring 2010

Instructor:	Eric Gottlieb	**Meeting Place:**	207 Kennedy
Office:	317 Ohlendorf	**Meeting Time:**	TR 8:00 – 9:15
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Office Hours:	MWF 1 – 2		
	TR 11 – 12		

Course description: Linear algebra is a set of powerful techniques with applications to many problems that arise in human endeavors. We will study some methods that have been developed to address these problems and examine some of their theoretical foundations. The problems and examples we will consider come from subjects like business, economics, and politics. We will use Excel from time to time.

We will begin with a brief review of (systems of) linear equations. We will learn how to solve linear systems using Gauss-Jordan elimination. We will discuss matrix algebra with applications to input-output analysis and Markov processes. Input-output analysis is used to determine how interdependent producers should behave. Markov processes are used to predict long term values of interdependent quantities that vary probabilistically.

Next, we will talk about linear programming (LP) problems. An LP problem is one in which you seek to maximize some linear function, such as profit, subject to certain linear constraints, such as budgetary or workforce limitations. You will learn to solve LP problems geometrically, using the simplex method, and by computer.

Integer and 0-1 programming problems, which are closely related to LP problems, are too labor-intensive to solve by hand. We will learn how to solve them using Excel. We will touch briefly on the subject of computational complexity.

We will conclude with a look at game theory, the study of strategic interactions between competing interests. We will explore the connection between game theory and LP problems.

Material to be covered, in chronological order, includes Chapter 2 (systems of linear equations, matrix algebra, Gauss-Jordan elimination, and input-output analysis), Chapter 8 (Markov processes), Chapter 3 (a geometric approach to LP), Chapter 4 (an algebraic/algorithmic approach to LP), and Chapter 9 (game theory). I may augment this material with some notes of my own, most notably on integer and binary programming and on the theoretical foundations of Markov processes.

I will assume that you are familiar with the material covered in sections 1.1 through 1.4. You should review those sections on your own.

In some cases, the methods I teach in class may be different from those in your text. I recommend learning both ways and using the one you like best.

At times, I will ask you to read material on your own. I very much want you to be able to acquire information and understanding independently, and I trust that you are up to the task. Such learning will be supported by Q&A during office hours or, time permitting, in class. Quizzes and exams will cover this material as well as material covered in lecture.

Class participation: I may have you work problems in class to help you solidify your understanding. I will call on you to solve problems. Participation in these activities may be used in deciding borderline grades.

Calculators are permitted on exams. I expect you to perform higher-order tasks (like computing inverses of matrices or solving systems of equations) on your own and to show your work, but you may use your calculator to check your answer.

Homework and quizzes: Homework for each section we cover is given in the attached sheet. I expect you to do the homework, but I will not collect it. I will give around ten short take-home quizzes, tentatively scheduled to be due on 26 January; 2 and 9, and 23 February; 2, 9, and 30 March; and 6, 13, and 27 April. There will usually be two problems on each quiz, and they will come from lecture or the reading or be similar to problems from the homework. For this reason and others, it is in your interest to read the book carefully, to do the homework, and to review your notes.

I reserve the right to give pop quizzes, especially if attendance is low on a given day, but advance notice will usually be given if quiz dates change or if I decide to give additional quizzes. There will be no makeup quizzes, but if you have a compelling and documented reason for missing a quiz, such as illness, athletic or academic travel, or a family emergency, then I may, at my discretion, omit that quiz in computing your average quiz grade.

Projects: There will be two writing projects concerning applications of the material we cover. These problems will be more substantial than those that we consider in class and may require the use of Excel. The projects are intended to help you to recognize linear algebra applications in real-world settings, to familiarize you with a tool for solving them, and to develop your ability to communicate technical concepts in writing. I intend to distribute the projects on Thursday 21 January and Tuesday 23 March and to collect them on Thursday 4 February and Thursday 8 April, but these dates may change (with notice) depending on our progress. Late submissions will be declined or reduced in score at my option.

Exams: There will be three in-class midterm exams and a comprehensive final exam, scheduled as shown below. The dates are firm but the material to be covered depends on our pace. You may take the final at either of the indicated times. Other alternative final exam times may be made available upon request.

Exam	Date	Material to be covered
1	Thursday 11 February	Chapter 2
2	Thursday 11 March	Chapters 8 and 3
3	Thursday 15 April	Chapter 4
Final	Friday 7 May at 1 PM or Friday 7 May at 5:30 PM	Comprehensive with added emphasis on material not covered on earlier exams

How I grade: The score you receive on a quiz, exam, or project is based on my assessment of your understanding, which is determined by the work you show. Therefore, simply producing the right answer does not guarantee a good score. Full credit will be granted when you show all

of your work, when you get the right answer, and when I can read and understand what you have written. Your grade may also suffer if you include extraneous material, use poor grammar, or write so messily that I cannot follow your work.

If the Honor Council finds that a student has committed an Honor Code violation in my class, I reserve the right to give no credit for that assignment. I also reserve the right to fail anyone convicted of an honor code violation in my class.

Attendance is not a formal part of your grade. However, poor attendance often predicts poor performance, so I will take roll. I may use attendance to decide borderline grades. If you miss more than four classes without adequate justification, I may ask the Dean to drop you from the class. If attendance is low on a particular day, I may give a pop quiz. Pop quizzes contribute towards your quiz average in the same way that scheduled quizzes do.

Your final grade is determined as follows:

Midterm Exams:	17% each
Quiz average:	17%
Projects:	5% each
Final Exam:	22%

The letter equivalent of your number grade is determined as follows:

93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	<59
A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

If you get stuck: Students are often reluctant to reveal confusion to their professors. I understand this sentiment, but I hope you won't take such an approach with me. As I see it, you wouldn't be in my class if you already knew the subject. I expect confusion from time to time; it is a natural, perhaps even necessary, part of the learning process. I prefer to see you confused in my office, where I may be able to help, than to see you do poorly on an exam. Seeing you move from confusion to understanding is one of the most satisfying parts of my job.

The moral is, don't be shy! Office hours are best time to see me, but if these are inconvenient, you can stop by any time. I try to keep an open door policy, but I can't guarantee that I will be available outside of office hours. You can contact me by email as well, but I find that the most effective and efficient way to work is face to face. Phone is not a good way to reach me as I do not check my messages often.

I encourage you to study with your fellow students. However, you should do so judiciously. For example, it would be a mistake to study another student's homework solutions and then go away feeling that you are prepared to work similar problems on your own. You must be able to work problems independently, as you will be required to do this on the exams.

The Honor Code: I take the Rhodes Honor Code seriously, and it is diligently enforced in my classes. All graded work must comply with the Rhodes Honor Code. If the Honor Council finds that a student has committed an Honor Code violation in my class, the student will receive no credit for that assignment. I reserve the right to fail anyone convicted of an honor code violation by the Honor Council.