

# Syllabus for Math 221-1, Summer 2015

Introduction to Linear Algebra

MoTuTh 1:00-3:05PM; Performing Arts and Humanities, Room 107

3 Credit Hours

<b>Instructor:</b>	Osman Guler, Professor of Mathematics		
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<b>Office Hours:</b>	MoTuTh 12:15-12:45pm; and by appointment		
<b>Prerequisites:</b>	Math 141, 151, or 380 with a grade of C or better		
<b>Textbook:</b>	Linear Algebra and its Applications, David C. Lay (4th Edition), by Addison-Wesley. You may wish to purchase the "Study Guide" to Lay's book.		
<b>On-line Resources:</b>	You should take advantage of the excellent resources (including review sheets and practice exams) at the course <a href="#">web site</a> .		
<b>Calculators:</b>	No calculators will be allowed in exams. You may, however, use calculators for homework, if you wish.		
<b>Tutoring:</b>	<a href="#">Tutoring is available during the summer; see details at the web site here.</a>		

## Course Contents

The course will cover

Chapter 1:	Sections 1.1-1.2	Tuesday, May 26
Chapter 1:	Sections 1.3-1.4	Thursday, May 28
Chapter 1:	Sections 1.5-1.6	Monday, June 1
Chapter 1:	Sections 1.7-1.8	Tuesday, June 2
Chapter 1:	Sections 1.9-1.10	Thursday, June 4
Chapter 2 :	Sections 2.1-2.2	Monday, June 8
Chapter 2 and 3 :	Sections 2.3-3.1	Tuesday, June 9
Chapter 3:	Sections 3.2-3.3	Thursday, June 11
Chapter 4:	Sections 4.1-4.2	Monday, June 15
Chapter 4:	Sections 4.3-4.4	Tuesday, June 16
Chapter 4:	Sections 4.5-4.6	Thursday, June 18
Chapter 5:	Sections 5.1-5.2	Monday, June 22

Chapter 5 and 6 :	Sections 5.3-6.1	Tuesday, June 23
Chapter 6:	Sections 6.2-6.3	Thursday, June 25
Chapter 6:	Sections 6.4-6.5	Monday, June 29
Final Exam:		Tuesday, June 30

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## **Course Description/Objectives**

Calculus and Linear Algebra are two **cornerstones** of modern mathematics and much else. For example, they are widely used across the physical and biological sciences, engineering, and economics, and computer science. A strong knowledge of Linear Algebra is required to understand the mathematics behind search engines like Google, image and audio formats like JPEG and MP3, quantum mechanics, DNA sequencing, and computer graphics, and regression analysis in statistics, just to name a few applications. Linear Algebra is also needed to solve the differential equations (both ordinary and partial) that model weather systems, biological systems, the stock market, VLSI circuits, econometrics models, operations research, and so on. In Math 221 you will learn the basic material in Linear Algebra that will later enable you to apply Linear Algebra to your chosen field. Mastering the **concepts** of linear algebra is perhaps even more important than learning how to perform linear algebraic **calculations**. The conceptual aspects of the subject become increasingly central as the course progresses.

## **Specific Learning Goals**

- Competence at basic calculations involving matrices and vectors, including the ability to solve low-dimensional linear systems and calculate the rank and inverse of a matrix using Gaussian elimination, calculate eigenvalues and eigenvectors, diagonalize matrices, and construct orthogonal bases using the Gram Schmidt algorithm.
  - Grasp of basic theory including results on the existence of solutions to linear equations, linear independence of vectors, the concept of a linear transformation, the theorem on the inverse of a matrix, determinants, vector spaces and subspaces, nullspaces, column spaces and the rank theorem, bases, characteristic equations and eigenvalues, eigenvectors, geometry of orthogonal projections.
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## **Academic Misconduct**

- I will not tolerate cheating in any form. All instances of cheating I discover will be reported to UMBC's academic integrity committee. (See the link for [Academic Integrity at UMBC](#) for more information.
- In particular, in this course, giving or receiving aid on exams will result in a grade of zero for that exam. Copying of homework solutions from other students in the class, from students who have previously taken this or an equivalent course, from a solutions manual, or from the web will be treated as a serious offense. At a minimum this will result in a grade of zero for that homework. For flagrant cheating on homework I reserve the right to give a grade of zero for the homework.

on which the students was found to have cheated as well as on all homeworks that were turned in prior to the discovery of the offense. Also see comments below in the subsection on Homework.

- Here is a summary of UMBC's official policy on academic misconduct, which I follow closely:

"By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory."

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## **Grading**

### **Grade Policy**

Letter grades in this course will be based on homework assignments, **3 50-minute Tests** and a **2-hour Comprehensive Final Exam**. They will have the following weights:

Test 1:	70/3%	<i>June 8 (Monday)</i>
Test 2:	70/3%	<i>June 15 (Monday)</i>
Test 3:	70/3%	<i>June 22 (Monday)</i>
Comprehensive Final Exam:	30%	<b>July 2, Thursday, 1-3PM? in Performing Arts and Humanities 107.</b>

Letter grades for the course will be based on your total score (**S**) which is the weighted sum of scores of the tests and the comprehensive final exam:

A	$80 < S \leq 100$ ;	B	$70 < S \leq 80$ ;	C	$60 < S \leq 70$ ;
D	$50 < S \leq 60$ ;	F	$0 \leq S \leq 50$		

You are guaranteed the corresponding grade if your score falls in the above ranges. However, the grading system may be changed for the entire class or in individual cases at the discretion of the instructor. In particular, *class attendance and participation* will be taken into account if your grade falls on the borderline between two grades. Also, a *strong showing in the final exam will be rewarded*; it signals to me that you have a solid understanding of the course at the end.

### **Exams**

- Please note that the dates announced above for the midterm exams are **tentative**. You can expect that the actual exam date will be given within a week

of the announced date, and will be announced at least one week in advance. The date of the final exam is fixed, being set by the university.

- A makeup midterm examination will be given only under the *most extraordinary circumstances with written documentation and prior approval from me*. There will be **no** make ups given for the final exam.
  - Please note that the final exam is comprehensive, and thus covers on the whole course!
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## **General Advice on How to Study for the Course**

Please remember that, ultimately, you are responsible for your own learning, and that I am here to *guide you and to give you directions*. Here are some suggestions:

- **The summer semester is about 2.5 as fast as a regular semester.** Therefore, it is imperative that you spend **25 or more hours a week** on this course outside of class time.
  - **Warning! This course gets harder as the semester progresses.** My experience is that student who receive a C on the midterms are in grave danger of getting D/F on the final and in the course.
  - **To do as well as you can, I strongly encourage you to come to see me with specific questions on a regular basis.**
  - **You are expected to read the section we will cover each period ahead of time.**
  - It is very important to keep the main definitions, statements of theorems, and simpler examples on the forefront of your minds throughout the course, since we will refer back to them many times. You will need to digest the material several times to master it - before class, in class, reading through material after class, re-deriving for yourself without any aid results discussed in class, and doing the assigned problems.
  - This is a fast paced course. Do not get behind. Do not miss class. If you miss a class or start to get lost, it will only be a week before you are totally lost. So ask for help from me and from your fellow students immediately!
  - I encourage you to **ask questions** both in and out of class. If you are confused most likely most of your class mates are too! So you'll be doing everyone a favor by asking your question.
  - In class I may call on people by name to answer questions. This is to keep you involved and helps me find out whether you are understanding what's going on. **If you do not feel comfortable being called on in class, please come and talk with me, and we will find another way to actively involve you.**
  - Come and talk with me in my office. Talk math with your fellow students, don't work in isolation.
  - Learn the art of taking good notes. My lectures will often present a somewhat complementary perspective on the subject to that in the textbook.
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