MA210E Linear Algebra

Spring 2004

Syllabus

Instructor:
Dr. Vladimir Riabov
Associate Professor
MA/CS Department
Office: STH-312
Phone: 603-897-8613
E-mail: vriabov@rivier.edu
Web: http://www.rivier.edu/faculty/vriabov/index.htm

Office Hours:
Mondays: 9:30 AM – 11:00 AM; Tuesdays: 3:30 PM – 5:30 PM;
Wednesdays: 9:30 AM – 11:00 AM; Thursdays: 4:30 PM – 6:30 PM

Class Hours:
Thursdays: 6:30 PM – 9:00 PM

Brief Course Description:
MA210 Linear Algebra is an introduction to vector spaces and subspaces, linear dependence and independence, basis and dimension, matrix algebra, solution of equations by matrix reduction, determinants, matrix inversion, linear transformations, eigenvalues, and eigenvectors. The course also includes applications of linear algebra and a proof component in which students learn what is needed in proofs and develop the ability to read and write proofs. Prerequisite: MA112.

Required Text:

Course Objectives:
Students will be given an opportunity:

- To develop understanding of the basic concepts of linear algebra.
- To acquire skills in operations with vectors and matrices.
- To acquire understanding of the nature of mathematical proofs and develop skills for carrying out proofs.
- To practice problem-solving using the apparatus of linear algebra.
- To develop the ability to read mathematical text and acquire skills for independent studies.
- To develop the ability to write clearly and concisely about mathematical ideas.
- To strengthen logical thinking and the ability of operate with mathematical abstractions.

Teaching & Learning Strategies:
The part of most class meetings will be lecture, but all students are encouraged to interact with me by asking questions and contributing ideas. Examples and hands-on activities will be given in class to illustrate concepts. Opportunities will be given for individual and collaborative work throughout the semester.
All new material will be introduced in class first. We will discuss it and work through a few examples. Your active involvement is crucial: please, participate in the discussion and contribute ideas.
The next stage will be your work at home with your class notes and the textbook. Please, read both your
notes and the assigned textbook material making sure you understand everything, study all the examples, and then do the assigned problems. If something is unclear, formulate it as a question for the next class. Group work is a great tool to use at this stage.

At the beginning of each class, we will discuss the assignment from the previous class meeting and address all concerns and uncertainties. Please, do not leave anything unclear: we can only move forward successfully if we have no hazy areas left behind. Questions are always welcome before, during and after class time.

**Course Policies & Requirements:**

1. You are expected to attend all classes, arrive on time for classes, and come prepared. Attendance will be taken at the beginning of each class meeting. If you arrive late, please, make sure your absence has been corrected. In case of illness, work-schedule conflicts, family commitments, or other emergencies that require absence from class, you are expected to notify me prior to the class meeting by sending an e-mail message, a phone message, or placing a written note in the mailbox next to my office door. If you are absent for two class meetings, you are required to set up a meeting with me to discuss the advisability of your remaining in the course.

2. Please, do the assigned reading, study the examples, solve the assigned problems, and formulate questions to discuss in class.

3. Assignments will be taken from the exercises in the text or given to you on handouts. Homework assignments are due the class meeting after they are assigned. Homework has to be handed in on the day for which it was assigned. If you cannot avoid an absence, please make sure that a friend, roommate, or classmate will deliver your homework to class, or mail it to me at Rivier College, 420 S. Main Street, Nashua, NH 03060. Late homework will not be accepted. All work has to be written neatly and clearly. Illegible work cannot be graded. Please, staple each homework assignment.

4. You are responsible for all material on all handouts whether or not you were in attendance at the time I distributed them. Please make arrangements for other students to collect handouts for you.

5. Plan to spend at least five hours per week outside of class learning course materials. Depending on background and depth of inquiry, more or less time will be needed by individual students. The estimated time commitment includes reviewing class notes, reading the textbook, doing and reviewing textbook examples and assignments, and preparing for quizzes and tests.

6. Have an email account and do check it regularly. I will communicate with you via email.

7. Keep handouts, class notes, and assignments organized in a three-ring binder. Submit homework on 8½" by 11" paper. I prefer you use graph paper. For each section, include a heading with your name, the textbook section number, the page number, and assigned problems.

8. OPTIONAL: You can obtain and bring to every class meeting a calculator that performs matrix operations, e.g., a TI-83+. You are expected to read the manual and figure out how to make it perform all required functions.

9. In every class, we will have a short written quiz. The best 5 quiz grades will be counted. There are no make-up quizzes.

10. We will have our final exam on May 6. It will be a two-hour written test. There is no make-up for the final exam.

**Grading Method**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Written home assignments</td>
<td>40%</td>
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<tr>
<td>Quizzes</td>
<td>30%</td>
</tr>
<tr>
<td>Final exam</td>
<td>30%</td>
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</tbody>
</table>

**Help**

There are multiple sources of help that can be used separately or in conjunction with each other to be successful in this class. Classmates are a great source of help since they are working on the material at the same time you are. I am also a source. Do not hesitate to contact me before or after class, during my office hours, by e-mail (preferably) or by phone. There are many other possibilities for assistance, such as other Rivier students, friends, neighbors and relatives. What is important is to seek help at the first sign of any confusion. Do not postpone asking questions or getting help.
N.B. You are responsible for understanding and complying with the contents of this syllabus. If you have any questions about this syllabus please raise them at the beginning of the session.

Bibliography


Tentative Course Outline

<table>
<thead>
<tr>
<th>Dates</th>
<th>Topics</th>
<th>Reading Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 15</td>
<td>Vectors in $\mathbb{R}^2$ and $\mathbb{R}^3$. Dot and cross products.</td>
<td>Sections 1.1 &amp; 1.2</td>
</tr>
<tr>
<td>January 22</td>
<td>Lines and planes.</td>
<td>Sections 1.3 &amp; 2.1</td>
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<tr>
<td>January 29</td>
<td>Systems of linear equations. Row-reduction of linear systems.</td>
<td>Sections 2.2 &amp; 2.3</td>
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<tr>
<td>February 5</td>
<td>Operations on matrices. Matrix equations and inverses.</td>
<td>Sections 3.1 &amp; 3.2</td>
</tr>
<tr>
<td>February 12</td>
<td>Theory of linear systems. LU Decompositions.</td>
<td>Sections 3.5 &amp; 3.6</td>
</tr>
<tr>
<td>February 19</td>
<td>Elementary matrices and linear systems. Definition of determinants.</td>
<td>Sections 3.7 &amp; 4.1</td>
</tr>
<tr>
<td>February 26</td>
<td>Properties of determinants. Cramer's rule.</td>
<td>Sections 4.2 &amp; 4.3</td>
</tr>
<tr>
<td>March 4</td>
<td>Linear dependence and independence. Subspaces of $\mathbb{R}^m$.</td>
<td>Sections 5.1 &amp; 5.2</td>
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<tr>
<td>March 11</td>
<td><strong>Spring Break</strong></td>
<td><strong>NO CLASSES</strong></td>
</tr>
<tr>
<td>March 18</td>
<td>Basis and dimension.</td>
<td>Sections 5.3 &amp; 5.4</td>
</tr>
<tr>
<td>March 25</td>
<td>Rank of a matrix.</td>
<td>Sections 5.3 &amp; 5.4</td>
</tr>
<tr>
<td>April 1</td>
<td>Vector spaces and subspaces. Linear independence, basis, and dimension.</td>
<td>Sections 6.1 &amp; 6.2</td>
</tr>
<tr>
<td>April 8</td>
<td>Definition of a linear transformation. Algebra of linear independence, basis, and dimension.</td>
<td>Sections 6.1 &amp; 6.2</td>
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<tr>
<td>April 15</td>
<td><strong>EASTER</strong></td>
<td><strong>NO CLASSES</strong></td>
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<tr>
<td>April 22</td>
<td>Kernel and image</td>
<td>Sections 7.1 &amp; 7.2</td>
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<td>April 29</td>
<td>Eigenvectors, and their applications.</td>
<td>Sections 7.3</td>
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<tr>
<td>Final Exam</td>
<td>Review of the material</td>
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<td>May 6</td>
<td><strong>Final Exam</strong></td>
<td><strong>Final Exam</strong></td>
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