

# MA502 Linear Algebra – Syllabus

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MA 502 – Fall 2017  
Linear Algebra  
**Texts:** “Matrix Theory”, S.A. Hobart  
“Advanced Linear Algebra”, S. Roman  
**Meetings:** 4:00-5:20pm Tue & Thu,  
in room SH202

It is extremely common for undergraduates to gain a basic understanding of linear algebra through one or two courses primarily aimed at non-majors. Many such courses do not explore beyond mechanical methods for answering simple questions about solutions of linear systems and generalized eigenspaces. Yet they provide essential tools and vocabulary for many applications and more advanced study.

This course will begin with a conceptual review of undergraduate linear algebra focusing on vector spaces over the real and complex fields. We will see how matrix theory becomes a natural tool for the study of vector spaces, linear transformations, and substructures. A non-trivial real or complex vector space has many, many bases and the choice of basis can greatly affect the computational difficulty of a problem. The fundamental role of canonical forms will repeatedly surface as we move from linear systems to eigenvalues to generalized eigenspaces. As we explore applications of this theory, we will strive to see the connection between abstract structures and computational tools.

## TERM SCHEDULE

Here is a rough outline of what we will cover in the 28 meetings we have together:

Week 1	<i>Vector Spaces, Subspaces</i>	Roman, Chap. 1
Week 2	<i>Linear Transformations, Rank, Nullity, etc.</i>	Roman, Chap. 2
Week 3-4	<i>Eigenvalues and Diagonalizability</i>	Roman, Ch. 8, Hobart, Ch. 2-4
Week 5-6	<i>Similarity, Orthogonality</i>	Hobart, Chaps. 5-6
Week 7	<i>Gram-Schmidt, Mid-Term</i>	Hobart, Chap. 7
Fall Break		
Week 8	<i>Normal Matrices, Cayley-Hamilton Theorem</i>	Hobart, Chap. 8
Week 9	<i>Singular Value Decomposition</i>	Hobart, Chap. 9
Week 10	<i>Jordan Canonical Form</i>	Hobart, Chap. 10
Week 11	<i>Projections and Positive-Definite Matrices</i>	Hobart, Chap. 11
Weeks 12-13	<i>Applications, Catch Up</i>	
Week 14	<i>Matrix Exponentials, Lie Groups</i>	Fulton & Harris
Dec 12	<i>Reserve Day</i>	(as needed)
Dec 14	<i>Exam</i>	comprehensive

But the progress of the course will be subject to change based on student interests.

## **WORKLOAD**

Each student is expected to attend and participate in every scheduled class meeting. Students will occasionally be called upon to prepare lecture material and present it at the board.

Each week, a number of exercises will be assigned for students to complete on their own or in groups. Some of the problems will not be collected for credit. The for-credit problems will be further broken down into two parts: assignments will consist of up to ten short-answer questions together with roughly three problems which require rigorous proofs. All problems submitted for credit are to be completed individually, without the aid of the internet or other persons.

We will have an in-class midterm exam on Thursday, October 12th and an in-class final exam on Thursday, December 14th.

Your grade will be apportioned as follows: %30 homework; %30 mid-term; %40 final exam.

## **INFORMATION ON THE WEB**

The course web page is

<http://www.wpi.edu/~martin/TEACHING/current.html>

## **ACADEMIC INTEGRITY**

As a student in this course, you are expected to familiarize yourself with WPI's Academic Integrity policies which can be found at

<https://www.wpi.edu/about/policies/academic-integrity>

All acts of fabrication, plagiarism, cheating, and facilitation will be prosecuted according to the university's policy. If you are ever unsure as to whether your intended actions are considered academically honest or not, please see Professor Martin (or check here).

## **STUDENTS WITH DISABILITIES**

If you need course adaptations or accommodations because of a disability, or if you have medical information to share with me that may impact your performance or participation in this course, please make an appointment with me as soon as possible. If you have approved accommodations, please request your accommodation letters online through the Office of Disability Services Student Portal.

If you have not already done so, students with disabilities who need to utilize accommodations in this class are encouraged to contact the Office of Disability Services (ODS) as soon as possible to ensure that such accommodations are implemented in a timely fashion. This office can be contacted via email: [DisabilityServices@wpi.edu](mailto:DisabilityServices@wpi.edu), via phone: (508) 831-4908, or in person: 124 Daniels Hall.