Math 201: Linear Algebra

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Office Hours Monday, Wednesday, Friday 11:30 am – 12:30 pm, Thursday 11 am – noon, or by appointment.

Course Description Linear algebra is a course that mixes basic equation-solving, abstract theory and deep applications. The main objects of study are matrices, vectors and vector spaces, and we will focus on the interplay between computational and theoretical aspects. This material is used in many higher level math courses as well as in many related fields.

Learning Outcomes By the end of the course, successful students will be able to:

- State and apply each of the equivalent parts of the Invertible Matrix Theorem
- Graphically analyze linear transforms
- Identify vector spaces and their dimensions
- In the context of various applications, set up systems of equations and determine the number of solutions and the implications of the form of the solution set

Course Materials Textbook: Draft version of *Functional Linear Algebra* by Robbins

Important Dates

We will have three in-class tests and a final exam. Each test will focus on the material learned since the last test, but will (necessarily) contain previous material. The final will be cumulative, but focus more heavily on material after the third test. **If you have a conflict with one of these dates please email me ASAP.**

Test 1	**Wednesday 2/6, in class**
Test 2	**Wednesday 2/27, in class**
Test 3	**Friday 3/29, in class**
Final Exam	**Tuesday 4/30, 2 – 5 pm**

Course Grades

The final course grade is determined in the following way:

MCSP Conversations/Quizzes			**7%**
Homework 15%	**Projects**	**15%**	
Tests (13% each)			**39%**
Final Exam			**24%**

A grade scale will be determined after final grades are computed, but will be no worse than the scale given below. Attendance and class participation will be considered when determining marginal grades.

		B+	87-89	C+	77-79	D+	67-69		
A	93-100	B	83-86	C	73-76	D	63-66	F	0-59
A-	90-92	B-	80-82	C-	70-72	D-	60-62		

MCSP Conversations The MCSP Department offers a series of designed to appeal to a broad audience. You are invited be involved with all of these meetings; however participation in at least two of these sessions is mandatory. After attending, you will submit within one week of the presentation a one page paper reflecting on the discussion. This should not simply be a regurgitation of the content, but rather a personal response to the experience. These reaction papers will be each be counted as a quiz.

Quizzes Since knowing the mathematical vocabulary we use in class is essential to understanding the material, we will have weekly (short) vocabulary quizzes. There will be no make-up quizzes, but at the end of the semester your lowest quiz score will be dropped.

Homework I will assign a graded homework problem each day. These problems are due at the beginning of the next class. **Late homework will not be accepted.** If you have to miss class, email me a picture of your homework or get a friend to turn it in for you. I am happy to help with these problems, but you **may not** work on them with anyone else.

Projects We will have three projects, each on an application of linear algebra. They will be extended problems written up as a paper, with emphasis placed not only on mathematical correctness but on the quality of the explanation.

Practice Problems After each section I will assign some problems from the book for practice. These will not be collected (the answers are in the back), and they are your chance to make sure you understand the material and to get help if you realize you need it.

Expected Work Policy This course expects you to spend at least 12 hours of work each week inside and outside of class.

Attendance Policy Class attendance is expected. If you do have to miss class, you are responsible for learning all material covered that day. If you have not discussed your absence with me beforehand, you will be unable to make up any work missed.

Electronic Devices You can use **only** your calculator (which cannot be a cell phone or computer). We will also use Mathematica for computationally intensive problems. (Please set your cell phones on silent and leave them in your bag.)

Special Needs If you have a disability that may require an accommodation in this course, please let me know and provide your documentation within the first 2 weeks of the semester. I must have your documentation at least 48 hours prior to any accommodation I make. (Check with the Center for Teaching and Learning for their scheduling guidelines.)

Academic Integrity I expect all of you to follow the Academic Integrity policies of Roanoke College. All graded work should be your own work! If you ever have questions about how these policies apply to our class please contact me. Any violations of our AI policies will automatically be turned over to the Academic Integrity Council.

Course Schedule

The following schedule is approximate and subject to change except for the test dates. It should give you an idea of the timing of the topics covered and assignments.

Day	Date	Topic	Assignments
M	J 14	Chapter 0: Motivation	
W	J 16	Section 1.1: Vector Operations	
F	J 18	**No Class**	
M	J 21	Section 1.2: Span	
W	J 23	Section 1.3: Linear Independence	
F	J 25	Section 2.1: Linear Functions	
M	J 28	Section 2.2: Matrices	
W	J 30	Section 2.2 / Section 2.3	
F	F 1	Section 2.3: Matrix Operations	
M	F 4	Review	
W	F 6	**Test 1**	
F	F 8	Fractals	Project 1 Assigned

M	F 11	Section 2.4: Matrix Vector Spaces	
W	F 13	Section 2.4	
F	F 15	Section 2.5: Kernel and Range	Project 1 Due
M	F 18	Section 2.5	
W	F 20	Section 2.6: Row Reduction	
F	F 22	Section 2.7: Applications of Row Reduction	
M	F 25	Review	
W	F 27	**Test 2**	
F	M 1	Sports Ranking	Project 2 Assigned
		Spring Break	
M	M 11	Section 2.8: Solution Sets	
W	M 13	Section 2.10: Invertibility	
F	M 15	Invertible Matrix Theorem Activity	
M	M 18	Section 3.1: Basis and Coordinates	Project 2 Due
W	M 20	Section 3.1	
F	M 22	Section 3.2: Polynomial Vector Spaces	
M	M 25	Section 3.3: Other Vector Spaces	
W	M 27	Review	
F	M 29	**Test 3**	
M	A 1	Google	Project 3 Assigned
W	A 3	Section 4.1: Eigenvalues and Eigenvectors	
F	A 5	4.2: Determinants	
M	A 8	Section 4.3: Eigenspaces	
W	A 10	Section 4.4: Diagonalization	Project 3 Due
F	A 12	**No Class**	
M	A 15	Section 4.5: Change of Basis Matrices	
W	A 17	Section 5.1: Length	
F	A 19	**No Class**	
M	A 22	Section 5.2: Orthogonality, 5.3: Orthogonal Projection	
Tu	A 30	**Final Exam** 2 – 5 pm	