Math 201: Linear Algebra

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Office Hours Monday 10:30 – 11:30 am, Thursday noon – 1:30 pm, Friday 10:30 – 11:30 am, or by appointment. Office hours will be held via Zoom using Meeting ID 540 375 4961 (my office phone number).

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 Format

We will meet online MWF during our class time.

Join these Zoom meetings using the links on our Inquire page. I expect you to have your video on during these meetings. I will be recording our Zoom lectures, and those recordings will be accessible to our class via Inquire.

Before Monday's class, please watch the skills videos for that week.

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

Important Dates We will have three tests and a final exam. Each test will have an in-class and a take-home portion. Tests 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 (computational) Monday 9/7
Test 1 (take-home) due by 1:10 pm Friday 9/11 Test 2 (computational) Monday 9/28
Test 2 (take-home) due by 1:10 pm Friday 10/2 Test 3 (computational) Monday 10/19
Test 3 (take-home) due by 1:10 pm Friday 10/23
Final Exam (computational) Saturday 11/21 during afternoon slot
Final Exam (take-home) due by 5 pm Saturday 11/21

Course Grades The final course grade is determined in the following way:

MCSP Conversations/Vocabulary	**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 Activities The MCSP department and Roanoke College offer many opportunities to engage with mathematical ideas outside of classes. Members of this class are encouraged to attend many of these activities, however attending at least two is mandatory. Examples include MCSP Conversation Series talks and student research showcases - if you're unsure if a given activity makes sense for this purpose, please email me to ask. Within one week of attendance you must submit a brief response to the activity. Each response will count as one quiz grade. To allow for social distancing, this semester's talks will be done via Zoom.

Vocabulary

Since knowing the mathematical vocabulary we use in class is essential to understanding the material, we will have weekly (short) vocabulary assignments where you create an ongoing linear algebra dictionary. Each week, you'll write down the definition of the vocabulary words listed in that week's section of Inquire. These are due by 1:10 pm the Wednesday of the following week.

Homework

You will have graded homework due by 1:10 pm Mondays, Wednesdays, and Fridays. Submit your homework as a PDF file using the link on our Inquire page. (There are several apps which allow you to scan to PDF using your phone.) **Late homework will not be accepted.** 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.

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.

Week	Dates	Topics	Assignments
1	A 19 – A 21	Chapter 0: Motivation Fri. is optional Zoom session	
2	A 24 – A 28	Sections 1.1, 1.2, 1.3 Wed. is optional Zoom session	
	Online content:	vector operations, vector equations	
3	A 31 – S 4	Sections 2.1, 2.2, 2.3 Wed. is optional Zoom session	

	Online content:	matrix times vector, matrix operations	
4	S 7 S 9	**Test 1** in-class Test 1 take-home due by 2:10 pm	Test 1 take-home assigned
	S 11	Project 1 set-up	Project 1 assigned
5	S 14 – S 18	Sections 2.4, 2.5	
	Online content:	kernel / Nul(A), range / Col(A)	Project 1 due Fri. by 5 pm
6	S 21 – S 25	Sections 2.6, 2.7, 2.8	
	Online content:	row reduction	
7	S 28 S 30	**Test 2** in-class Test 2 take-home due by 2:10 pm	Test 2 take-home assigned
	O 2	Project 2 set-up	Project 2 assigned
8	O 5 – O 9	Sections 2.10, 2.11, 3.2	
	Online content:	matrix inverses, Invertible Matrix Theorem	Project 2 due Fri. by 5 pm
9	O 12 – O 16	Sections 3.1, 3.2	
	Online content:	coordinate vectors, other vector spaces	
10	O 19 O 21	**Test 3** in-class Test 3 take-home due by 2:10 pm	Test 3 take-home assigned
	O 23	Project 3 set-up	Project 3 assigned
11	O 26 – O 30	Sections 4.1, 4.2, 4.3	
	Online content:	determinants, eigenvalues, eigenspaces	Project 3 due Fri. by 5 pm
12	N 2 – N 6	Sections 4.4, 4.5	
	Online content:	change of coordinates matrix, diagonalization	
13	N 9 – N 13	Sections 5.1, 5.2, 5.3	
	Online content:	dot product, norm	
14	N 16	optional Zoom review session	
Sat.	N 21	**Final Exam** take-home due by 5 pm **Final Exam** computational during afternoon	