Math 201, Spring 2020: Linear Algebra

Instructor	Maggie Rahmoeller

Phone: (540) 375-2505
Email: rahmoeller@roanoke.edu   *Office:* Trexler 270J

Class Meetings

MWF Noon - 1PM
Trexler 374

Office Hours

By appointment only through https://drmaggie.youcanbook.me/
Monday: 9:30AM-10:30AM
Tues/Thurs: 3PM - 4PM
Wed/Fri: 1:30PM - 3PM
Email me if none of these times work!

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.

Intended Learning Outcomes

By the end of this 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.

Required Materials

Textbook: Draft version of *Functional Linear Algebra*, by Dr. Robbins
Software: *Mathematica*, free download, https://webapps.roanoke.edu/www/it/mathematica/

Course Grades

The following table lists the weights for the various forms of assessment for this class.

Co-Curricular Activities / Quizzes	7%	Tests	39%
Homework	15%	Final Exam	24%
Projects	15%		

A grade scale will be determined after final grades are computed, but will be no worse than the scale given below:

		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		

Attendance & Make-Up Work

Attendance is critical to the understanding of the material in the course; it is both required and expected. Any absence that is not discussed with the instructor prior to the missed class is considered unexcused. When absent, excused or unexcused, you are responsible for all material covered in class. Work missed due to either an unexcused or excused absence can only be made up when arrangements are made in advance of the absence.

Expected Work Policy

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This course expects you to spend **at least 12 hours** on work each week inside and outside of class.

Co-Curricular Activities The Department of Mathematics, Computer Science and Physics and Roanoke College offer many opportunities to engage with mathematical ideas outside of class. Members of this class are encouraged to attend many of these activities; however, attending **at least two** of these events 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 one page paper reflecting on the event. This should **not** be a regurgitation of the content, but rather a **personal contemplation of the experience**. This does not have to be a formal paper. Each reflection paper will count as one quiz grade. If your reflection paper does more summarizing than reflection, points will be taken off.

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.

Reading

Daily reading of assigned sections from our textbook is expected. You should come to class prepared to discuss the material that you have read. You can find an approximate schedule for the sections we will cover on the last page of this syllabus. Readings from other sources will be assigned as appropriate.

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. Feel free to work with other students or ask me for help, but your submitted work needs to be your own work. Explain all steps required for completing the homework problem.

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). They are intended to help you understand the material and to help you realize when you need to ask for extra help.

Projects

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

Late Policy

As mentioned, I will not accept late homework, nor will I allow make-up quizzes. However, I will accept work for projects up to 2 days late. With each day late, your grade will drop by 15 percentage points.

Academic Integrity

Students are expected to adhere to the Academic Integrity policies of Roanoke College. All work submitted for a grade is to be your own work! Note that any electronic devices used during exams must be first okayed by your instructor (me), and used only in an appropriate manner, which is decided by your instructor (me).

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Accessible Education Services

Accessible Education Services (AES) is located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Laura Leonard, Assistant Director of Academic Services for Accessible Education, at 540-375-2247 or by e-mail at aes@roanoke.edu to schedule an appointment. If you have registered with AES in the past and would like to receive academic accommodations for this semester, please contact Laura Leonard at your earliest convenience to schedule an appointment.

Subject Tutoring Subject Tutoring is a CRLA Nationally Certified Program located on the lower level of Fintel Library in room 005. Subject Tutoring offers individual appointments in 15-, 30-, or 45-minute intervals. Hours are Sunday - Thursday 4 p.m. - 9 p.m. To make an appointment, go to www.roanoke.edu/tutoring. Be specific with what content you'd like to work on during your appointment.

Writing Center Roanoke College's Writing Center is located on the Lower Level of Fintel Library and offers writing tutorials focused on written and oral communication for students working on writing assignments/projects in any field. Writers at all levels of competence may visit the Writing Center at any point in their process, from brainstorming to drafting to editing, to talk with trained peer tutors in informal, one-on-one sessions. The Writing Center is open Sunday through Thursday from 4 to 9 pm. Simply stop in, or schedule an appointment by going to www.roanoke.edu/writingcenter, where our schedule of writing workshops and creative writing playshops is also posted. Questions? Email writingcenter@roanoke.edu or call 375-4949. Like our Facebook page for updates!

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Tentative Course The following schedule is approximate and subject to change, except for the test dates: Schedule

Mon	Jan 13	Chapter 0	Motivation
Wed	Jan 15	Section 1.1	Vector Operations
Fri	Jan 17	Section 1.2	Span
Mon	Jan 20	Section 1.3	Linear Independence
Wed	Jan 22	Section 2.1	Linear Functions
Fri	Jan 24	Section 2.2	Matrices
Mon	Jan 27	Section 2.2 / Section 2.3	Matrices / Matrix Operations
Wed	Jan 29	Section 2.3	Matrix Operations
Fri	Jan 31	**Review**	
Mon	Feb 3	**Test 1**	
Wed	Feb 5	Fractals	*Project 1 Assigned*
Fri	Feb 7	Section 2.4	Matrix Vector Spaces
Mon	Feb 10	Section 2.4	Matrix Vector Spaces
Wed	Feb 12	Section 2.5	Kernel and Range
			Project 1 Due
Fri	Feb 14	Section 2.5	Kernel and Range
Mon	Feb 17	Section 2.6	Row Reduction
Wed	Feb 19	Section 2.7	Applications of Row Reduction
Fri	Feb 21	**Review**	
Mon	Feb 24	**Test 2**	
Wed	Feb 26	Sports Ranking	*Project 2 Assigned*
Fri	Feb 28	Section 2.8	Solution Sets
		Spring Break	
Mon	Mar 9	Section 2.10	Invertibility
Wed	Mar 11	Invertible Matrix Theorem Activity	
Fri	Mar 13	Section 3.1	Basis and Coordinates
Mon	Mar 16	Section 3.1	Basis and Coordinates
			Project 2 due
Wed	Mar 18	Section 3.2	Polynomial Vector Spaces
Fri	Mar 20	Section 3.3	Other Vector Spaces
Mon	Mar 23	**Review**	
Wed	Mar 25	**Test 3**	
Fri	Mar 27	Google	*Project 3 Assigned*
Mon	Mar 30	Section 4.1	Eigenvalues and Eigenvectors
Wed	Apr 1	Section 4.2	Determinants
Fri	Apr 3	Section 4.3	Eigenspaces
			Project 3 Due

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Mon	Apr 6	Section 4.4	Diagonalization
Wed	Apr 8	Sections 4.4 / Section 4.5	Diagonalization / Change of Basis Matrices
Fri	Apr 10	**No Class!!**	
Mon	Apr 13	Section 4.5	Change of Basis Matrices
Wed	Apr 15	Section 5.1	Length
Fri	Apr 17	Section 5.2	Orthogonality
Mon	Apr 20	Section 5.3	Orthogonal Projection
Wed	**April 22**	**Final Exam**	**8:30 - 11:30AM**