Math 201, Spring 2018: Linear Algebra

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

Class Meetings: MWF 1:10-2:10PM Trexler 263

Office Hours:
MWF: 9AM-10AM
Thurs: 9AM-10:30AM
Or email me to meet at a different time!

Course Information:
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: *Linear Algebra and its Applications*, by Lay, Lay, and McDonald, 5 edition. **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.

Homework	15%	Projects	25%
Tests (12% each)	36%	Final Exam	24%

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.

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

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	Homework will be assigned almost every class period, and graded on completeness and correctness. Completeness includes using complete sentences, restating each problem in your answers, and explaining your answers.
Study Problems	I will also assign other daily problems that will not be collected - answers will be in the back of the book. You are expected to complete these problems when assigned and to ask for help if you need it.
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.
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).
MCSP Conversation Series	The Department of Mathematics, Computer Science and Physics offers a series of discussions that appeal to a broad range of interests related to these fields of study. These co-curricular sessions will engage the community to think about ongoing research, novel applications and other issues that face our discipline. Members of this class are invited to be involved with all of these meetings; however participation in **at least two** of these sessions is mandatory. After attending, students will submit a one page paper **within a week** reflecting on the discussion. This should **not** simply be a regurgitation of the content, but rather a **personal contemplation of the experience**. This does not have to be a formal paper. This reflection paper will be counted as a homework assignment.
MCSP Tea	Our department offers a weekly tea time for students and faculty - stop by the MCSP Study Lounge (Trexler 271) for tea and cookies on Thursdays from 2:30PM to 3:30PM. Come meet other students as well as chat with the MCSP faculty members in a casual setting! We commonly play card games!
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 Dr. Sue Brown, Director of Academic Services and Acting Coordinator of Accessible Education Services, at 540-375-2247 or by e-mail at sbrown@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 Dr. Brown 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 30-minute intervals for Lab Sciences, Modern Languages, Math and CPSC, Social Sciences, Business and Economics. Hours are Sunday - Thursday 4 p.m. - 9 p.m. For a list of tutorials or to make an appointment, go to www.roanoke.edu/tutoring.

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!

Course Schedule The following schedule is approximate and subject to change.

Mon	Jan 15	Section 1.1	Systems of Linear Equations
Wed	Jan 17	Section 1.2	Row Reduction and Echelon Forms
Fri	Jan 19	Section 1.3	Vector Equations
Mon	Jan 22	**Project 1**	
Wed	Jan 24	Section 1.4	Matrix Equations
Fri	Jan 26	Section 1.5	Solution Sets of Linear Equations
Mon	Jan 29	Section 1.7	Linear Independence
		Project 1 due	
Wed	Jan 31	**Review**	
Fri	Feb 2	**Test 1**	
Mon	Feb 5	Section 1.8	Linear Transformations
Wed	Feb 7	Section 1.9	The Matrix of a Linear Transformation
Fri	Feb 9	Section 2.1	Matrix Operations
Mon	Feb 12	Section 2.2	The Inverse of a Matrix
Wed	Feb 14	Invertible Matrix Theorem Activity	
Fri	Feb 16	Section 2.4 & 2.5	Partitioned Matrices & Matrix Factorizations
Mon	Feb 19	Section 3.1	Introduction to Determinants
Wed	Feb 21	Section 3.2	Properties of Determinants
Fri	Feb 23	**Review**	
Mon	Feb 26	**Test 2**	
Wed	Feb 28	**Project 2**	
Fri	Mar 2	Section 4.1	Vector Spaces
		Spring Break	
Mon	Mar 12	Vector Space Activity	
Wed	Mar 14	Section 4.1	Subspaces
Fri	Mar 16	Section 4.2	Null and Column Spaces and Linear Transformations
Mon	Mar 19	Section 4.2	Null and Column Spaces and Linear Transformations
		Project 2 due	
Wed	Mar 21	Section 4.3	Linearly Independent Sets; Bases
Fri	Mar 23	Section 4.4	Coordinate Systems
Mon	Mar 26	**Review**	
Wed	Mar 28	**Test 3**	
Fri	Mar 30	**No Class!!**	
Mon	Apr 2	**Project 3**	
Wed	Apr 4	Section 4.5	The Dimension of a Vector Space
Fri	Apr 6	Section 4.6	Rank
Mon	Apr 9	Section 4.7	Change of Basis
		Project 3 due	
Wed	Apr 11	Sections 5.1 & 5.2	Eigenvalues and Eigenvectors & Characteristic Equation

Fri	Apr 13	**No Class!!**	
Mon	Apr 16	Section 5.3	Diagonalization and Linear Transformations
Wed	Apr 18	Section 5.3	Diagonalization and Linear Transformations
Fri	Apr 20	Section 6.1	Inner Product, Length, and Orthogonality
Mon	Apr 23	Section 6.2	Orthogonal Sets
Mon	**April 30**	**Final Exam**	**2-5PM**