Queens College/CUNY

Syllabus

Linear Algebra I
Math 231-05(42040) & Math 231-11(42039):
Spring Semester of 2026, 4 credits
Monday and Wednesday
4:40pm-6:30pm & 6:55pm -- 8:35pm
Kiely 277

Instructor

Professor Yunping Jiang
Phone: 718-915-3618
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Office hours: Monday, 3:30 pm-4:30 pm
Office Location: Kiely 506

Course Information

Course descriptions can be also found in the Undergraduate Buin/Catalog:
4 hr.; 4 cr. Prereq.: MATH 141 or 151, MIN GRADE C-
An introduction to linear algebra with emphasis on techniques and applications. Topics to be covered include solutions of systems of linear equations, vector spaces, bases and dimension, linear transformations, matrix algebra, determinants, eigenvalues, and inner products.

The mode of instruction

This is an in-person class taught in the classroom. In some special situation, it will be taught by using Zoom and the link of zoom meetings will be sent by email. The Dropbox will be used to collect homework.

Pathways requirement

This course is a Pathways requirement (Pathways Requirements).

Course Goals/Objectives/Learning Outcomes

Philosophy: This course provides a comprehensive introduction to Linear Algebra, blending computational techniques with abstract mathematical perspectives. It begins with the classical

problem of solving systems of linear equations and progresses to modern methods involving matrices, vector spaces, and linear transformations. The course balances theoretical understanding with practical computation, aiming to equip students with the skills to model mathematically and apply these concepts across various disciplines. It also fosters familiarity with mathematical proofs and computations, offering insight into how abstraction leads to unexpected outcomes. Designed to prepare students for further studies in STEM, this course builds the foundational knowledge needed for advanced coursework.

Textbook: Elementary Linear Algebra (11th Edition (Electronic Version)), Howard Anton/Anton Kaul

Contents: This course covers

Chapter 1. Systems of linear equations and matrices. Approx. 8 hours
Chapter 2. Determinants. Approx. 6 hours
Chapter 3. Euclidean vector spaces (Section 3.1 only). Approx.1 hour
Chapter 4. General vector spaces. Approx. 14 hours
(Include function spaces. Introduce general definition of linear transformation (§8.1))
Chapter 5. Eigenvalues and eigenvectors (omit Sections 5.3 and 5.4). Approx. 5 hours
Chapter 6. Inner product spaces (omit Section 6.5). Approx. 8 hours
(Ideally, cover a little bit about Fourier series (Section 6.6)).
Chapter 8. General Linear transformations (omit Section 8.4). Approx. 6 hours

Homework: Solving well-chosen problems is an essential part of learning and understanding mathematics at any level. Homework will be assigned in every class (posted in the class webpage or in Dropbox), and I will review your submissions in detail. Students are strongly encouraged to ask questions and discuss their work during office hours. All assigned homework must be completed and submitted in a shared folder in Dropbox. I will go over some homework problems in the class.

Outcome: Students are expected to develop computational proficiency in solving systems of linear equations, evaluating determinants, determining properties such as linear independence and spanning, finding eigenvalues and eigenvectors, and applying inner products in various contexts. To support these objectives, the instructor may choose to introduce the use of a TI-calculator to handle larger examples, facilitate finding eigenvalues, and aid in diagonalizing matrices. Additionally, students are expected to understand and recall mathematical definitions and the proofs of key theorems. As these proofs are presented, they will gain exposure to various proof techniques, including direct arguments, proofs by contradiction, and proofs by induction. Students are also required to write their own proofs for simple results based on the definitions and theorems studied. These theoretical aspects should be assessed through methods determined by the instructor. Students should learn and be tested on proofs of some the following theorems:

1. A homogeneous system with more unknowns than equations has infinitely many non-trivial solutions.
2. Some equivalent conditions for invertibility of a square matrix A:
    a. A$\mathbf{x}=\mathbf{0}$ has only the trivial solution;
    b. the reduced row echelon form of A is the identity;
    c. A is a product of elementary matrices.

3. A square matrix A is invertible if and only if det(A) is not 0.
4. S = {$\mathbf{v}_1$, …, $\mathbf{v}_n$} is a basis (linearly independent and span) for a vector space V, If and only if every vector in V can be written uniquely as a linear combination of vectors in S.
5. Suppose that S = {$\mathbf{v}_1$, **…,** $\mathbf{v}_n$} span a vector space V. Let {$\mathbf{w}_1$, … , $\mathbf{w}_m$} be a set of vectors in V with m > n. Then the vectors $\mathbf{w}_1$, …, $\mathbf{w}_m$ are linearly dependent.
6. Let T: V --> W be a linear transformation. Then Ker(T) is a subspace of V and Range(T) is a subspace of W.
7. Suppose that S = {$\mathbf{v}_1$, … ,$\mathbf{v}_n$} is a set of orthogonal, non-zero vectors. Then the vectors in S are linearly independent. In addition, if **v** is in Span(S), then
   $v = (\langle \mathbf{v}, v_1\rangle / \langle \mathbf{v}_1, \mathbf{v}_1\rangle)\mathbf{v}_1 + \dots + (\langle \mathbf{v}, \mathbf{v}_n\rangle / \langle \mathbf{v}_n, \mathbf{v}_n\rangle)\mathbf{v}_n$.
8. The scalar a is an eigenvalue of a square matrix M if and only if det (a I-M) = 0.
9. The Cauchy-Schwarz Inequality.

Communication: Students can discuss the course materials and questions in person in my officer hour or email me.

Attendance: The attendance will be recorded for every class. If you have some important reason to be absent from a class, please inform me either in person or by email as soon as possible before the class.

Examinations: There are two midterm examinations and a final examination. Remember that there is no makeup for any midterm examination.

Grade: I will treat homework and attendance seriously. Homework and attendance before a midterm examination will be integrated into the score of a student in that midterm examination. The score of each midterm will be counted once and the score of the final examination will be counted twice. That means you will have four scores during this semester. I will drop one of the lowest scores among these four scores and use the average of the other three scores as your final score. Please note that this grading policy works only for students who take all midterm exams and the final exam.

Grade	Final Score
A+	97-100
A	93-96
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69

D	60-66

Class Schedule

Lectures

Date	Lecture	Date	Lecture
1/26/2026	Lecture 1	3/18/2026	Lecture 14
1/28/2026	Lecture 2	3/23/2026	Lecture 15
2/2/2026	Lecture 3	3/25/2026	Lecture 16
2/4/2026	Lecture 4	3/30/2026	Lecture 16
2/9/2026	Lecture 5	4/13/2026	Lecture 18
2/11/2026	Lecture 6	4/15/2026	Lecture 19
2/18/2026	Lecture 7	4/20/2026	Lecture 20
2/23/2026	Lecture 8	4/22/2026	Lecture 21
2/25/2026	Lecture 9	4/27/2026	Lecture 22
3/2/2026	Lecture 10	4/29/2026	Lecture 23
3/4/2026	Lecture 11	5/4/2026	Lecture 24
3/9/2026	Lecture 12	5/6/2026	Lecture 24
3/11/2026	Lecture 13	5/11/2026	Lecture 26
3/16/2026	Exam 1	5/13/2026	Exam 2
First Day of Class: January 26, 2026 President Day: February 16,2026, No Class Spring Break: April 1-9, 2026		Last Day of class: May 12, 2026 Final Exam Period: May 16-24,2026 Deadline of Final Grade: May 29, 2026	

Homework

Section 1.1	1,3,5,7,8,9,11,13,15,17	Section 4.3	2,3,5,7,10,13
Section 1.2	1,3,5,7,9,11,13,14,15,17,19,21	Section 4.4	1,2,6,7,11,13
Section 1.3	1,2,3,5,7,11,13	Section 4.5	1,3,9,12,14,15,17
Section 1.4	1,3,5,6,7,15,17,25,27,33	Section 4.6	1,2,3,7,9,15,17
Section 1.5	1,3,5,7,11,13,15	Section 4.7	1,3,7,9,11,17
Section 1.6	1,3,13,15,21	Section 4.8	1,3,5,7,9
Section 1.7	1,3,5,7,9,13,14,17,19,21	Section 4.10	5,11,17,19,21
Section 1.8	1,3,11,13,15,27,31,32	Section 5.1	1,3,5,7,13,15
Section 2.1	1,3,5,7,9,11,15,17,19,21,23	Section 5.2	1,3,5,7,9,17,19
Section 2.2	1,3,5,6,9,11,15,17,25,29	Section 6.1	1,3,5,7,13,27,29,41,42,44,45
Section 2.3	1,3,5,7,9,15,17,19,21,25,27	Section 6.2	1,5,7,11,13,18,21,24,27

Section 3.1	9,11,13,19,21	Section 8.1	1,19,21
Section 4.1	1,2,3,5,7,8,9,10,19,20	Exam2	
Section 4.2	1,2,7,9,11,15,22	Final Exam	
Exam1			

Reasonable Accommodations for Students with Disabilities

The Office of Special Services (SPSV) is committed to supporting students with qualifying disabilities under the Americans with Disabilities Act (ADA) by providing reasonable accommodations to ensure equal access. If you have previously received accommodations due to a disability, believe you may have a disability, or have a temporary disability, please visit the office's website (https://www.qc.cuny.edu/sp/) for further information on the assistance they can offer you. Accommodations are not retroactive, so you are encouraged to get registered sooner rather than later. You may also contact their office at qc.spsv@qc.cuny.edu or call 718-997-5870 during office hours for assistance as well.

Academic Integrity

All students must follow CUNY POLICY ON ACADEMIC INTEGRITY, https://www.cuny.edu/about/administration/offices/legal-affairs/policies-procedures/academic-integrity-policy/

Generative AI

No generative AI can be used during the exams.

Student wellness

As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. QC student wellness services are available free of charge. You can learn more about confidential mental health services available on campus at: Counseling Services Department.

Use of Student Work

All programs in New York State undergo periodic reviews by accreditation agencies. For these purposes, samples of student work are occasionally made available to those professionals conducting the review. Anonymity is assured under these circumstances. If you do not wish to have your work made available for these purposes, please let the professor know before the start of the second class. Your cooperation is greatly appreciated.

Course Evaluations

During the final four weeks of the semester, you will be asked to complete an evaluation for this course by filling out an online questionnaire. Please participate in these course evaluations. Your comments are highly valued, and these evaluations are an important service to fellow students and to the institution since your responses will be pooled with those of other students

and made available online. Please note that all responses are completely anonymous; no identifying information is retained once the evaluation has been submitted.

Tutoring or Other Support Services

[suggested text] QC offers different academic support services. The QC Learning Commons provides peer tutoring, study spaces and other services. The Writing Center is a multilingual academic and intellectual support space where Queens College students work in collaboration with peer tutors to improve their writing.

Technical Support

Students who need help with their Queens College accounts (email, CUNY portal, Brightspace, and CUNYfirst) can call the ITS help desk at 718-997-4444 Monday to Friday from 9 am to 5 pm or email Support@qc.cuny.edu. For more information, visit Information Technology Services. Students can use desktop computers in the Powdermaker Hall 210 computer lab or in the library, as well borrow loaner laptops: Computers & Printing – Queens College Library).

Classroom Photography and Recording Policy

Neither photographs nor recordings (audio or video) of all or parts of classes at Queens College may be made without written permission from the course instructor(s).

The Office of Student Affairs and the Office of Special Services may provide for the recording of classes on behalf of a student receiving disability accommodations, missing class due to religious beliefs, or experiencing extended absence due to medical or other exigent circumstances.

The Queens College Classroom Photography and Recording Policy applies to both students and visitors. Students and visitors are not authorized to copy, download, or disseminate authorized recordings and photographs to others. Students in violation of this policy may be subject to disciplinary action, and visitors in violation of this policy are subject to removal from the classroom and/or campus.