

SUNY Korea  
AMS  
Spring 2023

Applied Linear Algebra  
AMS 210-90  
Rev. 12/05/2022

## SYLLABUS

**INSTRUCTOR:** Dr. Ky Tran

**OFFICE:** B525

**LECTURE:** MW 5:00PM – 6:20PM, ROOM: B203

**OFFICE HOURS:** MW 2:30PM - 4:00PM

**EMAIL:** ky.tran@stonybrook.edu

**PHONE:** 82-32-626-1911

**TA AND TA OFFICE HOURS:** TBA

**COURSE WEBSITE:** Brightspace

**COURSE DESCRIPTION:** An introduction to the theory and use of vectors and matrices; matrix theory including systems of linear equations; theory of Euclidean and abstract vector spaces; eigenvalues and eigenvectors; linear transformations.

**PREREQUISITES:** AMS 151 or MAT 131 or MAT 141 or MAT 126, or level 7 on the mathematics placement examination.

**TEXTBOOK:**

Required Text: “Contemporary Linear Algebra”, by Howard Anton, Robert C. Busby, Wiley Publisher, 1st edition, ISBN: 978-0471163626.

Recommended for additional reading: “Linear Algebra”, by Cherney, Denton and Waldron, PDF is available for free, see <https://www.math.ucdavis.edu/linear/>.

**TOPICS TO BE COVERED:**

1. Vectors
2. Solving systems of linear equations
3. Matrices: matrix algebra, matrix operations, determinants, eigenvalues and eigenvectors

4. Linear transformations
5. Applications
6. Introduction to general vector spaces

**HOMEWORK:** Homework assignments are given weekly. No late assignment will be accepted. Please submit the questions in the order in which they are assigned and submit a detailed and complete solution for full credit on each question. Your work should be neat and clean if your instructor is expected to read it. This is your opportunity to showcase what you understand.

You may discuss homework problems with other classmates, or with TAs, or with your instructor. However, you must write the solutions by yourselves in order to be accepted.

Homework will be submitted directly to Blackboard. There will be no paper homework collected, eliminating any possibility of lost assignments. Write out your complete solutions on paper. Then use your scanner or mobile application such as tiny scanner app (Adobe Scan is a great app, you can download from Play Store or Apple Store. Another candidate is Camscanner) to take pictures of your assignment and save them as ONE single PDF. This PDF is what you will submit via Blackboard under your assignment. Submitting your work as multiple PDFs or in alternate formats is not acceptable and your assignment will not be graded.

The lowest two homework scores will be dropped before computing the average.

#### **EXAM:**

Midterm 1 (tentative): Monday, April 17, 2023

Midterm 2 (tentative): Monday, May 15, 2023

Final (tentative): Wednesday, June 14, 2023, 3:15PM - 5:45PM

No make-ups are allowed if you miss an exam without serious and documented reason.

#### **GRADING POLICY**

The final grade is based upon the following:

Homework: 15%; Midterm 1: 25%; Midterm 2: 25%; Final: 35%.

By the School Policy of Attendance, if a student has more than 20% unexcused absences, the student's final grade will be an F.

Grade Scale:

Percentage	[0, 60)	[60, 70)	[70, 73)	[73, 77)	[77, 80)
Grade	F	D	C-	C	C+

Percentage	[80, 83)	[83,87)	[87, 90)	[90, 93)	[93, 100]
Grade	B-	B	B+	A-	A

**CELL PHONE AND OTHER ELECTRONIC DEVICES:** Cell phones and other electronic devices use are not permitted in class for any reason, thus eliminating distractions. Please set your

cell phones to silent mode, and turn off all your electronic devices during the class time. If you are expecting an emergency call, please sit near the door, and answer the phone outside.

**Learning Outcomes** After completing this class, students will be able to:

1. Become familiar with a diverse set of linear models and use them to interpret theory and techniques throughout the course:
  - a system of 3 linear equations in 3 unknowns;
  - a Markov chain model;
  - a dynamic (iterative) linear systems of equations;
  - a general equilibrium model.
2. Compute and apply basic vector-matrix operations:
  - scalar products;
  - matrix-vector products;
  - matrix multiplication.
3. Demonstrate diverse uses of scalar and vector measures of a matrix:
  - matrix norms;
  - dominant eigenvalue and dominant eigenvector.
4. Solve a system of linear equations using:
  - Gaussian elimination;
  - determinants;
  - matrix inverses;
  - iterative methods,
  - least squared approximate solutions using pseudo-inverses.
5. Demonstrate how Gaussian elimination determines if a system of linear equations is:
  - overdetermined;
  - underdetermined – and how to determine the family of solutions;
  - uniquely determined – and find the solution.
6. Apply basic ideas of numerical linear algebra:
  - computational complexity of matrix operations;
  - LU decomposition;

- using partitioning to simplify matrix operations;
  - ill-conditioned matrices and the condition number of a matrix.
7. Learn and use basic theory about the vector spaces associated with a linear transformation:
    - linear independence;
    - the null space;
    - the range space;
    - orthonormal spaces.
  8. Examine a sampling of linear models, chosen from linear regression, computer graphics, markov chains, and linear programming.
  9. Strengthen ability in communicating and translating of mathematical concepts, models to real world settings:
    - present solutions to problems in a clear, well-laid out fashion;
    - explain key concepts from the class in written English;
    - convert problems described in written English into an appropriate mathematical form;
    - convert the mathematical solutions into a written answer.

## **School Policy on Attendance**

1. If a student has over 20% unexcused absences, the student's final course grade will be an F.
2. Students should report the reason of absence to the professor in advance, or immediately after the absence.
3. When a student excuses his/her absence, the student must provide documentation of the reason for the absence to the professor.
4. The professor of the course reserves the right to excuse absences.
5. The professor may excuse the absence if the submitted documentation fulfills the following conditions: extreme emergencies, severe medical reasons with doctor's note, very important events.

## **Academic Integrity**

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at [http://www.stonybrook.edu/commcms/academic\\_integrity/index.html](http://www.stonybrook.edu/commcms/academic_integrity/index.html)

## **Cheating Policy**

The grade of Q is assigned to a student found guilty of academic dishonesty. The Q remains on the transcript and is computed in your G.P.A. as a grade of F. Furthermore, a note describing the academic dishonesty is attached to your permanent records with the university.

## **Disability Support Services (DSS) Statement**

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact One-Stop Service Center, Academic Building A201, (82) 32-626-1117. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential. In addition, this statement on emergency evacuation is often included, but not required. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and One-Stop Service Center.

## **Critical Incident Management**

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

## **Course Evaluations**

Stony Brook University values student feedback in maintaining the high quality education it provides and is committed to the course evaluation process, which includes a mid-semester assessment as well as an end-of-the-semester assessment, giving students a chance to provide information and feedback to an instructor which allows for development and improvement of courses. Please click the the following link to access the course evaluation system: <http://stonybrook.campuslabs.com/courseeval/>