



# MAE501: Linear Algebra in Engineering Spring 2024

Instructor: Prof. Mohamed Housseem Kasbaoui  
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Tuesday and Thursday, 9:00am – 10:15am | SCOB 210

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## Course Information

**Course Description:** MAE 501 is a graduate-level class covering basic concepts of linear algebra and their application in engineering. Emphasis is both on the fundamental mathematical concepts as well as their implementation via programming in Python.

**Credits:** 3

**Prerequisites:** Graduate Engineering students only, credit only for MAE 50.

## Learning outcomes

Upon successful completion of the course, students will have the ability to:

- Solve linear systems of equations using exact and iterative methods by hand and using programming languages.
- Demonstrate a working knowledge of important characteristics of matrices, such as its four fundamental subspaces, rank, determinant, eigenvalues, eigenvectors, singular values and singular vectors.
- Perform various matrix factorizations.
- Solve problems with applications in data science, image compression, reduced-order modeling, and high-performance computing.

## Textbooks

Strang, Gilbert. **Introduction to Linear Algebra, 6th Edition, Wellesley-Cambridge Press, ISBN 9781733146678, 2023.**

The textbook should be considered as a reference; all materials required for the course will be presented in class. To get the most out of the lectures, you are encouraged to read the book chapters before the class period in which the material will be discussed.

## Office Hours

Office hours will be posted on Canvas as soon as schedules are finalized.

Students are encouraged to ask their questions related to assignments during office hours or lectures. **Emails seeking help with assignments will not be answered.** With any other queries, you can expect a response within 48 hours.

## Course Schedule

	Topic		Assignments	Note
Week 1	Linear Equations	Ch. 2		1 <sup>st</sup> day 1/09
Week 2	Linear Equations		THW1 out	
Week 3	Vector Spaces & Subspaces	Ch. 3	THW1 due	CHW1 out
Week 4	Vector Spaces & Subspaces		THW2 out	CHW1 due
Week 5	Orthogonality	Ch. 4	THW2 due	
Week 6	Review & midterm exam 1			CHW2 out Exam 2/15
Week 7	Orthogonality  Determinant		THW3 out	CHW2 due
Week 8	Determinant	Ch.5	THW3 due	CHW3 out
Week 9				Spring break
Week 10	Eigenvalues and Eigenvectors	Ch. 6	THW4 out	CHW3 due
Week 11	Eigenvalues and Eigenvectors		THW4 due	
Week 12	Review & midterm exam 2		THW5 out	Exam 03/28
Week 13	Singular Value Decomposition	Ch. 7	THW5 due THW6 out	
Week 14	Singular Value Decomposition		THW6 due	
Week 15	Review & midterm exam 3			CHW4 out Exam 04/18
Week 16	Singular Value Decomposition			CHW4 due
Week 17	Final exam			Exam 05/02

## Grading Policy

Grades reflect your performance on assignments and adherence to deadlines. The course score will be based on the following:

Assessment	Weight
Theory homework (THW)	40%
Coding homework (CHW)	10%
Midterm exams	35%
Final exam	15%

Note that, though these percentages are expected to remain as shown, they may change if circumstances warrant.

This course will be graded on an A-E plus/minus scale, shown below. Depending on the exams' difficulty, the grading scale cut-offs may be changed at the discretion of the instructor.

Final score	Grade
97 to 100%	A+
94 to < 97%	A

90 to < 94%	A-
87 to < 90%	B+
84 to < 87%	B
80 to < 84%	B-
76 to < 80%	C+
70 to < 76%	C
Below 70 %	E

## Exam Policy

Midterm exam #1 is scheduled for **Thursday, February 15<sup>th</sup>, 2024 (9:00am to 10:00am)** in-class.

Midterm exam #2 is scheduled for **Thursday, March 28<sup>th</sup>, 2024 (9:00am to 10:00am)** in-class.

Midterm exam #3 is scheduled for **Thursday, April 18<sup>th</sup>, 2024 (9:00am to 10:00am)** in-class.

The final exam will be held during finals week on **Thursday May, 5<sup>th</sup>, 2024 (7:30am to 9:20am)**.

**There will be no rescheduling of the exams.**

In cases of documented illness or family emergency, I **MUST** be notified immediately before the start time of the exam. In such situation, I will drop the exam from the calculation of your final score.

Students requesting testing accommodation must be registered with the Student Accessibility and Inclusiveness Services and must submit appropriate documentation substantiating recommended testing accommodation.

## Attendance Policy

Though attendance at lecture will not be monitored, attendance at each class period is considered to be mandatory. You are responsible for all material, including announcements, presented in class. You are responsible for recovering missed information if you are absent for any reason.

## Homework Policy

There will be a total of **10 assignments**: 6 theory assignments and 4 coding assignments. Theory assignments are to be completed by hand. **Coding assignments must be completed using Python on Google Colaboratory.** Both handwritten and programming portions must be submitted on GradeScope.

### Homework submission

For the **theory assignments**, you will submit a single PDF report of your scanned work. Reports with poor image quality will not be graded. If using your phone/table to digitize your handwritten work, ensure that your work is legible. Reports must be neat, legible and professional. It is **NOT** sufficient to write an equation and an answer with no additional explanation.

For the **coding assignments**, you will submit the notebook file (.ipynb) and python file (.py) generated by Google Colaboratory. Your code will be partially auto-graded, and you will have multiple opportunities to resubmit up until the due date.

### Late submissions

For theory assignments, a penalty of -5% of the base score will be applied **each 10min past the due date.**

In the case of documented emergency/illness, late work may be turned in up to 24 hours following the initial due date. You must notify me immediately and receive my approval, no later than on the original due date.

### Grading policy

1. Your theory and coding homework with lowest scores will be dropped from grade calculation.
2. There will be no make-up work or extra assignments to improve your grade.

### Regrade requests

Regrade requests must be submitted within 48h of the initial return date on GradeScope (see further information below). **Regrade requests sent over email or after the 48h window will be denied.**

### Academic Integrity Policy

1. Submissions that are essentially identical between students will be returned without grading, and the students involved will be reported to the Academic Integrity Office.
2. Copying solutions from Chegg.com or similar websites is a violation of the Academic Integrity Policy (AIP). As such, it will be reported to the Academic Integrity Office (AIO).
3. Posting assignments on Chegg.com or similar websites is considered intellectual property infringement (see section on Copyright Laws).
4. A code similarity checker will be run to detect similar answers. Students with similar codes will be reported to the AIO.

### Regrade Policy

If you would like to submit a regrade request, you must place the request **within 48H of the initial return date via Gradescope**. The request must include i) for which problem or part the regrade is requested and ii) an explanation of why you think a regrade is warranted. Submitting a regrade request subjects the entire assignment or exam to a regrade.

### Communicating with the Instructor

ASU email is an [official means of communication](#) among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly.

***You are responsible for all course information that is sent to your ASU email address, whether through the Canvas, the roster or directly from the instructor or TA.***

## Syllabus Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. Remember to check your ASU email and the course site often.

## Academic Integrity

*Engineering is an honorable profession. Please do not dishonor it by engaging in unethical or unprofessional behavior.*

Cheating will not be tolerated, and suspected cheating will immediately be reported to the Student Academic Services Office of the Ira A. Fulton Schools of Engineering.

Students are encouraged to work together to complete homework assignments; however, there are restrictions. Please be sure to follow class regulations in completing and turning in your homework. The following ARE allowed and encouraged:

1. Attending office hours and asking questions regarding solution to homework problems.
2. Small group discussion of methodology and concepts for solving homework problems. Discussion may include the process for solving problems (including programming) as long as a) all participants in the discussion contribute and b) the discussion does not result in any document that details solution to homework problems or actual code, and c) the names of all participants in the group discussion are included on each student's submission.

The following are NOT allowed:

1. Copying of any portion of another student's homework or exam.
2. Allowing the copying by another student of your own homework solution or exam.
3. Making available in any way, including online or via Facebook, any homework assignment solution or examination solution to any other person.<sup>1</sup>
4. Copying any homework solution or exam solution from any previous semester.
5. Receiving help from anyone to such an extent that the work is no longer your own.
6. Hiring of or using a tutor or tutoring service to do homework problems or exams.
7. Using any online service, such as Chegg, CourseHero, or any other online site for any reason, including:
  - a. to complete homework, exams or any other work product,
  - b. to post or share any materials for this course, including (but not limited to) homework assignments, exams, or your solutions to any of these.<sup>1</sup>
8. Copying the solution to any homework problem from any internet or other source.
9. Use of a solutions manual for any textbook, including but not limited to that used in this class.
10. Any other action that constitutes a violation of the ASU academic integrity policy.

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<sup>1</sup> Note that all course materials are implicitly copyrighted by Arizona State University. Sharing, distributing, copying, or uploading their content is strictly forbidden and will be prosecuted under Federal copyright law and/or the ASU Student Code of Conduct.

The "rule" for homework is that you MAY discuss how to solve problems, but the work you turn in for a grade MUST be your individual work. If you are in doubt about whether or not your activities are allowed, please ask!

Academic honesty is expected of all students in all examinations, papers, academic transactions and records. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see <http://provost.asu.edu/academicintegrity>

## **Disability Resources**

Students who feel they will need disability accommodations in this class but have not registered with the Disability Resource Center (DRC) should contact DRC immediately. The DRC Tempe office is located on the first floor of the Matthews Center Building. DRC staff can also be reached at: (480) 965-1234 (V) or (480) 965-9000 (TTY). For additional information, visit: [www.asu.edu/studentaffairs/ed/drc](http://www.asu.edu/studentaffairs/ed/drc).

## **Expected Classroom Behavior - Campus Courses**

Arrive on time for class. Excessive tardiness will be subject to sanctions. Under no circumstances should you allow your cell phone to ring during class. Any disruptive behavior, which includes ringing cell phones, listening to your mp3/iPod player, text messaging, constant talking, eating food noisily, reading a newspaper will not be tolerated. The use of laptops (unless for note taking), cell phones, MP3, IPOD, etc. are strictly prohibited during class.

## **Reporting Title IX Violations**

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at <https://sexualviolenceprevention.asu.edu/faqs>.

## **Policy on Sexual Discrimination**

Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment, and retaliation by employees, students, contractors, or agents of the university based on any protected

status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information.

**Title IX** is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at <https://sexualviolenceprevention.asu.edu/faqs>.

**Mandated sexual harassment reporter:** As an employee of the University I am considered a mandated reporter and therefore obligated to report any information regarding alleged acts of sexual discrimination that I am informed of or have a reasonable basis to believe occurred.

ASU Counseling Services, <https://eoss.asu.edu/counseling>, is available if you wish to discuss any concerns confidentially and privately.

## Copyrighted Materials

Course content, including lectures, are copyrighted materials and students may not share outside the class, upload to online websites not approved by the instructor, sell, or distribute course content or notes taken during the conduct of the course (see ACD 304–06, “Commercial Note Taking Services” and ABOR Policy 5-308 F.14 for more information).

You must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.

## Policy Against Threatening Behavior

**Per the Student Services Manual, SSM 104–02:** Students, faculty, staff, and other individuals do not have an unqualified right of access to university grounds, property, or services. Interfering with the peaceful conduct of university-related business or activities or remaining on campus grounds after a request to leave may be considered a crime. All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students.