

Linear Algebra

MACT2132
Spring 2023

Course Syllabus

What's the course schedule?

Section	Instructor	Time	Location	Days	TA	UG TA
1	Isabel Müller	02:00 - 03:15	Waleed CP63	MR	Kamal Eldin	Youssif Abuzied
2	Isabel Müller	11:30 - 12:45	Waleed CP57	MR	Kamal Eldin	Moaz Essam
3	Eslam Badr	02:00 - 03:15	SSE CP 37	WU	Kamal Eldin	Ahmed Jaheen
4	Eslam Badr	03:30 - 04:45	SSE CP 32	WU	Kamal Eldin	Adham Elasfar

Instructor for sections 1 and 2

Name: Isabel Muller

E-mail: isabel.muller@aucegypt.edu

Department: Mathematics and Actuarial Science, Office 1034

Office Hours*: open door, by appointment.

Instructor for sections 3 and 4

Name: Eslam Badr

E-mail: eslammath@aucegypt.edu

Department: Mathematics and Actuarial Science, Office 1037

Office Hours*: WU 12:45 – 2:00 pm, or by an appointment.

Teaching Assistant

Name: Kamal Tawfik

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Office Hours*: TBA
Undergraduate Teaching Assistants:

Name: Youssif Abuzied
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Name: Adham Elasfar
E-mail: adham_samy@aucegypt.edu
Office Hours*: TBA

*Note: For the most updated hours, please check the Blackboard.

Important Note

Please read this Course Syllabus closely, as it provides you with all the course requirements, course readings, schedule of activities, and due dates for deliverables, which are all listed in the appropriate sections in this syllabus. By taking this course, **you, the TAs, and the lecturers agree to abide by all the rules and regulations provided in this syllabus**. Changes in this syllabus may occur during the semester, so make sure to check blackboard for the latest updates. We will be as flexible as possible but within the limits that ensure fairness to all students.

Communication Procedures

URL: <http://blackboard.aucegypt.edu> requires your AUC email credentials to login. Once logged in, select this course. If successful, you will see a link to the complete syllabus, class announcements, assigned homework, and any additional course material. You can view your grades, use the email tool, or utilize the discussion tool to communicate with your classmates. You will receive a notice via blackboard (either an announcement, or an email) if there is additional information, exam date change, etc, or an urgent message, class canceled, etc, that directly impacts this course.

Also, you can use Whatsapp to facilitate communications among yourselves and the TAs. Please click on the following link through your phone to join our Whatsapp group:

<https://chat.whatsapp.com/ETgluQ38dATA3iT7ev8LcA>

What's this course?

This course covers topics in linear algebra, including solutions of linear equations, matrices and determinants, vector spaces and subspaces, linear independence, bases and dimension, inner product and orthonormal bases, linear transformations, eigenvalues and eigenvectors.

What will I be able to do after finishing this course?

After completing the course, students will be able to:

- Apply the Gauss-Jordan algorithm to determine all solutions of a given system of linear equations, in particular, to see if the system admits a unique solution.
- Calculate the determinant of a given square matrix, and conclude whether the matrix is invertible or singular.
- Select an appropriate matrix or vector technique to obtain a solution to a given description of an application problem.
- Evaluate whether definitions of a set of objects with a well-defined addition and scalar multiplication constitute a real vector space. If valid, demonstrate all axioms; if not, give a counterexample to a vector space property.
- Determine whether a given function defines an inner product on a vector space or not. If valid, use it to compute length, directions and orthogonal projections.
- Describe the kernel and the image of a linear transformation between vector spaces. In particular, decide whether it is one-to-one and/or onto.
- Investigate the eigenvalues and the corresponding eigenvectors of a given square matrix. In particular, conclude whether such a matrix is diagonalizable or not.
- Follow a proof of a theorem as well as prove simple mathematical statements.

What are the course materials?

- We will mainly follow the following textbook: *Elementary Linear Algebra*, by R. Larson (Metric Version), 8th Edition, 2017, Cengage Learning.
WebAssign ISBN : 9781337699839
- We will cover most of Chapters 1-7.
- We will do all of our homework assignments online using **WebAssign** (used for Calculus I-III). The goal of this system is to provide you with rapid feedback on your homework assignments. The system responds immediately to a submitted FINAL answer. In some cases, it also provides some hints and explanations when you input an incorrect response. **Additionally**, in each assignment you need to submit your work to some selected problems through **Gradescope**, which will be announced beforehand.
- We have a discounted price (£ 15.5) for those who can buy their access codes online. **Note that** the access codes for the calculus text are **NOT** valid for this course, as we are using a different textbook.

How do I enroll in the Webassign course?

- Please follow the enrolment directions in the attached link

https://www.cengage.com/coursepages/American_WA_MACT2132211

- Class Key: [AUC.EG62557109](#)
- If you have any questions or you need any help from the WebAssign team, you will need to issue a support ticket by going to the URL in the enrolment directions file.

How do I enroll in the Gradescope course?

- First, visit www.gradescope.com and sign up using your AUC email.
- Join our Linear Algebra (MACT 2132). Write your **name exactly as written in Blackboard**, preceded by your section number. For example, “03 Fulana Ahmed” or “01 John Doe”. The entry code is **8NZP3P**.
- Make sure you add your ID number.
- Please make sure you download the appropriate scanner app for free onto your phone as described in the handouts. These free apps are the most compatible with Gradescope but any scanner app that allows you to convert images to pdfs should be sufficient.
- You can go on YouTube or watch the provided linked videos below for instructions on how to upload assignments.

<https://www.youtube.com/watch?v=oHvYPaYVhpo>
<https://www.youtube.com/watch?v=K6IEuGEUikc>

- For further questions, feel free to ask the instructor or TA. It is better to upload as a pdf as opposed to scanned images (This will make sense when you watch the videos).

How is my grade determined?

All exams, and assignments will be counted toward your final numeric score and letter grade in the course. In particular, there will be no "best m out of n ". Also, there is no prespecified cut off points that will be used for transforming your final numeric scores to your final letter grade.

- 10% Online WebAssign + 10% Gradescope hardcopies: **Late submissions will NOT be accepted.**
- 10% MATLAB Exercises (**7% regular assignments + 3% programming part**)
- Two Midterms (20% each). **Both midterms will be counted.**
- Comprehensive Final: 30%.

	Date	Time
Exam 1	Tuesday, March 14	06:00 pm - 07:30 pm
Exam 2	Saturday, April 29	10:00 am - 11:30 am
Final Exam	Wednesday, May 24	11:30 am - 01:30 pm

(*) February 7 is the closing date of Drop/Add.

(**) March 30 is the deadline for course dropping.

Make-up exams will only be given to students who could not take the regular exam for a well-documented excuse that is approved by the dean of students. The excuse needs to be initiated with the dean of students, and communicated with the instructor, prior to (and not after) the exam.

Can I use a calculator in this class?

A scientific calculator might be helpful. However, graphing calculators and programmable calculators are **NOT ALLOWED** on exams.

Is there anything I need to know for the exams?

- All exams are cumulative. What you fail to learn in the beginning may hurt you at the end.
- All exams are closed books, closed notes, and closed colleagues.
- You must **SHOW ALL YOUR WORK** in exams. Unsupported answers are considered miracles and, while inspirational, will receive little or no credit.
- All exams are planned to be face to face unless stated otherwise.
- **Important Note:** As our recent experience showed, cheating in the exams gets discovered. Cheaters will then fail the course and will be reported to the academic integrity committee, which usually gives severe punishments.

Emotional Support

The basis for effective learning is mental self-care and health. If you feel overwhelmed at any point during the term, please do not hesitate to seek help.

Center for Student Well-being (CSW)

The Center for Student Well-Being (CSW) works to help students develop resiliency to enable them to cope with challenges on the emotional, behavioral, or cognitive levels.

They offer private consultation as well as general information. See

<https://www.aucegypt.edu/students/well-being> for further information.

Disability Policy

If you have established accommodations with Student Disability Services (SDS), please activate your accommodations via Simplicity and contact the instructor to discuss how the approved accommodations will be implemented in this course.

Is there anything I need to know concerning academic integrity?

While we expect you to help and cooperate with each other in study groups, and during the project, the work in the assignments, and exams is expected to be your own. Academic integrity is a commitment, even in the face of adversity, to five fundamental values: honesty, trust, fairness, respect and responsibility. All activities at AUC, from teaching to administrative and support functions, serve the process of learning.

Academic fraud and dishonesty include, but are not limited to, the following categories: cheating, plagiarism, fabrication, multiple submissions, obtaining unfair advantage, unauthorized access to academic or administrative systems, aiding and abetting, impersonation, threatening harm, and copyright infringement. For more details see

<http://in.aucegypt.edu/aucacademics/academic-integrity>.

University's Academic Standards, Integrity, and Honesty Codes (see <http://www.aucegypt.edu/academics/integrity/Pages/default.aspx>) will be strictly enforced.

We have zero-tolerance for any violation of the academic integrity code

Attendance and Participation Policy:

Attendance and participation in class sessions are essential to the process of education at AUC. If students fail to attend classes, they fail to take advantage of an educational opportunity. For this reason, students are expected to attend classes regularly. In fact, your attendance in all classes is strongly advised. **In the event you miss more than 6 classes during the semester for any reason, you should drop the course if the absences occur before the last date for dropping classes; otherwise, you may be given a grade of "F" for the course.**

Important Notes

- Respect both my responsibility to teach and the right of other students to learn.
- Attend ALL lectures.
- Full attendance is highly appreciated.
- Lectures will start punctually on time, being late will count as partial attendance (2/3) only.
- Copied assignments will initiate an academic integrity case.
- More than 6 absences may drop your letter grade or fail you the course.
- Refrain from side-talking.

- Put your mobile phones on silent mode.
- Feel free to interrupt and ask questions.
- The ultimate goal of the lecture is to enrich your knowledge.

How do I benefit best from this course?

Below is a study guide for the wise student to be successful in an online course:

1. Access the Blackboard course website and the Whatsapp's group frequently, at least every other day for announcements and discussions.
2. Read the section of the textbook ahead of time, watch and listen to the online lectures, and take notes.
3. Participate in class discussions.
4. Do all homework problems.
5. Ask the lecturer and/or the TA during their office hours.
6. Review the material before each exam.
7. Take a good night's sleep.

Course Plan

Section	Title	Section	Title
1.1	Systems of Linear Equations	4.3	Subspaces
1.2	Gauß-Jordan Method	4.4	Spanning Sets & Linear Independence
2.1	Matrix Operations	4.5	Basis and Dimension
2.2	Properties of Matrices	4.6	Rank of a Matrix
2.3	The Inverse of a Matrix	5.1	Dot Product
2.4	Elementary Matrices	5.2	Inner Product Spaces
3.1	The Determinant of a Matrix	5.3	Orthonormal Bases
3.2	Determinants & Operations	6.1	Linear Transformations
3.3	Properties of Determinants	6.2	Kernel and Range
3.4	Applications of Determinants	6.3	Matrix Representation
4.1	\mathbb{R}^n as a Vector Space	7.1	Eigenvalues and Eigenvectors
4.2	Abstract Vector Spaces	7.2	Diagonalisation*

* If time permits.

MR classes:

The Comprehensive Final Exam is on May 24, 11:30 am - 1:30 pm.

UW classes:

Week	Sunday	Sections covered		Wednesday	Sections covered	Important Events
1				Feb 01	2.1/2.2	
2	Feb 05	2.2/1.1		Feb 08	1.1/1.2	
3	Feb 12	1.1/1.2		Feb 15	2.3	HW1 (2.1, 2.2)
4	Feb 19	2.4		Feb 22	3.1/3.3/3.2	HW2 (1.1, 1.2)
5	Feb 26	3.1/3.3/3.2		Mar 01	3.2/3.4	HW3 (2.3), MATLAB 1
6	Mar 05	4.1/4.2		Mar 08	4.1/4.2	HW4 (3.1, 3.2, 3.3), MATLAB 2
7	Mar 12	4.3		Mar 15	4.4	Exam 1 MATLAB 3
Exam 1 is on Tuesday, Mar 14 at 6:00 pm - 7:30 pm, covering chapters 1, 2, 3.						
8	Mar 19	4.4		Mar 22*	4.5	HW5 (4.1, 4.2)
9	Mar 26*	4.5/4.6		Mar 29*	4.6	HW6 (4.3)
10	April 02*	7.1		April 05*	7.1/7.2**	HW7 (4.4, 4.5)
11	Apr 09	Break		April 12	Break	HW8 (4.6), MATLAB 4
12	Apr 16	Break		April 19	6.1/6.3	HW9 (7.1, 7.2), MATLAB 7
13	April 23	Eid Holiday		April 26	6.1/6.3	Exam 2
Exam 2 is on Saturday, April 29 at 10:00 am - 11:30 am, covering chapters 4, 7.						
14	April 30	6.2		May 03	6.2	HW10 (6.1, 6.3)
15	May 07	5.1/5.2		May 10	5.1/5.2	HW11 (6.2), MATLAB 6

16	May 14	5.2/5.3		May 17	5.3	HW12 (5.1, 5.2, 5.3), MATLAB 5
17	May 21	Q & A				Final Exam, MATLAB Programming
<p align="center">The Comprehensive Final Exam is on Wednesday, May 24, 11:30 am - 1:30 pm.</p>						

** If time permits.

* Lectures during Ramadan

Holidays

Notes:

- **March 30 is the deadline for course dropping.**
- **There are 3 trials for each homework assignment.**
- **Note that all homework assignments are due at 11:59 PM.**

Good luck and a successful term to everyone!
Dr. Isabel and Dr. Eslam