UMass Boston
Department of Mathematics
Math 260 - Linear Algebra
Spring 2023

Syllabus

Course Name: Math 260 - Linear Algebra (3 credits)

Section: Section 03 (7632)

Description: This is an introductory class in Linear Algebra. Topics include basic algebraic operations of Matrices, Linear systems of equations, Gauss-Jordan elimination, subspaces, linear independence, bases, dimension, linear maps, determinants, orthogonality, orthogonalization process, eigenvalues and eigenvectors, as well as a brief discussion on abstract vector spaces.

Pre-requisites: MATH 140 (or an equivalent course) OR Permission of Instructor

Schedule: TuTh 2:00PM - 3:15PM in Y04-4110
For every hour in class, you should dedicate at least two additional hours studying for this course.

Textbook: Lecture notes provided by the instructor.
Recommended supplemental text: Linear Algebra with Applications, 5th Edition, by Otto Bretscher. Published by Pearson, ISBN 0-321-79697-7.

Instructor: Catalin Zara, Professor of Mathematics.
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    Office: W 03-154-15
    Website: `czara.aczsite.net`

Office hours: TuTh 1:00pm - 1:45pm in W03-154-15,
TuTh 3:20pm - 3:50pm in Y04-4110 and 5:30pm - 6:15pm in TBD.
We will be using *Blackboard* for class discussion. Rather than emailing questions to me, I strongly encourage you to post your questions on *Blackboard*.

Assignments: *Exams*: There will be three in-class exams on Feb 23, Apr 4, and May 4. Calculators will not be required and will not be allowed on exams. Make-up exams will be allowed only with an official excuse. In all other situations, a missed exam will get a score of zero. The UMass Boston's policy on class attendance and excused absences is available at
`https://www.umb.edu/registrar/academic_policies/class_attendance`

Homework: For each section you will have an online problem set, using WeBWorK. Additional problems, with complete solutions required, may be assigned during the semester. Late homework will be penalized.

Grading:

Assignment	Points		Final grade	Points	Percentage
Exam 1:	100 points		A	360	90%
Exam 2:	100 points		B	320	80%
Exam 3:	100 points		C	280	70%
Homework:	100 points		D	240	60%
Total:	400 points				

Attendance: Regular class attendance is required and active class participation is expected. Students are responsible for material and announcements missed due to an absence. Please come to class on time and turn off your cell phone before the class begins.

Academic Integrity and Student Code of Conduct: Education at UMass Boston is sustained by academic integrity. Academic integrity requires that all members of the campus community are honest, trustworthy, responsible, respectful, and fair in academic work at the university. As part of being educated here, students learn, exercise, increase, and uphold academic integrity. Academic integrity is essential within all classrooms, in the many spaces where academic work is carried out by all members of the UMass Boston community, and in our local and global communities where the value of this education fulfills its role as a public good. Students are expected to adhere to the Student Code of Conduct, including policies about academic integrity, delineated in the University of Massachusetts Boston Graduate Studies Bulletin, Undergraduate Catalog, and relevant program student handbook(s), linked at `www.umb.edu/academics/academic_integrity`.

Special accommodations: UMass Boston is committed to creating learning environments that are inclusive and accessible. If you have a personal circumstance that will impact your learning and performance in this class, please let me know as soon as possible, so we can discuss the best ways to meet your needs and the requirements of the course. If you have a documented disability, or would like guidance about navigating support services, contact the Ross Center for Disability Services by email (ross.center@umb.edu), phone (617-287-7430), or in person (Campus Center, UL Room 211). To receive accommodations, students must be registered with the Ross Center and must request accommodations each semester that they are in attendance at UMass Boston. For more information visit: `www.rosscenter.umb.edu`. Please note that the Ross Center will provide a letter for your instructor with information about your accommodation only and not about your specific disability.

Additional Resources: UMass Boston is a vibrant, multi-cultural, and inclusive institution committed to ensuring that all members of our diverse campus community are able to thrive and succeed. The university provides a wide variety of resources to support students' overall success. As we continue to deal with the evolving impacts of the COVID-19 pandemic, these resources are more important than ever.

- Are you in emotional distress? Call 617.287.5690 to speak with a licensed clinician 24/7 who can offer support, crisis recommendations, and assistance with finding resources.
- Have a campus question or issue? Use Here4U in the UMass Boston app or via `www.umb.edu/here4U`.
- Want advice in navigating a university or life situation? Contact the Dean of Students Office at `www.umb.edu/deanofstudents`.
- Want to connect with housing and food insecurity support, student life groups and events, or recreation activities? Visit `www.umb.edu/life`.
- Want to access resources specifically for immigrant-origin, DACA, TPS, and undocumented students? Visit `www.umb.edu/immigrant`.
- Looking for additional identity-based community support? Find more resources at `www.umb.edu/identity-support`
- Want to make the most of your academic experience? Visit `www.umb.edu/academics/vpass/academic_support`.
- Unable to attend class on a specific date or participate in an exam or class requirement due to a religious observance? Fill out the excused absence form (requires 2-weeks' notice) to request religious accommodation at `www.umb.edu/religiousabsence`.

Expectations: Students enrolled in this course are expected to be:
- Motivated and disciplined;
- Adequately familiar with background material;
- Committed and actively involved in their own learning;
- Able to work in groups;
- Secure enough to ask for help.

Goals: By fully participating in all course activities, students should be able to:
- Understand the fundamental concepts of linear algebra;
- Use linear algebra to solve problems;
- Build and improve portable skills;
- Apreciate the beauty and power of mathematics.

Changes: Any changes or class cancellations will be announced in class or by e-mail, or will be posted online. Course materials and announcements are posted on *Blackboard*.

Recommended Practice Problems

From Bretscher 5th Edition, Pearson Publishing. ISBN10: 0-321-79697-7

1.1 Introduction to Linear Systems	# 1, 7, 19, 21, 23, 25, 27, 31, 37, 42
1.2 Matrices, Vectors, and Gauss-Jordan Elimination	# 1, 7, 9, 21, 27, 29, 35, 37, 39, 47
1.3 On the Solutions of Linear Systems; Matrix Algebra	# 1, 7, 8, 13, 23, 35, 37, 52, 55, 59
2.1 Introduction to Linear Transformations and Their Inverses	# 1, 5, 7, 17, 23, 27, 33, 42, 51, 53
2.2 Linear Transformations in Geometry	# 1, 5, 7, 11, 18, 21, 26, 27, 31, 53
2.3 Matrix Products	# 3, 7, 13, 15, 23, 29, 41, 61, 63, 71
2.4 The Inverse of a Linear Transformation	# 5, 9, 19, 29, 31, 53, 79, 85, 90, 91
3.1 Image and Kernel of a Linear Transformation	# 5, 13, 15, 21, 23, 31, 33, 41, 42, 53
3.2 Subspace of $\mathbb{R}^n$; Bases and Linear Independence	# 1, 8, 17, 19, 25, 29, 33, 34, 43, 55
3.3 The Dimension of a Subspace of $\mathbb{R}^n$	# 7, 17, 23, 25, 27, 29, 32, 61, 68, 71
3.4 Coordinates	# 5, 11, 17, 21, 23, 27, 35, 39, 50, 53
4.1 Introduction to Linear Spaces	# 1, 5, 9, 10, 23, 27, 31, 33, 36, 51
4.2 Linear Transformations and Isomorphisms	# 3, 7, 15, 25, 39, 45, 53, 54, 57, 63
4.3 The Matrix of a Linear Transformation	# 1, 3, 7, 13, 21, 35, 37, 50, 55, 60
5.1 Orthogonal Projections and Orthonormal Bases	# 5, 9, 13, 15, 17, 19, 27, 35, 41, 45
5.2 Gram-Schmidt Process and QR Factorization	# 5, 11, 13, 19, 25, 27, 33, 35, 39, 45
5.3 Orthogonal Transformations and Orthogonal Matrices	# 3, 7, 8, 15, 35, 37, 40, 47, 61, 69
5.4 Least Squares and Data Fitting	# 1, 2, 5, 9, 19, 21, 25, 33, 37, 39
5.5 Inner Product Spaces	# 3, 5, 10, 11, 15, 19, 23, 27, 31, 32
6.1 Introduction to Determinants	# 3, 5, 9, 15, 17, 29, 33, 41, 49, 55
6.2 Properties of the Determinant	# 1, 5, 15, 25, 27, 32, 36, 43, 45, 50
6.3 Geometrical Interpretations of the Determinant; Cramer's Rule	# 1, 7, 11, 13, 14, 23, 25, 31, 45, 47
7.1 Diagonalization	# 1, 3, 11, 13, 17, 38, 41, 53, 61, 71
7.2 Finding the Eigenvalues of a Matrix	# 3, 5, 9, 11, 12, 27, 29, 33, 38, 45
7.3 Finding the Eigenvectors of a Matrix	# 5, 9, 11, 19, 21, 35, 37, 45, 47, 51
8.1 Symmetric Matrices	# 3, 5, 7, 11, 12, 14, 16, 17, 27, 43
8.2 Quadratic Forms	# 1, 3, 5, 7, 15, 19, 29, 33, 35, 64
8.3 Singular Values	# 1, 3, 5, 9, 10, 11, 12, 13, 17, 18