M 221-004 — Introduction to Linear Algebra — Spring 2017

TR 09:25 am – 10:40 am, Wilson Hall 1-124

Instructor: Dr. Dominique Zosso

E-mail: dominique.zosso@montana.edu

Howto: `www.insidehighered.com/views/2015/04/16/advice-students-so-they-dont-sound-silly-emails-essay`

Office hours: T 2–3; R 1–2, and as scheduled by (email-)appointment, in Wilson Hall 2-242.

Course text: *Introduction to Linear Algebra*, by Gilbert Strang, 5^{th} edition, Wellesley Cambridge Press, 2016 (ISBN 978-0-9802327-7-6), *plus complementary sources provided where necessary.*

Description: M 221 "Introduction to Linear Algebra" is an introductory course to linear algebra. Topics covered include (but are not limited to): Matrix algebra, systems of linear equations, determinants, vector algebra and geometry in Euclidean 3-space, eigenvalues, eigenvectors (Chapters 1-6). You will use the software package MATLAB for more computational aspects of the course.

Learning outcomes: Upon completion of the course, students will be able to:

1. Explain the basic linear algebra topics:
   (a) the theory of linear equations,
   (b) matrix algebra,
   (c) determinants,
   (d) vector spaces,
   (e) linear transformations,
   (f) orthogonality,
   (g) eigenvalues and eigenvectors;
2. Explain some applications of linear algebra,
3. Write and read simple proofs.

Prerequisites: Calculus II (M 166Q or M 172Q).

Homework: Weekly homework problems will be assigned regularly. Homework problems are integrative part of the curriculum. It is strongly encouraged to routinely check any paper-and-pencil calculations with MATLAB (Emphasis on: as a check, not to get the solution in the first place). Homework assignments will not be collected, corrected or graded. But, to learn this material (and to do well on exams and quizzes), you should master all of the homework problems. Indeed:

Quizzes: At the beginning of about every other class, there will be a 5-10 minutes quiz roughly covering current lectures and homework problems **(be there on time!)**. The two lowest (or two missed) quizzes will be dropped, but make-up quizzes will not be given.

Exams: There will be two 75 minute midterms: tentatively on **Tuesday, January 31** and **Thursday, March 9**, in class. There will be a final exam on **May 4, 12:00–1:50 pm**, in 1-124 Wilson Hall. No makeup exams will be given under any circumstances (except as required by University policy). For each exam, you must bring a picture ID. **Closed book: No books, calculators, scratch paper or notes will be allowed during exams.**

Grading policy: Quizzes: 25%, Midterm I: 15%, Midterm II: 25%, Final (comprehensive): 35%.

Tentative class schedule:				**Homework**
T	1/10		SPRING CONVOCATION (no class)	
R	1/12	§1.1	Course introduction | Vectors	1–5,8,10,11,13,15–22,26,27,30
T	1/17	§1.2	Vector lengths, dot-product	1–4,6,8,11–13,17,19,27,29,34
R	1/19	§1.3	Matrices	1,3,4,6,7,9,14
T	1/24	§2.1	Vectors and linear equations	1–7,9,10,13,15–18,20–30,32,33
R	1/26	§2.2	Variable elimination	1–6,9–13,16,17,20–22,28
T	1/31		**MIDTERM I** (in class)	**2/1 is last day to drop w/o W**
R	2/2	§2.3	Elimination on matrices	1,3–7,9,10,12,13,16,17,24–27,29
T	2/7	§2.4	Matrix operations	1–4,6,7,12,15–17,19,26,29–33
R	2/9	§2.5	Matrix inverses	1,3,4,7–12,19,21–25,29–31,33
T	2/14	§2.6	**LU** decomposition	1,2,4–8,10–12,15,16,20
R	2/16	§2.7	Transposes and permutations	1-8,11–13,18,19,22,26,30,31,38,39
T	2/21	§3.1	Vector spaces	1–4,6,10,12–16,18–20,22,23,26,27
R	2/23	§3.2	Nullspace	1,3–5,8–13,16–18,20–22,28,30,33,41,42
T	2/28	§3.3	Completely solving $\mathbf{Ax} = \mathbf{b}$	1–5,8,10–12,14,16–22,26,27,32,33
R	3/2	§3.4	Independence, basis, dimension	1,2,7–12,15,16,18,19,21–23,26,28,39
T	3/7	§3.5	Dimension of the four subspaces	1–3,6,7,11,14,16,21,22,24,26
R	3/9		**MIDTERM II** (in class)	
			SPRING BREAK	
T	3/21	§4.1	Orthogonality of the four subspaces	1–5,9,10,14,15,17,19,20,24–26
R	3/23	§4.2	Projections	1–3,5–9,11–13,16–19,21–23,26,27
T	3/28	§4.3	Least squares	1–3,5–7,9–11,17,21,26,27
R	3/30	§4.4	**QR** decomposition	1–3,6–8,11,13–15,18,19,22–24,30,33
T	4/4	§5.1	Determinant	1–5,7–10,13,14,16,19,22,24
R	4/6	§5.2	Permutations and cofactors	1–5,12,13,19,27,28
T	4/11	§5.3	Cramer's rule	1,3,6,8,16–20,21,27–30
R	4/13	§6.1	Introduction to eigenvalues	1–8,13,14,16,17,19,24,27,29,32
T	4/18	§6.2	Diagonalization	1–4,8,9,11,12,15–17,20,26,33
R	4/20	§6.4	Symmetric matrices	2–6,11-13,16,25,27,28
T	4/25		Leeway	
R	4/27		REVIEW (in class)	
			FINAL EXAM — May 04, 12:00–1:50 pm — 1-124 Wilson Hall	

Section numbers (§) refer to the book. Homework numbers refer to problems in the book associated with the section under study. Homework assignments are expected to be completed by the next class meeting.

Behavioral expectations: Montana State University expects all students to conduct themselves as honest, responsible, and law-abiding members of the academic community and to respect the rights of other students, members of the faculty and staff, and the public to use, enjoy, and participate in the University programs and facilities. For additional information reference see:
`http://www.montana.edu/policy/student_conduct/`

Collaboration: University policy states that, unless otherwise specified, students may not collaborate on graded material. Any exceptions to this policy will be stated explicitly for individual assignments. If you have any questions about the limits of collaboration, you are expected to ask for clarification.

Plagiarism: Paraphrasing or quoting anothers work without citing the source is a form of academic misconduct. Even inadvertent or unintentional misuse or appropriation of another's work (such as relying heavily on source material that is not expressly acknowledged) is considered plagiarism. If you have any questions about using and citing sources, you are expected to ask for clarification. Academic Misconduct Section 420 of the Student Conduct Code describes academic misconduct as including but not limited to plagiarism, cheating, multiple submissions, or facilitating others misconduct. Possible sanctions for academic misconduct range from an oral reprimand to expulsion from the University.

Academic Expectations: Section 310.00 in the MSU Conduct Guidelines states that students must:

A) be prompt and regular in attending classes;

B) be well prepared for classes;

C) submit required assignments in a timely manner;

D) take exams when scheduled;

E) act in a respectful manner toward other students and the instructor and in a way that does not detract from the learning experience; and

F) make and keep appointments when necessary to meet with the instructor.

In addition to the above items, students are expected to meet any additional course and behavioral standards as defined by the instructor.

Withdrawal Deadlines: After April 13, 2017, I will only support requests to withdraw from this course with a W grade if extraordinary personal circumstances exist.

Students with Disabilities: If you have a documented disability for which you are or may be requesting an accommodation(s), you are encouraged to contact your instructor and Disabled Student Services as soon as possible.

Student Educational Records: All records related to this course are confidential and will not be shared with anyone, including parents, without a signed, written release. If you wish to have information from your records shared with others, you must provide written request/authorization to the office/department. Before giving such authorization, you should understand the purpose of the release and to whom and for how long the information is authorized for release.