

Syllabus

Title	Introduction to Linear Algebra
Number	MATH 3310-201
Time	MW 3:30–4:45
Place	PLG 203
Instructor	David Milovich
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Office	LBV 321
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Hours	MW 1:45–3:15; TR 3:30–5:00
Department	Mathematics and Physics
College	Arts and Sciences
Institution	Texas A&M International University
Term	Spring 2016

Course description. Introduction to linear transformations and matrices; vector spaces, vector operations. Prerequisite: MATH 2415

Student learning outcomes. Upon successful completion of this course, the student will be able to:

- sketch the sum, difference and linear combinations of two or more given vectors, sketch a (two- or three-dimensional) vector with given components, and compute the components of a vector given as an arrow in an affine space;
- write the parametric form and normal form of the equation of a line or of a plane and use them for problem solving;
- using the Gauss-Jordan Elimination method, solve a system of linear equations (namely find a parametric representation of the solution space) or find the dimension and bases of the subspace spanned by a set of vectors. In particular, compute the rank and nullity of a matrix and describe the kernel and range of a linear transformation;
- determine whether the product of two given matrices or the powers of a matrix are defined; or whether the inverse of a matrix exists, and when it is defined/exists, compute it and interpret it;
- describe the linear transformation defined by a given matrix with respect to given bases. Conversely, given a description of a linear transformation, compute its matrix with respect to given bases. In particular, given the matrix of a linear transformation with respect to a certain pair of bases, compute the matrix of a linear transformation with respect to another pair of bases (“change of basis”);
- compute the eigenvalues and eigenvectors of a matrix, and determine whether the matrix is diagonalizable; and
- perform the Gram-Schmidt process to orthogonalize a basis of a vector space, and use it to compute the orthogonal complement of a subspace or the orthogonal projection of a vector onto a subspace.

Calculator. Recommended: A calculator with 3D graphing and Gaussian elimination (examples: TI-89 Titanium or TI-Nspire CX CAS).

Homework. I will grade homework for completeness. If you can’t complete a problem, write at least a paragraph explaining what you tried and how you got stuck. For teaching purposes, I may share copies of your solutions with the class. (To opt out, clearly label your homework as “confidential.”)

Grading. Letter grades (which may include +/- modifiers) will be given for individual assignments and tests. These grades will be converted to GPA scores and then averaged according to the following weights: median homework score: 19%; Test 1: 17%; Test 2: 17%; Test 3: 17%; final exam: 30%.

Tests. Unlimited notes and books are allowed for tests. A calculator is strongly recommended. Phones are not allowed.

Make-ups. There are no make-ups for missed work, except by situations covered by university rules. (See the Student Handbook and attached Policies of the College of Arts and Sciences.)

day	date	HW due	tentatively scheduled topics
1	Jan 20		systems of equations: elementary operations
2	Jan 25		Gauss-Jordan elimination
3	Jan 27		Gauss-Jordan elimination
4	Feb 01		systems of equations: matrix-vector form ($Ax=b$)
5	Feb 03		displacement vectors: arrow algebra
6	Feb 08	1--4	subspaces of Euclidean spaces
7	Feb 10		kernels, spans, column and row spaces
8	Feb 15		bases, dimension, and rank
9	Feb 17		bases, dimension, and rank
10	Feb 22	5--8	dot products, lengths, and angles
11	Feb 24		orthogonal projections, complements, and bases
12	Feb 29		application: linear regression
13	Mar 02		test: days 1--8
14	Mar 14	9--12	abstract vector spaces
15	Mar 16		abstract linear transformations
16	Mar 21		the matrix of a linear transformation
17	Mar 23		rotation, reflection, scaling, and skewing matrices (2D)
18	Mar 28		rotation, reflection, scaling, and skewing matrices (3D)
19	Mar 30	14--17	composition and matrix multiplication
20	Apr 04		left and right inverse linear transformations
21	Apr 06		test: days 9--17
22	Apr 11		left and right matrix inverses
23	Apr 13	18--21	change of basis
24	Apr 18		orthonormal bases; orthogonal matrices
25	Apr 20		QR factorization; symmetric and positive definite matrices
26	Apr 25		determinants; signed hypervolume
27	Apr 27	22--25	eigenvectors and the spectral theorem
28	May 02		complex eigenvalues and eigenvectors
29	May 04		Jordan normal form
30	May 09		test: days 18--25
	May 10	26--29	reading day (no class)
	May 16		comprehensive final exam (3:30—6:30)

Policies of the College of Arts and Sciences

(Required on all COAS Syllabi / Last Revised: July 16, 2015)

Classroom Behavior

The College of Arts and Sciences encourages classroom discussion and academic debate as an essential intellectual activity. It is essential that students learn to express and defend their beliefs, but it is also essential that they learn to listen and respond respectfully to others whose beliefs they may not share. The College will always tolerate diverse, unorthodox, and unpopular points of view, but it will not tolerate condescending or insulting remarks. When students verbally abuse or ridicule and intimidate others whose views they do not agree with, they subvert the free exchange of ideas that should characterize a university classroom. If their actions are deemed by the professor to be disruptive, they will be subject to appropriate disciplinary action, which may include being involuntarily withdrawn from the class.

Plagiarism and Cheating

Plagiarism is the presentation of someone else's work as your own. **1)** When you borrow someone else's facts, ideas, or opinions and put them entirely in your own words, you must acknowledge that these thoughts are not your own by immediately citing the source in your paper. Failure to do this is plagiarism. **2)** When you also borrow someone else's words (short phrases, clauses, or sentences), you must enclose the copied words in quotation marks as well as citing the source. Failure to do this is plagiarism. **3)** When you present someone else's paper or exam (stolen, borrowed, or bought) as your own, you have committed a clearly intentional form of intellectual theft and have put your academic future in jeopardy. This is the worst form of plagiarism.

Here is another explanation from the 2010, sixth edition of the *Manual of The American Psychological Association (APA)*:

Plagiarism: Researchers do not claim the words and ideas of another as their own; they give credit where credit is due. Quotations marks should be used to indicate the exact words of another. *Each* time you paraphrase another author (i.e., summarize a passage or rearrange the order of a sentence and change some of the words), you need to credit the source in the text.

The key element of this principle is that authors do not present the work of another as if it were their own words. This can extend to ideas as well as written words. If authors model a study after one done by someone else, the originating author should be given credit. If the rationale for a study was suggested in the Discussion section of someone else's article, the person should be given credit. Given the free exchange of ideas, which is very important for the health of intellectual discourse, authors may not know where an idea for a study originated. If authors do know, however, they should acknowledge the source; this includes personal communications. (pp. 15-16)

Consult the Writing Center or a recommended guide to documentation and research such as the *Manual of the APA* or the *MLA Handbook for Writers of Research Papers* for guidance on proper documentation. If you still have doubts concerning proper documentation, seek advice from your instructor prior to submitting a final draft.

Use of Work in Two or More Courses: You may not submit work completed in one course for a grade in a second course unless you receive explicit permission to do so by the instructor of the second course.

Penalties for Plagiarism: Should a faculty member discover that a student has committed plagiarism, the student should receive a grade of 'F' in that course and the matter will be referred to the Honor Council for possible disciplinary action. The faculty member, however, may elect to give freshmen and sophomore students a "zero" for the assignment and to allow them to revise the assignment up to a grade of "F" (50%) if they believe that the student plagiarized out of ignorance or carelessness and not out of an attempt to deceive in order to earn an unmerited grade. This option should not be available to juniors, seniors, or graduate students, who cannot reasonably claim ignorance of documentation rules as an excuse.

Caution: Be very careful what you upload to Turnitin or send to your professor for evaluation. Whatever you upload for evaluation will be considered your final, approved draft. If it is plagiarized, you will be held responsible. The excuse that "it was only a draft" will not be accepted.

Caution: Also, do not share your electronic files with others. If you do, you are responsible for the possible consequences. If another student takes your file of a paper and changes the name to his or her name and submits it and you also submit the paper, we will hold both of you responsible for plagiarism. It is impossible for us to know with certainty who wrote the paper and who stole it. And, of course, we cannot know if there was collusion between you and the other student in the matter.

Penalties for Cheating: Should a faculty member discover a student cheating on an exam or quiz or other class project, the student should receive a "zero" for the assignment and not be allowed to make the assignment up. The incident should be reported to the chair of the department and to the Honor Council. If the cheating is extensive, however, or if the assignment constitutes a major grade for the course (e.g., a final exam), or if the student has cheated in the past, the student should receive an "F" in the course, and the matter should be referred to the Honor Council. Under no circumstances should a student who deserves an "F" in the course be allowed to withdraw from the course with a "W."

Student Right of Appeal: Faculty will notify students immediately via the student's TAMIU e-mail account that they have submitted plagiarized work. Students have the right to appeal a faculty member's charge of academic dishonesty by notifying the TAMIU Honor Council of their intent to appeal as long as the notification of appeal comes within 10 business days of the faculty member's e-mail message to the student. The *Student Handbook* provides details

UConnect, TAMIU E-Mail, and Dusty Alert

Personal Announcements sent to students through TAMIU's UConnect Portal and TAMIU E-mail are the official means of communicating course and university business with students and faculty – not the U.S. Mail and not other e-mail addresses. Students and faculty must check UConnect and their TAMIU e-mail accounts regularly, if not daily. Not having seen an important TAMIU e-mail or UConnect message from a faculty member, chair, or dean is not accepted as an excuse for failure to take important action. Students, faculty, and staff are encouraged to sign-up for *Dusty Alert* (see www.tamiau.edu). *Dusty Alert* is an instant cell phone text-messaging system allowing the university to communicate immediately with you if there is an on-campus emergency, something of immediate danger to you, or a campus closing.

Copyright Restrictions

The Copyright Act of 1976 grants to copyright owners the exclusive right to reproduce their works and distribute copies of their work. Works that receive copyright protection include published works such as a textbook. Copying a textbook without permission from the owner of the copyright may constitute copyright infringement. Civil and criminal penalties may be assessed for copyright infringement. Civil penalties include damages up to \$100,000; criminal penalties include a fine up to \$250,000 and imprisonment.

Copyright laws do not allow students and professors to make photocopies of copyrighted materials, but you may copy a limited portion of a work, such as an article from a journal or a chapter from a book for your own personal academic use or, in the case of a professor, for personal, limited classroom use. In general, the extent of your copying should not suggest that the purpose or the effect of your copying is to avoid paying for the materials. And, of course, you may not sell these copies for a profit. Thus, students who copy textbooks to avoid buying them or professors who provide photocopies of textbooks to enable students to save money are violating the law.

Students with Disabilities

Texas A&M International University seeks to provide reasonable accommodations for all qualified persons with disabilities. This University will adhere to all applicable federal, state, and local laws, regulations and guidelines with respect to providing reasonable accommodations as required to afford equal education opportunity. It is the student's responsibility to register with the Director of Student Counseling and to contact the faculty member in a timely fashion to arrange for suitable accommodations.

Student Attendance and Leave of Absence (LOA) Policy:

As part of our efforts to assist and encourage all students towards graduation, TAMIU provides LOA's for students, including pregnant/parenting students, in accordance with the Attendance Rule (Section 3.24) and the Student LOA Rule (Section 3.25), which includes the "Leave of Absence Request" form. Both rules can be found in the TAMIU Student Handbook ([URL: http://www.tamiau.edu/studentaffairs/StudentHandbook1.shtml](http://www.tamiau.edu/studentaffairs/StudentHandbook1.shtml)).

Under Title IX of the Education Amendments of 1972, harassment based on sex, including harassment because of pregnancy or related conditions, is prohibited. A **pregnant/parenting student** must be granted a leave of absence (LOA) for as long as the student's physician deems the absence medically necessary. As a TAMIU faculty member, we must:

- (1) allow a pregnant/parenting student to submit work after a deadline that was missed because of a LOA due to pregnancy or childbirth,
- (2) if grading is based in part on class attendance or participation, allow a pregnant/parenting student to earn the credits missed so that the student can be reinstated to the status held before the LOA, and
- (3) at the conclusion of the LOA, allow the pregnant/parenting student to return to the same academic and extracurricular status held when the LOA began.

If we receive a request from a student for a LOA, including pregnant/parenting students, we will promptly report it to and seek guidance from the Office of Student Affairs at ext. 2282.

Incompletes

Students who are unable to complete a course should withdraw from the course before the final date for withdrawal and receive a "W." To qualify for an "incomplete" and thus have the opportunity to complete the course at a later date, a student must meet the following criteria:

1. The student must have completed 90% of the course work assigned before the final date for withdrawing from a course with a "W", and the student must be passing the course;
2. The student cannot complete the course because an accident, an illness, or a traumatic personal or family event occurred after the final date for withdrawal from a course;
3. The student must sign an "Incomplete Grade Contract" and secure signatures of approval from the professor and the college dean.
4. The student must agree to complete the missing course work before the end of the next long semester; failure to meet this deadline will cause the "I" to automatically be converted to a "F"; extensions to this deadline may be granted by the dean of the college.

This is the general policy regarding the circumstances under which an "incomplete" may be granted, but under exceptional circumstances, a student may receive an incomplete who does not meet all of the criteria above if the faculty member, department chair, and dean recommend it.

Student Responsibility for Dropping a Course

It is the responsibility of the STUDENT to drop the course before the final date for withdrawal from a course. Faculty members, in fact, may not drop a student from a course without getting the approval of their department chair and dean.

Independent Study Course

Independent Study (IS) courses are offered only under exceptional circumstances. Required courses intended to build academic skills may

not be taken as IS (e.g., clinical supervision and internships). No student will take more than one IS course per semester. Moreover, IS courses are limited to seniors and graduate students. Summer IS course must continue through both summer sessions.

Grade Changes & Appeals

Faculty are authorized to change final grades only when they have committed a computational error or an error in recording a grade, and they must receive the approval of their department chairs and the dean to change the grade. As part of that approval, they must attach a detailed explanation of the reason for the mistake. Only in rare cases would another reason be entertained as legitimate for a grade change. A student who is unhappy with his or her grade on an assignment must discuss the situation with the faculty member teaching the course. If students believe that they have been graded unfairly, they have the right to appeal the grade using a grade appeal process in the *Student Handbook* and the *Faculty Handbook*.

Final Examination

Final Examination must be comprehensive and must contain a written component. The written component should comprise at least 20% of the final exam grade. Exceptions to this policy must receive the approval of the department chair and the dean at the beginning of the semester.