

# MATH 2318-02 (LINEAR ALGEBRA)

## Syllabus for SPRING 2017

**Classroom:** MAGC 2.410

**Time:** T&R 9:25am – 10:40am

**Instructor:**

Dr. Zhijun (George) Qiao

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**Office hours:** TR 10:45am-12:15pm or by appointment.

**Prerequisite:**

A student must have completed and passed Calculus I (MATH 2413) with a grade C or better. The student not meeting this requirement will be asked to drop the course.

**Textbook:** Required textbook – *Linear Algebra and Its Applications*, 5<sup>th</sup> edition, by [David C. Lay](#), [Steven R. Lay](#), [Judi J. McDonald](#), Pearson, 2016, ISBN-13: 978-0321982384 ISBN-10: 032198238X

**Topics:** Topics include systems of linear equations, matrices and their algebraic properties, determinants, vectors, Euclidean N-space, linear transformations and their matrix representations, vector spaces, eigenvalues and eigenvectors, and applications to the sciences and business. See Chapters 1, 2, 3, 5, 6, and 7.

**Calculator:** A calculator (TI-83 plus) capable of performing matrix manipulations (row reduction, matrix algebra, eigenvalues and eigenvectors) is recommended, but not required. Encourage to use math software (Maple, Matlab, etc) to do calculations. **Daily supplies:** You need to bring Textbook, Notebook, Loose leaf paper, Graph paper, Pen, Pencil etc to the class.

**Course Objectives:** The purpose of this course is to use a computational approach to present an introduction to basic concepts of linear algebra. By the end of this course, a successful student will be able to solve and analyze linear equations, use matrices to solve problems, perform matrix algebra, analyze properties of sets of vectors and vector spaces, analyze linear transformations and apply them in geometric settings, compute eigenvalues and eigenvectors and use them to solve problems, and apply inner products to examine orthogonality and its application to the method of least squares. Emphasis will be placed on the learning and understanding of definitions and abstractions in mathematics, as well as the study of the use of linear algebra in real-world problems. A more detailed list of topics is given later under Tentative *Course Schedule*.

**Student Learning Outcomes: After completing this course students will be able to**

1. Solve linear systems using matrices and Gaussian elimination, understand the different types of solutions that are possible, and use these ideas in applied problems.
2. Perform the common operations of matrix algebra and use them to solve applied problems.
3. Compute the determinant of a square matrix and understand its properties.
4. Understand the ideas of linear independence, spanning set, basis, change of basis of a linear transformation, rank of a matrix, vector space, subspace, and their application to applied problems.
5. Understand eigenvectors and eigenvalues, how they characterize the action of some linear transformations, and how to use them to solve applied problems.

- (Optional) Use the ideas of inner products, orthogonality, and projections to determine least-squares solutions to a linear system and perform Gram-Schmidt orthogonalization on a set of vectors.

**Intended Student Learning Outcomes: Students completing the B.S. program in Mathematics will**

- Demonstrate in-depth knowledge of Mathematics, its scope, application, history, problems, methods, and usefulness to mankind both as a science and as an intellectual discipline.
- Demonstrate a sound conceptual understanding of Mathematics through the construction of mathematically rigorous and logically correct proofs.
- Identify, formulate, and analyze real world problems with statistical or mathematical techniques.
- Utilize technology as an effective tool in investigating, understanding, and applying mathematics.
- Communicate mathematics effectively to mathematical and non-mathematical audiences in oral, written, and multi-media form.
- Demonstrate an appreciation of and enthusiasm for lifelong scientific inquiry, learning, and creativity.

**General Grade Policy**

**Quizzes and Homework** – Homework assignment is assigned daily through the Webwork and textbook/handouts, and will consist of problems from the textbook and occasional handout. Tests and final exam are based on the homework problems. It is strongly recommended that students work all those homework problems since final exam and test score are used to determine your grade. Completing the assignments is the *single most important part* of this course. You will be expected to spend, on average, about 3 hours each week to complete the assignments. The assigned problems will be graded automatically through webwork system or regular hand grading. They will form the basis for the mid-term and final exams. No late homework will be accepted.

**Tests** – there will be three one-hour in-class tests. All tests must be taken during their scheduled times. The test time will be announced in advance (basically, a test will be given every two chapters), and a short review will be given before each test. All students must show their work on the tests (on each test, I will give you extra credit if you can complete the bonus problem). Score will be provided to you separately. No retest opportunities.

**Final Exam** – The common comprehensive final exam is tentatively scheduled on **Thursday, May 11, 2017, 8:00am – 9:45am. All students must take the final exam on the scheduled time. A summary review will be given in the class before the final exam.**

**Grading** – The course grade will be based on

Best 10 of the weekly HW/Quiz at 10 pts each	100 pts
Test 1	100 pts
Test 2	100 pts
Test 3	100 pts
Comprehensive Final Exam	100 pts
<hr/> Total	<hr/> 500 pts

The course grade will be assigned according to a scale no higher than A(90-100%), B(80-89%), C(70-79%), D(60-69%), F(below 60%).

### **THERE WILL BE NO MAKE-UP QUIZZES OR EXAMS GIVEN.**

If a student is absent during a scheduled major test and quiz, the student must go by the instructor's office during the scheduled office hours to discuss the validity of the excuse. In the case of a valid excuse, the missed test grade will be replaced by the final exam grade. If a student does not have a valid excuse, the grade for the missed test is a zero and cannot be replaced. If you arrive late to a test you will not be given additional time to complete the exam. Anyone arriving to a test after somebody else who took the exam has left will not be allowed to take the exam. Students missing more than one exam may be dropped from the course. With an unexcused absence, a score of 0 will be recorded for the missed HW/Quiz or exam.

**Tutoring:** There are several tutoring places available on campus. Math Lab I, II (MAGC 1.106, MAGC 1.308) .and the Math Learning Center in the LEAC Building room 114.

### **Classroom Behavior:**

- All beepers and cellular phones must be turned off before you enter the classroom.
- Once in class, a student is expected to remain in class for the duration of the class. If a student needs to leave class early, than the student needs to discuss the situation with the instructor before class begins.
- During class students are expected to be courteous to the instructor and other classmates. Examples of discourteous behavior are unnecessary talking, sleeping, tardiness, leaving class while instructor is lecturing, sharpening pencils during the lecture, etc.
- No Food Allowed In Classroom.
- Chronic tardiness and discourteous behavior will not be tolerated and is cause for a student's dismissal from class for the remainder of the semester.

### **Calendar of Activities**

Jan17	First day of class for full semester
Jan 30	Last day to add a class for spring 2017 semester
Mar 13 – 18	Spring Break, <b>no classes</b>
Apr 13	Last day to drop (DR grade) a class or withdraw (grade of W)
Apr 14 – 15	Easter holiday, <b>no classes</b>
May 3	Last day of classes for full semester
May 4	Study Day, <b>no classes</b>
May 5 - 11	Final Exams ( <a href="#">Schedule</a> )

### **UTRGV Policy Statements**

UTRGV requires all electronic communication between the University and students be conducted through the official University supplied systems UTRGV-Mail. Please use your UTRGV-Mail account for all correspondence with me.

### **Calculators, Cell Phones, and Other Electronic Equipment**

Calculators will be permitted for use on quizzes and exams. Electronic equipment such as cell phones, pocket organizers, tablet or laptop computers, or electronic writing pads or pen-input devices will not be permitted during quizzes and exams. Please make sure that cell phones are turned off and stored away during class.

### **MANDATORY COURSE EVALUATION PERIOD:**

Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (<https://my.utrgv.edu/home>); you will be contacted through email with further

instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available: Apr 12 – May 3 for full spring semester courses

**ATTENDANCE:** Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV’s attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

**STUDENTS WITH DISABILITIES:**

If you have a documented disability (physical, psychological, learning, or other disability which affects your academic performance) and would like to receive academic accommodations, please inform your instructor and contact Student Accessibility Services to schedule an appointment to initiate services. It is recommended that you schedule an appointment with Student Accessibility Services before classes start. However, accommodations can be provided at any time. **Brownsville Campus:** Student Accessibility Services is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at [ability@utrgv.edu](mailto:ability@utrgv.edu). **Edinburg Campus:** Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at [ability@utrgv.edu](mailto:ability@utrgv.edu).

**SCHOLASTIC INTEGRITY:**

As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism, and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

**SEXUAL HARASSMENT, DISCRIMINATION, and VIOLENCE:**

In accordance with UT System regulations, your instructor is a “responsible employee” for reporting purposes under Title IX regulations and so must report any instance, occurring during a student’s time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at [www.utrgv.edu/equity](http://www.utrgv.edu/equity), including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect in an environment free from sexual misconduct and discrimination.

**COURSE DROPS:** According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

### Tentative Course Schedule:

Section	Topics	Quiz/Test
1.1	Systems of Linear Equations	
1.2, 1.3	Row Reduction and Eschelon Form	HW/Quiz 1
1.3, 1.4	Vector equations and the matrix equation $Ax=b$	
1.5, 1.6	Solution sets of linear systems.	HW/Quiz 2
1.6, 1.7	Applications. Linear independence of vectors.	
1.8, 1.9	Linear transformations and their matrix representations	HW/Quiz 3
1.9, 1.10	Linear models in the real world	
		<b>Test 1</b>
2.1, 2.2	Matrix operations and the inverse of a matrix	
2.3	Properties of invertible matrices	HW/Quiz 4
2.5	LU factorizations	
2.7	Applications to computer graphics	HW/Quiz 5
2.8	Subspaces, column space, null space, and basis.	
2.9	Dimension and rank	HW/Quiz 6
3.1, 3.2	Determinants and their properties	
3.3	Applications of determinants: Cramer's Rule, volumes.	HW/Quiz 7
5.1, 5.2	Eigenvalues and eigenvectors; the characteristic equation	
		<b>Test 2</b>
5.2, 5.3	The characteristic equation. Diagonalization	
5.5	Complex eigenvalues	HW/Quiz 8
5.6	Discrete dynamical systems	
6.1, 6.2	Inner product, length, orthogonality, and orthogonal sets	HW/Quiz 9
6.2, 6.3	Orthogonal projections	
6.5	Least squares	HW/Quiz 10
6.6	Application of least squares to curve fitting.	
7.1	Diagonalization of symmetric matrices	HW/Quiz 11
7.2	Quadratic forms	
		<b>Test 3</b>
	Review	HW/Quiz 12
	<b>Dead day (No class)</b>	
<b>All Contents in the whole semester</b>	<b>Final Exam (May 11, 2017, 8:00-9:45am)</b>	

