ENGR 2300.502.17S Linear Algebra for Engineers

The University of Texas at Dallas Spring 2017

Day & Time: Tuesday & Thursday 5:30 - 6:45 p.m. (FN 2.202) Friday 3:00 - 4:00 p.m. (JSOM 1.110)

Professor Contact Information

Prof. Carlos Busso email: <u>busso@utdallas.edu</u> phone: (972) 883-4351 Room ECSN 4.216 Office hours: Tuesday 1:00-2:00 p.m. (ECSN 4.216) Friday 1:00-2:00 p.m. (ECSS 2.203) (or by appointment)

Teacher Assistant (TA)

TBA

Pre- or co-requisites: MATH 2414 or MATH 2419 Pre- or Co-Requisite

Textbook: R. Larson, Elementary Linear Algebra, Eight edition / Seventh edition

Suggested Texts, readings, & Materials: S. Leon, Linear Algebra with Applications, prentice hall, 9e

Course Description:

This course is an undergraduate level intended for sophomore year B.S. students. The course will cover aspects of Matrices, vectors, linear systems of equations, Gauss-Jordan elimination, LU factorization and rank. Vector spaces, linear dependence/independence, basis, and change of basis. Linear transformations and matrix representation; similarity, scalar products, orthogonality, Gram-Schmidt procedures, and QR factorization. Determinants: eigenvalues, eigenvectors, and diagonalization. Introduction to problem solving using MATLAB.

Student Learning Outcomes:

Students are expected to be able to:

- Solve Ax = b for linear systems by elimination
- Deduce Basis and Dimension for the four fundamental subspaces
- Compute determinants and understand its properties
- Compute eigenvalues and eigenvectors
- Explore engineering applications which build on the concepts of linear algebra presented in the course

Topics:

Matrices and System of Linear Equations, Determinants (Chapters 1, 2, 3)

- 1. Systems of linear equations and solution. Gaussian elimination and Gauss-Jordan reduction; rank of matrix.
- 2. Matrix algebra: addition, multiplication; identity matrix; inverse and transpose; symmetric and skewsymmetric matrices. Solutions of linear systems, LU factorization.
- 3. Determinants: definition and computation; inverse, products, and singularity.

Vector Spaces, Orthogonality (Chaps. 4, 5)

- 1. Matrices and vectors; Subspaces; span and spanning sets. Linear independence; basis and dimension; change of basis.
- 2. Matrices; row and column spaces; rank and nullity; implications for linear systems. \
- 3. Dot product and norm; orthogonality; orthogonal subspaces, projection, and bases; orthogonal matrices; least- squares problems.
- 4. Gram-Schmidt orthogonalization; QR factorization. Linear transformations and operators; range and kernel; matrix representations.

Linear transformations, Eigenvalue problems (Chaps. 6, 7)

- 1. Linear transformations and operators; range and kernel; matrix representations.
- 2. Eigenvalues and eigenvectors: definition; characteristic polynomial; product and sum of eigenvalues; similar matrices.
- 3. Independence of eigenvectors; multiplicity/degeneracy of eigenvalues; diagonalization.
- 4. Complex matrices and eigenvalues; Hermitian, unitary, and normal matrices; orthonormal basis of eigenvectors.
- 5. Systems of linear differential equations; introduction.

Assignment and Grading

Exam 1	(22.5%)	Thursday,	02/16/2017 (5:30pm-6:45pm)
Exam 2	(22.5%)	Thursday,	03/23/2017 (5:30pm-6:45pm)
Final	(30%)	Thursday,	TBA
Homework	(10%) (ev	ery week)	
Quiz	(10%)		
Project	(5%)		

Quizzes (During review sessions)

Q1: 01/20/2017 Q2: 02/03/2017 Q3: 03/03/2017 Q4: 04/07/2017 Q5: 04/21/2017

- * Exams and final are in-class, closed book & notes
- * HW will be assigned and collected every Thursday. (Late homework wont be accepted)
- * 5 Quizzes
- * No exam grades will be dropped. No Make-up exam will be given without medical excuses or prior arrangement
- * Mandatory attendance

Project:

- Explore engineering applications which build on the concepts of linear algebra
- Group of 3-4 students, topic will be assigned, create a 5 minute video.
- Due 04/21/2017

Tentative percent - letter grade conversion												
97-100	A+	87-89	B+	77-79	C+	67-69	D+	<60	F			
94-96	А	83-86	В	73-76	С	63-66	D					
90-93	A-	80-82	B-	70-72	C-	60-62	D-					

I preserve the right to curve/modify this conversion

Teacher Statement:

My goal as teacher is that you learn as much as possible about linear algebra, that you find the material interesting and that you finish the course wanting to know more about this subject. You can facilitate this by:

- (i) ask me questions, make use of my office hours,
- (ii) read something other than the required text book,
- (iii) if you are struggling with the material, come and ask me about it as soon as you realize this and not the day before the midterm or final,
- (iv) learn to use MATLAB,
- (v) turn up for the lectures.
- (vi) please be on time late arrivals are very disturbing to other students in the class and also to me. I review the previous class at the start of each lecture and also make announcements at this time.

Important Dates:

Late Registration and Last Day to Add/Swap 01/17/2017 Last day to drop a class without a "W" 01/25/2017 Undergraduate Courses, WL Ends, 03/27/2017 Last day of classes: 4/30/2017

Course & Instructor Policies

Email

Emails are the preferred way to contact me. Please add <ENGR2300> in the subject of emails, so I can give priority to your emails. I only read eLearning mail periodically.

Late Work

Homework will not be accepted after the deadline. Make-up exams or projects will not be given without advance notice to the instructor.

Extra Credit

I do not offer "extra credit" work or "special consideration" to allow students a chance to raise their grade. If a personal situation arises during the semester that may affect your classroom performance, please talk to me sooner rather than later. If you wait until the end of the semester, I won't be able to help you. I can work with you more easily if you speak to me when the situation arises. I cannot help you if I do not know you need help.

Classroom Citizenship

In keeping with this course's professional communication mandate, students are expected to use every opportunity in the course to practice communicating in a civil and professional manner. It is not allowed to exit the class during the lectures to avoid distracting other students. If a student need to leave early, he/she must let the instructor know before the class.

Technology Requirements

The course is taught using eLearning. The student should develop the habit of checking both eLearning and their UTD email often for assignments and announcements. Reliable and frequent internet connectivity is indispensable – not having internet access will make your learning more difficult and will not serve as a valid excuse for shortcomings. Failure to check UTD or eLearning email, errors in forwarding email, and email bounced from overquota mailboxes are not acceptable excuses for missing course email. Additionally, to protect your privacy rights, I will only send email through your official UTD email address or eLearning email. If you choose, you can redirect both of these addresses to external addresses.

Classroom and Equipment Use Policies

No laptops, cell phones, pagers, or other electronic messaging services may be used in the classrooms, unless the student (1) need a laptops for the presentation (2) have cleared it with me first and then only on an emergency basis.

Technical Support

If you experience any problems with your UTD account you may send an email to: <u>assist@utdallas.edu</u> or call the UTD Computer Helpdesk at 972-883-2911.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

These descriptions and timelines are subject to change at the discretion of the Professor.