# MATH 2418.501 Spring 2018: Linear Algebra

Tues. & Thurs.: 5:30pm-6:45pm at GR 4.428

#### Instructor Information and Office Hours

Section: MATH 2418.501 Instructor: Dr. Qingwen Hu Office: Founders Building 2.610E Office hours: Fri.: 9:00am - 11:30am/Appt. Telephone: (972) 883 6599 E-mail:qingwen@utdallas.edu

#### **Textbook and References**

- Required: Gilbert Strang, *Introduction to Linear Algebra*, Willesley Cambridge Press, 5th Edition. ISBN: 978-0-9802327-7-6.
- Suggested for additional reading: Howard Anton, Elementary Linear Algebra, Wiley 11th Edition. (Textbook and student solutions manual are recommended.)

#### **Problem Sessions and eLearning**

- Students must enroll in one of the problem sessions MATH 2418.3xx in addition to the lecture sections.
- The section MATH 2418.701 is the exam section for the entire MATH 2418 students.
- The instructors will post important announcements on the MATH 2418.701 (the exam section) page of eLearning: https://elearning.utdallas.edu.

#### **TA Information**

ТА	E-mail@utd	Problem Session	Time
Samson Folarin	sbf140030	301 CB3 1.312	Wed. 8:00am–9:50am
		303  CB3 1.308	Wed. $10:00 \text{am} - 11:50 \text{am}$
Zachary Coleman	zwc150030	304 SLC 2.302	Wed. 10:00am–11:50am
		306 CB3 1.308	Wed. $1:00 \text{pm}-2:50 \text{pm}$
Jorge Garcia	jsg170130	305 CB1 1.102	Wed. 1:00pm-2:50pm
		308 CB1 1.106	Wed. 3:00pm-4:50pm
Francis Bilson Darku	fxb130230	309 CB3 1.308	Wed. 8:00am–9:50am

Eggy Howcort Howcordog	ash170620	312 CB3 1.308	Mon. 10:00am–11:50am
Esau Hervert-Herhandez	eanir0050	313 FN 2.104	Wed. $1:00 \text{pm}-2:50 \text{pm}$
Palit Priyojit	pxp174130	310 CB3 1.302	Wed. $8:00 \text{am} - 9:50 \text{am}$
		314  CB 1.222	Wed. $1:00 \text{pm}-2:50 \text{pm}$
Pajandra K C Khatri	rxk153630	302 FN 2.202	Wed. 8:00am–9:50am
Rajendra K C Knatri		315 CB1 1.102	Wed. $3:00 \text{pm}-4:50 \text{pm}$
Het Mankad	hym130030	311 FN 2.202	Wed. $10:00 \text{am} - 11:50 \text{am}$
		398 SLC 2.302	Wed. 8:00am–9:50am

#### Materials to Cover

We will cover the following sections of the textbook.

Chapter 1: Sections 1.1, 1.2, 1.3 Chapter 2: Sections 2.1–2.7 Chapter 3: Sections 3.1–3.5 Chapter 4: Sections 4.1–4.4 Chapter 5: Sections 5.1, 5.2 Chapter 6: Sections 6.1–6.5 Chapter 7: Sections 7.1, 7.2 and more if time permits

#### **Course Description and Objectives**

Students will learn concepts and techniques of linear algebra. Course topics include systems of linear equations, determinants, vectors and vector spaces, linear transformations, eigenvalues and eigenvectors, and quadratic form.

- 1) Given a system of linear equations, students will be able to apply the Gauss-Jordon and Gaussian algorithms to determine all solutions, and determine whether the system is consistent and whether the solution is unique.
- 2) Given a square matrix, students will be able to accurately calculate its determinant, and deduce whether the matrix is invertible or singular using elementary row operations; Basic properties of determinants and elementary matrices; Equivalence conditions of invertibility of a square matrix.
- 3) Given definitions of a set of objects with a well-defined addition and scalar multiplication, students will be able to evaluate whether this constitutes a real vector space. If valid, students will be able to demonstrate each axiom; if invalid, students will be able to present and verify an explicit counter-example to a vector space property.
- 4) Given an explicit matrix, students will be able to determine its eigenvalues, and for each such eigenvalue students will be able to create a basis for the corresponding eigen-space; Diagonalizability of square matrices.

- 5) Given a matrix, students will be able to accurately determine basis vectors for its row space, column space, null space and their orthogonal complements.
- 6) Students will be able to use the Gram-Schmidt process to construct an orthogonal basis for an inner product spaces; Students will be able to find the least squares solutions of a linear system.
- 7) Students will be able to find the singular value decomposition (SVD) of a given matrix.

# Course Policy & Grading Scheme

## Assignments:

• A pdf file for assignment will be posted weekly during each weekend except for exam weeks. *Assignments* will be posted at the course homepage on

## https://elearning.utdallas.edu

- The assignments will be collected by the TA during the problem sessions.
- NOT all the problems will be collected, but each quiz (see below) is based on ALL the problems in the corresponding homework. Five or more assignment problems will be collected each week.
- The lowest score will be dropped.

*Remark:* The point of assignments is to increase the understanding of the material not simply to prepare students for exams. The list of exercises from the book provide ample materials to practice. It is highly recommended and is a very good learning habit that one works on the exercises immediately after each lecture, without waiting for problem sessions or posting of assignments. To be prepared for exams students should understand the theory and work through as many of the suggested problems as one needs in order to become comfortable with the material. Quizzes

- There are weekly quizzes taken in the problem sessions except for exam weeks.
- Each quiz is based on the assignment that is due during the problem session.
- The lowest score will be dropped.

## Exams

- Details of each exam will be posted to eLearning about a week before the exam.
- The final is technically cumulative but with more emphasis on what was covered after the second midterm.
- See Important Dates below for the time and dates.

# Late/Missed Coursework

• There is no make-up for late or missed assignments, quizzes, or exams, unless extreme circumstances with proper documentation accepted by the instructor.

• In cases of extreme circumstances, one is expected to report to the instructor **before** the deadline of the coursework and resolve the problem within **one** week after the deadline.

## Calculators

• You may use a basic or scientific calculator, but not programmable calculators with matrix and/or graphing features during quizzes and exams.

## Grading scheme:

- – Two midterm exams: 20% each
  - Weekly assignments: 20%
  - Weekly quizzes: 15%
  - Final exam: 25%
- All letter grades will be assigned in accordance with the table of numeric to alphabetic conversions given below.

[90; 93) A-, [93; 97) A, [97; 100<sup>+</sup>] A+ [80; 83) B-, [83; 87) B, [87;90) B+ [70; 73) C-, [73; 77) C, [77;80) C+ [60; 63) D-, [63; 67) D, [67;70) D+ [0, 60) F.

## Classroom citizenship:

- Students are expected to keep quiet during lectures, while raising hands for questions are always welcome;
- Use of cell phones and laptops is NOT allowed.

# **Important Dates**

Classes begin:	Monday, January 08, 2018
Martin Luther King Day University Closing:	Monday, January 15, 2018
Last Day to Drop a Class without a "W":	Wednesday, January 24, 2018
Midterm Exam I:	Monday 7:00pm–8:15pm, February 19, 2018
Midterm Exam II:	Monday 7:00pm–8:15pm, April 02, 2018
Spring Break:	Mon., Mar. 12, 2018–Sun., Mar. 18, 2018
Last Day of Classes Full-Term Session:	Sunday April 29, 2018
Reading Day:	April 30, 2018
Final Exam:	Wednesday 2:00pm–4:45pm, May 2, 2018

*Remark:* The room assignments for each of the examinations will be announced at eLearning.

# Schedule (subject to change)

The following is a tentative lecture schedule which shows the materials to be covered every week and which contains the due days of the homework assignments and quizzes.

*Important*: Homework assignments and quizzes are due during one's problem sessions either on Monday or on Wednesday.

Week	Tuesda	ay	Monday (or Wednesday)			Thursd	ay
$_{\rm I}$ 1/9th 1		1/8th	2	(1/10 th)	1/11th	3	
1	Sec. 1.1			Problem Session/no quiz		Sec. 1.2	
II 1/16th 4		1/15th	5	(1/17 th)	1/18th	6	
		Problem session		Sec. 2.1			
	Dec. 1.0			no HW/Quiz Due		Dec. 2.1	
	1/23rd	7	1/22nd	8	(1/24th)	1/25th	9
TIT				HW 1 $(1.1+1.2)$			
111	Sec. 2.2			HW 2 $(1.3+2.1)$		Sec. 2.3	
				Quiz 1 Due			
IV	1/30th	10	1/29th	11	(1/31st)	2/1st	12
1 V	Sec. 2.4			HW 3 Due – Quiz 2		Sec. 2.5	
V	2/6th	13	2/5th	14	(2/7 th)	2/8th	15
v	Sec. 2.6			HW 4 Due – Quiz $3$		Sec. 2.7	
VI	2/13th	16	2/12th	17	(2/14 th)	2/15th	18
V I	Sec. 3.1			HW 5 Due – Quiz $4$		Sec. 3.2	
VII	2/20th	19	2/19th	20	(2/21 st)	2/22nd	21
V II	Sec. 3.3			Exam Week - no quiz		Sec. 3.4	
	2/27th	22	2/26th	23	(2/28th)	3/1st	<b>24</b>
VIII				HW 6 $(3.1+3.2)$			
VIII	Sec. 3.5			HW 7 $(3.3+3.4)$			
				Quiz 5 Due			
IV	3/6th	<b>25</b>	3/5th	26	(3/7 th)	3/8th	27
	Sec. 4.2			HW 8 Due - Quiz 6		Sec. 4.3	
x	3/13rd	<b>28</b>	3/12th	29	(3/14 th)	3/15th	30
Λ				Spring Break			
VI	3/20th	31	3/19th	32	(3/21st)	3/22nd	33
	Sec. 4.4			$\rm HW~9~Due-Quiz~7$		Sec. 5.1	
VII	3/27th	<b>34</b>	3/26th	35	(3/28th)	3/29th	36
	Sec. 5.2			HW 10 Due – Quiz 8 $$		Sec. 5.3	
XIII	4/3rd	<b>37</b>	4/2nd	38	(4/4th)	4/5th	39
	Sec. 6.1			Exam Week – No quiz		Sec. 6.2	
	4/10th	40	4/9th	41	(4/11 th)	4/12th	42
XIV				HW 11 $(5.2+5.3)$			
	Sec. 6.3		HW 12 (6.1+6.2)			Sec. 6.4	
				Quiz 9 Due			

VV	4/17th	43	4/16th	44	(4/18 th)	4/19th	<b>45</b>
Δν	Sec. 6.5			HW 13 Due – Quiz 10		Sec. 7.1/7.2	
VVI	4/24th	46	4/23th	47	(4/25 th)	4/26th	48
	Sec. 7.2			HW 14 Due – Quiz 11		Sec 7.3	
XVII			5/1st	5-5/7th Final Examination	on Week		

# 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

 ${\tt http://go.utdallas.edu/syllabus-policies}$ 

for these policies.

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