Linear Algebra

Class Time: Monday., Wednesday. 9. - 10.30, 10.30 – 12. 00, 13.00 – 14.30
Sunday, Tuesday, Thursday, 8 – 9 , 9-10
Class Location: S1.25, B1.27, B1. 56, B3.56
Instructor: Dr. Salih TATAR
Prerequisite: Calc 1 and Calc 2
Office: SG-38
Phone: +966-1-215-7644
Email: statar@alfaisal.edu
Office Hours: Sunday and Thursday 10 – 12

Text Books:

Elementary Linear Algebra. By Howard Anton & Chris Rorres, 11th edition

Recommended Material: Linear Algebra with Applications, Jeffrey Holt, Second Edition

Course Description:

This course provides an introduction to linear algebra topics. Emphasis is placed on the development of abstract concepts and applications for vectors, systems of equations, matrices, determinants, vector spaces, multi-dimensional linear transformations, eigenvectors, eigenvalues, diagonalization and orthogonality. Upon completion, students should be able to demonstrate understanding of the theoretical concepts and select and use appropriate models and techniques for finding solutions to linear algebra-related problems with and without technology

Course Objectives:

At the end of the course students will acquire a solid knowledge of Linear Algebra, and will be capable to solve many practical problems using tools of Linear Algebra. More specifically:

- Students will recognize linear systems and linear problems in general
- Students will learn how to solve linear systems and when the solutions exist
- Students will learn how to compute the determinant of a matrix and use it to solve systems and to compute the inverse
- Students will learn how to manipulate matrices, compute and analyze the eigenvectors and eigenvalues and their use in different contexts
- Students will learn the algebra of vector spaces and do linear transformation between them
- Students will learn the process of orthogonalization and its use in optimization problems
- Students will learn to implement using OCTAVE of some learned methods

Grading Scheme:

2 Quizzes	20 %
2 Midterm Exams	40 %
Hw(s)	10 %
Final Exam: Comprehensive	30 %
TOTAL	100 %

A	95-100 %	**A-**	90-94 %
B+	86-89 %	**B**	83-85 %
B-	80-82 %	**C+**	76-79 %
C	73-75 %	**C-**	70-72 %
D+	66-69 %	**D**	60-65 %
F	< 60 %		

All quizzes and exams will be closed book and closed notes. A successful student will prepare by reading the text book, attending lectures, participating in class discussions and questions, and by doing homework and practice problems.

Attendance Policy

- **Policy related to missing classes:** Regardless of the reasons, a student missing 15% or more of classes will be denied (DN) from the course. The 15% absences are intended to accommodate for medical emergencies[1] and cases of bereavement of an immediate family member[2]. Only in these cases will the student be allowed to make up missed class work or missed exams
- **Arriving late to class:** Coming to class 5 minutes after the start of class time is considered late, and 3 lates will count as 1 absence. Coming to class 10 minutes late will be considered as an absence.

[1]*Medical emergency counts for only verifiable communicable diseases and unforeseen, beyond the student's control, hospitalization. It needs to be documented by the hospital (not a clinic, much less a private practice doctor) and will be verified.*
[2]*Bereavement document from the Ministry of Health will be required in case, God forbid, of a death in your immediate family. In such a case, you will be excused for three days.*

Cell Phone/ Laptop/ IPad Policy

All electronic devices are not allowed during the exams (except calculators under the instructor permission). Most notably **cell phones are not allowed even in off mode. An irrevocable score zero (0) will be assigned to any student caught with a cell phone and may be subject to further disciplinary measures.** Students are not allowed to use their mobile phones, IPads or laptops during regular classes. Any student caught using any of these devices will be instructed to leave the classroom and will be given a full absence for that particular lecture.

Academic Integrity

Students are expected to maintain academic integrity at all times and to seek assistance from the instructor when uncertain. Students who engage in activities which misrepresent their academic work through plagiarism, cheating, and falsification infractions of academic integrity will be subject to serious disciplinary measures, ranging from a zero grade in that assessment to the dismissal from the university altogether. All aspects of the course are covered by these rules, including homework, lab reports, course reports, quizzes, and exams.

Consequences of Misconduct

When discipline and misconduct issues become apparent, a student will initially receive a verbal warning as a reminder to respect the professor's authority during class time. If this misconduct during class time occurs few more times, the student will be terminally dismissed from the particular course or from the university altogether. Any student disrupting an examination may be instantly dismissed from the examination room and risk taking an F grade.

Assignments, Quizzes and Exams

Late assignments will not be accepted; they must be completed on the day they are due to receive credit. There is no provision to make-up for missed homework assignments, quizzes, midterm or final exams except under reasons deemed acceptable by your professor (*refer to attendance policy section*).

The professor is expected to **return promptly** the grades of homework assignments, lab reports, quizzes, and midterm exams and to go over them with proper feedback and solutions. Grades will be posted within a maximum of one week after the day on which the assessment was offered.

Students must always present their Alfaisal ID cards during exam times.

Lines of Communication

If you have any concern or suggestion, it is imperative to follow the following steps in the order they are listed:

1. First, talk to your professor to resolve your issue.

2. Second, if your issue has merit and was not resolved by your professor in a reasonable time frame, you may then contact the Chair of the Department.

3. Third, if your issue has merit to be escalated further along the hierarchy, you may then contact the Vice Dean for Academic & Student Affairs. The Vice Dean will address your issue on time.

4. Failure to give due chance and time to resolving your issue with your professor, your Department Head, and your Vice Dean, and going above their heads straight to the Dean or to the Provost, will certainly invite disciplinary measures for not adhering to the institutional lines of communication outlined above.

Notes:

1. If your issue has no merit, learn to take **NO** for an answer; do not expect a miracle from the Department Chair nor from the Vice Dean.

2. Students are discouraged from nagging their professors to extract undeserved higher grades. Students who engage in this behavior will be automatically barred from consideration when their professors study borderline cases for possible slight grade improvement at the end of the semester.

MAT 212

Alfaisal University
جامعة الفيصل
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Fall 24- 25

Tentative Schedule (Subject to change):

Students are expected to read each assigned chapter before class.

Date	Chapters	Suggested problems
Week 1 18-24 Aug.	Syllabus 1.1 Introduction to Systems of Linear Equations 1.2 Gaussian Elimination	Page 9: 5 ,6, 7, 8, 15, 19, 20 Page 23: 5, 6 ,7, 25 – 30
Week 2 25-31 Aug.	1.3 Matrices and Matrix Operations 1.4 Inverses; Algebraic Properties of Matrices	Page 36: 3, 4 Page 37: 11 Page 49: 5, 6. Page 50: 15 - 24 Page 59: 11 - 18
Week 3 1-7 Sep.	1.5 Elementary Matrices and a Method for Finding inverse matrix 1.6 More on Linear Systems and Invertible Matrices	Page 66: 1 - 8, 9, 13 - 17 Page 72: 7, 9, 10 Page 73: 18, 19, 21, 26
Week 4 8-14 Sep.	1.7 Diagonal, Triangular, and Symmetric Matrices 1.9 Applications of Linear Systems	Page 94: 1 Page 95: 9- 15
Week 5 15-21 Sep.	**Quiz 1(16 Sep)** 2.1 Determinants by Cofactor Expansion 2.2 Evaluating Determinants by Row Reduction	P:111, Q: 4,5,7,10, 11, 15,21,22,23.29 P:117, Q: 9-13, 23
Week 6 22-28 Sep.	2.3 Properties of Determinants; Cramer's Rule **National Day-Monday**	P:127, Q: 7,8,15,17, 19,21,24,26,33-35
Week 7 29 Sep.-5 Oct.	3.1 Vectors in 2-Space, 3-Space, and n-Space 3.2 Norm, Dot Product, and Distance in R^n	P:141, Q: 12-21 P:153: 5, 7-10
Week 8 6-12 Oct.	**Midterm 1(7 Oct)** 3.3 Orthogonality 3.4 The Geometry of Linear Systems	Page 162: 1, 2 Page 179: 1, 7, 9
Week 9 13-19 Oct.	3.5 Cross Product 4.1 Linear Inequalities in two variables **Long Weekend-Thursday**	Page 180: 11, 13, 15, 17 In chapter4.pdf, highlighted (with yellow color) questions in the section 4.1 problems
Week 10 20-26 Oct.	4.1 Linear Inequalities in two variables 4.2 Linear Programming	In chapter4.pdf, highlighted (with yellow color) questions in the section 4.2 problems

Week 11 27 Oct.-2 Nov.	4.2 Linear Programming	
Week 12 3-9 Nov.	**Quiz 2(4 Nov)** 4.3 Multiple optimum solutions	In chapter4.pdf, highlighted (with yellow color) questions in the section 4.3 problems
Week 13 10-16 Nov.	**Break**	
Week 14 17-23 Nov.	4.4 Simplex method	In chapter4.pdf, highlighted (with yellow color) questions in the section 4.4 problems
Week 15 24-30 Nov.	**Midterm 2(25 Nov)** 4.4 Simplex method 4.5 degeneracy, unbounded solutions and multiple solutions	chapter4.pdf, highlighted (with yellow color) questions in the section 4.5 problems
Week 16 1-7 Dec.	5.1 Eigenvalues and eigenvectors 5.2 Diagonalization	Page 300: 1-12. Page 311 : 5-7, 17-19
Week 17 8-14 Dec .	**Revision** **Long Weekend-Wednesday and Thursday**	
	Final Exam Period	