



BME 204: Introduction to Linear Systems

Course Catalog

Matrices, determinants, systems of linear equations, vector spaces, linear transformations, Eigenvalues, Eigenvectors, and related topics.

Text Book(s)

Title	Elementary Linear Algebra
Author(s)	Howard Anton
Publisher	Taylor and Francis
Year	2010
Edition	10 th Edition, ISBN-10:0470559918

References

Books	Linear Algebra, 4 th Edition, by Friedberg, Insel, and Spence, Published by Pearson, 2003, ISBN-10: 0130084514, ISBN-13: 9780130084514.
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Instructor

Instructor	Dr. Rabah Al abdi
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Pre-requisites

Prerequisites by topic	Intermediate Analysis
Prerequisites by course	Math 201
Co-requisites by course	NA
Prerequisite for	NA

Topics Covered		
Week	Topics	Chapters in Text
1-4	Systems of Linear Equations and Matrices	CH1
5-7	Determinants	CH2
7-9	Vectors and Vector Space	CH3/CH4
9	Eigenvalues and Eigenvectors	CH5
10-11	Inner Product Spaces	CH6
11-12	Linear Transformations	CH8
13-15	Diagonalization and Quadratic forms, Numerical methods, and Matlab applications	CH7/CH9/CH10

Evaluation		
Assessment Tool	Expected Due Date	Weight
Homework, Quizzes, and semester works	One week after homework problems are assigned	10%
First Exam	According to Dept. schedule	25 %
Second Exam	According to Dept. schedule	25 %
Final Exam	According to the University final examination schedule	40 %

Objectives and Outcomes:	
Objectives	Outcomes
1. Ability to understand ideas of vectors and matrices and dot products[1,2,7]	1.1. Understand the ideas of vectors and matrices and dot product 1.2. Appreciate the role of linear algebra in electrical engineering
2. Understand and apply linear algebra theorems[1,2,7]	2.1. Define vector spaces and subspaces 2.2. Identify Nullspace and column space 2.3. Identify Rank of the matrix 2.4. Identify independence, Basis and dimension
3. Ability to solve linear system of equations[1,2,7]	3.1. Solving linear equations 3.2. Determine the Orthogonality of the four vector spaces 3.3. Perform the Least squares approximations 3.4. Define the projections 3.5. Design the orthogonal bases using the Gram-Schmidt method

4. Ability to solve eigenvalue problem[1,2,7]	4.1. Identify the determinant 4.2. Identify the eigenvalues and eigenvectors 4.3. Solving linear differential wquations 4.4. Identify symmetric, similar and positive definite matrices 4.5. Perform the singular value decomposition
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Contribution of Course to Meeting the Professional Component

The course contributes to equip engineers with the fundamentals of Linear Algebra that is useful in many engineering applications.

Relationship to Program Outcomes (1-5)						
1	2	3	4	5	6	7
40 %	40%					20%

Relationship to Biomedical Engineering Program Objectives

PEO1	PEO2	PEO3	PEO 4
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- Active learning, where students should be active and involved in the learning process inside the classroom, will be emphasized in the delivery of this course.
- Different active learning methods/approaches such as: Engaged Learning, Project-Based Learning, Cooperative Learning, Problem-based Learning, Structured Problem-solving, will be used.
- The teaching method that will be used in this course will be composed of a series of mini lectures interrupted with frequent discussions and brainstorming exercises.
- A typical lecture would start with a short review (~ 5 minutes) using the blackboard. This review will also depend on discussions which will gauge the students’ digestion of the previous material. Then, the students would have a lecture on new materials using blackboard. The lecture presentation will be paused every 15 – 20 minutes with brainstorming questions and discussions that will allow the students to reflect and think in more depth about what they learned in that presentation.
- Then, some example problems will be presented and discussed with the students to illustrate the appropriate problem solving skills that the students should learn. The lecture will be continued for another 15 – 20 minutes, followed by examples and/or a quiz covering the materials taught in the previous two weeks.

Policy	
Attendance	Attendance will be checked at the beginning of each class. University regulations will be strictly followed for students exceeding the maximum number of absences (20%).
Homework	Working homework problems is an essential part of this course and they represent a key opportunity to learn the subjects presented and discussed. All homework problems assigned during a given week are due at the beginning of class on the second meeting of the following week unless otherwise stated. Late homework will not be accepted. Failure to turn in this particular homework on time will result in a grade of zero for the homework contribution to your final grade. Teamwork is encouraged; however, the work one hands in must represent his/her own effort. Homework solutions will be discussed with the teaching assistant
Quizzes	Quizzes will be part of this course. No make-up quizzes will be conducted
Student Conduct	It is the responsibility of each student to adhere to the principles of academic integrity. Academic integrity means that a student is honest with him/herself, fellow students, instructors, and the University in matters concerning his or her educational endeavors. Cheating will not be tolerated in this course. University regulations will be pursued and enforced on any cheating student

Prepared by:

Dr. Rabah Al abdi,

February 25, 2020