جامعة آل البيت
دائرة ضمان الجودة والتخطيط

بسم الله الرحمن الرحيم

جامعة آل البيت

College of Science
Department of Mathematics
Course syllabus: Linear Algebra (I) (401241)
First semester 2019/2020

1. Instructor Information:

Instructor Name	Prof. Hani Khashan		
Office Hours	Sunday ,Tuesday, Thursday	11-12 9-10	
Office Number and Telephone Extension	2121		
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2. Course Description:

Systems of linear equations; matrices and matrix operations; homogeneous and non homogeneous systems; Gaussian elimination; elementary matrices and a method for finding determinants and inverses. Euclidean vector spaces; linear transformations from $\mathbb{R}^n$ to $\mathbb{R}^m$ and their properties; general vector spaces; subspaces; basis; dimension; row space; column space; null space of a matrix; rank and nullity; inner product spaces; eigenvalues and diagonalization; linear transformations.

3. Course Information:

Course number: 401241	Course Title: Linear Algebra (I)	Level : Second year
Course Nature: Theoretical	Prerequisite: 401101	Lecture time: Sun. Tue. Thu. 12:00 – 13:00
Academic year: 2019 – 2020	Semester: First	Credit Hours: 3

4. Course Objectives:

Students are expected to

1. Solve systems of linear equations by using Gaussian and the Gauss-Jordan elimination method.
2. Compute determinants, and prove the basic theorems about determinants and their properties.
3. Employ matrices to solve systems of linear equations.
4. Prove the basic theorems about systems of linear equations and matrices.
5. Define the concepts of vector spaces, subspaces, linear combinations, and determine spanning sets, linear independence, bases, dimension, row space, column space, null space, rank, and nullity.
6. Define the concepts of inner product spaces, and determine norms, angles between vectors, orthogonality, and orthonormal bases.
7. Compute the eigenvalues and eigenvectors of matrices, and prove the basic theorems about these concepts.
8. Make use of the basic facts about linear transformations and their matrix representations.

After completing this course, students should demonstrate competency in the following skills:

1. Solving systems of linear equations by Gaussian and the Gauss-Jordan elimination method.
2. Computing determinants and proving the basic theorems about determinants.
3. Being able to recognize vector spaces, subspaces, linear combinations, spanning sets, linear independence, bases, dimension, row space, column space, null space, rank, and nullity.
4. Recognizing the concepts of inner product spaces, norms, angles between vectors, orthogonality, and orthonormal bases.
5. Computing the eigenvalues and eigenvectors of matrices, and prove the basic theorems about these concepts.

5. Intended Student Learning Outcomes:

Successful completion of the course should lead to the following outcomes:

1) Students can be able to solve systems of linear equations by using Gaussian and the Gauss-Jordan elimination method. Moreover, they can compute determinants, and prove the basic theorems about determinants and their properties.
2) Students can prove the basic theorems about systems of linear equations and matrices.
3) Students can define the concepts of vector spaces, subspaces, linear combinations, and determine spanning sets, linear independence, bases, dimension, row space, column space, null space, rank, and nullity. They can also define the concepts of inner product spaces, and determine norms, angles between vectors, orthogonality, and orthonormal bases.
4) Students can compute the eigenvalues and eigenvectors of matrices, and prove the basic theorems about these concepts. Moreover, they use of the basic facts about linear transformations and their matrix representations.

1) Course Content:

The Weeks	The Subjects
1	Introduction to systems of linear equations. Gaussian elimination. Matrices and Matrix Operations.
2	Inverses. Rules of matrix arithmetic. Elementary matrices and a method for finding the inverse of a matrix.
3	Further results on systems of equations and inevitability. Diagonal, Triangular, and Symmetric Matrices.
4	Determinants by Cofactor Expansion. Evaluating determinants by row reduction.
5	Properties of the determinant function. A combinatorial approach to determinants.
6	Euclidean n-spaces and linear transformations from $\mathbb{R}^n$ to $\mathbb{R}^m$.
7	Real vector spaces. Subspaces. Linear independence.
8	Basis and Dimension. Row Space, Column Space, and Nullspace. Rank and Nullity.
9	Inner products spaces. Angles and orthogonality in inner product spaces.
10	Orthonormal bases. Gram-Schmidt Process.
11	Eigenvalues and Eigenvectors.
12	Diagonalization and some properties.
13	General linear transformations. Kernel and Range.
14	Inverse linear transformations.
15	Review.

2) Teaching and learning Strategies and Evaluation Methods:

Learning Outcomes	Teaching Strategies	learning Strategies	Evaluation Methods
1) Students can be able to solve systems of linear equations by using Gaussian and the Gauss-Jordan elimination method. Moreover, they can compute determinants, and prove the basic theorems about determinants and their properties. 2) Students can prove the basic theorems about systems of linear equations and matrices. 3) Students can define the concepts of vector spaces, subspaces, linear combinations, and determine spanning sets, linear independence, bases, dimension, row space, column space, null space, rank, and nullity. They can also define the concepts of inner product spaces, and determine norms, angles between vectors, orthogonality, and orthonormal bases. 4) Students can compute the eigenvalues and eigenvectors of matrices, and prove the basic theorems about these concepts. Moreover, they use of the basic facts about linear transformations and their matrix representations.	- In order to succeed in this course, each student needs to be an active participant in learning both in class and out of class. - Class time will be spent on lecture as well as discussion of homework problems and some group work. - To actively participate in class, students need to prepare by reading the textbook and doing all assigned homework before class (homework will be assigned each class period, to be discussed the following period). - Students should be prepared to discuss their homework (including presenting their solutions to the class) at each class meeting - their class participation grade will be determined by their participation in this. - Students are encouraged to work together and to ask questions and seek help from the professor, both in and out of class. But they have to write their homework by themselves.	-Provide students with the desire for and ability to accomplish lifelong learning. -Provide the tools and setting for self-discovery. -Involve educating students to be independent thinkers who develop professional attitudes, learn quality technical skills, and develop good written and oral communications.	- Classroom presentations - Quizzes - Discussion - First exam, Second exam and Final exam.

1) Assessment:

Assessment	Grade Proportion	Week/Dates
Class Work (Quizzes, Homework and Attendance of the lecture)		
First exam	**25 %**	**7th Week**
Second exam	**25 %**	**12th Week**
Final exam	**50 %**	**End of Semester**
Total	**100 %**	

2) Text Book:

The main reference	Elementary Linear Algebra
Author(s)	Robin J. Wilson, John J. Watkins
Publisher	JOHN WILEY & SONS, INC.
Year	2005
The edition	9th edition
The reference website	https://www.academia.edu/33292799/Elementary_Linear_Algebra_9th_Edition_-_Howard_Anton_e_Chris_Rorres.pdf

3) References and additional resources:

1)	Introductory Linear Algebra with Applications by Bernard Kolman and David R. Hill, MacMillan Publishing Company,1993
2)	