جامعة آل البيت
دائرة ضمان الجودة والتخطيط

بسم الله الرحمن الرحيم

جامعة آل البيت

College of Science
Department of Mathematics
Course syllabus: Linear Algebra (2)
First semester 2019/2020

1. Instructor Information:

Instructor Name	Prof. Ali Handam	
Office Hours	Sunday ,Tuesday, Thursday	9-10
	Monday, Wednesday	2:30-3:30
Office Number and Telephone Extension		
Email	alihandam@yahoo.com	

2. Course Description:

Vector spaces; subspaces; quotient spaces; linear independence and bases; dual spaces; inner product spaces; orthonormal bases; linear transformations; eigenvalues, eigenvectors and determinants of linear transformations; matrix representation; change of basis and similarity; invariant subspaces; canonical forms of linear transformations; diagonal form; triangular form; nilpotent transformations; Jordan form; companion matrices; commutators; the trace functional and Jacobson's lemma; normal transformations and the spectral theorem.

3. Course Information:

Course number: 401441	Course Title: Linear Algebra ii	Level : Fourth year
Course Nature: Theoretical	Prerequisite: 0401241	Lecture time: Sun. Tue. Thu. 12:00 – 1:00
Academic year: 2019 – 2020	Semester:First	Credit Hours: 3

4. Course Objectives:

1- Engage students in sound mathematical thinking and reasoning. This should include students finding patterns, generalizing, and asking/answering relevant questions.
2- Provide a setting that prepares students to read and learn mathematics on their own.
3- Explore multiple representations of topics including graphical, symbolic, numerical, oral, and written. Encourage students to make connections among the various representations to gain a richer, more flexible understanding of each concept.
4- Analyze the structure of real-world problems and plan solution strategies. Solve the problems using appropriate tools.
5- Develop a mathematical vocabulary by expressing mathematical ideas orally and in writing.
6- Enhance and reinforce the student's understanding of concepts through the use of technology when appropriate.

5. Intended Student Learning Outcomes:

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

A. Knowledge and Understanding Skills: Student is expected to

A1. Explore multiple representations of topics including graphical, symbolic, numerical, oral, and written.

A2. Make connections among the various representations to gain a richer, more flexible understanding of each concept.

B. Intellectual Analytical and Cognitive Skills: Student is expected to

B1. Make mathematical thinking and reasoning, find patterns, generalize, and ask/answer relevant questions.

B2. Read and learn mathematics on his own.

B3. Analyze the structure of real-world problems and plan solution strategies. Solve the problems using appropriate tools.

C. Subject- Specific Skills: Student is expected to

C1. Write and read proofs in linear algebra.

C2. Find basis and dimension for vector spaces.

C3. Find the kernel and range of a linear transform.

C4. Find Jordan form for given matrices.

D. Creativity /Transferable Key Skills/Evaluation: Student is expected to

D1. Develop a mathematical vocabulary by expressing mathematical ideas orally and in writing. D2. Enhance and reinforce the student's understanding of concepts through the use of technology when appropriate.

6. Course Content:

Course Content		
Week	**Topics**	
1	Linear transformations	
2	matrix representation of linear transformations between finite dimensional vector spaces	
3	Diagonalization of matrices and linear transformations	
4	Characteristic polynomials, minimal polynomials, Cayley – Hamilton Theorem	
5	Inner product spaces, linear transformations and functionals on inner product spaces	
6	Types of operators (matrices) on inner product spaces	
7	Self adjoint matrices, positive matrices	
8	Characteristic numbers,annihilating polynomials	
9	Invariant subspaces, direct-sum decomposition	
10	Cyclic decomposition, rational form	
11	Quadratic forms	
12	Inner product spaces, linear functionals and adjoints	
13	Unitary operators, normal operators	
14	Forms on inner product spaces	
15	Bilinear forms	

7. Teaching and learning Strategies and Evaluation Methods:

Learning Outcomes	Teaching Strategies	learning Strategies	Evaluation Methods
A1. Explore multiple representations of topics including graphical, symbolic, numerical, oral, and written. A2. Make connections among the various representations to gain a richer, more flexible understanding of each concept.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give homework assignments	- Classroom presentations - Discussion - First exam
B1. Make mathematical thinking and reasoning, find patterns, generalize, and ask/answer relevant questions. B2. Read and learn mathematics on his own. B3. Analyze the structure of real-world problems and plan solution strategies. Solve the problems using appropriate tools.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give homework assignments	- Classroom presentations - Discussion - Second exam
C1. Write and read proofs in linear algebra. C2. Find basis and dimension for vector spaces. C3. Find the kernel and range of a linear transform. C4. Find Jordan form for given matrices.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give homework assignments	
D1. Develop a mathematical vocabulary by expressing mathematical ideas orally and in writing. D2. Enhance and reinforce the student's understanding of concepts through the use of technology when appropriate.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give homework assignments	- Classroom presentations - Discussion - Final exam

8- 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 %**	

9. Text Book:

The main reference	*Elementary Linear Algebra: Applications*
Author(s)	Anton, Howard, and Rorres, Chris.
Publisher	JOHN WILEY & SONS, INC.
Year	2014
The edition	11th edition
The reference website	

10. References and additional resources:

1)	T. S. Blyth and E. F. Robertson, *Basic Linear Algebra* (Springer, London, 2nd edition 2002).
2)	C. W. Curtis, *Linear Algebra -- An Introductory Approach* (Springer, New York, 4th edition, reprinted 1994).
3)	R. B. J. T. Allenby, *Linear Algebra* (Arnold, London, 1995).