جامعة آل البيت
دائرة ضمان الجودة والتخطيط

بسم الله الرحمن الرحيم

جامعة آل البيت

College of Science
Department of Mathematics
Course syllabus: Applied Algebra
First semester 2020/2021

1. Instructor Information:

Instructor Name	Prof. Ali Handam
Office Hours	Sunday ,Tuesday, Thursday
Office Number and Telephone Extension	
Email	alifirstsem@gmail.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: 401447	Course Title: Applied Algebra	Level : Fourth year
Course Nature: Applied	Prerequisite: 0401241	Lecture time: Sun. Tue. Thu. 11:00 – 12:00
Academic year: 2020 – 2021	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 applied algebra.
C2. Constructing Curves and Surfaces Through Specified Points
C3. Find age-specific population growth.
C4. Find quadratic forms.
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+2	Inverses, rules of matrix arithmetic, determinants, Eigenvalues and Eigenvectors, linear transformations.	
3+4	Geometry of linear operators	
5	Least squares fitting to data	
6+7	Quadratic forms	
8	LU- decompositions	
9+10	Constructing Curves and Surfaces Through Specified Points	
11+12	Geometric linear programming	
13	Markov chain	
14	Cryptography	
15	Age-specific population growth	

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 applied algebra. C2. Constructing Curves and Surfaces Through Specified Points C3. Find age-specific population growth. C4. Find quadratic forms.	- 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. 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	**https://drive.google.com/file/d/1jxqMsCIEhvJLopeDEpnJnED4K4WO7TQj/view?usp=sharing**

9. 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).