Course Specifications

Course Title:	Linear algebra 2	
Course Code:	**MTH 346**	
Program:	**B.Sc in Mathematics**	
Department:	**Mathematics Department**	
College:	**College of Science at Al- Zulfi**	
Institution:	**Majmaah University**	

Table of Contents

A. Course Identification

1. Credit hours: 2	

2. Course type

a. University ☐ College ☐ Department ✓ Others ☐

b. Required ✓ Elective ☐

3. Level/year at which this course is offered: Level Elective

4. Pre-requisites for this course (if any): MATH 229 Linear Algebra 1

5. Co-requisites for this course (if any)**: N/A**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	28	70 %
2	**Blended**	8	20 %
3	**E-learning**	6	10 %
4	**Correspondence**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	28
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify) Seminars and presentations	0
	Total	

B. Course Objectives and Learning Outcomes

1. Course Description
   - Introducing students to some of the advanced concepts in Linear Algebra with some applications.
   - To enable the students to apply the concepts of Linear Algebra to solve Mathematics, Statistics, Engineering and Social sciences problems.

2. Course Main Objective
It should be 4 credit Hours course.
There should be inclusion of basic computer based solution of the problems of Linear Algebra.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Deepen students' concepts	We first introduce new notions, give examples from the simple ones (numbers sets) to those related to matrices, functional sets, we establish the attached properties, we give and prove different theorems related to those notions. Finally, we construct new examples and concepts. To well fix the principal facts, homework is proposed.
1.2	Improve students understanding and awareness.	
١,٣	Expand students' exposure to solve the problems	
2	**Skills :**	
2.1	Ability to think analytically and critically;	C2
2.2	Ability to understand and analyze the mathematical problems	C2
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Review on matrices	6
2	Triangular and similar matrices.	3
3	Characteristic polynomial- Eigen values & Eigen vectors	3
4	Diagonlization of a matrices.	3
5	Exponential of matrices - Properties of e^{tA}	3
6	Repeated eigenvalues and nondiagonalizable matrices Complex eigenvalues.	6
7	Complex eigenvalues.	3
8	Solving system of linear Differential equations using exponential of matrices.	6
9	Danvour Analysis- Real Canonical Form.	6
10	Caley-Hamilton theorem.	3

Total	42

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	State the axioms defining characteristic polynomials , diagonalizable matrix …	We first introduce new notions, give examples from the simple ones (numbers sets) to those related to matrices, functional sets, we establish the attached properties, we give and prove different theorems related to those notions. Finally, we construct new examples and concepts. To well fix the principal facts, homework is proposed.	-MCQ on principal theorems -Proving additional notions that can been elaborated from the general study -In general we introduce a short question to control the ability of the student to make the relationship between all the parts of the course.
1.2	Deduce simple statements from these axioms.		
1.3	Provide examples of different notions		
1.4	Determine the diagonalizable matrix.		
1.5	State, prove and apply some of the classical theorems of diagonalization.		
1.6	Apply diagonalization to solve systems of linear differential equations.		
1.7	Apply Cayley Hamilton theorem to compute the exponent of matrix.		
2.0	**Skills**		
2.1	The ability to recognize diagonalizable matrix.	Explanations and examples given in lectures.	Short questions and discussion during the tutorial class+ short quizzes.
2.2	The ability to compute the exponent of matrix.	Guidance and supervision of the work developed in tutorial classes.	
2.3	To have the ability to to solve systems of linear differential equations.	By using many examples	
2.4	The ability to make calculus the ring of characteristic polynomials.		
3.0	**Values**		
3.1	The students should be able to formulate and solve mathematical problems such as:	**Direct teaching**: Lectures **Aimed teaching**: Discovery and oral questions **Indirect teaching**: Cooperative Learning	• Homework • Quiz • Midterms • Final Exams
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	1	Midterm 1	7th week
2	3	Homework	Through of semester
3	4	Quizzes	Through of semester
4	5	Electronic Test	13th week
5	6	Presentation	Through of semester
6	7	Final exam	End of semester
7	1	Midterm 1	7th week
8			

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

1- 4-office hours per week in the lecturer schedule.

- Monday 8-10.

2- The contact with students by e-mail and website.

3- activation of the virtual classrooms and academic guidance via Black Board **LMS**.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1- R. Allemby : Linear Algebra , Addison-Wesley, 1996. 2- Serge Lang : Linear Algebra, Edward Arnold, London, Sydney,1995.
Essential References Materials	3- - Jim Hefferson, LinearAlgebra, Verginia CommonWealth University, Mathematics,2009 4- - B. Kolman, D.R. Hill, Introductory Linear Algebra an Applied First Course, 8th Edition,
Electronic Materials	http://www.mathworks.com/ http :// www.springer.com

	http:// www.sciencedirect.com
	http:// www.gigabedia .org/
	http:// www.siam.org/
	http://ww.cmi.univ-mrs.fr/
	http://ww.arxiv.org/
	http://www.ims.ac.uk/
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- Classroom with capacity of 30-students. - Computer Lab of Mathematics Department
Technology Resources (AV, data show, Smart Board, software, etc.)	Mathematical software packages like MATHEMATICA
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	https://www.intmath.com/plane-analytic-geometry/intro.php http://mathworld.wolfram.com/topics/Geometry.html

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students/ internal committee	Direct (Students evaluation electronically organized by Deanship of registration and admission)/ Verification of students' papers
Extent of achievement of course learning outcomes	Staff members (Peer Reviewer)	Indirect (Frequent meetings consultation among the teaching staffs)
Quality of learning resources.	Staff members (course coordinators)	Direct (Meeting between course coordinators and the tutors)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Mathematics Department
Reference No.	27
Date	8/8/1442 H -21/3/2021 G

Head of Department

Dr. Muqrin Almuqrin