



## Course Specifications

<b>Course Title:</b>	LINEAR ALGEBRA I
<b>Course Code:</b>	MATH 2250
<b>Program:</b>	BACHELOR OF SCIENCE IN MATHEMATICS
<b>Department:</b>	MATHEMATICS
<b>College:</b>	COLLEGE OF SCIENCE AND HUMANITIES ALKHARJ
<b>Institution:</b>	PRINCE SATTAM BIN ABDUALZIZ UNIVERSITY

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## A. Course Identification

<b>1. Credit hours:</b> 4(4,0,0)
<b>2. Course type</b>
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> Level 5
<b>4. Pre-requisites for this course (if any):</b> Math 2240
<b>5. Co-requisites for this course (if any):</b> None

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	4 hours per week	%100
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	48
2	Laboratory/Studio	0
3	Tutorial	0
4	Others (specify)	60
	<b>Total</b>	<b>108</b>

## B. Course Objectives and Learning Outcomes

<p><b>1. Course Description</b>            Matrix Definition – Matrix Operations – Symmetric Matrices – Transpose and Inverse of a Matrix – Hermitian Matrices – Markov Matrices – Factorization – Positive definite Matrix – Row Operations – Row Reduced Echelon Form – Linear system of Equations – Solving <math>Ax=0</math> and <math>Ax=B</math> – Vector Spaces and Subspaces – Basis and Dimension – Orthogonality – Similar Matrices – Singular Value Decomposition – Least Squares Approximations – Determinants – Properties of Determinants – Applications of Determinants – Cramer’s Rule – Gauss elimination rule – Gauss Jordan Elimination – Eigenvalues and Eigenvectors – Diagonalization – Linear Transformation – Matrices with MATLAB</p>
<p><b>2. Course Main Objective</b></p> <p>1. What is the main purpose for this course?            The course aims to provide thorough knowledge to students about various concepts of Elementary Linear Algebra such as Matrices, Determinants, Matrix Operations, Solution of Equations using Matrices and determinants, Eigen Value, Eigen Vectors, and Diagonalisation etc. It also aims to give a basic idea about vector spaces and associated theories such as basis, dimension, Linear Transformation etc.</p>

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding</b>	
1.1	Gain knowledge about different types of matrices and their operations Understand the concept of homogeneous and non-homogeneous linear equations and the matrix method to solve the same	K1
1.2	Learn and recall the properties of determinants, eigen values, eigen vectors and diagonalisation	K2
2	<b>Skills :</b>	
2.1	Able to solve system of homogeneous and non-homogeneous system of equations using matrix methods and using crammer's rule	S1
2.2	Compute Eigen values and Eigen vectors and check if the matrix is diagonalisable	S2

### C. Course Content

No	List of Topics	Contact Hours
1	Matrices – Definition, Types, Operations	6
2	Row Operations, Row Reduced Echelon Form	4
3	Solution of Equations	6
4	Vector Spaces – Subspaces – Basis – Dimension	4
5	Determinants – Properties of Determinants	4
6	Application of Determinants	6
7	Gauss, Gauss – Jordan Elimination	4
8	Eigen Value and Eigen Vectors	5
9	Diagonalisation	5
10	Linear Transformation	4
<b>Total</b>		48

### 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	<b>Knowledge and Understanding</b>		
1.1	Gain knowledge about different types of matrices and their operations Understand the concept of homogeneous and non-homogeneous linear equations and the matrix method to solve the same	1. Class Room Lectures 2. Interactive sessions 3. Exclusive Office Hours for clearing doubts in small groups	1. Two Internal Exams 2. Atleast two Quiz 3. End Semester Exam
1.2	Learn and recall the properties of determinants, eigen values, eigen vectors and diagonalisation		
2.0	<b>Skills</b>		
2.1	Able to solve system of homogeneous and non-homogeneous system of equations using matrix methods and	1. Application oriented exercises during tutorial	1. Quiz 2. Assignments Homework

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.2	using crammer's rule Compute Eigen values and Eigen vectors and check if the matrix is diagonalisable	session. 2. Homework to improve the analytical skills 3. Group Discussion during lectures and Interactive Session	3. Homework to be given so that the students discuss among themselves or refer materials from textbook to find solution

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1	4,8	5%
2	Mid Term Exam I	6	20%
4	Mid Term Exam II	10	20%
5	Continuous Assessment – Homework, Assignment, Attendance etc.		5%
6	End Semester Exam		50%

\*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. Exclusive Office Hours – 5 Hours per week
2. Academic Advising for Students – 1 Hour per week

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<ul style="list-style-type: none"> <li>- Strang Gilbert. "Introduction to Linear Algebra", 3rd ed. Wellesley, MA: Wellesley- Cambridge Press, March (2003), ISBN: 0961408898.</li> <li>- Introduction to linear algebra by Gilbert and Howard Anton</li> <li>- Linear Algebra: A Modern Introduction, David Poole</li> </ul>
<b>Essential References Materials</b>	NIL
<b>Electronic Materials</b>	Web Sites, Facebook, Twitter, etc.
<b>Other Learning Materials</b>	Lecture Notes Prepared by the Department of Mathematics

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms with Smart boards with seating facilities for at least 30 students
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Smart board, Internet Connection for Blackboard

Item	Resources
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NIL

### G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course learning outcomes,	Quality Assurance Committee	Course Evaluation
effectiveness of Classroom teaching strategies from students through interactions	Senior Faculty Members / HoD	Peer Review
Effectiveness of teaching and assessment	University	End Semester online survey

**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	
Reference No.	
Date	