King Abdulaziz University
Academic Assessment Unit

# COURSE PORTFOLIO 

## FACULTY OF SCIENCE

## DEPARTMENT OF MATHEMATICS

| COURSE NAME: | Linear Algebra |
| :--- | :--- |
| COURSE NUMBER: | 241 |
| SEMESTER/YEAR: | $1^{\text {st }}$ Term $\quad 1437 / 1438$ |
| DATE: | $17 / 12 / 1437$ |

## PART II



## COURSE SYLLABUS

Chapter I:Systems of linear Equations
-Introduction to system of linear equations
-Gaussian Elimination
-Gauss -Jordan Elimination
Chapter II:Matrices
-Operation with Matrices
-Properties of Matrix operations
-The inverse of a Matrix
Chapter III:Determinants
-The Determinant of a Matrix
-Evaluation of a Determinant using elementary operations
-Properties of Determinants
-Applications of Determinants
ChapterIV:Vector Spaces
-Vectors in Rn
-Vector Spaces
-Subspaces of Vector Spaces
-SpanningSets and Linear Independence
-Basis and Dimension
-Rank of a Matrix and Systems of Linear Equations
Chapter VI:Linear Transformations
-Introduction to Linear Transformations
-The Kernel and Range of a Linear Transformation
-Matrices for Linear Transformations
ChapterVII:Eigenvalues and Eigenvectors
-Introduction to Eigenvalues and Eigenvectors

## Instructor Information

Name of the instructor Dr. Siham Alsayyad
Office location Room 13 Building 7
Office hours

|  | Sat | Sun | Mon | Tue | We <br> $d$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Time |  | $9-10,12.5-$ <br> 1 | $10-1$ | $9-12.5-$ <br> 1 |  |

2Sontact number(s) 63202
\& E-mail address salsayyad@kau.edu.sa

## Course Information

Course name Linear Algebra
LSourse number 241
Course meeting times

|  | Sun | Mon | Tue | Wed | Thu |
| :---: | :---: | :---: | :---: | :---: | :---: |
| DAR | $10-11$ |  | $10-11$ |  | $10-11$ |
|  |  |  | $1-2$ |  |  |

Places
\& Course prerequisites and requirements

| Course name | Course number |
| :---: | :---: |
| Calculus I | Math 101 |
| Fundamentals of Mathematics | Math 251 |

## Description of the Course

Introduction to systems of linear equations, Gaussian elimination and Gauss-Jordan elimination for solving equations
2. Matrices, operations on matrices, properties of matrix operations, inverse of a matrix
\& Determinant of a matrix, elementary row operations, properties of determinants, Cramer's rule
Vector spaces, subspaces, linear combinations, linear independence, bases and dimensions
\& Rank of a matrix, the coordinates, change of bases
\& Linear transformations, kernel, range, nullity of a linear transformation, linear transformations and matrices, symmetric matrices
2s Introduction to eigenvalues, eigenvectors and eigenspaces

## Course Objectives

Introduce the basic topics of linear algebra such as matrices, vector spaces, linear transformations, bases and dimension
Develop the students skills to solve linear equations in n variables
Study eigenvalues and eigenvectors

## Learning Resources

\& Elementary Linear Algebra ( $6^{\text {th }}$ edition, 2004)
By: Larson / Falvo
\& Elementary Linear Algebra
By: Howard Anton/ John Wiley

## Course Requirements and Grading

Student assessment: 1st Exam. 20marks
2nd Exam. 20 marks
Home work on line 10 marks
Section 10 marks
Final Exam. 40 marks

## Expectations from students:

Be punctual
Commit to a decent appearance
Turn off mobile phone during the lecture
Student responsibilities to the course
Study the book
Attend all exams
Be alert during lectures
Participate in the course exercises

## \& Important rules of academic conduct

Missed exams with acceptable excuses will be counted as a percentage of all exams
A student that exceeds a $25 \%$ of being absent with no acceptable excuse is deprived from entering the final exam.

## Learning Resources

Elementary Linear Algebra ( $6^{\text {th }}$ edition, 2004)
By: Larson / Falvo

## Detailed Course Schedule

| Week \# | Topic | Exercises |
| :---: | :---: | :--- |
|  | Chapter1: Systems of linear equations <br> 1.1 Introduction to Systems of Linear Equations <br> Examples (1-5) | Exercises 1-6,16,65,69,70 |

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| Week \# | Topic | Exercises |
| :---: | :---: | :---: |
| 5\&6 | 3.2 Evaluation of a Determinant Using Elementary Operations <br> Examples (2-6) | Exercises 15-20,31-33,48 |
|  | 3.3 Properties of Determinants <br> Examples (1-6) | Exercises <br> 3,4,7- <br> 9,12,15,23,25,45,47,49,50,64,65,69, <br> 72,73 |
|  | 3.5 Applications of determinants Examples (1-4) | Exercises $2-4,11,15,25-27,29,43$ |
| 7\&8 | Chapter4: Vector Spaces <br> 4.1 Vectors in $R^{n}$ <br> Examples (4-6) | Exercises 13, 15, 23, 27, 28,47-49 |
|  | 4.2 Vector Spaces <br> Examples (2-4,6-8) | Exercises $1,3,4,6,19-24,29(a, b), 33,34$ |
|  | 4.3 Subspaces of Vector Spaces Examples (1-4+6-8) | Exercises $1,4,7,9,29,31-35,41,44,45$ |
| $9 \& 10$ | 4.4 Spanning Sets and Linear Independence <br> Examples (1-13) | $\begin{aligned} & \text { Exercises } \\ & 2,7,9,13,15,18,19,21,27,31,32,39,49 \text {, } \\ & 59,65 \end{aligned}$ |
|  | 4.5 Basis and Dimension Examples (1-12) | $\begin{array}{\|l\|} \hline \text { Exercises } \\ 8,9,11,16,17,21,25,35,41,43,45,49,6 \\ 3,67,70,73,79 \end{array}$ |
|  | 4.6 Rank of a Matrix and Systems of Linear equations <br> Examples (2-9) | Exercises $2,3,7,9,13,15,21,23,27,29,35,66$ |

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| Week \# | Topic | Exercises |
| :---: | :---: | :---: |
| $\begin{gathered} 11 \& 12 \\ \& 13 \end{gathered}$ | Chapter6: Linear transformations <br> 6.1 Introduction to Linear transformations <br> Examples (1-2,4-6,9-10) | $\begin{aligned} & \text { Exercises } \\ & 2,3,9,10,15,17,20,22,23,32,33,39,53, \\ & 68,69,73 \end{aligned}$ |
|  | 6.2 The Kernel and Range of a Linear transformation Examples (1-2,4-9) | Exercises $1,3,5,9,11,13,17,22,31,33,49,51,56$ |
| 14\&15 | 6.3 Matrices for Linear transformations Examples (1-2,4) | Exercises 2,4,5,11,13,15,48-50,54,55 |
|  | Chapter7: Eigenvalues and Eigenvectors <br> 7.1 Eigenvalues and Eigenvectors Examples (1-2,4-5,7-8) | Exercises $\begin{aligned} & 2,7,11(a, b), 13(a, b), 15,17,19,23,25,6 \\ & 3,65 \end{aligned}$ |

## Practical Sessions Schedule Model

| Lab. <br> $\#$ | Date | Exp/Practical title | Reading <br> Assignment | What is Due? |
| :---: | :---: | :---: | :---: | :---: |
| 1 | Sep 1 | Safety \& Regulations |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
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| 13 |  |  |  |  |
| 14 |  |  |  |  |
| 15 |  |  |  |  |
| 16 |  |  |  |  |

## PART III



## COURSE RELATED MATERIAL

Contains all the materials considered essential to teaching the course, includes:

Quizzes, lab quizzes, mid-terms, and final exams and their solution set Paper or transparency copies of lecture notes/ handouts (optional)
Practical Session Manual (if one exists)
Handouts for project/term paper assignments

## PART IV

## EXAMPLES OF STUDENT LEARNING

Examples of student work. (Included good, average, and poor examples)

Graded work, i.e. exams, homework, quizzes
Students' lab books or other workbooks
Students' papers, essays, and other creative work
Final grade roster and grade distribution
Examples of instructor's written feedback of student's work, (optional) Scores on standardized or other tests, before and after instruction, (optional)
Course evaluation, self evaluation or students comments (optional)

Part V. Instructor Reflections on the Course

2 Instructor feedback and reflections
E Propose future improvement and enhancement
Evaluate student competency and reflect on their course evaluation for improvements to the course
es Conceptual map of relationships among the content, objective, and assessment
Recent trends and new approaches to teach the course.

## COURSE PORTFOLIO

CHECKLIST

