Department of Mathematics

Syllabus Math 107, Second Semester 1437/1438 H

Course Code: Math 107
Course Title: Matrices and Vectors

Instructor and coordinator:

Dr. Khawaja Zafar Elahi
Room 2A138 Bld 4, Mathematics department
E -Mail: kzelahi@ksu.edu.sa
Website: http://faculty.ksu.edu.sa/khawaja/default.aspx

Text Books:

1. Linear Algebra by H. Anton
   (any book on Linear Algebra from Library 512. 5)
2. Calculus by Swokowski, Olinick and Pence, 6th Ed, PWS publishing Co.
   (any book on Calculus from Library 515.1 5)

Additional Material:

Lecture Notes on
Linear Algebra, Vector and Several Variables Calculus
by Khawaja Zafar Elahi

Course Objectives:

1. Matrices and their use in solving system of linear equations
2. Determinants and applying them in various geometrical and systems of linear equations problems
3. Vector Algebra ,vector valued functions
4. Calculus of several variables, Partial differentiations and their application in Mathematics and Engineering

Course Learning outcomes:

1. Understanding of system of linear equations, matrices, calculus of vectors and several variables.
2. Improve students' theoretical and analytical skills by going inside the depth of different applications of system of linear equations.
3. Can solve and understand the solutions of system of linear equations, understand the ideas of matrices and be able to work out problems.
4. Understand vector algebra, applying the concepts of Vector Algebra to derive equation of line and plane, and to find volume of parallelepiped.
5. The student has to have the ability to handle vector valued functions its derivative and integrals.
6. The student has to have the ability to handle function of several variables. Understand the Concept of Gradient and apply it for the applications in several variables.

Weekly Course Details

Linear Algebra

WEEK 1

Chapter 1: System of Linear Equations

1.0 Basic Definitions of Matrices
1.1 System of linear equation
1.2 Methods for solving system of linear equations
1.3 Gauss Elimination Method

WEEK 2

1.4 Gauss Jordon Method
1.5 Row Echlon form
1.6 Reduced Row Echlon form
1.7 Homogeneous system

WEEK 3

Chapter 2: Matrices

2.1 Properties of Matrices and Algebra of matrices
2.2 Scalar Multiplication
2.3 Matrix Multiplication
2.4 Inverse of 2x2 matrix
2.5 Power of Matrix
2.6 Elementary Matrix
2.7 Methods of finding inverse of matrix
2.8 Solving Linear system by Inverse Matrix

WEEK 4

Chapter 3: Determinant

3.1 Determinant
3.2 By Direct Multiplication
3.3 By cofactor
3.4 By row operation

WEEK 5

3.5 Properties of Determinantial function
3.6 Minor and cofactors, Inverse by cofactors
3.7 Crammer' Rule

Calculus

WEEK 6

Chapter 10: Vectors and the Geometry of Space

10.1 Vectors in the Plane
10.2 Vectors in Space
10.3 The Dot Product

WEEK 7,8

10.4 The Cross Product
10.5 Lines and Planes in Space
10.6 Surfaces in Space

WEEK 9

Chapter 11: Vector-Valued Functions

11.1 Vector-Valued Functions
11.2 Limits, Derivatives
11.3 Velocity, Acceleration.

WEEK 10

11.4 Curvature , Unit Tangent Vector, Principal Normal Vector
11.5 Tangential and Normal Components of Acceleration

WEEK 11

Chapter 12: Functions of Several Variables and Differentiation

12.1 Functions of Several Variables
12.2 Limits and Continuity

WEEK 12

12.3 Partial Derivatives

WEEK 13

12.4 Tangent Planes and Linear Approximations, Increments and Differentials
12.5 The Chain Rule
12.6 The Gradient and Directional Derivatives

WEEK 14

12.7 Extrema of Functions of Several Variables
12.8 Constrained Optimization and Lagrange Multipliers

WEEK 15
Revision WEEK

Midterm Examinations:

Midterm Exam I: Date: **Material covered in first 7 week**
Midterm Exam II: Date: **Material covered in 8th to 14th week**

Final Exam

Useful on line material:

1. https://www.khanacademy.org/math/
2. ocw.mit.edu › Courses › Mathematics
3. mathworld.wolfram.com › ... › Linear Algebra › General Linear Algebra
4. www.sosmath.com/matrix/matrix.html
5. http://www2.warwick.ac.uk/fac/sci/maths/undergrad/ughandbook/content/ma106/elementary_linear_algebra_10th_edition.pdf **(Linear Algebra by H. Anton (Soft copy))**