Department of Mathematics

Syllabus Math 107, Second Semester 1436/37 H

Course Code: Math 107
Course Title: Matrices and calculus

Instructor and coordinator:

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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 Dr. 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. To solve and understand the solutions of system of linear equations , understand the ideas of matrices and be able to work out problems.
4. Vectors, vector algebra, Scalar product and Vector product of two and three vectors,Applying the idea to derive equation of line and plane, find volume of parallelepiped.
5. The student has to have the ability to handle vector valued functions.
6. The student has to have the ability to handle function of several variables. Concept of Gradient a bases for the application in several variables.

Weekly Course Details

Linear Algebra

WEEK 1
Chapter 1: System of Linear Equations
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 Echelon form
1.6 Reduced Row Echelon form
1.7 Homogeneous system
WEEK 3
Chapter 2: Matrices
2.1 Matrix 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 Determinant function
3.6 Minor and cofactors, Inverse by cofactors
3.7 Crammer' Rule

WEEK 15
Revision WEEK

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
11.3Velocity, Acceleration.
WEEK 10
11.4 Curvature , Unit Tangent Vector, Principal Normal Vector
11.5 Tangential and NormalComponents 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

Midterm Examinations:

Midterm Exam I: Date: 29/05/1437H **Material covered in first 7 week**
Midterm Exam II: Date: 20/07/1437H **Material covered in 8^{th} to 14^{th} 15 week**

Grading:

First midterm Exam	25 marks
Second midterm Exam	25 marks
Final Exam	40 marks
Tutorial	10 marks

Total 100 marks

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