

Course Title	Multivariable Calculus	Course Code	MT1008
Department	Fast School of Computing (FSC)	Campus	Lahore
HEC Knowledge Area	Natural Sciences	Credit Hrs.	3
Pre-requisite(s)	Calculus & Analytical Geometry	Grading Scheme	Relative
Applicable From	Spring 2024		

Course Objective	Develop a thorough understanding of advanced topics of multivariable calculus and their applications. Understand the concept of Laplace Transform, Fourier Series, Fourier Transform and Z Transform.
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No.	Assigned Program Learning Outcome (PLO)
2	An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering science.

I = Introduction, R = Reinforcement

E = Evaluation, A = Assignment, Q = Quiz, M = Midterm, F=Final, L = Lab, P = Project, W = Written Report.

No.	Course Learning Outcome (CLO) Statements	Assessment Tools
1	Defining Functions of Several Variables, Computing Partial Derivatives, Directional and Gradient Vectors.	Q1, M1, A1, F
2	Evaluation of Iterated Integrals, in Rectangular, Polar, Cylindrical Coordinates and their Applications.	M1, A1, F
3	Line Integral and its Applications, of Work, Circulation and Flux.	M1, F
4	Greens Theorem in Plane, its Tangential and Normal Form, Surface Integrals, Divergence and Stokes theorem, Laplace Transform and its operational Properties.	Q2, A2, M2, F
5	Expanding Functions in terms of Fourier Series, Fourier Sin and Cosine Series, Introduction to Fourier Transformation and Discrete Transformations (Z transformation).	Q3, A3, F

Text Books	Title	Thomas Calculus (Thirteenth Edition).
	Author	George B. Thomas, Jr.
	Publisher	PEARSON.
	Title	Differential Equations with Boundary-Value Problems (Ninth Edition)
	Author	Dennis G. Zill.
	Publisher	Cengage Learning.
	Title	Integral Transform and their Applications (Second Edition).
	Author	Lookenath and Dambaru.
	Publisher	Chapman.
Reference Books		Advanced Modern Engineering Mathematics, 4th edition, by Glyn James. Calculus (Sixth Edition) By Swokowski.

Week	Course Contents/Topics	Chapter*	CLO*
1	Functions of several variables, Limit and continuity of Higher dimensions.	14.1, 14.2	1
2	Partial derivatives, Chain Rule, Directional Derivative and Gradient Vectors.	14.3, 14.4, 14.5	1
3	Double and Iterated Integrals over Rectangles, Double Integrals over General Regions, Area by Double Integration. Quiz#1	15.1, 15.2, 15.3	2
4	Double integrals in polar form, Triple Integrals in Rectangular Coordinates.	15.4, 15.5	2, 3
5	Substitution in Multiple Integrals, Line Integral. Vector Fields and line Integrals: Work Circulation and Flux.	16.1, 16.2	3
6	Path Independents.	16.3	5
6A	Sessional Exam -I		
7	Conservative Fields and Potential Functions, Greens Theorem in the Plane, Surfaces and Area.	16.3, 16.4, 16.5	5
8	Surface Integrals, Stocks Theorem.	16.6, 16.7	5
9	The Divergence Theorem and a Unified theory, Definition of the Laplace Transform. Quiz#2	16.8, 7.1	5, 4
10	Inverse Transforms and Transforms of Derivatives.	7.2	4
11	Operational Properties I, Translation on the S-Axis, Translation on the t-Axis, Orthogonal Functions.	7.3, 11.1	4
12	Sessional Exam -II		
12A	Fourier Series, Fourier Cosine and Sine Series.	11.2, 11.3	4
13	Definition of the Fourier Transform and Example.	2.3	4
14	Definition of the Z transform and Examples. Quiz#3	12.3	4
15	Basic Operational Properties of Z Transforms.	12.4	4
16			
	Final Exam		

Weightage distribution is given below.

Assessment Tools	Weightage
Assignments (3)	7%
Quizzes (3)	8%
Midterms I	15%
Midterms II	20%
Final Exam	50.0%