

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

<b>Course Objective</b>	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

<b>Text Books</b>	<b>Title</b>	Thomas Calculus (Thirteenth Edition).
	<b>Author</b>	George B. Thomas, Jr.
	<b>Publisher</b>	PEARSON.
	<b>Title</b>	Differential Equations with Boundary-Value Problems (Ninth Edition)
	<b>Author</b>	Dennis G. Zill.
	<b>Publisher</b>	Cengage Learning.
	<b>Title</b>	Integral Transform and their Applications (Second Edition).
	<b>Author</b>	Lokenath and Dambaru.
<b>Reference Books</b>	<b>Publisher</b>	Chapman.
		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. <b>Quiz#1</b>	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	<b>Sessional Exam -I</b>		
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. <b>Quiz#2</b>	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	<b>Sessional Exam -II</b>		
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. <b>Quiz#3</b>	12.3	4
15	Basic Operational Properties of Z Transforms.	12.4	4
16			
	<b>Final Exam</b>		

Weightage distribution is given below.

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