



## Lahore University of Management Sciences

### **MATH 102: Calculus II** **Sec I & Sec-II** **Fall 2023-2024**

#### Course Catalog Description

This is the second of a two-semester calculus sequence. This course covers vectors, lines, planes, quadratic surfaces, vector functions, arc length and curvature of a space curve, partial derivatives and linear approximations, maxima and minima of the functions of several variables, Lagrange multipliers, multiple integrals, change of variables formula for multiple integrals, line integrals, surface integrals, Green's theorem, Stokes' theorem, divergence theorem, sequences and series, power series, Taylor and Maclaurin series.

#### COURSE TEACHING METHODOLOGY

Classes will be conducted on-campus.

#### Course Details

Credit Hours	3
Core	Core Course for Math
Elective	
Open for Student Category	BS students
Closed for Student Category	

#### Course Prerequisite(s)/Co-Requisite(s)

Prerequisites: MATH 101 (Calculus I) AND MATH 120

Co-requisites: None

#### Course Offering Details

Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	75 min	Days / Timings and Venues	TBA
Recitation (per week)	Nbr of Rec (s) Per Week	x	Duration			
Lab (if any ) per week	Nbr of Session(s) Per Week	x	Duration			
Tutorial (per week)	Nbr of Tut(s) Per Week	1	Duration	TBA		



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TAs	TBA

### Course Learning Outcomes

MATH 102	Students will be able to:
CLO1:	Define two and three dimensional Cartesian coordinate systems and make connections between sets of points and equations
CLO2:	Describe limits in two and three dimensions, partial derivatives in two and three dimensions; tangent planes to surfaces and linear approximations; calculate gradients and directional derivatives, apply Lagrange multipliers
CLO3:	Integrate in two and three dimensions; be familiar with some applications of integration in higher dimensions; double integrals using Jacobians and change of variables, triple integrals in Cartesian, cylindrical, and spherical coordinates; evaluate line and surface integrals
CLO4:	Use Green's theorem, Stokes' theorem and the divergence theorem. Know the basic results about the convergence of sequences and series.

### Relation to EE Program Outcomes

EE-240 CLOs	Related PLOs	Levels of Learning	Teaching Methods	CLO Attainment checked in
CLO1	PLO1	Cog-1	Instruction, Tutorial, Assignments	Quiz, Midterm, Final
CLO2	PLO1	Cog-2 & 3	Instruction, Tutorial, Assignments	Quiz, Midterm, Final
CLO3	PLO1	Cog-3	Instruction, Tutorial, Assignments	Quiz, Midterm, Final
CLO4	PLO1	Cog-3 & 4	Instruction, Tutorial,	Quiz, Final



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### Grading Breakup and Policy

Assignments: 10%  
 Quizzes: 20%  
 Midterm exam: 30%  
 Final exam: 40%

### Textbook(s)/Supplementary Readings

Textbook: **Calculus**, 7<sup>th</sup> edition, by **James Stewart**, BROOKS/COLE.

### COURSE OVERVIEW

Week No.	Book Chapter	Topic	Book sections	Related CLOs & Additional Remarks
1-2	12 Vectors and the Geometry of Space	Vectors in two and three dimensions, dot product, cross product, equations of lines and planes, cylinders and quadric surfaces	12.1-12.6	CLO1 4 lectures
3-4	13 Vector Functions	Vector functions and space curves, derivatives and integrals of vector functions, arc length and curvature	13.1-13.3	CLO1 2 lectures
5-7	14 Partial Derivatives	Functions of several variables, limit and continuity, partial derivatives, tangent planes and linear approximations, the chain rule, directional derivatives, maximum and minimum values, Lagrange multipliers	14.1-14.8	CLO1, CLO2 6 lectures
<b>Midterm Exam</b>				
8-9	15 Multiple Integrals	Double integrals over rectangles, iterated integrals, double integrals over general regions, triple integrals	15.1-15.3, 15.7	CLO3 4 lectures
10	15 Multiple Integrals	Change of variables in multiple integrals, double integrals in polar coordinates, triple integrals in cylindrical coordinates, triple integrals in spherical coordinates	15.10, 15.4, 15.8-15.9	CLO3 2 lectures
11-12	16 Vector Calculus	Vector fields, line integrals, the fundamental theorem for line integrals, Green's theorem, curl and divergence, parametric surfaces and their areas, surface integrals, Stokes' theorem, the divergence theorem	16.1-16.9	CLO4 6 lectures
13-14	11 Infinite Sequences and Series	Sequences, series, the integral test, the comparison test, alternating series, absolute convergence, ratio test, root test, power series, representations of functions as power series, Taylor and Maclaurin series	11.1-11.6, 11.8-11.10	CLO4 4 lectures



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### Final Exam

#### Examinations Details

Midterm Exam	Duration: 120 minutes Exam Specifications: <b>Closed books/Closed Notes, Calculators not allowed</b>
Final Exam	Duration: 150 minutes Exam Specifications: <b>Closed books/Closed Notes, Calculators not allowed</b>