Lahore University of Management Sciences

Math-101 Calculus-I
(Section 1-7)

Fall 2023-2024

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Course URL (if any)	https://sites.google.com/view/waqasliazhar/courses/fall-22-calculus?authuser=0

Course Basics				
Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	75min
Recitation/Lab (per week)	Nbr of Lec(s) Per Week		Duration	
Tutorial (per week)	Nbr of Lec(s) Per Week	TBA	Duration	TBA

Course Distribution	
Core	Core
Elective	
Open for Student Category	This course is particularly designed for the first year students, who are interested in pursuing their degrees in engineering, economics, computer sciences and physical sciences.
Close for Student Category	This course will be challenging for the students in terms of rigor practicing and reading projects. The students with no background of trigonometry might have to make more efforts to meet the course rigor level.

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COURSE DESCRIPTION
Calculus is a foundational course at SSE; it plays an important role in the understanding of science, engineering, economics, and computer science, among other disciplines. This introductory calculus course covers differentiation and integration of functions of one variable, with applications. Topics include: Concepts of Function, Limits and Continuity Differentiation Rules, Application to Graphing, Rates, Approximations, and Extremum Problems Definite and Indefinite Integration The Fundamental Theorem of Calculus Techniques of Integration Approximation of Definite Integrals, Improper Integrals, L'Hopital's rule, Applications of Integration.

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COURSE PREREQUISITE(S)
Pre req: (MATH 100, Math in A levels, FSc OR Equiv.) & Anti-req: MATH 101H & Equivalence: MATH 101H

COURSE OBJECTIVES
After completing this course, students should have developed a clear understanding of the fundamental concepts of single variable calculus and a range of skills allowing them to work effectively with the concepts. The basic concepts are: 1. Derivatives as rates of change, computed as a limit of ratios 2. Integrals as an anti-derivative and area under the curve. After completing this course, students should demonstrate competency in the following skills: Use both the limit definition and rules of differentiation to differentiate functions. Sketch the graph of a function using asymptotes, critical points, the derivative test for increasing/decreasing functions, and concavity. Apply differentiation to solve applied max/min problems. Apply differentiation to solve related rates problems. Evaluate integrals by using the Fundamental Theorem of Calculus. Apply integration to compute arc lengths, volumes of revolution and surface areas of revolution. Evaluate integrals using advanced techniques of integration, such as inverse substitution, partial fractions and integration by parts. Use L'Hospital's rule to evaluate certain indefinite forms. Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.

Course Learning Outcomes (CLO)	
CLO1	Define idea of limit, formal limits and continuity of a function, limit definition of derivative. Applications of differential and integral calculus
CLO2	Apply the principles and techniques of differential and integral calculus to solve physical and engineering problems.
CLO3	Understanding Riemann integrals as anti-derivatives, Evaluate integrals using advanced techniques of integration to solve mathematical problems. .

Grading Breakup and Policy
a) Homework (web work) 15% b) Midterm-40% d) Final 45%

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Examination Detail	
Midterm Exam	Yes/No: Yes Combined Duration: 2-3 hrs **Date: 28-10-2023** Exam Specifications: No notes/No books/No calculators
Final Exam	Yes/No: Yes Combined Comprehensive Duration: 2-3 hrs **Date: 20-12-2023** Exam Specifications: No notes/No books/No calculators **"Mid-Term Replacement Policy"**

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COURSE OVERVIEW			
Week/ Lecture/ Module	Topics	Recommended Readings	Matching CLOs
	A preview of calculus	JS 0	
	Review of functions and Models	Strang 1.1-1.7 JS 1.1,1.2	**CLO 1**
	Limits and continuity	Strang 2.6-2.7 JS 2.3, 2.5	
	Derivatives, Derivatives of polynomials	Strang 2.1-2.2 JS 3.1, 3.2	
	Product and quotient rules	Strang 2.5 JS 3.3	
	Differentiation of trig functions, slop and tangent line	Strang 2.4 JS 3.4	
	Chain's rule	Strang 2.3 JS 3.5	**CLO 1 + 2**
	Implicit Differentiation	Strang 4.1 JS 3.6	
	Rates of change in the natural sciences and related rates	JS 3.7-3.8	
	Linear approximation and differentials	Strang 3.1 JS 3.9	
	Maximum and Minimum value of a function	Strang 3.2-3.3 JS 4.1	
	Sketching the graph of a function	Strang 3.1 JS 4.1	
	Mean Value Theorem	Strang 3.8 JS 4.2	
	Graph of the derivative of a function	Strang 3.2-3.3 JS 4.3	
	Limits at infinity: Horizontal asymptote	JS 4.4	
	Inverse Function	JS 7.1	
	Derivative of exponential and logarithm	JS 7.2-7.3	

	functions		
	Indeterminate forms and L'Hospital's rule	Strang 3.8 JS 7.8	
	Anti-derivatives and indefinite integrals	Strang 5.1-5.3, 5.5-5.6 JS 5.2	CLO 3
	Fundament theorem of calculus	Strang 5.4, 5.7 JS 5.3	
	Definite integrals and Area under the curves	Strang 5.4 JS 6.1	
	Techniques of Integration	Strang 7.2 JS 8.1,8.2,8.3,8.4	
	Applications of integration [Volumes, Area of revolution and Average values]	JS 6.2,6.3,6.5	
	Improper integrals	Strang 7.5 JS 8.8	

* (JS stands for James and Stewart)

Textbook(s)/Supplementary Readings

Reference Book: Single Variable Calculus by James Stewart.

Reading Reference: Calculus by Gilbert Strang, http://ocw.mit.edu/resources/res-18-001-calculus-online-textbook-spring-2005/textbook/

Accomodations

- Assignments are due within a certain time period and there will be no extensions in the deadlines.
- Grading will be relative.
- No Grade Change requests shall be entertained after the Grader has finalized Grades.
- There will be a "**Midterm replacement policy",** which allows your Midterm exam grade to be replaced by the Final Exam grade.
- Final Exam will be a comprehensive exam.