Lahore University of Management Sciences

MATH 205 – Introduction to Analysis I
Tentative
Spring Semester 2023-2024

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Course URL (if any)	TBA

Course Basics				
Credit Hours	4			
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	100 min
Recitation/Lab (per week)	Nbr of Lec(s) Per Week		Duration	
Tutorial (per week)	Nbr of Lec(s) Per Week	1	Duration	45 min

Course Distribution	
Core	For Math Major
Elective	
Open for Student Category	All students
Close for Student Category	None

COURSE DESCRIPTION

This course covers the fundamentals of mathematical analysis: construction of real numbers, topology of reals, convergence of sequences and series, limits, continuity, compactness, differentiability and mean value theorem, Taylor's theorem. It shows the utility of abstract concepts and teaches an understanding and construction of proofs

COURSE PREREQUISITE(S)	
	Math 102 (Calculus-II)

COURSE OBJECTIVES	
	The objective of this course is to understand the basic facts on real number system, sequences and series, topology of real line, limits, continuous functions and differentiation.

Learning Outcomes	
	Learn the content of real analysis. Learn to read and write rigorous proofs. Learn good mathematical writing skills and style.

Grading Breakup and Policy (tentative)

Skill Problems: 5%
Assignment(s)/ In class quiz(s): 25%
Midterm Examination: 30%
Final Examination:40 %

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Examination Detail	
Midterm Exam	Yes/No: Yes Combine Separate: Separate Duration: TBD Exam Specifications: Closed book/Closed notes/No calculator
Final Exam	Yes/No: Yes Combine Separate: Separate Duration: TBD Exam Specifications: Closed book/Closed notes/No calculator

COURSE OVERVIEW

Week/ Lecture/ Module	Topics	Recommended Readings	Objectives/ Application
1-2	**Basic Ideas** Sets, algebra of sets, functions and relations, cardinality	Chapter 1 [BS]	Sets, functions and cardinality
3-5	**The Real Numbers** Field axioms, order axioms, bounded sets, completeness axioms	Chapter 2 [BS]	Some axioms, sup, inf
6-10	**Sequences** Basic Properties, Monotone Sequences, Subsequences and the Bolzano-Weierstrass Theorem , Limits of a Sequence , The Nested Interval Theorem , Cauchy Sequences	Chapter 3 [BS]	Concept of sequences and their convergent
11-14	**Series** Basic Definitions, Positive Series, Convergence Tests, Absolute and Conditional Convergence, rearrangements of series.	Chapter 3& 9 [BS]	Series and convergence tests
15-19	**Limits of Functions** Basic Definition, Limits , Continuous Functions ,Uniform Continuity	Chapter 4 & 5 [BS]	Limit and continuity
20-25	**Differentiation** The Derivative at a Point, Derivatives and Extreme Points, Differentiable Functions , Applications of the Mean Value Theorem , Taylor's Theorem , L'Hˆospital's Rules and Indeterminate Forms	Chapter 6 [BS]	Differentiation , mean value theorem, Taylor's theorem and their applications
26-28	**The Topology of R** Open and Closed Sets, Relative Topologies and Connectedness	Chapter 11 [BS]	Set point topology

Textbook(s)/Supplementary Readings

[BS] R. G. Bartle, D. R. Sherbert, Introduction to Real Analysis, 3rd edition, John Wiley & Sons, Inc 2000.
[TBB] B S. Thomson,J B. Bruckner, A M. Bruckner, Elementary Real Analysis Prentice Hall (Pearson) 2001.
[LL] Notes on Real Analysis by Lee Larson . Available at http://www.math.louisville.edu/~lee/ira/IntroRealAnal.pdf
[Ru] W. Rudin,, Principles of Mathematical Analysis, 3rd edition