KU5DSCMAT301: REAL ANALYSIS I

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSC	300-399	KU5DSCMAT301	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4		1	30	70	100	2

Course Description

This course provides a rigorous foundation in real analysis, focusing on the theoretical underpinnings of calculus and the structure of the real number system. Topics include properties of real numbers, sequences and series of real numbers. Emphasis is placed on developing precise mathematical reasoning and proof-writing skills. The course is essential for students intending to pursue advanced studies in mathematics or related fields.

Course Prerequisite

Set theory, Functions.

Course Outcomes

CO No.	Expected Outcome	Learning Domains
1	Understand finite and infinite sets, Countable and Uncountable sets, Cantor's theorem.	Understand
2	Understand Algebraic Properties, Order Properties and Absolute values of $\mathbb{R}$. Understand the Completeness Property of $\mathbb{R}$ and its applications to derive Archimedean Property and Density theorem.	Apply
3	Understand Sequences and their Limits, Limit Theorems	Understand
4	Understand Subsequences and the Bolzano-Weierstrass Theorem, The Cauchy Criterion.	Understand
5	Understand Infinite Series, Absolute Convergence and nonabsolute Convergence	Understand

Mapping of Course Outcomes to PSOs							
	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓	✓					
CO 2	✓	✓					
CO 3	✓	✓					
CO 4	✓	✓					
CO 5	✓	✓					

COURSE CONTENTS

Contents for Classroom Transaction

MODULE	UNIT	DESCRIPTION	HOURS
I		**Finite and Infinite Sets**	**12**
	1	a) Finite and Infinite Sets b) Countable sets c) Uncountable sets d) Cantor's theorem	
II		**The Real Numbers**	**13**
	1	a) Algebraic and Order Properties of $\mathbb{R}$ b) Absolute Value and Real Line c) The Completeness Property of $\mathbb{R}$ d) Applications of the Supremum Property	
III		**Sequences**	**18**
	1	a) Sequences and their Limits b) Limit Theorems c) Monotone Sequences d) Subsequences and the Bolzano-Weierstrass Theorem e) The Cauchy Criterion	

IV	**Series**		**12**
	1	g) Introduction to Infinite Series	
		h) Absolute Convergence, Tests for Absolute Convergence	
		i) Tests for Non-absolute Convergence	
V	**Teacher Specific Module**		**5**
	Directions		
	Logic and proofs		
	Finite and countable sets		
	Properly divergent sequences		

Essential Readings

1. R.G. Bartle and D. R. Sherbert, Introduction to Real Analysis (4th edition), Wiley

Reference Distribution

Module	Unit	Reference No.	Sections	Remarks
I	1	1	Sections 1.3	
II	1	1	Section 2.1, 2.2, 2.3, 2.4	
III	1	1	Sections 3.1, 3.2, 3.3, 3.4, 3.5	
IV	1	1	Sections 3.7, 9.1, 9.2, 9.3	

Suggested Readings

1. T.M. Apostol, Mathematical Analysis (2nd edition), Addison-Wesley
2. W. Rudin, Principles of Mathematical Analysis (3rd edition), McGraw-Hill
3. H.L. Royden, Real Analysis (3rd edition), PHI
4. R.R. Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Company
5. D. Chatterjee, Real Analysis, PHI.

Assessment Rubrics

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper *	12
b)	Assignment	12
c)	Seminar, Viva-Voce	6
Total		**100**

* A student has to appear for at least two written tests. Average mark of best two tests is to be considered for internal mark.

** **Use of Scientific Calculators below 100 functions (that is, upto *fx 99*) shall be permitted.**