KU6DSCMAT302: REAL ANALYSIS II

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	DSC	300-399	KU6DSCMAT302	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 fundamental structures and functions within the real number system. Topics include the theory of intervals, properties of continuous and uniformly continuous functions, and the Riemann integral. The course also explores special functions, specifically the Beta and Gamma functions, highlighting their analytical properties and applications. Designed for students pursuing advanced mathematics, this course emphasizes precise reasoning, proof techniques, and the theoretical underpinnings of calculus.

Course Prerequisite

Familiarity with the real number system including supremum and infimum.

Basic limit theory.

Understanding of sequences of real numbers.

Experience with writing mathematical proofs (e.g., direct, contrapositive, contradiction, induction).

Course Outcomes

CO No.	Expected Outcome	Learning Domains
1	Understand the characterization of intervals	Understand
2	Understand Continuous Functions, composition of continuous functions and continuous functions on intervals.	Understand
3	Understand Uniform Continuity, Monotone and Inverse Functions	Understand

4	Understand Riemann Integral and Riemann-integrable Functions	Understand
5	Understand Fundamental Theorem of Calculus	Understand
6	Understand Improper Integrals	Understand
7	Understand Beta and Gamma Functions and their properties.	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	✓						
CO 6	✓						
CO 7	✓						

COURSE CONTENTS

Contents for Classroom Transaction

MODULE	UNIT	DESCRIPTION	HOURS
I		**Continuous Functions**	**14**
	1	a) Intervals b) Continuous Functions c) Combination of Continuous Functions d) Continuous Functions on Intervals	

II	**Uniform continuity and Monotone functions**		**13**
	1	a) Uniform Continuity b) Monotone and Inverse Functions	
III	**Riemann Integral**		**14**
	1	a) Riemann Integral b) Riemann Integrable functions c) The Fundamental Theorem of Calculus	
IV	**Improper Integrals and Beta and Gamma Functions**		**14**
	1	**Improper Integrals**	
	2	**Beta and Gamma Functions** (a) Beta and Gamma Functions – Definitions (b) Properties of Beta and Gamma Functions (c) Transformations of Gamma Function (d) Some Important Deductions (e) Duplication formula	
V	**Teacher Specific Module**		**5**
	Directions		
	Sequences of functions		
	Series of functions		

Essential Readings

1. R.G. Bartle and D. R. Sherbert, Introduction to Real Analysis (4th edition), Wiley
2. G.B. Thomas Jr., M.D. Weir and J.R. Hass, Thomas' Calculus (12th edition), Pearson Education
3. S. Narayan and P.K. Mittal, Integral Calculus (11th edition), S. Chand Publishers.

Reference Distribution

Module	Unit	Reference No.	Sections	Remarks
I	1	1	Sections 2.5, 5.1, 5.2, 5.3	

II	1	1	Sections 5.4, 5.6	
III	1	1	Sections 7.1,7.2, 7.3	Proof of Additivity theorem, Lebesgue's Integrability Criterion and proof of Composition theorem are excluded
IV	1	2	Section 8.7	
	2	3	Sections 7.1, 7.2, 7.3, 7.4, 7.5	

Suggested Readings

6. T.M. Apostol, Mathematical Analysis (2nd edition), Addison-Wesley
7. W. Rudin, Principles of Mathematical Analysis (3rd edition), McGraw-Hill
8. H.L. Royden, Real Analysis (3rd edition), PHI
9. R.R. Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Company
10. 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.**