

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NMCD522	Measure theory	3	0	0	3

Course Objective

- The modern notion of measure, developed in the late 19th century, is an extension of the notions of length, area or volume. The objective of this course is to introduce the concepts of measure and integral with respect to a measure, to show their basic properties, and to provide a basis for further studies in Analysis, Probability, and Dynamical Systems.

Learning Outcomes

The student will be able

- to understand the abstract measure theory and definition and main properties of the integral.
- to construct Lebesgue's measure on the real line and in n-dimensional Euclidean space.
- use the concept of measure theory to solve the problems related to probability theory, stochastic calculus and functional analysis

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1	Semi-algebra, Algebra, Monotone class, Sigma algebra, Monotone class theorem, Measure spaces, Outline of extension of measures from algebras to the generated sigma algebras, Measurable sets; Lebesgue Measure and its properties.	9	Students will be able to understand Measure space.
2	Measurable functions, Egoroff's theorem, Lebesgue integral and its properties, monotone convergence theorem, Fatou's Lemma, Dominated convergence theorem, various modes of convergence and their relations.	10	This unit will help student to understand Lebesgue integrals and different convergence theorem.
3	Signed measures, Hahn and Jordan decomposition theorems, Lebesgue-Radon-Nikodym theorem, Lebesgue decomposition theorem, the representation of positive linear functionals on $C_c(X)$.	9	Students will learn signed measures and the different decomposition theorems.
4	Introduction to L_p -spaces, Riesz-Fischer theorem; Riesz Representation theorem for L_2 -spaces. Absolute continuity of measures, Dual of L_2 -spaces.	8	Students will be able to understand the basics of L_p spaces.
5	Product measure spaces, iterated integrals, Fubini's and Tonelli's theorems, Outline of fundamental theorem of calculus for Lebesgue integrals.	6	Students will get the idea of products measures spaces and iterated integrals.
Total		42	

Text Books:

1. H.L. Royden, Real Analysis, 4th Edition, Prentice Hall India, 2011.

Reference Books:

1. I. K. Rana, An Introduction to Measure and Integration, 2nd Edition, Narosa, 2004.
2. G. D. Barra, Measure Theory and Integration, 2nd Edition, Woodhead Publishing, 2003