(Master of Science in Statistics) (Master of Science) (M. Sc.) (Statistics) Semester (I)

Course Code	PS01CSTA51	Title of the Course	PROBABILITY THEORY
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	To understand the modern theory of probability through measure theory approach.

Course Content		
Unit	Description	Weightage* (%)
1.	Convergence of sequence of sets, fields and sigma fields, monotone class, Borel sets in R and R^n. Counting measure, Lebesgue and Lebeasgue-Steiltjes measures, probability measures, sigma-finite measures, properties of measures.	25
2.	Measurable functions, Random variables and arithmetic properties of random variables, Lebesgue Integration of a measurable function with respect to a measure, Expectation of random variables, monotone convergence theorem, Fatou's theorem, Dominated convergence theorem.	25
3.	Moments' inequalities like, Holder's inequality, Basic inequality, Jenson's inequality, Liaponov's inequality, sequence of random variables, four modes of convergences, convergence in distribution, convergence in probability, convergence in rth mean and almost sure convergence and their inter relationships	25
4.	Characteristic function, uniqueness theorem, Borel- Cantelli Lemma, Independence, Weak law and strong law of large numbers for iid sequences, CLT for sequence of iid random variables and independent random variables	25

Teaching-Learning Methodology	Interactive Class Lectures, ICT Tools, Problem solving and Group Seminar.

Evaluation Pattern

Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students develop good understanding of fundamental concepts of measure theory.
2.	Student is able to relate various concepts of measure theory with probability theory.
3.	Students understand convergence of sequence of random variables and related results.
4.	Student knows probability inequalities and their applications.
5.	Student can apply knowledge of convergence for obtaining various limiting distributions.

Suggested References:	
Sr. No.	References
1.	Bhat, B. R. (1999). Modern Probability Theory, An introductory Textbook, New Age International (P) Ltd, India
2.	Basu. A. K.(1999). Measure Theory and Probability, PHI, New Delhi
3.	Capinski, M. and Zastawniak, T. (2003). Probability Through Problems, Springer
4.	Ross, S. (2014). A first Course in Probability (9^{th} ed.) ,Pearson Edu. Dorling Kindersley (India) Pvt Ltd.
5.	Feller, W. (2009). An Introduction to Probability Theory and its Applications, 3^{rd} ed. Vol.1, John Wiley Eastern
6.	Kingman, J. F. C. and Taylor, S. J. (1966). Introduction to Measure and Probability, Cambridge University Press.
7.	Cacoullos, T (1989). Exercises in Probability, Springer International Student Edition

8.	Rohatgi, V.K. and Md. Ehsanes Saleh, A.K. (2001), An Introduction to Probability and Statistics, John Wiley
9.	Ash, R. B. and Catherine, A.D. (2005). Probability and Measure Theory, 2nd ed., Academic Press, Elsevier
10.	Grimmett, G. and Welsh, D. (2014). Probability An Introduction (2nd ed.), Oxford Press

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