# SMA 3164 Probability and Measure Theory

**Prerequisite:**MAT 3160 - Principles of Statistical Inference

**Purpose of the Course**

To enable students to understand and apply measure theoretic concepts in relation to probability theory.

**Expected Learning Outcomes**

At the end of this unit, the student should be able to:

1. Discuss the concepts of probability theory and measure theory, and how the complement each other
2. Apply measure theoretic concepts to describe properties of random variables and distribution functions
3. Use the concepts of convergence in distribution and probability
4. Formulate and discuss scientific problems involving randomness in mathematical terms.

**Course Description**

Introduction to probability spaces;The theory of measure and integration;Random variablesand limit theorems;Distribution functions, densities and characteristic functions; Convergence of random variables and their distributions; Uniform integrability and the Lebesgue convergence theorems; Weak and strong laws of large numbers, central limit theorem, conditional probabilities and Radon-Nikodym derivatives of measures; Strong and weak convergence of probability measures, measurability and observability.

**Teaching Methodology:** Lectures, tutorials, and group discussions.

**Instructional Materials and/or Equipment**

Liquid Crystal Displays, White boards and Flip charts.

**Course Assessment**

Continuous Assessment 40%

Examination 60%

**Core Reading Materials**

**Textbooks**

1. Capinski M. & Kopp E. (2006). *Measure, Integral and Probability*. (2ndEd.). New York: Springer-Verlag. ISBN: 978-1852337810
2. Taylor M. (2006). *Measure Theory and Integration*. Providence: American Mathematical Society.ISBN*:* 978-0821841808

# [Athreya](http://www.amazon.com/Krishna-B.-Athreya/e/B001HCVRZW/ref=la_B001HCVRZW_ntt_srch_lnk_2?qid=1466076888&sr=1-2) K.B. &Lahiri S. N. (2006). *Measure Theory and Probability Theory*.New York: Springer-Verlag. ISBN: 978-0387329031

**Core Journals**

1. *Journal of Probability and Statistics. Brazilian Statistical Society*.ISSN: 0103-0752
2. *Journal of Theoretical Probability. Springer.*ISSN:0894-9840
3. *Probability Theory and Related Fields. Springer.* ISSN:0178-8051

**Reference Materials**

**Textbooks**

1. Feller, W. (2008). *An Introduction to Probability Theory and its Application*. (2nd Ed.) New Jersey: Wiley. ISBN: 978-0471257080
2. Taylor, J. C. (2012). *An Introduction to Measure and Probability*. New York: Springer.ISBN:978-0387948300.
3. Parhasarathy K. R. (2005). *Probability on Metric Spaces*. Providence: AMS Chelsea Publishing. ISBN: 978-0821838891

**Reference Journals**

1. *Theory of Probability and its Applications. Society for Industrial and Applied Mathematics (SIAM)*. ISSN:1095-7219
2. *American Journal of Mathematics. Johns Hopkins University Press.* ISSN: 0002-9327