

Advanced Probability Theory

Credits: 7.5 ECTS

Course organiser and lecturer

Department of Mathematics and Mathematical Statistics

Jun Yu, e-mail: jun.yu@umu.se

Prerequisites

Courses in probability theory and inference theory at second-cycle level, corresponding to 5MS073 and 5MS058. Students are assumed to have a good knowledge of advanced calculus. A course in real analysis or measure theory prior to this course is also recommended but not strictly necessary.

Objective

The goal of the course is in a mathematically rigorous fashion to provide essential materials in probability theory that a first- or second-year graduate student typically needs to learn as preparation for work on a PhD degree in mathematical statistics.

There will be one three-hour lecture per week and one three-hour exercise presentation and discussion per week.

Content

This course provides important concepts, results and proofs in measure-theoretic probability theory with an emphasis on statistics. It covers probability spaces and random elements, integration and differentiation, distributions and their characteristics, conditional expectations, asymptotic theory, and a large number of exercises that include many additional results.

Examination

The examination consists of an oral exam and a written exam at the end of the course.

Literature

The main course literature is Jun Shao's book (recommended buying). The other books are complementary reading. They are excellent reference literature.

Shao, J. *Mathematical Statistics*, 2nd Edition. Springer, 2003.

Shao, J. *Mathematical Statistics: Exercises and Solutions*. Springer, 2005.

Billingsley, P. *Probability and Measure*, Anniversary Edition. Wiley, 2012.