UNIVERSITY OF GOTHENBURG

DEPARTMENT OF MATHEMATICAL SCIENCES

MSF600 Advanced topics in probability, 7.5 credits

Avancerade ämnen i sannolikhetsteori, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Mathematical Sciences on 2022-06-23 to be valid from 2023-01-16, spring semester of 2023.

Field of education: Science 100%
Department: Department of Mathematical Sciences

Position in the educational system

The course can be part of the following programmes: 1) Mathematical Sciences, Master's Programme (N2MAT) and 2) Bachelor's Programme in Mathematics (N1MAT)

Main field of studies	*Specialization*
Mathematical Statistics	A1F, Second cycle, has second-cycle course/s as entry requirements

Entry requirements

Knowledge corresponding to the courses *MSG110 Probability theory* and *MMA110 Integration theory.*

Learning outcomes

On successful completion of the course the student will be able to:

- prove and use the strongest possible versions of the Strong and Weak Law of Large Numbers,
- use triangular arrays with application to the St. Petersburg paradox
- prove and use Kolmogorov's theorem on random series.

Other learning outcomes might appear and will vary between different course instances.

Course content

This topics course will cover various aspects of probability theory and the topics will vary from year to year. A sample of such topics which might be covered are

- General weak law of large numbers for triangular arrays with applications, including to the St. Petersburg paradox
- Random series
- The Strong law of large numbers under only a first moment assumption
- Kakutani's Theorem for absolute continuity/mutual singularity of product measures
- Convergence in distribution with various probabilistic examples
- Characteristic functions (aka Fourier transforms), the Central Limit Theorem, the Lindeberg- Feller Theorem and various applications
- Random Walks
- Brownian Motion
- Percolation Theory (from Statistical Mechanics)

Form of teaching

Lectures

Language of instruction: English

Assessment

Hand in tasks and an oral exam.

If a student who has twice received a failing grade for the same examination component wishes to change examiner ahead of the next examination session, such a request should be made to the department in writing and should be approved by the department unless there are special reasons to the contrary (Chapter 6 Section 22 of the Higher Education Ordinance). If a student has received a recommendation from the University of Gothenburg for study support for students with disabilities, the examiner may, where it is compatible with the learning outcomes of the course and provided that no unreasonable resources are required, decide to allow the student to sit an adjusted exam or alternative form of assessment. In the event that a course has ceased or undergone major changes, students are to be guaranteed at least three examination sessions (including the ordinary examination session) over a period of at least one year, but no more than two years after the course has ceased/been changed. The same applies to internships and professional placements (VFU), although this is restricted to just one additional examination session.

Grades

The grading scale comprises: Pass (G) and Fail (U).

Course evaluation

The course will be evaluated at the end of the course together with the students. This will be followed by.an anonymous survey.

The results of and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.