Faculty of Science

MASTM27, Mathematical Statistics: Nonparametric Inference, 7.5 credits
Matematisk statistik: Icke-parameterisk inferens, 7,5 högskolepoäng
Second Cycle / Avancerad nivå

Details of approval
The syllabus was approved by Study programmes board, Faculty of Science on 2016-09-22 and was last revised on 2016-09-22. The revised syllabus applies from 2016-09-22, spring semester 2017.

General Information
The course is an elective course for second-cycle studies for a Degree of Master of Science (120 credits) in Mathematical Statistics.

Language of instruction: English

Main field of studies  Depth of study relative to the degree requirements
Mathematical Statistics  A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes
The overall goal is to provide the students with tools, and show results, that are used in modern inference theory. Important applications can be found in e.g. survival analysis, nonparametric methods for estimating densities, regression functions and spectral densities. The course can also serve as an introduction to these fields.

Knowledge and understanding
Upon completion of the course, the student is to be able to:

• account for weak convergence on general function spaces
• account for the basic properties of empirical processes, and the Donsker's and Glivenko-Cantelli theorems
• account for functional differentiability of statistical functionals, as well as applications to limit distributions of statistical functionals, and applications in survival analysis.

This is a translation of the course syllabus approved in Swedish
• account for the theory for nonparametric and parametric bootstrap methods, as well as bootstrap of limit distributions for statistical functionals
• account for the theory for nonparametric density estimation
• account for the theory for nonparametric regression
• account for the theory for M and Z estimators, as well as applications to maximum likelihood estimators and least squares estimators

**Competence and skills**

Upon completion of the course, the student is to be able to:
• summarise a scientific article in Inference theory and present this orally at a seminar

**Course content**

Description of the subject specific contents of the course:
• Empirical processes. Covering numbers and bracketing numbers. VC classes (Vapnik–Chervonenki’s classes) of functions.
• Quantile estimators.
• The partial sum process. Donsker’s theorem for this.
• Nonparametric estimations of regression functions.
• M and Z estimators. Applications to maximum likelihood och least square estimators.
• Empirical processes and partial sum process results for weakly and strongly dependent stationary data. Kernel estimation of densities and regression functions.
• The empirical spectral process. Nonparametric estimation of spectral densities.

**Course design**

The teaching consists of lectures and a compulsory self-study project to deepen the understanding of a chosen subject within the course.

**Assessment**

The examination consists of an oral exam and a project seminar.
Students who fail the regular exam are offered a re-examination shortly afterwards.

*Subcourses that are part of this course can be found in an appendix at the end of this document.*
Grades
Marking scale: Fail, Pass, Pass with distinction.
For a passing grade on the course the student should pass the oral exam as well
the project presentation.
The final grade of the course is given by the grade of the oral exam.

Entry requirements
For admission to the course knowledge equivalent to MASC01 Probability theory, 7.5
credits, is required. English B.
Subcourses in MASM27, Mathematical Statistics: Nonparametric Inference

Applies from V17

1601 Examination, 7.5 hp
   Grading scale: Fail, Pass, Pass with distinction