Faculty of Science

MASM12, Mathematical Statistics: Non-linear Time Series Analysis, 7.5 credits

Matematisk statistik: Olinjära tidsserier, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2007-01-31 and was last revised on 2007-01-31. The revised syllabus applies from 2007-07-01, autumn semester 2007.

General Information

The course is an elective course for second-cycle studies for a Master of Science in Mathematical statistics.

Language of instruction: Swedish and English

Main field of studies	*Depth of study relative to the degree requirements*
Mathematical Statistics	A1F, Second cycle, has second-cycle course/s as entry requirements
Mathematics	A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

The aim of the course is that students on completion of the course should have acquired the following knowledge and skills:

Knowledge and understanding

On completion of the course, the students are expected to:

- be able to explain qualitative differences between linear and non-linear models,
- be able to distinguish between the properties of parametric and non-parametric models,
- understand stochastic filtering of latent processes using Kalman filters and particle filters,

- be able to apply methods useful when data is non-stationary.

Competence and skills

On completion of the course, the students are expected to:

- be able to determine whether data needs to be modelled using a non-linear model,
- be able to fit a suitable model to data using different methods,
- be able to solve all the parts of a modelling problem using scientific, technical and statistical theory (from this course and other courses) where the solution includes model specification, inference and model choice,
- present the solution in a technical report.

Judgement and approach

On completion of the course, the students are expected to:

- be able to utilize scientific articles within the field and related fields.

Course content

Different types of non-linear time series models. Non-parametric estimates of non-linearities, i.a. using kernel estimates. Identification of model structure using parametric and non-parametric methods, parameter estimation. State models for non-linear systems, filtering. Prediction in non-linear systems. Modelling using non-linear stochastic differential equations. Recursive methods for parameter estimation in non-stationary time series. Design of experiments for identification of dynamic systems.

Course design

Teaching consists of lectures, computer exercises and projects. Participation in project work, computer exercises and thereby integrated teaching is compulsory.

Assessment

The examination is done through written project reports and an oral presentation.

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 entire course passed project reports, oral presentation and participation in compulsory parts is required. The final grade is the grade on the project.

Entry requirements

For admission to the course knowledge equivalent to MASM17 Time series analysis, 7.5 credits is required together with English B.

Subcourses in MASM12, Mathematical Statistics: Non-linear Time Series Analysis

Applies from H07

0701 Project, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction
0702 Computer Exercises, 0,0 hp
Grading scale: Fail, Pass