Faculty of Science

# MASM25, Mathematical Statistics: Spatial statistics with Image analysis, 7.5 credits
# Matematisk statistik: Spatial statistik med bildananalys, 7,5 högskolepoäng
Second Cycle / Avancerad nivå

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## Details of approval
The syllabus was approved by Study programmes board, Faculty of Science on 2010-12-07 to be valid from 2010-07-01.

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

Language of instruction: English and Swedish

Main field of studies Depth of study relative to the degree requirements

Mathematics A1N, Second cycle, has only first-cycle course/s as entry requirements

Mathematical Statistics A1N, Second cycle, has only first-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:

- explain and use the concept of a stochastic model, in particular from a Bayesian perspective,

- describe the principles of Bayesian modelling and inference,
- identify and describe stochastic models and analysis methods for high-dimensional problems, in particular regarding spatial statistics and image analysis.

*Skills and abilities*
On completion of the course, the students are expected to:

- independently suggest and analyse stochastic models for high-dimensional data, in particular in spatial statistics and image analysis,
- independently implement a computer program for the solution of a given statistical problem and relating analysis method,
- present motivations, course of action, and conclusions in the solution of a given statistical problem, both written and orally.

Judgement and approach
On completion of the course, the students are expected to:

- identify and problematize possibilities and limitations of stochastic modelling and inference, in particular in high-dimensional problems,
- be able to assume a stochastic point of view on random variation in natural phenomena.

## Course design
Bayesian methods for stochastic modelling, classification and reconstruction. Random fields, Gaussian random fields, Kriging, Markov fields, Gaussian Markov random fields, non-Gaussian observations. Covariance functions, multivariate techniques. Simulation methods for stochastic inference (Gibbs sampling). Applications in climate, environmental statistics, remote sensing, and spatial statistics.

## Course implementation
Teaching consists of lectures,  exercises, computer exercises and projects. Participation in computer exercises, projects and thereby integrated teaching is compulsory.

## Assessment
The examination is done by written and oral presentation of the the project.

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

## Grades

For passing grade on the entire course passing grade on the project presentation (written and oral), and participation in compulsory parts are required. The grade is formed by weighing together the results on the parts
which are included the examination.
Marking scale: Fail, Pass, Pass with distinction.

## Entry requirements

For admission to the course knowledge equivalent to at least one of the courses MASC03, Markov processes, 7.5 credits
or MASC04, Stationary Stochastic processes, 7.5 credits are required together with English B.