LUND UNIVERSITY

Faculty of Science

MASM15, Mathematical Statistics: Statistical Modelling of Extreme Values, 7.5 credits

Matematisk statistik: Statistisk modellering av extremvärden, 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 (N 2007/148) and was last revised on 2026-05-18 by The Education Board of Faculty of Science. The revised syllabus comes into effect 2026-05-18 and is valid from the spring semester 2027.

General information

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

Language of instruction: English

Main field of study	*Specialisation*
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 course aims to give theoretical knowledge in mathematical modelling of extreme events and discusses in detail how the theory can be applied in practice. Different courses of action for modelling of extreme values are discussed and guidance is given as to how the models can be modified to fit different practical situations. The students should also learn about more advanced models for extreme value analysis, including extreme values for non-stationary processes.

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:

- describe the fundamental results in uni-variate extreme value analysis,
- be able to describe the fundamental statistical methods of extreme value theory,
- understand the mathematical theory behind the methods and implications of the assumptions made in order to develop the theory, as well as understand the impact of these assumptions on application of theory,
- be able to describe the differences between the uni-variate and multivariate extreme value theory.

Competence and skills

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

- identify those situations where extreme value theory can be used,
- identify which computer packages are available for application of theory and also know how to use those discussed in the course,
- be able to estimate and predict extreme events in the uni-variate case,
- be able to explain the mathematical models and statistical methods for extreme value analysis,
- be able to explain what type of data is needed in order to apply the extreme value theory,
- give some examples of application of the theory,
- explain, step by step, how the theory can be applied,
- describe relevant sources for more information about those extreme value models that have been discussed during the course.

Judgement and approach

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

- assess whether the theory can be used on a specific problem,.

Course content

Extreme value theory concerns mathematical modelling of random extreme events. The course introduce mathematical models for extreme values and develop statistical methods for them.

The course will

- present the fundamental statistical methods for extreme value analysis,
- discuss examples of applications, i.a., regarding floods, storm damage, human life expectancy, and corrosion,
- provide practical use of the models, and
- point to some open problems and possible developments.

Course design

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

Assessment

Assessment takes the form of computer exercises (laboratory work) (1.5 credits) during the course and by a written exam (6 credits) at the end of the course.

Students who did not pass the ordinary exam are offered a re-examination shortly after.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
For a passing grade on the entire course a passed written exam, passed computer exercise reports as well as participation in all compulsory course parts are required.

The grading scale for the computer exercises are Fail and Pass, whereas the written exam is graded according to the scale Fail, Pass, Pass with Distinction.

The final grade is the grade on the written exam.

Entry requirements

For admission to the course knowledge equivalent to the courses MASA03, Mathematical Statistics: Basic Course, 15 credits and MASC01, Mathematical Statistics: Probability Theory, 7.5 credits is required.

Further information

The course is given by Centre for Mathematical Sciences, Lund University.

The course cannot count towards a degree together with MAS231 Statistical Modelling of Extreme Values 7.5 hp.
The course is read together with FMSN55 Statistical Modelling of Extreme Values 7.5 credits which is a
course given by Lund's engineering school LTH.
The examination of the course is scheduled according to LTH:s exam schedule