

Faculties of Humanities and Theology

ÄMAA51, Mathematics 4 with mathematical statistics for teacher students, 30 credits

Matematik 4 med matematisk statistik för ämneslärare, 30 högskolepoäng First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2016-10-19 to be valid from 2016-10-19, autumn semester 2016.

General Information

The course is included in the Master?s programme in Secondary Education offered jointly by Lund and Kristianstad universities.

Language of instruction: English

Learning outcomes

The aim of the course is to enable students to acquire the following knowledge and skills on completion of the course.

Knowledge and understanding

On completion of the course, the students shall be able to

- use and describe basic mathematical concepts, methods and techniques in linear analysis and discrete mathematics as well as in probability theory and statistics theory
- perform different calculations of relevance to the subject areas of the respective modules

- relate issues of random variation and observed data to the concepts of random variables, distributions and relationships between variables
- describe basic techniques for statistical inference, use them on simple statistical models, and modify and adapt them to more complicated models

Competence and skills

On completion of the course, the students shall be able to

- interpret relevant information, and independently identify, formulate and solve problems of relevance to the subject areas of the different modules
- design a statistical model based on a problem retrieved from the real world or from collected data
- use a calculation program for simulation and interpretation of statistical models and for the analysis of data
- select, modify, execute and interpret a statistical procedure that answers a set statistical question
- identify the logical structure in mathematical arguments and the execution of mathematical proof
- plan and carry out teaching activities linked to a selection of course components from the modules on the theories of probability and statistics that are of relevance to upper secondary school mathematics
- communicate mathematical arguments in speech and writing

Judgement and approach

On completion of the course, the students shall be able to

- review a statistical model and its ability to describe the real world
- evaluate and use a formal treatment of mathematics

Course content

The course consists of the modules:

- Linear Analysis (7.5 credits)
- Discrete Mathematics (7.5 credits)
- Probability Theory including Subject Didactics (7.5 credits)
- Statistics Theory including Subject Didactics (7.5 credits)

Linear Analysis (7.5 credits)

Function series, uniform convergence, pointwise convergence. Fourier series, Parseval's formula. Cosine and sine series. Applications in classical partial differential equations.

Discrete Mathematics (7.5 credits)

Combinatorics, generating functions, recurrence relations and difference equations. Rings and fields with application to coding theory.

Probability Theory including Subject Didactics (7.5 credits)

The probability axioms. Conditioned probability, independent events. Stochastic variables in one and several dimensions and their functions. Expectation, variance and covariance. Normal distribution, binomial distribution, the Poisson distribution and other important distributions. Conditioned distributions and conditioned expectations. Sums and linear combinations of stochastic variables. The law of large numbers and the central limit theorem. Planning and implementation of teaching activities linked to a selection of course components of relevance to upper secondary school mathematics.

Statistics Theory including Subject Didactics (7.5 credits)

Descriptive statistics. The properties of point estimations. The ML method and LS method. Principles of interval estimation and hypothesis testing. Methods for normal distribution observations. Approximative methods based on normal distribution. Correlation. Linear univariate and multiple regression; polynomial regression. Planning and implementation of teaching activities linked to a selection of course components of relevance to upper secondary school mathematics.

Course design

The teaching consists of lectures and teaching of small student groups in the form of lessons and laboratory exercises. An essential feature in the small group sessions is practice in problem-solving and oral communication in mathematics. Participation in laboratory sessions and associated components is compulsory.

The assessment is based on the following components of the different modules:

- Linear Analysis, written exam, 7.5 credits
- Discrete Mathematics, written exam, 7.5 credits
- Probability Theory, written exam, 5 credits
- Statistics Theory, written exam, 5 credits
- Didactic project in mathematical statistics, 5 credits

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.

The grades awarded on all assessed components are Pass or Fail. The results of the written exams are presented as exam points, of which the total number of points per exam is proportionate to the number of credits for the relevant module. For a grade of Pass on each written exam, the student must have achieved at least 50% of the total available number of points. For a grade of Pass on the whole course, the student must have been awarded this grade on all assessed components. For a grade of Pass with Distinction, the student must have passed all assessed components and achieved at least 75% of the total available number of points.

Entry requirements

To be admitted to the course, students must have passed 45 credits of the courses Mathematics including Subject Didactics 1, Mathematics including Subject Didactics 2 and Mathematics including Subject Didactics 3.

Further information

The course is coordinated with MASA01 Mathematical Statistics: Basic Course, 15 credits, MATB13 Discrete Mathematics, 7.5 credits, and MATB16 Linear Analysis, 7.5, and may not be included in a degree together with these courses.

Subcourses in ÄMAA51, Mathematics 4 with mathematical statistics for teacher students

Applies from H16

- 1601 Linear Analysis, written exam, 7,5 hp Grading scale: Fail, Pass
- 1602 Discrete Mathematics, written exam, 7,5 hp Grading scale: Fail, Pass
- 1603 Probability Theory, written exam, 5,0 hp Grading scale: Fail, Pass
- 1604 Statistical Theory, written exam, 5,0 hp Grading scale: Fail, Pass
- 1605 Didactics Project in Mathematical Statistics, 5,0 hp Grading scale: Fail, Pass