



LUND
UNIVERSITY

Faculty of Science

MASB02, Mathematical Statistics for Chemists, 7.5 credits *Matematisk statistik för kemister, 7,5 högskolepoäng* First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2007-01-31 and was last revised on 2022-11-16. The revised syllabus applies from 2022-11-16, autumn semester 2023.

General Information

The course is an elective course for first-cycle studies for a Bachelor of Science in Chemistry.

Language of instruction: Swedish

Main field of studies

Mathematics

Depth of study relative to the degree requirements

G1F, First cycle, has less than 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The course is intended to give the student the basics in mathematical modelling of random variation and an understanding of the principles behind statistical analysis. It shall also give the students a toolbox containing the most commonly used models and methods, as well as the ability to use these in practical situations. The emphasis lies on models and methods for analysis of experimental data and measurement errors.

The course fills two purposes, providing a fundamental knowledge of mathematical statistics, as well as giving a foundation for further studies.

The fundamental knowledge is essential to those who, in their professional lives, will not necessarily be involved in statistical analyses on a daily basis, but who, on occasion, will be expected to perform basic statistical tests and present the results to their colleagues. They will also be expected to be able to read and assess the analyses of others.

The course shall also give a basis for further studies, particularly in design of experiments and methods for multidimensional data (Chemometrics).

Knowledge and understanding

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

- relate questions about random variation and observed data to the concepts random variables, distributions and relationships between variables;
- explain the concepts of independence, probability, distribution, expectation, and variance,
- calculate the probability of an event, and the expectation and variance from a given distribution,
- describe fundamental techniques for statistical inference and be able to use them on basic statistical models,
- explain the purpose and principles of design of experiments.

Competence and skills

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

- construct a simple statistical model describing a problem based on a real life situation or on a collected data material,
- use a computational program for simulation and interpretation of statistical models, as well as for data analysis,
- choose, modify, perform, and interpret a statistical procedure that answers a given statistical problem,
- use statistical terms within the field in writing.
- give account of an statistical analysis in a technical report.

Judgement and approach

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

- examine a statistical model and its ability to describe reality,

Course content

The course treats:

- Basic probability theory and statistics,
- confidence interval,
- statistical methods like design of experiments and regression analysis,
- applications: analysis of measurements,
- different types of errors and their propagation,
- comparisons between averages and variations,
- concepts and methods for quality control,
- estimation of error rates; regression,
- calibration; planning of factorial designs,
- optimization of design parameters,
- response surface techniques.

There will be a focus on applications in chemistry.

Course design

Teaching consists of lectures, exercises, projects and computer exercises. Participation in computer exercises and project is compulsory.

Assessment

Examination consists of a written exam at the end of the course, and computer exercises, project report as well as a computational ability test during 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.

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 a passed written exam, passed project reports and computer based tests related to each computer exercise as well as participation in all compulsory course parts are required.

The grades awarded for the computer exercises, project reports and computer based test are Fail and Pass. The grade on the written exam is Fail, Pass, Pass with distinction. The final grade is the grade on the written exam.

Entry requirements

For admission to the course knowledge equivalent 15 credits in Mathematics is required.

Further information

The course may not be included in a higher education qualification together with any course code starting with MASB or with MASA02 Mathematical Statistics: Basic Course, 15 credit.

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

Subcourses in MASB02, Mathematical Statistics for Chemists

Applies from H23

- 2301 Test, 0,5 hp
Grading scale: Fail, Pass
- 2302 Laboratory Work, 0,5 hp
Grading scale: Fail, Pass
- 2303 Project, 1,0 hp
Grading scale: Fail, Pass
- 2304 Examination, 5,5 hp
Grading scale: Fail, Pass, Pass with distinction

Applies from H15

- 0703 Test, 0,5 hp
Grading scale: Fail, Pass
- 0704 Laboratory Work, 0,5 hp
Grading scale: Fail, Pass
- 0705 Project, 1,0 hp
Grading scale: Fail, Pass
- 0706 Examination, 5,5 hp
Grading scale: Fail, Pass, Pass with distinction