ÖREBRO UNIVERSITET

Computational Statistics, 6 credits

Statistiska beräkningar och datorintensiva metoder, 6 högskolepoäng

Course Code/Codes	20ST014.
Subject Area	Statistics
School/equivalent	School of Business
Valid from	Spring 2025
Approved	2016-03-17
Revised	2024-09-26
Approved by	Head of School
Translation to English, date and signature	2024-09-19 SNMR

1   Course content

- Basic concepts in numerical analysis
- Numerical optimization, linear algebra and integration
- Random number generation
- Monte Carlo simulation and variance reduction
- Bootstrap and Jackknife
- MCMC methods.

2   Outcomes

2.1   The course in relation to the doctoral programme

The course shall primarily refer to the following intended learning outcomes for third-cycle courses and study programmes as described in the Higher Education Ordinance, i.e. the doctoral student shall demonstrate:

Knowledge and understanding
- broad knowledge and systematic understanding of the research field (part of outcome 1)
- familiarity with the methods of the specific field of research in particular (part of outcome 2)

Competence and skills

- the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively (part of outcome 4)
- the ability to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames (part of outcome 4)

- the ability to review and evaluate research and other qualified tasks (part of outcome 4)
- the ability to identify the need for further knowledge (outcome 7)

Judgement and approach

- specialised insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used (outcome 10)

The intended learning outcomes are listed in the same order as in the general syllabus for the programme.

2.2   Intended course learning outcomes

To obtain a passing grade, the doctoral student shall demonstrate:

Knowledge and understanding

After completing the course the student shall have

- knowledge of numerical methods and their limitations (Written Examination, Assignments)
- knowledge of common computationally intensive methods for statistical analysis (Written Examination, Assignments).

Competence and skills

The student shall after completing the course be able to

- independently implement computational algorithms (Assignments).

Judgement and approach

After completing the course the student has the ability to

- independently adapt and select an appropriate algorithm based on the requirements of the statistical issue (Written Examination, Assignments)
- independently seek new knowledge and judge its relevance for the statistical issue at hand (Assignments)
- independently design simulation studies for evaluating the statistical properties of a test or estimator (Written Examination, Assignments).

3   Reading list and other teaching material

The following course readings and teaching material will be used on the course:

Givens, G. H. & Hoeting, J. A. (latest edition)
Computational Statistics
Wiley

4   Teaching formats

Teaching on the course takes the following format:

Lectures and computer labs

5 Examination

1.

The course is assessed through the following examinations which will be graded separately:

Written Examination, 5 credits (Code: A001)

Assignments, 1 credit (Code: A002)
Oral and written presentation.

For examinations consisting of several examination components, the following applies: If during the course it is concluded that a doctoral student is unable to complete a certain examination component, the examiner may set a substitute assignment provided that circumstances do not reasonably allow for the course component to be completed at a later date during the run of the course.

6 Grades

Examinations on third-cycle courses and study programmes are to be assessed according to a two-grade scale with either of the grades 'fail' or 'pass' (local regulations).

The grade shall be determined by a teacher specifically nominated by the higher education institution (the examiner) (Higher Education Ordinance).

To obtain a passing grade on examinations included in the course, the doctoral student is required to demonstrate that he/she attains the intended course learning outcomes as described in section 2.2. Alternatively, if the course consists of multiple examinations generating credit, the doctoral student is required to demonstrate that he/she attains the outcomes that the examination in question refers to in accordance with section 5.

A student who has failed an examination is entitled to a retake.

If an examination consists of several examination components, and a student fails an examination component, the examiner may, as an alternative to a retake, set a make-up assignment with regard to the examination component in question.

A doctoral student who has failed an examination twice for a specific course or course element is entitled, upon his/her request, to have another examiner appointed to determine the grade.

7 Admission to the course

7.1 Admission requirements

To gain access to the course and complete the examinations included in the course, the applicant must be admitted to a doctoral programme at Örebro University.

Moreover, the student should be admitted as a doctoral student in Statistics, alternatively have a passing grade on the course Statistics, Inference Theory, Second Cycle, 5 credits or have received the corresponding knowledge in other ways.

7.2 Selection

Selection between applicants who have been admitted to doctoral programmes at Örebro University and who otherwise meet the admission requirements as listed above is made according to the following order of precedence:

1. Applicants from the subject of Statistics.

If no other selection criteria are specified in this section, priority shall be given to applicants with a lower number of course credits left before the award of their degree over applicants with a higher number of remaining course credits. Should two or more students have equal number of credits, selection will be done through the drawing of lots. This also applies within any selection groups listed unless otherwise stated.

7.3 Other applicants than doctoral students admitted at Örebro University

Other applicants than doctoral students admitted at Örebro University may be given access to the course on the grounds of provisions for and/or agreements regarding contracted courses, joint degrees, national graduate schools or cooperation in other respects with other universities.

Any decisions on what such other applicants may be given access to the course are made separately and on the basis of the provisions and/or agreements that occasion the student to apply for the course.

For participation in the course in other respects, the same provisions shall apply as for doctoral students admitted to Örebro University.

8 Transfer of credits for courses, study programmes and other experience

Provisions on the transfer of credits can be found in the Higher Education Ordinance and on the university's webpage.

9 Other information

The course is given in English.

Transitional provisions

If applicable, enter text here. Otherwise delete by clicking the tab and pressing the delete key three times.