Stockholm University

Course Description for **Computational Statistics** Advanced level course, 7.5 HEC (Spring term 2025

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1. **Contents**
The course addresses **some** basic principles for
numerical computations,
function optimization,
integration,
simulation techniques, and
introduction to statistical programming using the programming language R

The course consists of two parts/units:
Statistical computation, exam, 4.5 HEC (Exam Code: 11ST) Statistical computation, home assignment, 3 HEC (Exam Code: 12ST)

2. Learning Outcomes

To pass the course, the student should be able to:

demonstrate knowledge of basic principles of numerical computing design and organize algorithms for function optimization, integration, and simulation of distributions
solve statistical computing problem with help of statistical software carry out simulation experiments

3. Teaching Format

Teaching consists, mainly, of lectures and computer labs. During the lectures, new topics are introduced and their connection and relevance to the hand in assignments is established. A description of the lecture contents and reading instructions for the course literature is given in the *Reading Instructions* available at the latest when the course starts (see Athena). Also, further material related to the course will be made available in Athena.

4. Assessment (Examination)

The course is examined partly through individual hand-in assignments (for the part with exam code: 12ST) and, partly, through an individual classroom exam (for the part with exam code: 11ST) using the provided computer and R or Rstudio.

Hand-in assignments are to be submitted according to the deadlines below. Students who have failed a home assignment will be offered a second examination during February/March with (up to) three (possibly new) assignments. Students who have not handed in any home assignment but want to participate at this second examination in February/March should flag this by sending an email to the examiner **until February 17**. If the need arises, oral examination may be used as complement in this part of the course. See deadlines for home assignments (exam-code 12ST) in the following table:

	Handing out	**Deadline**
Assignment 1	January 21	January 28
Assignment 2	January 28	February 4
Assignment 3	February 4	February 11

Do not forget to sign up for the exam in time! This is your own responsibility. After the exam there will be a note on Athena when the exams are marked and available for return.

5. Grading criteria

The hand-in assignments (exam code 12ST) are graded with Pass, if all three assignments are passed, or with Fail, if one or more assignments are not passed.

The written exam is graded as follows.

Grade Criteria

- A **Excellent:** requires at least 90% in the exam.

- B **Very Good:** requires at least 80% in the exam.

- C **Good:** requires at least 70% in the exam.

- D **Satisfactory:** requires at least 60% in the exam.

- E **Adequate:** requires at least 50% in the exam.

- F **Totally Inadequate:** less than 50% in the exam.

  The entire course is passed if hand-in assignments are passed and the written exam is at least graded with E. The grade of the entire course is then equal to the grade of the written exam. If hand-in assignments are failed or the written exam is graded with F, the grade of the entire course is F.

  Approved tools and aids and cheating on the examination

  The hand-in assignments are executed individually. The written examination is to be done individually. For both assignments and written examination, plagiarism of all types is prohibited. Text matching software may be used.
  AI: The use of AI tools is permitted as an aid during the learning process but not to produce material for any kind of examination. Any type of plagiarism is prohibited which includes AI-generated text. The use of AI tools for the improvement of an originally self-written text is not permitted. Text matching software and AI-generated text detectors are used by the department. Read ”Guidelines for disciplinary matters at Stockholm University” https:// www.su.se/medabarteta/organisation- styrning/styrdokument-regelboken /utbildning/regler-och- handl¨aggningsordning-f¨or-disciplin¨arenden-1.605869

The written examination is to be done individually. The exam will take place in a computer lab such that R or Rstudio can be used. During the examination all forms of collaboration, discussion, usage of mobile phones, or any attempts to connect to the internet are prohibited.

Permitted facilities: one page of paper size A4 (both pages) with own handwritten notes. In general, no further own facilities are permitted. Special tools may, if necessary, be allowed upon request and after approval of the examiner. Students who need special support and tools should contact the department’s student counsellor as soon as possible, no later than 3 weeks before the exam. More information regarding examination regulations is available on the department and Stockholm University webpages.

6. Course Literature

- Givens GH, Hoeting JA (2013). *Computational Statistics*, Second Edition. John Wiley & Sons, Inc., Hoboken, New Jersey. Available online as e-book in the SU library, https:// libris.kb.se/bib/16093161

- Gentle JE (2009). *Computational Statistics*. Springer, New York. Available online as e-book in the SU library, https://libris.kb.se/bib/ 11857446

- Gentle JE, Härdle WK, Mori Y (2012). *Handbook of Computational Statistics: Concepts and Methods*. Second edition. Springer.
  Available online as e-book in the SU library, https://libris.kb.se/bib/ 13511662

Further references

- The Comprehensive R Archive Network (CRAN). https://cran.r- project.org/

- Wood SN (2015). *Core Statistics*. Cambridge University Press, New York.
  Chapter 5.
  https://www.cambridge.org/core/books/core- statistics/F303F4463E162C6534641616AE38C0A6
  • Matloff N. The Art of R programming. No Starch Press. Available online, https://ebookcentral.proquest.com/lib/sub/detail.action? docID=1137514

7. Course coordinators

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• Computer labs and assignments: Yulia Ryanova, e-mail: yulia.ryanova@stat.su.se