

Course description ST5501

Statistisk vetenskapsteori och metod, AN, 7.5 hp

Theory and Methodology of Statistical Science, 7.5 ECTS.

Course content

The course deals with some basic scientific theoretical approaches to knowledge formation in an empirical way as well as statistical problem solving and modelling from an applied perspective. A consistent theme in the course is the role of models in empirical science.

The course starts with some basic scientific theoretical approaches to knowledge formation, for example, how scientific knowledge is generated and changed. Different classical theoretical approaches to science are related to different statistical methods (e.g. hypothesis testing, Bayesian statistics, likelihood methods), to shed light on the relationship between philosophical questions about science and statistical inference and evidence/results.

Furthermore, the course provides an in-depth understanding of experimental and non-experimental research methods, especially validity, causal conclusions, control of sources of error, and management of confounders. The course also provides tools for independently examining scientific theoretical assumptions behind different statistical methods.

The course also discusses ethical aspects and the statistician's role and responsibility towards clients, respondents, users and the surrounding society.

The course consists of two modules:

1. Exam, 4.5 credits
2. Assignment, 3 credits

Learning outcomes

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

- account for some central epistemological approaches and their relationship to statistical methods
- discuss the advantages and disadvantages of experimental and non-experimental methods in specific situations
- apply statistical methods for causal conclusions, control of sources of error and management of confounders
- account for ethical aspects and reason about these in specific situations.

Teaching format

Eight lectures, in English.

Examination

The course is examined by a written examination at the end of the course and one assignment to be handed in at the same time as the first occasion of the written exam.

Course literature

The teacher will indicate what parts of the following items to focus on.

- Hansson, S.O. (1997). The art of doing science. Department of Philosophy and the History of Technology, KTH.
- Chalmers, A. (2013). What is this thing called science? 4th ed. St Lucia: University of Queensland Press.
- Welsh, A.H. (1996). Aspects of statistical inference. New York: Wiley.
- Cowles, M.K. (2013). Applied Bayesian statistics: with R and OpenBugs examples. New York: Springer.
- Häggström, O. (2017). Need for nuance in null hypothesis significance testing debate. Educational and psychological measurement, 74, 616-630.
- Rosenbaum, P.R. (2020). Design of observational studies. 2nd ed. Cham: Springer.
- Hedlin, D. (no date). Sensitivity analysis in an observational study. Note for the project "Advancing pharmacological care for patients with diabetes and dementia using the Swedish Dementia Registry"
- Hedlin, D. (no date). A computed 95% confidence interval does cover the true value with probability 0.95 – epistemically interpreted. Manuscript submitted to Journal of the Royal Statistical Society, with three referee reports appended.
- American Statistical Association (2022). Ethical guidelines for statistical practice.
- Additional material distributed during the course, e.g. lecture notes, exercises, etc., will be posted on the learning platform Athena.

Examiner and teachers

The Department of Statistics is located in House 4, level 6, Albano Campus. General information about the department (office hours, phone numbers, schedules, etc.) is posted on the department website, www.statistics.su.se.

Teacher

Dan Hedlin

– lecturer, examiner,
course coordinator

Reception hours

On agreement

E-mail

dan.hedlin@stat.su.se

Schedule

The schedule with exact times and places can be found at the course website or TimeEdit Stockholms universitet.

Although attendance is not mandatory, it is strongly recommended that students attend all teaching sessions in order to better achieve the learning goals.

Examination

Students are assessed by examination of the learning outcomes with respect to the learning goals through two written examinations:

- Module 1 - Individual exam. Graded according to a criterion-referenced seven-grade scale.
- Module 2 –Individual assignment. Graded according to a two-grade scale with the grades Pass (G) and Fail (U)

Deadline to sign up for the exam is usually 10 days before the exam. However sometimes the last day to sign up is earlier than 10 days before. Please check the sign-up period for each single exam in Ladok. You register for the exam via Ladok. If you have problems with the registration, contact expedition@stat.su.se.

If you have not registered correctly, you cannot take the exam.

Grades

Grading of the course is on a criterion-referenced seven-grade scale:

A	Excellent
B	Very good
C	Good
D	Satisfactory
E	Pass
Fx	Inadequate
F	Totally inadequate

To pass the course at least grade E on Module 1 and grade pass on Module 2 are required. The grading of the course will be based solely on the grading of Module 1, provided that Module 2 has been graded as a pass. If you pass Module 1 but fail Module 2, the grade of the course will be Fx.

Module 1

- Students who have obtained at least grade E on the course cannot retake the exam to achieve a higher grade.
- Both Fx and F on Module 1 are fails. To pass the course, the student must retake the exam.
- Students with either Fx or F on the course can redo the examination at least four times, provided that the course is still offered, to achieve at least grade E.
- A student who has obtained either grade Fx or F twice on the same exam has the right to demand another examiner the next time the student takes the same exam. This must be done in writing to the head of department.

Module 2

- Any type of plagiarism is prohibited and text-matching tools will be used.
- A student may fail if she or he is unable to give satisfactory answers to written or oral questions about any of the hand-in assignments in Module 2. Should the examiner wish to ask questions about any assignment orally, a time will be agreed on with the student.
- It is forbidden to post solutions to any of the assignments publicly in any form, for example by uploading the solution in a public repository such as GitHub.
- If you miss the first submission occasion and submit for the first time at the resubmission occasion and then fail, you have no more chances to resubmit during the current term
- If you miss the first submission or fail, you may be given another assignment
- Deadline first submission: May 26, no later than 16.00 hrs, via Athena
- Re-submission for failed hand-in assignments: June 12, no later than 16.00 hrs, via Athena.

USE OF 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-handlaggningsordning-för-disciplinärenden-1.605869>