



**STOCKHOLMS UNIVERSITET**  
**Department of Statistics**  
Frank Miller

**Autumn semester 2019**  
September 2, 2019

## **Experimental Design, Advanced level, 7.5 ECTS.**

### **Course Description**

The course treats experimental methods used in social sciences as well as economics, science, technology and medicine. The aim of the course is to give knowledge in statistical experimental design in regards to designing and conducting experiments and analysis of data generated from experiments. Experiments that are given special focus in the course include single factor experiments, randomized blocks, Latin squares, factorial experiments (e.g.  $2^k$  factorial experiments), and analysis of variance. Different applications of experimental design and analysis of variance are given much focus in the course.

The course provides a basis for further advanced studies and research studies in Statistics.

#### **Learning outcome**

After completing the course, students should be able to:

- give an account of methods used for experimental design
- choose adequate experimental designs for different types of problems and situations
- analyse data generated by factorial experiments by using analysis of variance

#### **Teaching format**

The teaching consists of lectures and exercises including computer labs. During computer labs, students will gain practical skills regarding planning the experiments and analyzing data from experiments using the statistical software SAS. Detailed instructions will be given in connection with the computer lab.

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). The last lecture on **October 22, 13:00-16:00**, includes **presentation of course work** and is therefore **mandatory to attend**. For time and room of lectures and computer lab use [this link](#).

#### **Course literature**

Montgomery, D.C. (2013). Design and Analysis of Experiments, 8<sup>th</sup> edition. OR  
Montgomery, D.C. (2017). Design and Analysis of Experiments, 9<sup>th</sup> edition.

#### **Lecturers**

Frank Miller, office B736, tel. 08-162976, frank.miller@stat.su.se (lectures; course coordinator; examiner)  
Mahmood Ul-Hassan, office B745, tel. 08-162970, mahmood.ul-hassan@stat.su.se (computer labs)

#### **Information**

Further information will be posted on Athena. Athena will be used during the course for communication. Please do not hesitate to write an email (frank.miller@stat.su.se) or come to my office (B736) for questions.

#### **Examination and grading criteria**

Examination will comprise a written test (max 76 points), written report of two home assignments (max 7 points each) and a written and oral report of a course work exercise (max 10 points). The sum of these points (i.e. maximum of 100 points) will be basis for the grade according to the table below.

Grading is done according to a 7-point scale:

A. Excellent	90-100 points and at least 50% of points in each of HA1, HA2 and course work
B. Very good	80-89 points and at least 50% of points in each of HA1, HA2 and course work
C. Good	70-79 points and at least 50% of points in each of HA1, HA2 and course work
D. Satisfactory	60-69 points and at least 50% of points in each of HA1, HA2 and course work
E. Adequate	50-59 points and at least 50% of points in each of HA1, HA2 and course work
Fx. Inadequate	None of the criteria above but at least 40 points in the written test
F. Totally Inadequate	Anything less than 40 points in the written test

To pass the entire course, a minimum grade of E is required.

*The written test (exam on **October 29, 15:00-20:00** and **November 28, 15:00-20:00**)*

The written test (exam) comprises several problems that can give a total of 76 points. Read below about the permitted facilities for this exam. Note that it is required to **sign up for examination, as well as for re-examination, at least one week in advance**, otherwise you will not be being allowed to participate.

*Home assignments and course work*

The two home assignments should be done individually without the help of others and comprise at most 7 points each. The software SAS should be used for completing the home assignments. The course work can be done and presented in groups of up to 3 students, without help of other students, and comprises at most 10 points. Mandatory deadlines to submit the home assignments and course work:

	First examination		Re-examination (if less than 50% of points at first examination)		
	Hand out	Submission deadline	Hand out	Submission deadline	
Home Assignment 1	Oct 7	<b>Oct 14</b>	Nov 5	Nov 12	Individual
Course work	Oct 10	<b>Oct 17</b> ; oral presentation: <b>Oct 22</b>	Nov 8	Nov 15; oral presentation: Nov 18	Group work
Home Assignment 2	Oct 14	<b>Oct 21</b>	Nov 12	Nov 19	Individual

Students who have received the grade Fx or F on an examination are entitled to at least four additional examinations to achieve the lowest grade E as long as the course is given.

Students who have received the grade E on an examination may not retake this examination in order to attempt to achieve a higher grade. Students who have received the grade Fx or F on an examination on two occasions by the same examiner have the right to request that a different examiner be appointed to set the grade of the examination. Such a request must be in writing and sent to the head of the department. Here, the term examination denotes all compulsory elements of the course.

All the credit points from the assignments need to be achieved at this period of teaching. No credit points from the assignments achieved this time can be transferred to the next time the course will be given.

### **Approved tools and aids and cheating on the examination**

The course work is executed in groups. Naturally discussion and collaboration between group members is both necessary and encouraged. Note however that grades are set individually and can vary between group members, and that it is the individual's performance in the group work that is examined.

The written examination and the two home assignments are to be done individually. All forms of collaboration for those are prohibited. For the course work and two home assignments: **Plagiarism of all types is prohibited**, and text matching software may be used if needed. **Permitted facilities for the written examination are:** pocket calculator without stored formulas and text, and one page of paper size A4 (front-page only) with own handwritten notes and formulas. All necessary statistical tables will be distributed at the examination. Mobile phones with calculator applications are not 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.

Use of unauthorized means of assistance in examinations or in other ways attempts to mislead during exams or when study performance is to be otherwise assessed will be reported to the disciplinary board in accordance with university rules.