MSA680   Data science for biomedicine, 7.5 credits

Data science för biomedicin, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Mathematical Sciences on 2021-05-25 to be valid from 2021-08-30, autumn semester of 2021.

Field of education: Science 100%
Department: Department of Mathematical Sciences

Position in the educational system

The course can be part of the following programmes: 1) Mathematical Sciences, Master's Programme (N2MAT) and 2) Applied Data Science Master's Programme (N2ADS)

Main field of studies	*Specialization*
Mathematical Statistics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

Knowledge corresponding to at least one of the courses *DIT862 Statistical Methods for Data Science* or *MSG110 Probability Theory*.

Learning outcomes

On successful completion of the course the student will be able to:

- explain basic experimental design of controlled studies and the use of simulation for complex designs.
- perform appropiate data analysis for the designs covered in the course.
- explain the mixed models framework for fixed and random effects and conduct appropiate statistical analysis of longitudinal data using standard software (SAS).

- recognize hierarchical data structures and perform appropiate statistical analysis using standard software (R)

Course content

The aim of the course is to provide basic knowledge of models and methods in data science
for biomedicine.
Topics covered by the course are:

- Introduction to controlled randomised experiments
- Basic designs and randomisation for controlled experiments
- Hypothesis testing for efficacy, non-inferiority and bio-equivalence
- Sample size calculation
- Bootstrap, simulation, multiplicity
- Survival analysis
- Introduction to linear mixed effects models
- Estimation for the marginal model
- Inference for the marginal model
- Inference for the random effects
- Fitting mixed models (in SAS)
- Non-linear mixed models
- Introduction to hierarchical models
- Fitting hierarchical models (in R)

Form of teaching

Lectures, and computer exercises where SAS and R are used.

Language of instruction: English

Assessment

The assessment is based on a written exam and mandatory computer exercises.

A student who has taken two exams in a course or part of a course without obtaining a pass grade is entitled to the nomination of another examiner. The student needs to contact the department for a new examiner, preferably in writing, and this should be approved by the department unless there are special reasons to the contrary (Chapter 6 Section 22 of the Higher Education Ordinance).

If a student has received a recommendation from the University of Gothenburg for special educational support, where it is compatible with the learning outcomes of the

course and provided that no unreasonable resources are required, the examiner may decide to allow the student to sit an adjusted exam or alternative form of assessment.

In the event that a course has ceased or undergone major changes, students are to be guaranteed at least three examination sessions (including the ordinary examination session) over a period of at least one year, but no more than two years, after the course has ceased/been changed. The same applies to placements and professional placements (VFU), although this is restricted to just one additional examination session.

Grades
The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation
At the end of the course the students will be asked to answer a questionnaire. The results of the evaluation and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.