



**Karolinska
Institutet**

Course syllabus for

Biostatistics, 6 credits

Biostatistik, 6 hp

This course syllabus is valid from autumn 2023.

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| Course code | 5MT013 |
| Course name | Biostatistics |
| Credits | 6 credits |
| Form of Education | Higher Education, study regulation 2007 |
| Main field of study | Molecular Life Science |
| Level | AV - Second cycle |
| Grading scale | Pass with distinction, Pass, Fail |
| Department | Department of Medical Epidemiology and Biostatistics |
| Decided by | Programme committee for study programmes in biomedicine |
| Decision date | 2023-03-07 |
| Course syllabus valid from | Autumn 2023 |

Specific entry requirements

A Bachelor's degree or a professional degree worth at least 180 credits. At least 10 credits should be in mathematics and at least 20 credits in life sciences (such as cell biology, biochemistry, microbiology, gene technology, or molecular biology). Proficiency in English equivalent to English B/English 6.

Objectives

The aim of the course is to equip the student with an understanding of fundamental statistical concepts and tools for data analysis in modern research in molecular life sciences. Tools and methods will be introduced for techniques relating biological outcomes to multiple possible explanatory variables.

Upon completion of the course, the student should be able to:

Regarding knowledge and understanding

- explain the concept of random variation in biological phenomena as it relates to experimental and observational studies in research,
- explain the difference between hypothesis testing and interval estimation and the relation between p-values and confidence intervals,
- describe appropriate statistical methods to quantify random and systematic effects in biological data
- discuss the distinction between explanatory and predictive modeling

Regarding competence and skills

- choose and carry out an appropriate statistical test for a comparison of two groups, perform the hypothesis test using standard statistical software, and interpret the results,
- choose and fit multivariable regression models of intermediate complexity using standard statistical software,
- communicate the results in a manner suitable for oral presentation and scientific publication

Regarding judgement and approach

- evaluate and integrate empirical evidence in relation to biostatistical problems and biostatistical literature,
- consider the ethical dimensions of statistical analysis and how findings are reported

Content

The purpose of the course is to train the student in statistical concepts and tools used in the analysis of biological datasets. Both theoretical and practical (hands-on) components will be included. The course will complement other courses in the programme with a bioinformatics perspective. It will introduce:

- (a) basic concepts and methods (including concepts of probability, probability distributions, statistical inference: confidence intervals and hypothesis tests)
- (b) statistical modelling and multivariable regression methods (including multivariable linear regression, continuous and categorical predictors, logistic regression, Cox proportional hazards models)
- (c) modelling and classification of high dimensional data (including multiple testing, distance measures and clustering, classification algorithms, crossvalidation)

Teaching methods

The teaching includes lectures and computer laboratory sessions. This will be complemented by other forms of learning such as group discussions. The course focuses on active learning, i.e. putting knowledge into practice and critically reflecting upon the knowledge.

Examination

The examination, which is graded Fail/Pass/Pass with distinction, consists of written assignments and an individual written examination. Written assignments are to be handed in before the end of the course according to the times specified in the schedule.

If there are special grounds, or a need for adaptation for a student with a disability, the examiner may decide to deviate from the syllabus's regulations on the examination form, the number of examination opportunities, the possibility of supplementation or exemptions from the compulsory sections of the course etc. Content and learning outcomes as well as the level of expected skills, knowledge and abilities may not be changed, removed or reduced.

Compulsory participation

It is compulsory to attend the introduction to the course and the sessions in which the assignments are presented/discussed.

The course director assesses if and, in that case, how absence can be compensated. Before the student has participated in all compulsory parts or compensated absence in accordance with the course director's instructions, the student's results will not be registered in LADOK. Absence from a compulsory activity may result in that the student cannot compensate the absence until the next time the course is given.

Limited number of examinations or practical training sessions

Students who have not passed the regular examination are entitled to participate in five more

examinations. If the student is not approved after four examinations, he/she is recommended to retake the course at the next regular course date, and may, after that, participate in two more examinations. If the student has failed six examinations/tests, no additional examination or new admission is provided.

The number of times that the student has participated in one and the same examination is regarded as an examination session. Submission of a blank examination is regarded as an examination. An examination, for which the student registered but not participated in, will not be counted as an examination.

Other directives

The course language is English.

Literature and other teaching aids

Specific study material and reference articles will be provided during the course.