



**Karolinska  
Institutet**

Course syllabus for

## **Applied biostatistics, 7.5 credits**

Tillämpad biostatistik, 7.5 hp

This course syllabus is valid from autumn 2024.

Please note that the course syllabus is available in the following versions:

Autumn2021 , Autumn2024

Course code	4BI108
Course name	Applied biostatistics
Credits	7.5 credits
Form of Education	Higher Education, study regulation 2007
Main field of study	Biomedicine
Level	AV - Second cycle
Grading scale	Pass with distinction, Pass, Fail
Department	Institute of Environmental Medicine
Decided by	Programme committee for study programmes in biomedicine
Decision date	2021-02-25
Revised by	Programme committee for study programmes in biomedicine
Last revision	2024-03-06
Course syllabus valid from	Autumn 2024

## **Specific entry requirements**

A Bachelor's degree or a professional degree worth at least 180 credits in biomedicine, biotechnology, cellular and molecular biology, medicine, or the equivalent. Proficiency in English equivalent to the Swedish upper secondary school course English 6/English B.

## **Objectives**

The main aim of the course is to equip students with statistical concepts and tools for relating biological outcomes to multiple possible explanatory variables.

The course will mainly focus on regression modelling.

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
- describe appropriate statistical methods to quantify random and systematic effects in complex biological data

- discuss the distinction between explanatory and predictive modelling

Regarding competence and skills

- choose and fit multivariate regression models of intermediate complexity using a standard statistical software package
- 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

Randomness of biological observations. Experimental and observational data. Types of data: nominal, ordinal, continuous variables. Data summary measures. Graphical representations. Concepts of probability and probability distributions. Parameter estimation: mean, proportion, standard deviation, standard error. Concepts of statistical inference: confidence intervals and hypothesis tests. Elementary parametric hypothesis tests. Univariate linear regression. Multivariate linear regression and general linear model. Continuous and categorical predictors. Role of covariates. Interactions. Nonlinear effect of covariates. Model fitting and diagnostics. Generalised linear models and logistic regression. Survival analysis and Cox proportional hazard models. Quantile regression. Models for longitudinal data.

## Teaching methods

Teaching is in the form of lectures and practical computer activities.

## Examination

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

### *Limitations of the number of examinations or practical training sessions*

A student who does not pass the examination on the first occasion is offered a maximum of five additional opportunities to sit the examination. A student who fails the examination on six occasions is not permitted to sit the examination again or to retake the course.

Participation in an examination is defined as an occasion on which a student attends an examination, even if the student submits a blank examination paper. If a student has registered to sit an examination, but does not attend the examination, this is not defined as participation in the examination.

The course examiner assesses if and, in that case, how absence from compulsory components can be compensated for. A student's study results cannot be finalised/registered until the student has participated in the compulsory components or compensated for their absence in accordance with the examiner's instructions. Absence from a compulsory component may mean that the student cannot compensate for absence until the next time the course is given.

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 section/s 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.

## Other directives

The course language is English and examination is performed in English.

Course evaluation will be carried out in accordance with the guidelines established by the Committee for Higher Education.

Oral evaluation in the form of course council meetings will be carried out during the course.

## Literature and other teaching aids

### *Recommended literature*

*Altman, Douglas G.*

#### **Practical statistics for medical research**

London : Chapman and Hall, 1991 - xii, 611 s.

ISBN:0-412-38620-8 (hft.) LIBRIS-ID:8286190

[Library search](#)

*Bland, Martin*

#### **An introduction to medical statistics**

3. ed., [Nachdr.] : Oxford : Oxford University Press, 2009 - XVI, 405 S

ISBN:978-0-19-263269-2 LIBRIS-ID:11926588

[Library search](#)

*Dalgaard, Peter*

#### **Introductory statistics with R**

2. ed. : New York : Springer, cop. 2008 - xvi, 363 s.

ISBN:978-0-387-79053-4 (pbk. : alk. paper) LIBRIS-ID:11305121

[Library search](#)

*Pagano, Marcello; Gauvreau, Kimberlee*

#### **Principles of biostatistics**

2. ed. : Pacific Grove : Duxbury, cop. 2000 - xvi, 525 s. , [42] s.

ISBN:0-534-22902-6 ; No price LIBRIS-ID:5036554

[Library search](#)

*Rosner, Bernard*

#### **Fundamentals of biostatistics**

6. ed. : Belmont, Calif. : Thomson/Brooks/Cole, cop. 2006 - xx, 868 p.

ISBN:0534418201 LIBRIS-ID:9942420

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