



LUNDS UNIVERSITET
Medicinska fakulteten

Research Programmed Board, FUN

COURSE SYLLABUS Reg.no U 2014/757, U 2018/79

Approved by FUN 2015-01-27, valid from 2015-01-01
Amended by FUN 2018-12-10, valid from 2018-12-10

Applied Statistics II – Biomedicine and Laboratory Medicine, METSBL2

3 credits

Third cycle

General information

The course provides students with general knowledge of commonly used statistical methods that are applicable in research within biomedicine and laboratory medicine. The course is intended for all doctoral students at the Faculty of Medicine whose research is mainly in these areas. *Applied Statistics I* is required for admission to the course, along with basic skills in the statistical software the participant chooses to use during the course (see also *Teaching* below).

Language of instruction

English.

Aim

The course is to provide students with practical knowledge of suitable ways to manage and analyse empirical data in research projects within biomedicine and laboratory medicine. The course will also prepare the participants for understanding and critically examining other empirical research in medical science, including outside their own field of research.

Learning outcomes

On completion of the course, the student shall be able to

- propose, perform, interpret, and critically review basic statistical analyses within each of the four different themes of the course: non-parametric testing, introduction to regression and analysis of variance, issues in design of experiments and reliability analyses.

Course content

The course covers four themes:

- 1) Non-parametric testing for the comparison of two or more groups
 - Mann-Whitney test
 - Wilcoxon Signed Rank test
 - Kruskal-Wallis test
- 2) Introduction to regression and analysis of variance
 - Simple linear regression
 - Analysis of variance (ANOVA)

- Relation between t-tests, linear regression and ANOVA
- Multiple testing and its consequences

3) Issues in design of experiments

- Dependent and independent observations
- Randomization and blinding
- Statistical testing, power and confidence intervals
- Reporting of study design and statistical analyses in basic science papers

4) Reliability analyses

- Correlation versus agreement
- Limits of agreement
- Cohen's kappa for categorical data

This advanced course in applied statistics, specialising in biomedicine and laboratory medicine, provides the participant with an introduction to the necessary tools for designing and analysing experimental data in biomedicine and laboratory medicine. The course starts with non-parametric testing for group comparisons. The course also provides students with an introduction to regression and analysis of variance, as well as issues in design of experiments. Finally, the course addresses different types of reliability analyses.

Teaching

The course includes four and a half days of teaching, and five and a half days of independent study and project work. Days 1–4 are full days of lectures, group exercises and computer lab exercises. During the computer lab exercises, the students will conduct analyses using a statistical software in which they are supposed to be comfortable with from previous courses. We require that the software is syntax-based. Accordingly, the course requires that the student has access to a laptop with the chosen software properly installed. Furthermore, on the basis of data retrieved from research within biomedicine or laboratory medicine and a set of research questions, the participants are to plan, perform, compile and present statistical analyses in groups. Project presentations will take place on the last day of teaching in the form of a brief talk to the course teachers and other course participants.

Assessment

The assessment is based on a take-home exam. A Pass on the course requires a Pass on the take-home exam, as well as a completed individual and group assignments, including active participation in the discussions about their own group's and other groups' work.

Grades

The grades awarded are Pass or Fail

Admission requirements

Passed Statistics I course or equivalent.

Reading list

Kirkwood B and Sterne J. *Essential Medical Statistics*. Blackwell Science, 2nd edition, 2003. Chapters 9–12, 17, 21, 30, 35–36 and 38.

Alternative:

Peacock J and Peacock P. *Oxford Handbook of Medical Statistics*. OUP Oxford, 2010.

Both are available as e-Books (see <http://www.lub.lu.se/>) Additional course material will be provided during the course.