

MATH-493

**Applied biostatistics**

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Cursus	Sem.	Type
Computational and Quantitative Biology		Opt.
Computer science	MA2, MA4	Opt.
Cybersecurity	MA2, MA4	Opt.
Data Science	MA2, MA4	Opt.
Data science minor	E	Opt.
Ing.-math	MA2, MA4	Opt.
Life Sciences Engineering	MA2, MA4	Opt.
Mathématicien	MA2	Opt.
Neuro-X minor	E	Opt.
Neuro-X	MA2, MA4	Opt.
SC master EPFL	MA2, MA4	Opt.
Statistics	MA2, MA4	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	During the semester
Workload	150h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Lecture	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

This course covers topics in applied biostatistics, with an emphasis on practical aspects of data analysis using R statistical software. Topics include types of studies and their design and analysis, high dimensional data analysis (genetic/genomic) and other topics as time and interest permit.

**Content**

Types of studies  
 Design and analysis of studies  
 R statistical software  
 Reproducible research techniques and tools  
 Report writing  
 Exploratory data analysis  
 Linear modeling (regression, anova)  
 Generalized linear modeling (logistic, Poisson)  
 Survival analysis  
 Discrete data analysis  
 Meta-analysis  
 High dimensional data analysis (genetics/genomics applications)  
 Additional topics as time and interest permit

**Keywords**

Data analysis, reproducible research, statistical methods, R, biostatistical data analysis, statistical data analysis

**Learning Prerequisites****Required courses**

This course will be very difficult for students with no previous course or experience with statistics. Previous experience with R is neither assumed nor required.

**Recommended courses**

Undergraduate statistics course

**Important concepts to start the course**

It is useful to review statistical hypothesis testing.

### Learning Outcomes

By the end of the course, the student must be able to:

- Interpret analysis results
- Justify analysis plan
- Plan analysis for a given dataset
- Analyze various types of biostatistical data
- Synthesize analysis into a written report
- Report plan of analysis and results obtained
- Synthesize analysis into a written report
- Report plan of analysis and results obtained
- Justify analysis plan
- Plan analysis for a given dataset
- Interpret analysis results
- Analyze various types of biostatistical data

### Transversal skills

- Write a scientific or technical report.
- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Take feedback (critique) and respond in an appropriate manner.
- Use a work methodology appropriate to the task.

### Teaching methods

Lectures and practical exercises using R. Typically, each week covers an analysis method in the lecture and then the corresponding exercise session consists of an R practical showing how to implement the methods using R. In each practical, students use R to carry out analyses of the relevant data type for that week.

### Expected student activities

Students are expected to participate in their learning by attending lectures and practical exercise sessions, posing questions, proposing topics of interest, peer reviewing of preliminary reports, and interacting with teaching staff regarding their understanding of course material. In addition, there will be a number of short activities in class aimed at improving English for report writing.

### Assessment methods

Evaluation is based on written reports of projects analyzing biostatistical data.

### Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

### Resources

#### Virtual desktop infrastructure (VDI)

No

### Bibliography

To be provided during the course.  
Pre-recorded lectures (videos) will also be provided.

**Moodle Link**

- <https://go.epfl.ch/MATH-493>