ADVANCED BIOSTATISTICS

Basic Information

This is a course, which contributes to MSc award in Biology

Course period	From September 1st till February 1st, 1 semester
Study credits	5 ECTS credits
Duration	180 hours
Language of instruction	English
Academic requirements	- BSc degree in Biology, Chemistry, Physics or Environmental Sciences or equivalent (transcript of records), - Good command of English (certificate or other official document)

Course Description

«Advanced biostatistics» is an elective course, which is designed to provide the student with the basic statistical methods, which are applicable in biostatistics. It is supposed that the course chould be chousen if the student would like to improve his or her skills in the common data analysis. It provides the necessary mathematical and modelling background for the ability to create the statistical models and to apply them to the medical data.

The most important part of this course is applied statistical methods. It provides the basic background, which is required for the variety of the statistical analysis of the medical problems.

The course is designed to cover a wide range of possible areas of biology and medicine. Grading this course will help the future specialist to construct and develop the explanation of the observed phenomena.

Course Aims

- To help students study new analytic methods or to ameliorate the existing knowledge in coding.
- To assist students to perform the high-level statistical analysis.
- To give students the understanding of how to ameliorate the analysis as a whole.
- To introduce the basic principles of Bayesian statistics and Bayesian networking.
- To give the introduction in collecting the biostatistical data.

Learning Outcomes of the Course

By the end of the course, the students will be able to:

- create the plan of the biostatistical research on the given problem,
- correctly collect samples from the biomedical objects,
- use the Bayesian methods in the analysis
- apply the survival analysis.

Course (module) Structure

Learning Activities	Hours
Lectures	18
Practice sessions / Seminars,	36
Self-study Assignments	90
Final Exam (including preparation)	36
Total study hours	**180**

Course Outline

Week	The title of the course subsection	Practice session / Assignments	Hours
• Semester 2			
1-6	Basic concepts of biostatistics	o Collecting the biostat data o Levels of measurement o Sampling .Home assignment No 1	(6/12/30)
7-12	Survival Analysis	o Relative risk estimation	

		o Risk-control study o The product-limit method o Logistic regression in survival analysis o Home assignment No 2	(6/12/30)
13-18	Bayesian Biostatistics	o Bayesian paradigm o Clinical trials statistics o Bayesian Inference o Application of Bayesian methods o Home assignment No 3	(6/12/30)
	Final Exam		36

Course Instructors and Tutors, Contact Information

Instructor	Contact Information
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Assessment

The final exam is an individual problem in the form of a simulated experimental dataset. The student must demonstrate the abilities in:

• creation likelihood estimation with the bootstrapping technique (20 points maximum),

• Bayesian functional analysis and Bayesian networking analysis (40 points maximum),

• clinical trials analysis (40 point maximum).

Grade policy:

A (excellent work)	91-100 %
B (above average work)	81-90 %
C (average work)	71-80 %
D (below average work)	50-70 %
F (failed work)	<50 %

Core reading

1. M. Ataharul Islam and Abdullah Al-Shiha (2018) Foundations of Biostatistics. Springer Nature Singapore Pte Ltd.

2. Ambrosius, W. (ed.) (2007) Topics in Biostatistics. Humana Press.
3. Chang, M. (2011) Modern Issues and Methods in Biostatistics. Springer, New York, NY.
4. Shahbaba, B. (2012) Biostatistics with R. Springer Science+Business Media, LLC.
5. Bekker, A., Chen, D.-G., Ferreira, J.T. (2020) Computational and Methodological Statistics and Biostatistics. Springer, Cham.