University of Gdańsk

Subject card

Subject name and code	Statistics in Biotechnology, PG_00153657		
Field of study	Biotechnology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	Bachelor's studies	Subject group	
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
Conducting unit	UG Institute of Biotechnology -> Intercollegiate Faculty of Biotechnology UG-MUG -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Grzegorz Gołuński	
	Teachers	dr Grzegorz Gołuński mgr Marcin Zakrzewski	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	0.0	15.0	0.0	0.0	25

E-learning hours included: 0.0

eNauczanie source addresses:

Moodle ID: 12467 Statystyka w biotechnologii 2024/2025
https://mdl.ug.edu.pl/course/view.php?id=12467

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	25	5.0	20.0	50

Subject objectives

The purpose of the course is to provide students with basic knowledge of general statistics in the fields of descriptive statistics and statistical inference; to develop the ability to use basic statistical terms and to interpret the obtained research results. Students will acquire the ability to prepare data for analysis and to conduct basic statistical analyses as well as to prepare a written report on the analyses conducted. They will also develop the ability to assess the measurement data critically.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOTECHL3_U03] The graduate is able to use basic mathematical and statistical methods to describe phenomena and analyse data; analyse basic data in professional databases used in biotechnology	The student knows how to prepare experimental data for statistical analysis and understands as well as applies methods of statistical inference. The student is familiar with the basic software to perform statistical analysis.	[SU4] test/exam - oral or written
[BIOTECHL3_U06] The graduate is able to prepare a targeted written study in Polish and/or English, covering detailed issues in the field of biotechnology, using scientific language, including specialist terminology and conceptual apparatus appropriate for biotechnology	The student is able to independently prepare a report on the analysis in the written form.	[SU3] text preparation/written work
[BIOTECHL3_W06] The graduate knows and understands basic knowledge in science and natural sciences necessary for understanding the phenomena and biological processes, particular cellular processes at the molecular level	The student has knowledge of general statistics and uses basic statistical terms. The student knows the principles of interpretation of research results and application of statistical methods in the field of biotechnology.	[SW4] test/exam - oral or written

Subject contents

Lecture part

- Introductory topics and structure analysis. Concept and methods of statistics, applications of statistics, basic concepts, statistical investigation (types, stages), types of variables and scales. Presentation of data: series, tables, graphs. Analysis of distribution: classical and positional measures of central tendency, dispersion, asymmetry and kurtosis.
- Random variables and their distributions. Discrete and continuous random variable. The concept of probability density functions and cumulative distribution function. Properties of distributions: binomial, Poisson, normal, t-Student, chi-square.
- Statistical inference. Concept of random sample, sample statistic and estimator. Point and interval estimation: mean, variance and proportion. Determination of minimum sample size. Verification of statistical hypotheses. The essence of hypothesis testing. Relationship between error of the first and second type in statistical hypothesis testing. Significance level vs. critical area - critical significance level (p-value). The concept of test power. Examples parametric and non-parametric tests uses. One-way analysis of variance (ANOVA), post-hoc tests, nonparametric equivalents of analysis of variance (Kruskal-Wallis test, Friedman test).
- Correlation and regression analysis. Pearson's linear correlation coefficient and testing its significance. Linear regression function (estimation and interpretation of function parameters, evaluation of fit, testing the significance of the regression coefficient). Spearman's rank correlation coefficient and testing its significance.

Laboratory part

- Basics of computational and statistical methods used in scientific research
- Working with a spreadsheet (basic operations, formulas, functions, cell blocking)
- Graphical presentation of data - types of charts, use, correct description
- Use of advanced MS Excel functions for data analysis - autofilters, indirect sums, sorting, conditional formatting
- Basics of descriptive statistics - measures of location, measures of dispersion, measures of asymmetry of distribution
- Interdependence of phenomena: linear correlation, other types of dependence

Prerequisites and co-requisites

basic computer familiarity

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
report	51.0%	15.0%
practical exam	51.0%	50.0%
theory exam	51.0%	35.0%

Recommended reading

Basic literature

1. Andrzej Stanisz, Przystępny kurs statystyki. Tom 1. Statystyki podstawowe, Wydawnictwo StatSoft, Kraków 2006

2. Wiesława Makać, Danuta Urbanek-Krzysztofiak; Metody opisu statystycznego, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2020

3. Andrzej Balicki, Wiesława Makać; Metody wnioskowania statystycznego, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2010

4. Materials prepared by the lecturer

	Supplementary literature	Tomasz Górecki; Podstawy statystyki z przykładami w R, Wydawnictwo BTC, Legionowo 2011
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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