University of Gdańsk

Subject card

Subject name and code	Statistics I, PG_00155446		
Field of study	Mathematics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2027/2028
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Optional subject group
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	6	ECTS credits	6.0
Learning profile	academic	Assessment form	exam
Conducting unit	Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Nikodem Mrożek	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	30.0	0.0	0.0	60

E-learning hours included: 0.0

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	60	10.0	80.0	150

Subject objectives

Introducing students to the basic concepts of descriptive statistics, hypothesis testing methods, and their practical application using statistical software.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MATL3_W08] knows and understands the structure of mathematical theories, is able to use mathematical formalism to build and analyze simple mathematical models in other fields of science	A student who passes the course: knows the basic measures of central tendency, dispersion, and measures of the relationship between two variables, has knowledge of constructing confidence intervals and classical parametric and non-parametric tests, including testing for normality of a univariate distribution.	[SW5] implementation of a problem task
[MATL3_U05] is able to correctly use the known concepts of probability and statistics, is able - at a simple and medium level of difficulty - to apply the known theorems and methods in these fields and is able to interpret the obtained results	A student who passes the course: is able to calculate basic descriptive statistics from a sample (mean, variance, median, skewness, kurtosis), can determine confidence intervals for the mean, variance, and proportion, can apply classical parametric tests concerning the mean, variance, proportion, and the Jarque-Bera test for normality of distribution, can apply Pearson's chi-square test for goodness of fit and independence, can analyze two samples in terms of mean and variance conformity and can determine the simple regression line, is able to analyze a given sample in terms of the discussed topics using R and Statistica packages.	[SU4] test/exam - oral or written [SU5] implementation of a problem task
[MATL3_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; is willing to act ethically	A student who passes the course: acts ethically, works independently on assigned issues if required, particularly during a test verifying acquired knowledge,	[SK5] implementation of a problem task
[MATL3_U10] is able to use the known software package or programming language to solve selected issues from the acquired fields, in particular mathematical analysis, linear algebra and statistics	A student who passes the course: is able to calculate basic descriptive statistics from a sample (mean, variance, median, skewness, kurtosis), can determine confidence intervals for the mean, variance, and proportion, can apply classical parametric tests concerning the mean, variance, proportion, and the Jarque-Bera test for normality of distribution, can apply Pearson's chi-square test for goodness of fit and independence, can analyze two samples in terms of mean and variance conformity and can determine the simple regression line, is able to analyze a given sample in terms of the discussed topics using R and Statistica packages.	[SU5] implementation of a problem task [SU6] demonstration of practical skills

Course outcome	Subject outcome	Method of verification
[MATL3_U09] is able to plan how to solve a specific problem and prepare a correct record of this solution, providing strict and precise justification for the correctness of his reasoning	A student who passes the course: is able to calculate basic descriptive statistics from a sample (mean, variance, median, skewness, kurtosis), can determine confidence intervals for the mean, variance, and proportion, can apply classical parametric tests concerning the mean, variance, proportion, and the Jarque-Bera test for normality of distribution, can apply Pearson's chi-square test for goodness of fit and independence, can analyze two samples in terms of mean and variance conformity and can determine the simple regression line, is able to analyze a given sample in terms of the discussed topics using R and Statistica packages.	[SU4] test/exam - oral or written
[MATL3_U08] is able to formulate definitions and theorems in an understandable way, both orally and in writing, and present correct mathematical reasoning regarding the acquired issues	A student who passes the course: is able to calculate basic descriptive statistics from a sample (mean, variance, median, skewness, kurtosis), can determine confidence intervals for the mean, variance, and proportion, can apply classical parametric tests concerning the mean, variance, proportion, and the Jarque-Bera test for normality of distribution, can apply Pearson's chi-square test for goodness of fit and independence, can analyze two samples in terms of mean and variance conformity and can determine the simple regression line, is able to analyze a given sample in terms of the discussed topics using R and Statistica packages.	[SU4] test/exam - oral or written
[MATL3_W12] knows and understands the principles of occupational health and safety	A student who passes the course: knows the basic measures of central tendency, dispersion, and measures of the relationship between two variables, has knowledge of constructing confidence intervals and classical parametric and non-parametric tests, including testing for normality of a univariate distribution.	[SW1] oral statement/ conversation/discussion
[MATL3_W09] knows and understands the role and importance of proof in mathematics, as well as the concept of the importance of assumptions	A student who passes the course: knows the basic measures of central tendency, dispersion, and measures of the relationship between two variables, has knowledge of constructing confidence intervals and classical parametric and non-parametric tests, including testing for normality of a univariate distribution.	[SW4] test/exam - oral or written

Course outcome	Subject outcome	Method of verification
[MATL3_U14] knows how to use computer programmes in the field of data analysis	A student who passes the course: is able to calculate basic descriptive statistics from a sample (mean, variance, median, skewness, kurtosis), can determine confidence intervals for the mean, variance, and proportion, can apply classical parametric tests concerning the mean, variance, proportion, and the Jarque-Bera test for normality of distribution, can apply Pearson's chi-square test for goodness of fit and independence, can analyze two samples in terms of mean and variance conformity and can determine the simple regression line, is able to analyze a given sample in terms of the discussed topics using R and Statistica packages.	[SU5] implementation of a problem task [SU6] demonstration of practical skills
[MATL3_U12] knows how to arrange and analyse an algorithm in accordance with the specification and save it in the selected programming language	A student who passes the course: is able to calculate basic descriptive statistics from a sample (mean, variance, median, skewness, kurtosis), can determine confidence intervals for the mean, variance, and proportion, can apply classical parametric tests concerning the mean, variance, proportion, and the Jarque-Bera test for normality of distribution, can apply Pearson's chi-square test for goodness of fit and independence, can analyze two samples in terms of mean and variance conformity and can determine the simple regression line, is able to analyze a given sample in terms of the discussed topics using R and Statistica packages.	[SU5] implementation of a problem task [SU6] demonstration of practical skills
[MATL3_W05] knows and understands the basic concepts, methods and theorems of probability and statistics, as well as basic examples illustrating specific concepts in these fields and enabling the refutation erroneous hypotheses or unauthorized reasoning	A student who passes the course: knows the basic measures of central tendency, dispersion, and measures of the relationship between two variables, has knowledge of constructing confidence intervals and classical parametric and non-parametric tests, including testing for normality of a univariate distribution.	[SW4] test/exam - oral or written
[MATL3_K10] is ready to analyze data and communicate the conclusions of such analysis in an accessible form	The student is ready to analyze data and communicate conclusions from such analysis in an accessible form	[SK5] implementation of a problem task
[MATL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning	A student who passes the course: is able to formulate questions to deepen their understanding of a given topic,	[SK5] implementation of a problem task
[MATL3_K09] is ready to critically evaluate arguments, find gaps in reasoning and constructively criticize other people's reasoning	A student who receives a credit is ready to critically evaluate arguments, find gaps in reasoning and constructively criticize the reasoning of others	[SK1] oral statement/conversation/discussion

Course outcome	Subject outcome	Method of verification
[MATL3_W10] knows and understands the basics of computational and programming techniques supporting the work of a mathematician and understands their limitations	A student who passes the course: knows the basic measures of central tendency, dispersion, and measures of the relationship between two variables, has knowledge of constructing confidence intervals and classical parametric and non-parametric tests, including testing for normality of a univariate distribution.	[SW2] presentation/project/paper/ report [SW5] implementation of a problem task
[MATL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education	A student who passes the course: understands the need for further education,	[SK4] test/exam - oral or written
[MATL3_K03] is ready to work in a team; understands the need for systematic work on all projects that have a long-term character	A student who receives a credit is ready to work in a team; understands the need to work systematically on all projects that are of a long-term nature	[SK5] implementation of a problem task
[MATL3_K06] is ready to formulate opinions on basic mathematical issues	A student who passes the course: is able to formulate opinions on basic mathematical issues,	[SK1] oral statement/conversation/ discussion

Subject contents

1. Elements of descriptive statistics - measures of central tendency, dispersion, skewness, and kurtosis. 2.Correlation coefficients and linear regression.3. Selected probability distributions appearing in statistics:normal distribution, chi-square, Student's t-distribution, Snedecor's F-distribution.4. Basic statistics and theirdistributions - estimators of mean and variance.5. Estimation of distribution parameters. Basic properties ofestimators - unbiasedness, consistency, efficiency. Cramer-Rao inequality.6. Methods of obtainingestimators (method of moments, maximum likelihood estimation).7. Interval estimation. Confidence intervalsfor the mean and variance.8. Verification of statistical hypotheses: Type I and II errors, power of the test,Neyman-Pearson lemma, testing for normality, and testing parametric hypotheses in models assumingnormal distribution of the studied variable.9. Non-parametric tests (Kolmogorov-Smirnov test, Wilcoxon test,Pearson's chi-square test).10. Practical exercises on the above topics using R and Statistica packages.

Prerequisites and co-requisites

Knowledge of the basics of mathematical analysis and probability theory.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
	51.0%	0.0%
exam	51.0%	100.0%

Recommended reading

Basic literature	1. L. Gajek, M. Kałuszka, Wnioskowanie statystyczne dla studentów, WNT Warszawa 1990.2. J. Greń, Modele i zadania statystyki matematycznej, PWN Warszawa 1972.3. W. Krysicki, J. Bartos, W. Dyczka, K. Królikowska, M. Wasilewski, Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach - część II, PWN W-wa 2004.4. A. Plucińska, E. Pluciński, Probabilistyka: Rachunek prawdopodobieństwa. Statystyka matematyczna. Procesystochastyczne, Wydawnictwa Naukowo - Techniczne Warszawa 2000.5. A. Jokiel-Rokita, R. Magiera. Modele i metody statystyki matematycznej w zadaniach, Oficyna Wydawnicza GiS, Wrocław2003.
Supplementary literature	T. Górecki, Podstawy statystyki z programem R, Wydawnictwo BTC 2011
eResources addresses	

Example issues/ example questions/ tasks being completed

not applicable

Work placement

Not applicable

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