

Subject card

Subject name and code	Statistics I, PG_00155446						
Field of study	Mathematics						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2026/2027		
Education level	undergraduate 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 Polish		
Semester of study	6		ECTS credits		6.0		
Learning profile	academic		Assessment form				
Conducting unit	Instytut Matematyki -> Faculty of Mathematics, Physics and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Nikodem Mrozek				
	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_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_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_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_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_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
	[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_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_K10] is ready to analyze data and communicate the conclusions of such analysis in an accessible form	n/a	[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	n/a	[SK1] oral statement/conversation/discussion
	[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

	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_K03] is ready to work in a team; understands the need for systematic work on all projects that have a long-term character	n/a	[SK5] implementation of a problem task
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 their distributions - estimators of mean and variance. 5. Estimation of distribution parameters. Basic properties of estimators - unbiasedness, consistency, efficiency. Cramer-Rao inequality. 6. Methods of obtaining estimators (method of moments, maximum likelihood estimation). 7. Interval estimation. Confidence intervals for 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 assuming normal 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
	exam	50.0%	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. Kryszewski, 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. Procesy stochastyczne, Wydawnictwa Naukowo - Techniczne Warszawa 2000. 5. A. Jokiel-Rokita, R. Magiera. Modele i metody statystyki matematycznej w zadaniach, Oficyna Wydawnicza GiS, Wrocław 2003.	
	Supplementary literature	T. Górecki, Podstawy statystyki z programem R, Wydawnictwo BTC 2011	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	not applicable		
Work placement	Not applicable		

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