University of Gdańsk

Subject card

Subject name and code	Statistics II, PG_00178081		
Field of study	Informatics and Econometrics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	7.0
Learning profile	academic	Assessment form	credit
Conducting unit	Department of Statistics -> Faculty of Management -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Beata Jackowska	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	15.0	0.0	0.0	75
	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	75	4.0	96.0	175

Subject objectives	Learning the basics of probability theory, estimation theory and hypothesis testing theory. Familiarization with the possibilities of using statistical inference methods. Acquiring the ability to select appropriate methods for generalizing results from a sample to the entire population and interpreting the obtained results.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[IiEL3_W05] Knows and understands the methods, techniques and informatics or statistics tools used to acquire, collect, process and present data in decision-making processes.	The student knows the basics of probability theory, estimation theory and hypothesis testing theory. The student understands the conditions for applying statistical inference methods. The student knows the principles of designing and conducting a statistical study in accordance with the standards of statistical inference.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report [SW3] text preparation/written work
[IiEL3_U03] Can obtain data from appropriately selected sources, use these data to solve economic and social problems, and process and interpret them using econometrics, informatics or statistics tools.	The student is able to solve economic and social problems using a simple random sample, draw inferences from that sample, and interpret the results with methods from mathematical statistics.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU4] test/exam - oral or written
[IiEL3_U02] Can select or construct econometrics, informatics or statistics tools and apply them to describe and solve economic and social problems.	The student is able to determine the necessary sample size, select and apply appropriate methods of statistical inference, and interpret the obtained results (generalize the results from the sample to the entire population).	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU4] test/exam - oral or written
[IiEL3_U01] Can analyze and interpret social and economic processes and phenomena using knowledge and econometrics, informatics or statistics tools from management and quality sciences, economics and finance.	The student is able to make inferences about a population based on a simple random sample using methods from mathematical statistics.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU4] test/exam - oral or written

Subject contents

Probability theory

1. Definition of a sigma-algebra and a probability measure. Interpretations of probability and properties of probability.
2. Conditional and total probability, Bayes' theorem. Independence of random events.
3. One-dimensional random variables: discrete and continuous random variables, the cumulative distribution function and its properties, moments of the random variable.
4. Selected distributions of a discrete random variable: two-point, binomial, geometric, negative binomial, hypergeometric and Poisson distribution (properties and applications).
5. Selected distributions of a continuous random variable: uniform, exponential and normal distribution (properties and applications).
6. Functions of random variables, truncated distributions.
7. Multivariate random variables: cumulative distribution function and its properties, moments of the random variable, discrete and continuous random variables, marginal distributions, conditional distributions, independence and correlation of random variables.
8. Limit theorems (laws of large numbers, central limit theorem).

Mathematical statistics

1. Descriptive statistics and statistical inference. Definition of a simple random sample. A sample statistic as a random variable. Sampling distributions (exact and asymptotic distributions).
2. Exact and asymptotic properties of estimators. Point estimation.
3. Interval estimation. Definition and interpretation of the confidence interval. Principles for constructing confidence intervals. Principles for determining the minimum sample size.
4. Testing statistical hypotheses. The relationship between type I and type II errors. Significance level, critical region, p-value and power of the test.
5. Parametric tests for: one mean (small and large samples), one proportion (large samples), two means (independent and dependent samples, small and large samples), two variances (independent and dependent samples, small and large samples), two proportions (independent and large samples).
6. Non-parametric tests: one-sample tests (Kolmogorov-Smirnov test, chi-square test), Shapiro-Wilk test for normality, two-sample tests (Wald-Wolfowitz test, Kolmogorov-Smirnov test, chi-square test, sign test), chi-square test of independence.

Prerequisites and co-requisites

1. Fundamentals of differential and integral calculus ("Mathematics I" in the 1st semester)

2. Fundamentals of descriptive statistics ("Statistics I" in the 1st semester)

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
written colloquium on probability theory	51.0%	33.4%
project in two-person teams	51.0%	33.3%
written colloquium on mathematical statistics	51.0%	33.3%

Recommended reading	Basic literature	1. Aczel A. D., Statystyka w zarządzaniu, PWN, Warszawa 2000; 2. Balicki A., Makać W., Metody wnioskowania statystycznego, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2004; 3. Fisz M., Rachunek prawdopodobieństwa i statystyka matematyczna, PWN, Warszawa 1976; 4. Krysicki W., Bartos J., Dyczka W., Królikowska K., Wasilewski M., Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, Część I i II, PWN, Warszawa 2004.
	Supplementary literature	1. Freund J.E., Walpole R.E., Mathematical Statistics, Prentice-Hall, 1987; 2. Gersternkorn T., Śródka T., Kombinatoryka i rachunek prawdopodobieństwa, PWN, Warszawa 1983; 3. Jakubowski J., Sztencel R., Rachunek prawdopodobieństwa dla (prawie) każdego, SCRIPT, Warszawa 2002; 4. Keller G., Managerial Statistics, South-Western Cengage Learning, 9th edition, 2012; 5. Krzykowski G., Szreder M., Rachunek prawdopodobieństwa i statystyka matematyczna, Część 1. Rachunek prawdopodobieństwa, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2002; 6. Krzyśko M., Statystyka matematyczna, Wyd. Uniwersytetu im. A. Mickiewicza w Poznaniu, 1997; 7. McColl J.H., Probability, Edward Arnold, London 1995; 8. Plucińska A., Pluciński E., Rachunek prawdopodobieństwa. Statystyka matematyczna. Procesy stochastyczne, Wydawnictwa Naukowo-Techniczne, Warszawa, 2000. 9. Szreder M., Istotność statystyczna w czasach Big Data, Wiadomości Statystyczne, vol. 64, 2019; 10. Wycinka E., Szreder M. (red), Zastosowania metod ilościowych w ubezpieczeniach, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2020 (rozdziały 6, 7).
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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