GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical Statistics, PG_00021039		
Field of study	Mathematics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Specialty subject group 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	1	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Instytut Matematyki Stosowanej -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Maryna Shcholokova	
	Teachers	dr Maryna Shcholokova	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	30.0	0.0	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	5.0	35.0	100

Subject objectives

The objective of the course Mathematical Statistics is to teach students how to analyze and interpret statistical data using descriptive and mathematical statistics methods.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W02] has enhanced knowledge of a selected branch of mathematics,theoretical or applied, knows classical definitions and theorems and their proofs and connections with other fields,understands problems being examined	[K7_W02]: The student possesses advanced knowledge in a selected field of theoretical or applied mathematics, can list classical definitions, theorems, and their proofs, understands their connections with other scientific fields, and is aware of issues currently under research.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
[K7_U06] uses probability distributions and their properties in practical issues, is familiar with the basics of statistics and the basics of statistical data processing	[K7_U06]: The student is able to apply probability distributions and their properties in practical problems, and has the ability to analyze and interpret statistical data using descriptive and mathematical statistics methods.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task
[K7_U03] uses differential and integral calculus, elements of complex analysis, algebraic methods, applies them in typical practical	[K7_U03]: The student is able to apply differential and integral calculus, elements of complex analysis, and algebraic methods to solve typical practical problems.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

Subject contents	1. Fundamentals of Probability Theory: Random variables and their distributions. Expected value, variance, moments. 2. Probability Distributions: Discrete and continuous distributions. Multivariate distributions. 3. Point and Interval Estimation: Estimation methods. Properties of estimators. 4. Hypothesis Testing: Parametric and non-parametric tests. Type I and II errors, power of the test. 5. Regression Analysis: Linear and nonlinear regression. Residual analysis. 6. Non-parametric Methods: Rank tests. 7. Elements of Time Series Analysis: ARIMA models. Trend and seasonality analysis.
Prerequisites and co-requisites	Before starting the course Mathematical Statistics, a student should possess the following knowledge, skills, and competencies: 1. Basic knowledge of probability calculus understanding concepts such as random variables, probability distributions, expected value, and variance. 2. Ability to use differential and integral calculus familiarity with basic differential and integral operations and their applications. 3. Fundamentals of linear algebra understanding concepts such as matrices, vectors, determinants, and systems of linear equations. 4. Knowledge of basic descriptive statistics concepts ability to calculate and interpret measures of central tendency (mean, median, mode) and measures of dispersion (standard deviation, variance). 5. Basic programming skills familiarity with basic tools used in data analysis.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory Exercises – Practical tasks performed in a computer lab, where students use statistical software to analyze data.	50.0%	40.0%
Group/Individual Projects – Students work with real-world data, applying statistical methods to analyze and interpret the results, and then present their findings.	50.0%	30.0%
A midterm exam at the end of the semester	50.0%	30.0%

Recommended reading	Basic literature	1. W. Kordecki: Probability Calculus and Mathematical Statistics. Definitions, Theorems, Formulas. 2. H. Jasiulewicz, W. Kordecki: Probability Calculus and Mathematical Statistics. Examples and Exercises. 3. I. Bąk, I. Markowicz, M. Mojsiewicz, K. Wawrzyniak: Statistics in Exercises. Part 1. Descriptive Statistics. 4. I. Bąk, I. Markowicz, M. Mojsiewicz, K. Wawrzyniak: Statistics in Exercises. Part 2. Mathematical Statistics. 5. W. Krysicki, J. Dyczka, K. Królikowska, M. Wasilewski: Probability Calculus and Mathematical Statistics in Exercises. Part 2. Mathematical Statistics. 6. A. Jokiel-Rokita, R. Magiera: Models and Methods of Mathematical Statistics in Exercises. 7. C. Radhakrishna Rao: Statistics and Truth. 8. W. Regel: 101 Exercises in Mathematical Statistics with Complete Solutions.
	Supplementary literature	1. W. Regel: 101 Exercises in Mathematical Statistics with Complete Solutions.
	eResources addresses	Uzupełniające Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Explain the concept of a random variable and provide examples of discrete and continuous distributions.2. What are the properties of expected value and variance?3. Describe the applications of the normal distribution in data analysis.4. Discuss the methods of point and interval estimation.5. What are the properties of a good estimator?6. Explain the differences between parametric and non-parametric tests.7. What are Type I and Type II errors? How do you calculate the power of a test?8. Present the linear regression model and discuss its applications.9. What are the methods for assessing the quality of fit of a regression model?10. Non-parametric methods: Describe rank tests and their applications.11. What are the advantages and disadvantages of non-parametric methods compared to parametric methods?12. Elements of time series analysis: Explain what ARIMA models are and what they are used for.13. What are the methods for analyzing trends and seasonality in time series?	
Work placement	Not applicable	

Document generated electronically. Does not require a seal or signature.