



Subject card

Subject name and code	Statistics and Statistical Testing in Engineering Perspective, PG_00068081						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2028/2029		
Education level	first-cycle 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	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Mathematics Center -> Vice-Rector For Education						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Lech Kujawski				
	Teachers		dr Lech Kujawski				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30		2.0		18.0	50
Subject objectives	Familiarize students with the fundamental concepts of probability theory and statistics. Develop students skills in analyzing and interpreting numerical data, as well as assessing its quality. Acquire competencies in applying statistical methods for data-driven decision-making based on sample information. Prepare students to utilize Six Sigma tools in diagnosing and optimizing production processes.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U07] can apply methods of process and function support, specific to the field of study		The student is familiar with statistical methods applicable to the analysis of data relevant to their field of study.		[SU4] Assessment of ability to use methods and tools		
	[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn		The student is capable of independently conducting a statistical study aimed at testing parametric or nonparametric hypotheses in populations or a univariate population.		[SU4] Assessment of ability to use methods and tools		
	[K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study		The student understands the need to deepen their knowledge and acquire skills in the applications of statistics. They are capable of supplementing and refining their acquired knowledge and skills, and can work systematically and independently.		[SW3] Assessment of knowledge contained in written work and projects		

Subject contents	Course content – lecture 1. Probability Theory • Random experiments and random events • Random variables and types of random variables • Distribution parameters of a random variable • Classical and positional measures of central tendency, dispersion, skewness, and concentration 2. Overview of Fundamental Probability Distributions • Bernoulli (01) distribution • Binomial distribution • Poisson distribution • Normal distribution • Students t distribution • Chi-squared distribution • FisherSnedecor (F) distribution • Weibull distribution 3. Sampling and Sample Distributions • Sampling procedures • Statistics as estimators of population parameters • Properties of estimators • Degrees of freedom 4. Graphical Presentation of Statistical Data • Histogram • Box plot • Frequency polygon • Area chart
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- Stacked area chart

5. Statistical Hypothesis Testing Parametric Methods

- Principles of hypothesis verification
- Parametric hypothesis tests for one or two populations
- Tests of means (including ANOVA and MANOVA)
- Tests of variance
- Tests of proportions

6. Statistical Hypothesis Testing Nonparametric Methods

- Nonparametric tests for univariate population characteristics
- Nonparametric tests for comparing two populations
- Tests of randomness
- Goodness-of-fit tests
- Nonparametric ANOVA, including:
 - MannWhitney U test
 - KruskalWallis test

7. Analysis of Dependence

- Correlation measures for quantitative variables
- Pearson correlation coefficient
- Spearman rank correlation coefficient
- Linear and nonlinear regression models

8. Six Sigma Methodology

- Principles and structure of Six Sigma
- Application of statistical methods in optimizing production processes

Course content – laboratory

1. Probability Theory

- Random experiments and random events
- Random variables and types of random variables
- Distribution parameters of a random variable
- Classical and positional measures of central tendency, dispersion, skewness, and concentration

2. Overview of Fundamental Probability Distributions

- Bernoulli (01) distribution
- Binomial distribution
- Poisson distribution
- Normal distribution
- Students t distribution
- Chi-squared distribution
- FisherSnedecor (F) distribution
- Weibull distribution

3. Sampling and Sample Distributions

- Sampling procedures
- Statistics as estimators of population parameters
- Properties of estimators
- Degrees of freedom

4. Graphical Presentation of Statistical Data

- Histogram
- Box plot
- Frequency polygon
- Area chart
- Stacked area chart

5. Statistical Hypothesis Testing Parametric Methods

	- Principles of hypothesis verification - Parametric hypothesis tests for one or two populations - Tests of means (including ANOVA and MANOVA) - Tests of variance - Tests of proportions 6. Statistical Hypothesis Testing Nonparametric Methods - Nonparametric tests for univariate population characteristics - Nonparametric tests for comparing two populations - Tests of randomness - Goodness-of-fit tests - Nonparametric ANOVA, including: - MannWhitney U test - KruskalWallis test 7. Analysis of Dependence - Correlation measures for quantitative variables - Pearson correlation coefficient - Spearman rank correlation coefficient - Linear and nonlinear regression models 8. Six Sigma Methodology - Principles and structure of Six Sigma - Application of statistical methods in optimizing production processes		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Autonomous preparation of a semester research paper.	51.0%	100.0%
Recommended reading	Basic literature	L.M. Chihara, T.C. Hesterberg, Mathematical Statistics with Resampling and R, Wiley, 2022.	
	Supplementary literature	Hogg, McKean, Craig ,Introduction to Mathematical Statistics, 2022.	
	eResources addresses		

Example issues/ example questions/ tasks being completed	Autonomous execution of statistical research and drawing of conclusions on an assigned topic.
Practical activities within the subject	Not applicable

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