COURSE DESCRIPTION CARD - SYLLABUS

Course name
Statistical Mathods in Scientific Research [N2IZarz1>MSwBN]

Course

Field of study
Engineering Management

Year/Semester
1/1

Area of study (specialization)
Enterprise Resource and Process Management

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
0

Other
0

Tutorials
10

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

1. The student has knowledge of mathematics in the field of mathematical analysis and probability theory and is able to use a calculator and statistical tables 2. The student has the ability to think logically, associate facts, analyze issues and correctly reasoning 3. The student is aware of the need to know the methods of data analysis when studying various subjects in the field of management engineering

Course objective

The aim of the course is to learn the basic methods of mathematical statistics and to gain the ability to apply acquired knowledge to analyze problems in various fields, including technical

Course-related learning outcomes

Knowledge:
The student defines advanced statistical methods such as estimation, inference, hypothesis testing, and regression analysis, demonstrating their importance in scientific research [P7S_WG_02].
The student names a variety of qualitative and quantitative data collection and analysis techniques that are used in market and organizational research, and characterizes their application [P7S_WG_03].
The student describes methods of time series and cross-sectional analysis, cites their advantages and

limitations, and identifies their role in forecasting economic and social phenomena [P7S_WG_07].

Skills:
The student applies statistical methods to economic model, social and organizational phenomena and develop research strategies [P7S_UW_01].
The student uses statistical software to analyze data, interpret results and draw scientific conclusions [P7S_UW_02].
The student performs complex data analysis, including multivariate and econometric modeling, to identify trends and patterns of behavior [P7S_UW_06].
The student critically evaluates the quality and usefulness of data, identifies potential errors and applies appropriate techniques to correct them [P7S_UW_07].

Social competences:
The student integrates statistical methods with other scientific disciplines, creating interdisciplinary research projects [P7S_KK_01].
The student evaluates the importance and impact of statistical results on decision-making in organizations and public policy [P7S_KK_02].
The student demonstrates an awareness of the ethical aspects of data research, including the privacy of respondents and the interpretation of research results while respecting cultural and social diversity [P7S_KR_01].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - written final test
Tutorials - one long test + activity
Assessment criteria:
below 50% - 2,0 50%-59% - 3,0 60%-69% - 3,5
70%-79% - 4,0 80%-89% - 4,5 90%-100% - 5,0

Programme content

1. A reference to elements of descriptive statistics, such as arithmetic mean, variance, standard deviation, proportion for both detailed and grouped series
2. Elements of probability theory - random events, classical and axiomatic definition of probability, probability properties, conditional and total probability, Bayes formula
3. Discrete random variables, their distributions and characteristics
4. Continuous random variables, their distributions and characteristics
5. Point and interval estimation of the population average, variance and standard deviation, and proportions in the population
6. Testing statistical hypotheses regarding the parameters of the studied features in the population. Types of decision errors.

Course topics

T01: Random variables as models of experimental results
T02: Numerical characteristics of random variables and basic distributions of discrete and continuous type
T03: Basic theorems of mathematical statistics and their applications
T04: Estimation of expected value, variance and index of distinguished elements
T05: Verification of parametric hypotheses
Updated: 29/09/2025

Teaching methods

Lecture - multimedia presentation + short arithmetic examples on the board + longer examples using MS Excel
Tutorials - solving tasks on the board, including discussion of the obtained solution and interpretation of results

Bibliography

Basic:
1. Jay L. Devore, Probability and Statistics for Engineering and the Sciences.
2. A.D. Aczel, Statystyka w zarządzaniu. Wydawnictwo Naukowe PWN, Warszawa.
3. D. Bobrowski, K. Maćkowiak-Łybacka, Wybrane metody wnioskowania statystycznego, Wyd. PP, Poznań 2004. (księg. stud. E1, W 51326).
4. W. Krysicki, J. Bartos, W. Dyczka, K. Królikowska i M. Wasilewski, Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, cz. II, PWN Warszawa, 1986. (księg. stud. E1, W 60812/2)

Additional:
1. D. Bobrowski, Probabilistyka w zastosowaniach technicznych, Wydawnictwo Naukowo Techniczne.
2. K. Andrzejczak, Statystyka elementarna z wykorzystaniem systemu Statgraphics. Wyd. PP.
3. M. Sobczyk, Statystyka, Wydawnictwo Naukowe PWN, 2007. (1998 - księg. stud. A2, W 146934; 2007 - czytelnia).
4. T. Górecki, Podstawy statystyki z przykładami w R. Wyd. BTC.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	20	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,00