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| **WSB University Branch/Department of Jaworzno**  |
| **Field of study: Computer Science**  |
| **Subject: Statistical methods in data analysis**  |
| **Educational profile: practical**  |
| **Level of education: undergraduate studies**  |
| **Number of hours per semester**  | 1  | 2  | 3  | 4  |
| I  | II  | III  | IV  | V  | VI  | VII  |
| **Full-time studies** (w/w/lab/pr/e)\*  |   |   | **16w / 16ćw**  |   |  |   |   |
| **Part-time studies** (w/æw/lab/pr/e)  |   |   | **12w / 12ćw**  |   |  |   |   |
| **LANGUAGE OF** **INSTRUCTION**  | Polish  |
| **LECTURER**   | Dr.-Ing. Saługa Piotr, Prof. AWSB  |
| **FORM OF ACTIVITIES**  | Lecture, exercises, consultations  |
| **SUBJECT** **OBJECTIVES**   | Students' mastery of the concepts of mathematical statistical methods with examples of their application. To familiarise students with research methods for the study of quantitative regularities and interdependencies observed in economic and social life. To indicate possible applications of statistical knowledge in computer science.  |
| **Reference to learning outcomes**  | **Description of learning outcomes**  | **Means of verification of the effect learning**  |
| **Directional effect**  | **PRK**  |
| **NEWS**  |
| INF1\_W201  | P6S\_WG  | Students will distinguish between a sample and a statistical population, they will be able to characterise phenomena using elements of statistical inference, they will define and use categories of the calculus of probability. Moreover, the student knows and understands the place of this discipline in the field of engineering and technical sciences and its connections with the sciences.  | Activity in class, work in student teams  |
| **SKILLS**  |

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| INF\_U301  | P6S\_UW  | The student classifies and prepares data for statistical analysis on the basis of point and range estimation; has the ability to verify statistical hypotheses; assesses the degree of probability of the occurrence of phenomena, detects relations between sample results and the development of values in the population, draws correct conclusions on the basis of performed calculations. Acquires information from literature, databases and other sources, also in a foreign language, in order to formulate and solve complex and unusual problems related to computer science and statistical methods in data analysis.  | Written tests on solving tasks in mathematical statistics.  |
| INF\_U02  | P6S\_UW  | The student is able to integrate the knowledge possessed in the field of statistical methods and data analysis, as well as information obtained in other subjects, and subsequently assess and critically analyse it. He or she is also able to draw conclusions on the basis of the information held and to formulate and justify opinions, while applying appropriate methods and tools from the scope of statistical methods and data analysis, including advanced information and communication techniques.  | Written tests on solving tasks from mathematical statistics, students' own work in the analysis of cases discussed in the following classes   |
| INF\_U05  | P6S\_UO  | The student has the necessary skills to estimate the time needed to complete a commissioned task, and is able to develop and complete tasks of both independent and team work, ensuring that deadlines are met.  | Written tests on solving tasks from mathematical statistics, students' own work in the analysis of cases discussed in the following classes   |
| **SOCIAL COMPETENCES**  |
| INF\_K401  | P6S\_KK  | The student is ready to critically evaluate his/her knowledge and perceived content concerning the achievements of statistics in data analysis in relation to computer science. The student is concerned about the linguistic and content correctness of his/her own statements, and is able to assess the correctness of statements concerning statistical methods in data analysis The student is aware of the need to improve his/her knowledge of statistical methods in data analysis and their usefulness in his/her professional work.  | Active participation in lectures and exercises and discussion. Observation and practical exercises in class. |
| **Student workload (in teaching hours 1h =45 minutes)\*\***  |

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| **Stationary** attendance at lectures = 16 participation in exercises = 16 preparation for exercise = 30 lecture preparation = 20 exam preparation = 10 implementation of project tasks = e-learning = Pass/examination = 4 other (consultation) = 4 **TOTAL: 100h** **Number of ECTS credits: 4 including in practical classes: 2**  | **Part-time** attendance at lectures = 12 participation in exercises = 12 preparation for exercise = 34 lecture preparation = 24 exam preparation = 10 implementation of project tasks = e-learning = Pass/examination = 4 other (consultation) = 4 **TOTAL: 100h** **Number of ECTS credits: 4 including in practical classes: 2**  |
| **PREREQUISITES**  | * knowledge of mathematics at secondary school level.
* ability to use a variety of calculation tools (calculator, spreadsheet, etc.).
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| **SUBJECT** **CONTENT**  | * knowledge of the terms: statistics, statistical survey, statistical community (population), statistical unit, general community (population), sample community (sample), representative sample,
* measures of central tendency: arithmetic mean, median, modal value (dominant), calculation of mean from averages, geometric mean, harmonic mean, quadratic mean, cubic mean, higher degree averages (order k),
* variance and standard deviation, loaded and unloaded estimator of the standard deviation,
* estimation issues: unconstrained, asymptotically unconstrained and efficient estimators, RaoCramer inequality
* parametric significance tests: test for population mean (u-test, Student's t-test), test for general population variance (chi-square test ( (2)),
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| **LITERATURE** **COMPULSORY**  | * I. Bak, I. Markowicz, M. Mojsiewicz, K. Wawrzyniak, Mathematical statistics. Examples and tasks, CeDeWu, Warsaw 2023
* P. Grzegorzewski, Statystyka matematyczna, Wydawnictwo Naukowe PWN, Warszawa 2024
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| **LITERATURE**  **SUPPLEMENTARY**  | * I. Bak, I. Markowicz, M. Mojsiewicz, K. Wawrzyniak, Descriptive statistics. Examples and tasks, CeDeWu, Warsaw 2017
* P. Bruce, A. Bruce, P. Gedeck, Practical statistics in data science. 50 key issues in R and Python, Helion, Gliwice 2024
* J. Greń, Mathematical Statistics. Models and tasks, Wydawnictwo Naukowe PWN, Latest

edition * S. Kowalik, Selected issues in mathematics. Lectures for doctoral students. Wydawnictwo Politechniki Śląskiej, Gliwice 2007.
* J. Krajewska - Śpiewak, Methods of data analysis examples from the field of production engineering, Wydawnictwo Politechniki Krakowskiej, Kraków 2022
* W. Krysicki, Statystyka matematyczna, Wydawnictwo Naukowe PWN, Warsaw 2002.
* K. Manczak, Methods for identifying multidimensional control objects. WNT, Latest edition
* M. Rabiej, Statistical analysis with Statistica and Excel, Helion, Gliwice 2018
* W. Regel, Basics of statistics in Excel, Wydawnictwo Naukowe PWN, Warszawa 2014
* W. Rudin, Fundamentals of mathematical analysis, Wydawnictwo Naukowe PWN, Warszawa 2024
* J. Walkenbach, M. Alexander, Data analysis and presentation in Microsoft Excel, Helion, Gliwice 2021
* A. Zeliaś, Statistical methods, Polskie Wydawnictwo Ekonomiczne PWE, Warsaw 2000
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| **SCHOLARLY** **PUBLICATIONS BY** **INSTRUCTORS** **RELATED TO THE** **TOPICS OF THE** **MODULE**  | * P. Saługa, R. Kapłan, P. Grzesiak, J. Kamiński, The concept of using statistical process control in the energy sector, [in:] Energy Market,
* P. Saługa, K. Pera, Estimation of price volatility and the convenience yield: a study based on zinc and lead example [in:] Prace naukowe Uniwersytetu Ekonomicznego we Wrocławiu 2012
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| **TEACHING** **METHODS**   | lecture; exercises solving tasks which take into account the programme followed in the course of the lectures, students' own work in the analysis of cases discussed in subsequent classes supplementary materials, to be consulted as part of the self-study on the WSB Online Platform for those interested in solving tasks using the EXCEL spreadsheet, consultations  |
| **LEARNING AIDS**  | Multimedia presentation; calculator, statistical tables, EXCEL, Predictive Solutions software (IBM SPSS Statistisc 25)  |
| **PROJECT** (insofar as it is carried out in the course module)  | Not applicable  |
| **FORM AND** **CONDITIONS OF** **PASSING** (broken down into face-to-face and elearning classes)  | Credit with marks. Written work - calculus assignments covering content covered in exercises and lectures. Written problem-solving colloquium.   |