#### card of course

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| Subject name | Mathematical Statistics - Lecture |

1. The placement of the subject in the study system

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| 1.1. Field of study | Computer science |
| 1.2. Form and path of study | Full-time/Part-time |
| 1.3. Level of education | First-cycle studies |
| 1.4. Study profile | Practical |

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| 1. 5. Specialty | Artificial intelligence |
| 1.6. Subject Coordinator | Dr Kamil Powroźnik |

2. General characteristics of the subject

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| 2.1. Belonging to a subject group | To choose from |
| 2.2. Number of ECTS | 2 |
| 2.3. Language of lectures | Polish |
| 2.4. Semesters in which the subject is taught | III |
| 2.5.Criteria for selecting course participants | For specialization: Artificial Intelligence |

1. Learning outcomes and course delivery
   1. Subject Objectives

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| No. | Subject Objectives |
|
| C1 | Introduction to the concepts and methods of mathematical statistics, including estimation, hypothesis testing, and regression analysis. |
| C2 | Understand the importance and applications of mathematical statistics in data analysis and decision making. |
| C3 | Preparation for the interpretation of statistical analysis results and their practical application in various fields. |

* 1. Subject-specific learning outcomes, divided into knowledge , skills and competences , with reference to the directional learning outcomes

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| No. | Description of subject  learning outcomes | Reference to  directional effects  learning (symbols) | Method of implementation (mark "X") | | | |
| ST | | NST | |
| Classes at the University | Activities on  the platform | Classes at the University | Activities on  the platform |
| After passing the course, the student knows and understands **the knowledge** | | | | | | |
| W1 | Knows the basic concepts of mathematical statistics, such as mean, variance, standard deviation, correlation. | INF\_W02 | X |  |  | X |
| W2 | Understands parameter estimation methods, including point and interval estimators. | X |  |  | X |
| W3 | Knows the principles of statistical hypothesis testing, including parametric and nonparametric tests. | X |  |  | X |
| W4 | Understands linear regression models and their application in analyzing relationships between variables. | X |  |  | X |
| W5 | Understands the application of statistics in practice, including the interpretation of test results and analyses. | X |  |  | X |
| After completing the course, the student is ready to take part in **social competences.** | | | | | | |
| K1 | Is aware of the need to use reliable data analysis methods in teamwork and research. | INF\_K02 | X |  |  | X |

3.3. Forms of teaching and their number of hours - Full-time studies (ST), Part-time studies (NST)

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| Path | Lecture | Exercises | Design | Workshop | Laboratory | Seminar | Lecturer | Classes conducted using distance learning methods and techniques in the form of a lecture. | Other | **ECTS points** |
| **ST** | 20 |  |  |  |  |  |  |  |  | 2 |
| **NST** |  |  |  |  |  |  |  | 10 |  | 2 |

3.4. Content of education (separately for each form of classes: (W, ĆW, PROJ, WAR, LAB, LEK, OTHER). It should be marked (X) how the given content will be implemented (classes at the university or classes on the e-learning platform conducted using distance learning methods and techniques)

TYPE OF CLASS: LECTURE

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| No. | Content of the course | Reference to subject-specific learning outcomes | Method of implementation (mark "X") | | | |
| ST | | NST | |
| **Classes at the University** | **Activities on  the platform** | **Classes at the University** | **Activities on  the platform** |
| 1. | Introduction to mathematical statistics, basic concepts and applications. | W1, K1 | X |  |  | X |
| 2. | Statistical measures such as mean, variance, standard deviation, correlation. | W1 | X |  |  | X |
| 3. | Parameter estimation, point and interval estimators, properties of estimators. | W2 | X |  |  | X |
| 4. | Statistical hypothesis testing, parametric and nonparametric tests. | W3 | X |  |  | X |
| 5. | Linear regression models, analysis of relationships between variables, interpretation of results. | W4 | X |  |  | X |
| 7. | Practical applications of statistics, analysis of examples and interpretation of results. | W5, K1 | X |  |  | X |
| 8. | Summary of classes and discussion of grades. |  | X |  |  | X |

3.5. Methods of verifying learning outcomes (indication and description of methods of conducting classes and verification of achievement of learning outcomes and method of documentation)

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| Subject Effects | Teaching methods | Methods of verifying learning outcomes | Documentation methods |
| KNOWLEDGE | | | |
| W1-W5 | Multimedia presentation, presentation of examples | **Final Exam:**  The written exam includes:   1. Theoretical questions testing knowledge of the concepts and methods of mathematical statistics. 2. Computational tasks such as parameter estimation, hypothesis testing, regression analysis. 3. Analyzing the results of statistical tests and interpreting their meaning in a practical context. | Archiving the exam at WSPA |
| SOCIAL COMPETENCES | | | |
| K1 | Multimedia presentation, presentation of examples | **Final Exam:**  The written exam includes:   1. Theoretical questions testing knowledge of the concepts and methods of mathematical statistics. 2. Computational tasks such as parameter estimation, hypothesis testing, regression analysis. 3. Analyzing the results of statistical tests and interpreting their meaning in a practical context. | Archiving the exam at WSPA |

3.6 . Criteria for assessing the achieved learning outcomes

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| Learning effect | For a grade of 3 or "pass."  the student knows and understands/is able to/is ready to | For a grade of 3.5, the student knows and understands/is able to/is ready to | For a grade of 4, the student knows and understands/is able to/is ready to | For a grade of 4.5, the student knows and understands/is able to/is ready to | For a grade of 5, the student knows and understands/is able to/is ready to |
| W | 51-60% of knowledge indicated in learning outcomes | 61-70% of knowledge indicated in learning outcomes | 71-80% of knowledge indicated in learning outcomes | 81-90% of knowledge indicated in learning outcomes | 91-100% of knowledge indicated in learning outcomes |
| U | 51-60% of skills indicated in learning outcomes | 61-70% of skills indicated in learning outcomes | 71-80% of skills indicated in learning outcomes | 81-90% of skills indicated in learning outcomes | 91-100% of skills indicated in learning outcomes |
| K | 51-60% of skills indicated in learning outcomes | 61-70% of skills indicated in learning outcomes | 71-80% of skills indicated in learning outcomes | 81-90% of skills indicated in learning outcomes | 91-100% of skills indicated in learning outcomes |

3.7. Literature

**Basic**

* Bąk, Iwona. Statystyka matematyczna : przykłady i zadania / Iwona Bąk, Iwona Markowicz, Magdalena Mojsiewicz, Katarzyna Wawrzyniak. Wyd. 2. Warszawa : CeDeWu, 2024.
* Grzegorzewski P., "Statystyka matematyczna", Wydawnictwo Naukowe PWN, 2024.

**Supplementary**

* Jóźwiak Janina, Podgórski Jarosław, Statystyka od podstaw, Polskie Wydawnictwo Ekonomiczne, Warszawa, 2022

4. Student workload - ECTS points balance

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| **Types of student activity** | **Student Load** | |
| **ST** | **NST** |
| **Classes requiring direct contact between the student and the academic teacher at the university premises** | **20** | **10** |
| Classes included in the study plan | 20 | 10 |
| **Student's own work** | **30** | **40** |
| Ongoing preparation for classes, preparation of project work/presentations/etc. | 15 | 20 |
| Preparation for passing classes | 15 | 20 |
| **TOTAL STUDENT HOURLY LOAD** | **50** | **50** |
| **Number of ECTS points** | **2** | **2** |

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| Last change date | 30/09/2024 |
| The changes were introduced | INF Education Quality Team |
| The changes were approved | Arkadiusz Gwarda, M.A. |