#### card of course

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| Subject name | Probability and Statistics |

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 | - |
| 1.6. Subject Coordinator | Dr Paweł Wlaź |

2. General characteristics of the subject

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| 2.1. Belonging to a subject group | Interdisciplinary/Practical |
| 2.2. Number of ECTS | 3 |
| 2.3. Language of lectures | English |
| 2.4. Semesters in which the subject is taught | III |
| 2.5.Criteria for selecting course participants | - |

1. Learning outcomes and course delivery
	1. Subject Objectives

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| No. | Subject Objectives |
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| C1 | To enable students to acquire the ability to correctly use the concept of probability space and calculate the probabilities of random events. |
| C2 | To acquire students the ability to study probability distributions and determine parameters of random variables. |
| C3 | To equip students with the skills to analyze basic experimental designs and probabilistic modeling of simple random phenomena. |
| C4 | To familiarize students with the issues of point and interval estimation, with particular emphasis on various interval estimation models. |
| C5 | Familiarization with the theory of statistical hypothesis testing and review of selected significance tests |

* 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 effectslearning (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 and understands the basic concepts and theorems of probability theory | INF\_W02 | X |  |  | X |
| W2 | Knows the basic methods and computational techniques used in theoryprobabilities | X |  |  | X |
| W3 | Knows the measures of descriptive statistics and interprets the obtained values | X |  |  | X |
| W4 | Understands the concept of estimation, recognizes estimated parameters and is able to choose the appropriate model for constructing confidence intervals | X |  |  | X |
| W5 | Formulates statistical hypotheses, selects correct models for their verification based on a sample, knows the stages of conducting statistical hypothesis verification | X |  |  | X |
| After passing the course, the student is **able** to: |
| U1 | Is able to correctly use basic concepts and theorems of probability calculus | INF\_U03INF\_U06INF\_U13INF\_U26 | X |  | X |  |
| U2 | Can determine selected probability distributions and basic parameters of discrete and continuous random variables | X |  | X |  |
| U3 | Describes the studied population using statistical measures and provides a graphic illustration | X |  | X |  |
| U4 | Determines confidence intervals for unknown values of the distribution parameters of the tested feature and determines the necessary number of measurements | X |  | X |  |
| U5 | Has the ability to verify basic statistical hypotheses and conduct statistical inference | X |  | X |  |
| After completing the course, the student is ready to take part in **social competences.** |
| K1 | understands the limitations of his/her own knowledge and the need for further education | INF\_K01 | 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** | 15 | 30 |  |  |  |  |  |  |  | 3 |
| **NST** |  | 15 |  |  |  |  |  | 10 |  | 3 |

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. | Definition of a random variable, distribution of a random variable, probability function and probability density of a random variable; distribution function of a random variable and its properties. | W1 | X |  |  | X |
| 2. | Parameters of distributions of random variables. Independence of random variables. | W1, W2 | X |  |  | X |
| 3. | Discrete distributions: one-point, two-point, Bernoulli, Poisson, geometric; continuous distributions: uniform, exponential, normal; standardization of the normal distribution . | W1, W2 | X |  |  | X |
| 4. | Basic statistical concepts. Elements of descriptive statistics (statistical series, analysis of the structure of statistical populations). | W3 | X |  |  | X |
| 5. | Interval estimation. Confidence interval models for the mean, variance and standard deviation and the structure index. The number of measurements required. | W4 | X |  |  | X |
| 6. | General principles of statistical hypothesis testing. Significance tests for mean, variance, and structure index. | W5 | X |  |  | X |
| 7. | Summary of classes and discussion of grades. |  | X |  |  | X |

TYPE OF CLASSES: EXERCISES

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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. | Calculating event probabilities using basic properties of probability. | U1 | X |  | X |  |
| 2. | Random variable, determination of distributions of discrete and continuous random variables; determination of parameters of these distributions | U2 | X |  | X |  |
| 3. | Examples of applications of discrete and continuous distributions. | U2 | X |  | X |  |
| 4. | Building detailed or interval statistical series, creating histograms, determining and interpreting basic parameters of the empirical distribution of the studied feature. | U3 | X |  | X |  |
| 5. | Determination of confidence intervals for the mean, variance and standard deviation and the structure index. Determination of the necessary number of measurements. | U4 | X |  | X |  |
| 6. | Formulation and verification of statistical hypotheses. | U5, K1 | X |  | X |  |
| 7. | 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 | Lectures with presentations covering theory and problem-solving methods | Exam (100% of the final grade from the lecture) | Examination papers |
| SKILLS |
| U1-U5 | Solving Problems Using Probability and Statistics | Tests in class and assignments for self-study. Each test and assignment is graded, the final grade for the exercises is calculated based on the average. | Protocols, test sheets, presented independent solutions |
| SOCIAL COMPETENCES |
| K1 | Solving Problems Using Probability and Statistics | Tests in class and assignments for self-study. Each test and assignment is graded, the final grade for the exercises is calculated based on the average. | Protocols, test sheets, presented independent solutions |

3.6. Assessment criteria for 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**

1. J.R. Movellan. Introduction to Probability Theory and Statistics [available online]
2. Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach. Cz. 1, Rachunek prawdopodobieństwa / W. Krysicki / Warszawa : Wydawnictwo Naukowe PWN, 2012
3. Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach. Cz. 2, Statystyka matematyczna / W. Krysicki / Warszawa : Wydawnictwo Naukowe PWN, 2012

**Supplementary**

1. F.M. Dekking, C. Kraaikamp, H.P. Lopuhaa, L.E. Meester. A Modern Introduction to Probability and Statistics [available online].

2. J. Jóźwiak, J. Podgórski, „Statystyka od podstaw”, PWE, Warszawa 2006.

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** | **45** | **25** |
| Classes included in the study plan | 45 | 25 |
| **Student's own work** | **30** | **50** |
| Ongoing preparation for classes, preparation of project work/presentations/etc. | 15 | 25 |
| Preparation for passing classes | 15 | 25 |
| **TOTAL STUDENT HOURLY LOAD** | **75** | **75** |
| **Number of ECTS points** | **3** | **3** |

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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. |