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| **WSB University Branch/Department of Jaworzno**  |
| **Field of study: Computer Science**  |
| **Subject: Probability calculus**  |
| **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 Hadaś-Dyduch Monika, Dr Rybczyński Jarosław  |
| **FORM OF ACTIVITIES**  | Lecture, exercises, consultations  |
| **SUBJECT** **OBJECTIVES**   | To introduce students to the basic concepts of probability calculus with examples of their application. To familiarise students with research methods for investigating quantitative regularities and interdependencies observed in economic and social life.  |
| **Reference to learning outcomes**  | **Description of learning outcomes**  | **Means of verification of the effect learning**  |
| **Directional effect**  | **PRK**  |
| **NEWS**  |
| INF1\_W201  | P6S\_WG  | The student will know and understand concepts of the nature of probability calculus, the application of combinatorics to probability calculations, the determination of functions of a random variable and their distributions, and knowledge of the basic elements of mathematical statistics. In addition, he/she has an advanced understanding of the terminology of the scientific discipline of computer science and the relationship with the sciences.  | Written credit colloquium and written tests in the exercises on the topics covered in the "Course content" below.  |
| **SKILLS**  |

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| INF\_U301  | P6S\_UW  | He/she has the ability to apply the knowledge he/she has to solve problems related to the topics taught in the further studies by: calculating probabilities of events, determining distributions of random variables, testing hypotheses by verification and the ability to process statistical data. The student develops the habit of expressing himself/herself correctly and precisely, following the example of the language used in mathematics. The student demonstrates the ability to apply calculus of probability in other fields of knowledge.  | Written tests on solving tasks from calculus of probability and mathematical statistics, students' own work in the analysis of cases discussed in the following classes  |
| INF\_U02  | P6S\_UW  | The student is able to integrate the knowledge he/she possesses from various mathematical disciplines, as well as the information obtained in class. Based on them, he/she knows how to evaluate data held, as well as analyse it critically. He or she is also able to draw conclusions and formulate and justify opinions using appropriate methods and tools, including advanced information and communication techniques.  | Written tests on solving tasks from calculus of probability and mathematical statistics, students' own work in the analysis of cases discussed in the following classes  |
| **COMPETENCES**  |
| INF\_K401  | P6S\_KK  | The student is prepared to critically evaluate his/her knowledge and perceived content of the calculus of probability in relation to computer science. The student is concerned with the linguistic and factual correctness of his/her own statements, and is able to evaluate the correctness of statements in the field of calculus of probability The student is aware of the need to improve his/her knowledge in the use of probability calculus and its usefulness in professional work.  | Active participation in lectures and exercises and discussion. Observation and practical exercises in class. |
| **Student workload (in teaching hours 1h =45 minutes)\*\***  |
| **Stationary** attendance at lectures = 16 participation in exercises = 16 preparation for exercise = 30 lecture preparation = 22 exam preparation = 8 implementation of project tasks = e-learning = Pass/examination = 4 other (consultation) = 4 **TOTAL: 100h**  | **Part-time** attendance at lectures = 12 participation in exercises = 12 preparation for exercise = 35 lecture preparation = 25 exam preparation = 8 implementation of project tasks = e-learning = Pass/examination = 4 other (consultation) = 4 **TOTAL: 100h**  |

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| **Number of ECTS credits: 4 including in practical classes: 2**  | **Number of ECTS credits: 4 including in practical classes: 2**  |
| **PREREQUISITES**  | * knowledge of mathematics at secondary school level.
* knowledge of probability calculus at secondary school level.
* ability to use basic calculation tools (calculator, spreadsheet)
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| **SUBJECT** **CONTENT**  | **1. CALCULUS OF PROBABILITY** * Probability definitions: axiomatic, statistical using relative frequency,

 Classical, geometric, subjective as a measure of belief, * elementary events and random events,
* probability of events,
* independent events,
* conditional probability,
* absolute probability,

**2. RANDOM VARIABLES AND THE DISTRIBUTION** * step random variable,
* the probability density function of a step random variable,
* the distribution of a step random variable,
* essential step distributions
* The probability density function and the distribution of a continuous random variable, - essential types of continuous distributions
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| **LITERATURE** **COMPULSORY**  | * J. Bartos, W. Dyczka, W. Krysicki, Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach część 1 i część 2, Wydawnictwo Naukowe PWN, Warszawa 2024
* R. Carnap, Logical foundations of probability, Wydawnictwo Naukowe PWN, Warsaw 2024
* W. Feller, Introduction to probability calculus part 1 and part 2, PWN Scientific Publishers, Warsaw 2024
 |
| **LITERATURE**  **SUPPLEMENTARY** | * I. Bak, I. Markowicz, M. Mojsiewicz, K. Wawrzyniak, Mathematical statistics. Examples and tasks, CeDeWu, Warsaw 2023
* J. Greń, Mathematical Statistics. Models and tasks. PWN, Warsaw 1982.
* S. Kowalik, Selected issues in mathematics. Lectures for doctoral students. Wydawnictwo Politechniki Śląskiej, Gliwice 2007.
* Krysicki W.: Rachunek prawdopodobieństwa. PWN, Warsaw 2003.
* Krzyśko M.: Lectures in probability theory. WNT, Warsaw 2000.
* Mańczak K.: Methods of identification of multidimensional control objects. WNT, Warsaw 1971.
* Plucińska A., Pluciński E.: Probability calculus. Mathematical Statistics. Stochastic processes, WNT, Warszawa 2005.
 |
| **SCHOLARLY** **PUBLICATIONS BY** **INSTRUCTORS** **RELATED TO THE** **TOPICS OF THE** **MODULE**  | * M. Hadaś-Dyduch, [Non-classical algorithm for time series prediction of the range of economic phenomena with regard to the interaction of financial market indicators,](https://scholar.google.pl/citations?view_op=view_citation&hl=pl&user=gvq1F4QAAAAJ&citation_for_view=gvq1F4QAAAAJ:zYLM7Y9cAGgC) Chinese Business Review 13 (4), pp. 221 - 231
* M. Hadaś-Dyduch, [Wavelets in Prediction: Theory, Method, Simulation, ,](https://scholar.google.pl/citations?view_op=view_citation&hl=pl&user=gvq1F4QAAAAJ&citation_for_view=gvq1F4QAAAAJ:TQgYirikUcIC) [Mathematical Economics2](http://bazekon.icm.edu.pl/bazekon/element/bwmeta1.element.ekon-element-issn-1733-9707)015, no. 11 (18), pp. 43 - 54 .
* J. P. Rybczyński, Wpływ metody przeliczania głosów na liczba przyznanych mandatów na przykładzie wyborów do Sejmu 2005 w województwie śląskim, co-authored with Foltys
 |
| Joachim • J.P.  | , Przegląd Organizacji, 2006, No. 4, pp.30-33 |   |
| Rybczynski,  | The Three-point volatility smile classification: Evidence from the Warsow |   |
|  | Stock Exchange during volatile summer 2011, |   |
| **TEACHING** **METHODS**   | lecture; exercises solving tasks which take into account the programme followed in the course of the lectures, Students' own work through case studies discussed in subsequent classes additional information for those interested in solving tasks using the EXCEL spreadsheet, consultations   |
| **LEARNING AIDS**  | Multimedia presentation; calculator, statistical tables, EXCEL software  |
| **PROJECT** (insofar as it is carried out as part of a course module)  | Not applicable  |

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| **FORM AND** **CONDITIONS OF** **PASSING**  | Credit with marks. Written work - calculus assignments covering content covered in exercises and lectures. Written problem-solving colloquium.   |