#### card of course

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| Subject name | Data mining from relational and non-relational databases - laboratory |

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 Rafał Stęgierski |

2. General characteristics of the subject

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| 2.1. Belonging to a subject group | Optional/practical |
| 2.2. Number of ECTS | 2 |
| 2.3. Language of lectures | English |
| 2.4. Semesters in which the subject is taught | IV |
| 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 |
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| C1 | To familiarize students with data mining methods in relational and non-relational database systems. |
| C2 | Developing practical skills in data analysis and processing using selected tools and programming languages. |
| C3 | Preparing students to solve real-world problems related to mining large data sets in various database environments. |

* 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 | The student knows and understands the basic concepts of data mining and their application in relational and non-relational databases. | INF\_W03  INF\_W04 | X |  | X |  |
| W2 | Knows the tools and techniques used in the data mining process, including methods for analyzing large data sets | X |  | X |  |
| W3 | Understands the differences between relational and non-relational models and their impact on the data mining process | X |  | X |  |
| After passing the course, the student is **able** to: | | | | | | |
| U1 | Is able to independently conduct data mining, from data preparation to results analysis. | INF\_U14 | X |  | X |  |
| U2 | Can apply advanced SQL queries and tools specific to non-relational databases such as MongoDB or Cassandra. | X |  | X |  |
| U3 | Is able to use selected tools and techniques to analyze data and visualize results. | X |  | X |  |
| U4 | Is able to integrate data from various sources (relational and non-relational) and prepare them for exploration and analysis using appropriate tools and techniques. | X |  | X |  |
| After completing the course, the student is ready to take part in **social competences.** | | | | | | |
| K1 | Is aware of the need for continuous improvement in the dynamically changing field of data analysis and database technologies | 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 ………………. | 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: LABORATORY

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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 data mining in relational databases, creating advanced SQL queries, indexing and query optimization. | W1, U1 | X |  | X |  |
| 2. | Data mining in non-relational databases, NoSQL basics, introduction to MongoDB and data processing in this environment | W2, U2 | X |  | X |  |
| 3. | Comparison of mining techniques in relational and non-relational databases, practical application of data analysis techniques, comparison of performance and usability | W3, U2 | X |  | X |  |
| 4. | Processing large data sets, tools for working with big data, integration of data from various sources | U3, K1 | X |  | X |  |
| 5. | Visualization and reporting of exploration results, creating visualizations using tools such as Tableau or Python (matplotlib, seaborn), referencing the effects | U3, U4 | X |  | X |  |
| 6. | 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-W4 | Sample tasks, presentation | Practical colloquium: Students are given a set of data (e.g. in CSV format or from a relational and non-relational database) and a set of tasks to perform. The tasks include:   * preparing data for analysis (e.g. data cleaning, integration from various sources), * performing data exploration using SQL queries and non-relational database tools, * conducting basic data analysis (e.g. identifying relationships, basic statistics), * visualization of results and interpretation of results. | Files archived on the WSPA platform |
| SKILLS | | | |
| U1-U4 | Sample tasks, presentation | Practical colloquium: Students are given a set of data (e.g. in CSV format or from a relational and non-relational database) and a set of tasks to perform. The tasks include:   * preparing data for analysis (e.g. data cleaning, integration from various sources), * performing data exploration using SQL queries and non-relational database tools, * conducting basic data analysis (e.g. identifying relationships, basic statistics),   visualization of results and interpretation of results. | Files archived on the WSPA platform |
| SOCIAL COMPETENCES | | | |
| K1-K2 | Sample tasks, presentation | Practical colloquium: Students are given a set of data (e.g. in CSV format or from a relational and non-relational database) and a set of tasks to perform. The tasks include:   * preparing data for analysis (e.g. data cleaning, integration from various sources), * performing data exploration using SQL queries and non-relational database tools, * conducting basic data analysis (e.g. identifying relationships, basic statistics),   visualization of results and interpretation of results. | Files archived on the WSPA platform |

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. Finch Victor; Data Analytics For Beginners: Your Ultimate Guide To Learn And Master Data Analysis. Get Your Business Intelligence Right – Accelerate Growth And Close More Sales Createspace Independent Publishing Platform Scotts Valley; 2017
2. Alex Petrov, "Baza danych od środka. Analiza działania rozproszonych systemów danych", Helion 2024
3. Cathy Tanimura, "Analiza danych z wykorzystaniem SQL-a. Zaawansowane techniki przekształcania danych we wnioski", Helion 2022

**Supplementary**

1. Martin Kleppmann, "Przetwarzanie danych w dużej skali. Niezawodność, skalowalność i łatwość konserwacji systemów", Helion 2018
2. Foster Provost, Tom Fawcett, "Analiza danych w biznesie. Sztuka podejmowania skutecznych decyzji", Onepress 2014

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. |