#### card of course

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| Subject name | Implementation of AI models using cloud technologies. Part 2 - 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 | 3 |
| 2.3. Language of lectures | English |
| 2.4. Semesters in which the subject is taught | V |
| 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 | Deepening knowledge of advanced cloud technologies, learning advanced methods of implementing and managing AI models in cloud environments. |
| C2 | Developing skills for scalable implementation of AI models, practical application of scalability and optimization techniques in cloud-based projects. |
| C3 | Integrating AI models with production applications and systems, creating AI-based applications and deploying them in production 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 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 advanced tools and cloud services supporting the implementation and management of AI models. | INF\_W05 INF\_W10INF\_W12 INF\_W19 | X |  | X |  |
| W2 | Understands the concepts of serverless computing and their application in implementing AI models. | X |  | X |  |
| W3 | Knows methods of integrating AI models with APIs and web and mobile applications. | X |  | X |  |
| W4 | Understands the challenges of optimizing the costs of deploying AI models in the cloud. | X |  | X |  |
| W5 | Possesses knowledge of monitoring and maintaining AI models in cloud environments. | X |  | X |  |
| After passing the course, the student is **able** to: |
| U1 | Can implement AI models in a serverless environment using tools such as AWS Lambda, Google Cloud Functions or Azure Functions. | INF\_U12 INF\_U13INF\_U19INF\_U21  | X |  | X |  |
| U2 | Can create and manage APIs for AI models using cloud services such as AWS API Gateway, Google Endpoints. | X |  | X |  |
| U3 | Can integrate AI models with web and mobile applications. | X |  | X |  |
| U4 | Can monitor the performance of AI models in a cloud environment using advanced analytical tools. | X |  | X |  |
| U5 | Can analyze the costs and effectiveness of implementing AI models, proposing optimization solutions. |  |  |  |  |
| After completing the course, the student is ready to take part in **social competences.** |
| K1 | Understands the importance of efficiency and accountability when deploying AI models in the cloud. | INF\_K02 INF\_K05 | X |  | X |  |
| K2 | Is aware of the ethical and social challenges associated with the use of AI in production environments | 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** |  |  |  |  | 30 |  |  |  |  | 3 |
| **NST** |  |  |  |  | 15 |  |  |  |  | 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: 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. | Advanced Cloud Services for AI , an overview of cloud tools and services supporting AI projects. | W1, K1, K2 | X |  | X |  |
| 2. | Serverless computing in the implementation of AI models , using AWS Lambda, Google Cloud Functions, Azure Functions. | W2, U1 | X |  | X |  |
| 3. | Creating and managing APIs for AI models , services such as AWS API Gateway, Google Endpoints. | W3, U2 | X |  | X |  |
| 4. | Integrating AI models with web and mobile applications , creating connections between AI models and applications. | W3, U3 | X |  | X |  |
| 5. | Monitoring and optimizing AI model performance in the cloud , monitoring tools, performance analysis. | W5, U4, K1 | X |  | X |  |
| 6. | Optimization of AI model implementation costs . Resource planning, analysis and cost reduction. | W4, U5 | X |  | X |  |
| 7. | Practical applications in production environments , examples of implementations in various fields. | W1, U1, K2 | 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 | Knowledge provided during the laboratory | Term Project: Scalable AI Model Implementation with API and Application Integration Description: Students implement an AI model, create an API interface, and integrate the solution with a web or mobile application . | The project was placed on the platform |
| SKILLS |
| U1-U5 | Practical classes performed at computer stations | Term Project: Scalable AI Model Implementation with API and Application Integration Description: Students implement an AI model, create an API interface, and integrate the solution with a web or mobile application. | The project was placed on the platform |
| SOCIAL COMPETENCES |
| K1-K2 | Practical classes performed at computer stations | Term Project: Scalable AI Model Implementation with API and Application Integration Description: Students implement an AI model, create an API interface, and integrate the solution with a web or mobile application. | The project was placed on the 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. Ameisen E., Building Machine Learning Powered Applications", O’Reilly Media, 2020

**Supplementary**

1. Stephenson D. „Big data, nauka o danych i AI bez tajemnic. Podejmuj lepsze decyzje i rozwijaj swój biznes” , Helion 2019

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** | **30** | **15** |
| Classes included in the study plan | 30 | 15 |
| **Student's own work** | **45** | **60** |
| Ongoing preparation for classes, preparation of project work/presentations/etc. | 25 | 30 |
| Preparation for passing classes | 20 | 30 |
| **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. |