**SYLLABUS**

**regarding the qualification cycle from 2024 to 2025**

1. Basic Course/Module Information

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| --- | --- |
| Course/Module title | *Artificial Intelligence* |
| Course/Module code \* |  |
| Faculty (name of the unit offering the field of study) | *College of Natural Sciences* |
| Name of the unit running the course | *Artificial Intelligence* |
| Field of study | *Computer Science & Computer Science and Econometrics* |
| Qualification level | *second degree* |
| Profile | *general academic profile* |
| Study mode | *full-time studies* |
| Year and semester of studies | *Year I, semester I* |
| Course type | *course subject* |
| Language of instruction | *English* |
| Coordinator | *Zbigniew Gomółka, PhD* |
| Course instructor | *Zbigniew Gomółka, PhD* |

\* - as agreed at the faculty

1.1.Learning format – number of hours and ECTS credits

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Semester  (n0.) | Lectures | Classes | Colloquia | Lab classes | Seminars | Practical classes | Internships | others | **ECTS credits** |
|  |  |  |  | 30 |  |  |  |  | 4 |

1.2. Course delivery methods

- conducted in a traditional way

- involving distance education methods and techniques

1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)

pass with a grade

2. Prerequisites

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| Mathematics ( i.e. matrix algebra, derivatives and integrals of functions), image recognition systems (optionally), programming in Matlab and one of the Phyton/JAVA/C++/C#/PHYTON, |

3. Objectives, Learning Outcomes, Course Content, and Instructional Methods

3.1. Course/Module objectives

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| --- | --- |
| O1 | *emphasise the main principles of computer-based image recognition* |
| O2 | *programming exemplary modules from image recognition system* |

3.2. Course/Module Learning Outcomes (to be completed by the coordinator)

|  |  |  |
| --- | --- | --- |
| Learning Outcome | The description of the learning outcome  defined for the course/module | Relation to the degree programme outcomes |
| LO\_01 | acquainting with the basics of the operation of selected methods and algorithms of artificial intelligence and their applications | K\_W03, K\_W04 |
| LO\_02 | developing problem-solving skills with the use of selected methods and algorithms of artificial intelligence. | K\_U04, K\_U05 |

**3.3. Course content**

1. Lectures

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| Content outline |
| 1. Contemporary Artificial Intelligence review |
| 1. Model of the single neuron and feed forward type networks |
| 1. Supervised learning methods, nets with fractional calculus |
| 1. Self-Organizing Maps and their learning strategies |
| 1. Deep Neural Networks and exemplary applications |
| 1. Examples of image recognition and signal clustering |
| 1. Intelligent solvers for discrete process optimization |

1. Laboratories

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| Content outline |
| 1. Introduction to Matlab NNet Toolbox |
| 1. BackPropagation algorithm upon the linear inseparable XOR problem |
| 1. Image compression with QuickProp algorithm |
| 1. Kohonen self-organizing map and learning rate strategy dynamics |
| 1. Eyetracking systems learned with DNN |
| 1. 32 channel EEG signal clustering |
| 1. Project on engineering application of artificial intelligence system |

3.4. Methods of Instruction

e.g.

*Lecture: a problem-solving lecture/a lecture supported by a multimedia presentation/ distance learning*

*Classes: text analysis and discussion/project work (research project, implementation project, practical project)/ group work (problem solving, case study, discussion)/didactic games/ distance learning*

*Laboratory classes: designing and conducting experiments*

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

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| --- | --- | --- |
| Learning outcome | Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes) | Learning format (lectures, classes,…) |
| LO-01 | observation during classes, project, oral exam | lectures, laboratories |
| LO-o2 | observation during classes, project, oral exam | lectures, laboratories |

4.2 Course assessment criteria

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| The assessment method of this course consists of:  • every student must satisfy the attendance requirements and that means 0-30 pts.;  • a project, which is evaluated up to 70 pts. |

5. Total student workload needed to achieve the intended learning outcomes

– number of hours and ECTS credits

|  |  |
| --- | --- |
| Activity | Number of hours |
| Scheduled course contact hours | 30 |
| Other contact hours involving the teacher (consultation hours, examinations) | 15 |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 55 |
| Total number of hours | 100 |
| Total number of ECTS credits | 4 |

\* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

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| --- | --- |
| Number of hours |  |
| Internship regulations and procedures |  |

7. Instructional materials

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| Compulsory literature:   1. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence (Uczenie głębokie i sztuczna inteligencja : interaktywny przewodnik ilustrowany) Jon Krohn, Grant Beyleveld, Aglaé Bassens, 2022 2. AI and Machine Learning for Coders: A Programmer's Guide to Artificial Intelligence 1st Edition (Sztuczna inteligencja i uczenie maszynowe dla programistów : praktyczny przewodnik po sztucznej inteligencji), Laurence Moroney, 2021, wyd. Helion. |
| Complementary literature:  1. AI : podejście pragmatyczne : wprowadzenie do uczenia maszynowego opartego na chmurze / Noah Gift ; przekład Marek Włodarz, 2019, APN Promise Warszawa. |

Approved by the Head of the Department or an authorised person

