COURSE DESCRIPTION CARD - SYLLABUS

Course name
Artificial intelligence [S1ETI2>AI]

Course

Field of study
Education in Technology and Informatics

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
10

Number of credit points

3,00

Coordinators

Lecturers

Prerequisites

Knowledge: knowledge of the programming basics in the chosen language. Skills: logical thinking, use of information obtained from the library and the Internet, programming in any programming language. Social competencies: understanding the need to learn and acquire new knowledge.

Course objective

The purpose of the course is to familiarize students with topics related to artificial intelligence methods, in particular artificial neural networks, their implementation in the Python/Matlab environment, as well as applications of artificial intelligence in technology.

Course-related learning outcomes

Knowledge:
1. The student should know the basic concepts related to the methods of artificial intelligence
2. The student should know the basic applications of artificial intelligence methods in selected fields of technology and everyday life

Skills:
1. The student is able to acquire information about artificial intelligence
2. The student can use the selected artificial intelligence method in Python/Matlab environment

3. The student is able to plan the application of selected artificial intelligence method to selected problem in engineering

Social competences:
1. The student is aware of the importance of non-technical aspects of engineering activities
2. The student is able to set priorities for the implementation of specific tasks

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Credit for the lecture based on the points earned on the test in the last class. Passing requires obtaining more than 50% of the points: >50% - dst, >60% - dst plus, >70% - db, >80% - db plus, >90% points - bdb.
Passed labs on the basis of the sum of points earned in the course of the current study progress check and the final test. Passing requires obtaining more than 50% of the points: >50% - dst, >60% - dst plus, >70% - db, >80% - db plus, >90% points - bdb.
Credit for projects based on the sum of points obtained for individual projects related to the application of artificial intelligence methods. Passing requires obtaining more than 50% of the points: >50% - dst, >60% - dst plus, >70% - db, >80% - db plus, >90% - bdb.

Programme content

Course content related to the basics of artificial neural networks, elements of fuzzy logic, evolutionary algorithms.

Course topics

Lecture:
1. Artificial intelligence - basics, definitions, methods, applications.
2. Artificial neural networks - basic structures.
3. Methods of learning and testing artificial neural networks.
4. Data - division into training, validation and test sets.
5. Generalization and re-learning of a neural network.
6. Examples of other structures of artificial neural networks.
7. Examples of applications of artificial neural networks in selected fields of engineering.
8. Classification trees - theoretical basis.
9. Applications of classification trees in selected fields of engineering.
10. Elements of fuzzy logic - theoretical basis.
11. Applications of fuzzy logic in selected fields of engineering.
12. Genetic and evolutionary algorithms - theoretical basis.
13. Artificial annealing and particle swarm algorithm - theoretical basis.
14. Applications of evolutionary algorithms in selected fields of technology.
15. Final test.

Laboratory:
1. Python/Matlab programming - principles relevant to the course: Artificial Intelligence.
2. Perceptrons - basics of implementation.
3. Feedforward neural networks - basics of implementation.
4. Classification trees - basics of implementation.
5. Fuzzy logic - basics of implementation.
6. Genetic algorithms - basics of implementation.
7. Final test.

Project:
1. Application of perceptrons in simple classification problems.
2. Application of feedforward neural networks in classification and linear regression problems.
3. Application of classification trees in simple classification problems.
4. Application of fuzzy logic in control/modeling.
5. Application of genetic/evolutionary algorithms in selected engineering problems.

Teaching methods

Lecture: multimedia presentation.
Laboratory: problem solving, programming in Matlab/Python, discussion.

Project: solving individual project tasks, discussion.

Bibliography

Basic:
1. Andrzej Kisielewicz, Sztuczna inteligencja i logika, Wydawnictwo WNT, Warszawa 2014 [in Polish].
2. Paweł Wawrzyński, Podstawy sztucznej inteligencji, Oficyna wydawnicza Politechniki Warszawskiej, Warszawa 2019 [in Polish].
3. Mariusz Flawiński, Wstęp do sztucznej inteligencji, Wydawnictwo Naukowe PWN, Warszawa 2011 [in Polish].
4. Stanisław Osowski, Sieci neuronowe w ujęciu algorytmicznym, Wydawnictwa Naukowo-Techniczne, Warszawa 1996 [in Polish].
5. Leszek Rutkowski, Metody i techniki sztucznej inteligencji, Wydawnictwo Naukowe PWN, Warszawa 2012 [in Polish].
6. Katarzyna Stąpór, Metody klasyfikacji w wizji komputerowej, Wydawnictwo Naukowe PWN, Warszawa 2011 [in Polish].
7. David E. Goldberg, Algorytmy genetyczne i ich zastosowania, Wydawnictwa Naukowo-Techniczne, Warszawa 1995 [in Polish].
8. Jarosław Arabas, Wykłady z algorytmów ewolucyjnych, Wydawnictwa Naukowo-Techniczne, Warszawa 2004 [in Polish].

Additional:
1. Praca zbiorowa pod red. W. Duch, J. Korbicz, L. Rutkowski, R. Tadeusiewicz, Sieci neuronowe, tom 6 z serii Biocybernetyka i inżynieria biomedyczna 2000 (red. M. Nałęcz), Akademicka Oficyna Wydawnicza Exit, Warszawa 2000 [in Polish].
2. Praca zbiorowa pod red. R. Tadeusiewicz, J. Korbicz, L. Rutkowski, W. Duch, Sieci neuronowe w inżynierii biomedycznej, tom 9 z serii Inżynieria biomedyczna. Podstawy i zastosowania (red. W. Torbicz), Akademicka Oficyna Wydawnicza Exit, Warszawa 2013 [in Polish].

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	55	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00