COURSE DESCRIPTION CARD - SYLLABUS

Course name

Machine learning and methods of artificial intelligence

Course

Field of study

Education in Technology and Informatics

Year/Semester

2/3

Area of study (specialization)

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

30

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

Dr hab. inż. Maciej TABASZEWSKI

e-mail: Maciej.Tabaszewski@put.poznan.pl

tel. 61 665 23 90

Faculty of Mechanical Engeenering

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

The student has basic knowledge from the fields of computing, is able to use the software and has basic programming skills. The student is able to learn independently and improve his knowledge.

Course objective

Transfer of knowledge about selected machine learning techniques and selected methods of artificial intelligence

Course-related learning outcomes

Knowledge

The student knows the basic concepts of artificial intelligence.

The student knows algorithms of induction of knowledge from collected examples

Skills

The Student is able to use information techniques appropriate to the implementation of tasks typical for engineering activities, in particular has the skills to develop and use information systems

The Student is able to process and analyze data in order to obtain knowledge

Social competences

The student is able to think and act in a creative way when solving technical and non-technical problems

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Effect.	Form of evaluation.	Evaluation criteria
Knowledge	written exam - test	mark 3,0 - (50% 60%> mark 3,5 – (60% 70%> mark 4,0 – (70% 80%> mark 4,5 – (80% 90%> mark 5,0 – (90% 100%>
Skills	written exam - short tasks	grades as above
Competences	spoken exam	grades as above

Programme content

1. Basic concepts of knowledge engineering, artificial intelligence, learning systems.

2. General overview of classification and clastering methods.

3. Limiting the number of linearly dependent features, evaluation of input values, classifier evaluation measures, testing of machine learning systems.

4. Distance methods (SVM, k-NN and its various variants, c-means), evaluation of missing data,

5.Knowledge induction from decision trees, random forests and ensembles of classifiers.

6. Induction of rules and induction of association rules.

7. Artificial neural networks for classification, structures of network, single-layer and multi-layer perceptrons, RBF networks, Kohenen networks, LVQ networks, CP networks, convolutional networks

8. Naive Bayesian classifier.

9. Fuzzy logic basics, fuzzy rules, control, fuzzy classification, induction of fuzzy rules

10. Cluster analysis. Hierarchical methods, c-means method, fuzzy k-means method

11. Logistic regression for classification purposes. Approximation and extrapolation, Linear and nonlinear regression, multiple regression, methods based on gray systems, GRA similarity study, and GM models (1,1) for forecasting

12. Optimization, simulated annealing algorithms, genetic algorithms, evolution strategies

13. Evolution of fuzzy systems. Pittsburgh and Michigan methods in induction of fuzzy rules.

15. Neural networks for approximation and forecasting. MLP and Elman networks, recursive networks

16. Fuzzy neural networks TSK (Takagi Sugeno Kang) in the problem of approximation and forecasting

17. Cellular automata in modeling phenomena

18. Expert systems.

Teaching methods

Multimedia presentation with theory and examples, discussion and problem analysis.

Bibliography

Basic

1.Daniel T. Larose, Odkrywanie wiedzy z danych, PWN, Warszawa 2006

2.Leszek Rutkowski, Metody i techniki sztucznej inteligencji, PWN, Warszawa 2005

3.Stanisław Osowski, Metody i narzędzia eksploracji danych, BTC, Legionowo 2013

Additional

1.Michał Białko, Sztuczna inteligencja i elementy hybrydowych systemów ekspertowych, Wydawnictwo Uczelniane Politechniki Koszalińskiej, Koszalin 2005

2.Paweł Cichosz, Systemy uczące się, WNT Warszawa 2000

3. Jacek Kornacki, Jan Ćwik, Statystyczne systemy uczące się, WNT, Warszawa 2005

Breakdown of average student's workload

	Hours	ECTS
Total workload	70	4,0
Classes requiring direct contact with the teacher	33	2,0
Student's own work (literature studies, preparation for lectures, preparation for exam) [1]	37	2,0

[1] delete or add other activities as appropriate