



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

The basics of artificial intelligence [S1Mech2>PSI]

### Course

Field of study  
Mechatronics

Year/Semester  
3/5

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  
15

### Number of credit points

4,00

### Coordinators

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### Lecturers

### Prerequisites

Set theory, matrix calculus, basics of automation. Performing operations on matrices, operating on sets, basics of control system design, python programming. Understands the need to learn and acquire new knowledge.

### Course objective

Learning about the basic methods of artificial intelligence and how they can be applied to control.

### Course-related learning outcomes

Knowledge:

Knows the structure, operation of artificial neurons and artificial neural networks.

Knows the methods of teaching artificial neural networks.

Knows the limitations of artificial neural networks and what control tasks they can be used to solve.

Knows the basics of fuzzy logic and construction of fuzzy controllers.

Knows the operation of genetic algorithms and the possibilities of their application

Skills:

Knows how to select a neural network and prepare data for its learning  
Knows how to apply artificial neural networks to pattern recognition and to control  
Is able to design and program a fuzzy controller  
Knows how to apply a genetic algorithm for simple optimization of, for example, controller parameters

Social competences:

Understands the need for lifelong learning; can inspire and organize the learning process of others  
Is aware of the role of artificial intelligence methods in the modern economy and its importance for society and the environment  
Is able to determine priorities for the implementation of a specific task

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written exam consist of 5 questions (for correct answer to each question - 1 point. Grading scale: below 2.6 pts - ndst, 2.6÷3.0 - dst, 3.1÷3.5 pts - dst+, 3.6÷4.0 pts. - db, 4.1÷4.5 pts. - db+, 4.6÷5.0 pts. - bdb).

Laboratory: Credit on the basis of correct execution of exercises and a report on each laboratory exercise as indicated by the instructor of laboratory exercises. After completion of the exercises, a written final test. All exercises and the final colloquium must be passed to receive credit for the laboratories.

Project: Credit on the basis of the execution of the project, the purpose of which will be the use of intelligent algorithms. In the last project class 3 questions to the project verifying the acquired knowledge of the person doing the project. The grade component is 55% documentation of the project 45% answers to the questions for the project.

### Programme content

Introduction: basics, benefits and risks of artificial intelligence.

The natural neuron. Artificial neuron and its model. Methods of learning neurons. Possibilities and limitations of the neuron. Artificial neurons: perceptron, adaline, Hebb and others. Program of neuron. Overview of types of neural networks. Back propagation method. Applications of neural networks for pattern recognition and modeling.

Fuzzy sets, numbers and relations. Basic operations on fuzzy sets. Fuzzy controllers: fuzzification, inference and sharpening. Program of a fuzzy controller.

Operation and implementation of genetic algorithms. Examples of applications.

### Course topics

- 1 Introduction to artificial intelligence
2. Multilayer perceptron implementation
- 3 SSN using tensorflow library
4. Genetic algorithm
5. Fuzzy logic

### Teaching methods

Lecture: Lectures in the form of presentations.

Labs: Implementation of smart algorithms. Running and testing algorithms on PCs and/or smartphones.

Project: Presentation in the form of tools for writing/compiling/running smart algorithms. Classes in the form of consultation and discussion of projects selected by students.

### Bibliography

Basic:

1. Rutkowski L., METODY I TECHNIKI SZTUCZNEJ INTELIGENCJI, WNT PWN, Warszawa, 2005.
- 2 Yager R., Filev D., Podstawy modelowania i sterowania rozmytego, WNT, Warszawa, 1995
3. Altrock C., Fuzzy logic, Oldenburg Verlag, 1993.

Additional:

Josh Patterson, Adam Gibson, Deep Learning. Praktyczne wprowadzenie, Helion.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	38	1,50