

Full time training
English – Mechatronics engineers – (MSc)
Mechatronics of Intelligent Robot Systems Specialization
E curriculum

Intelligent engineering systems + Intelligent systems

Subject code: BGK-MEI-2023-AMM-E-IES+IS

Intelligent engineering systems

- IES 01 Soft computing techniques
- IES 02 Fuzzy logic and interval arithmetics
- IES 03 Properties of activation functions, some common types
- IES 04 Operation of Neural Networks
- IES 05 Special features and RNN and CNN
- IES 06 Genetic algorithms and fitness functions
- IES 07 Operators of GAs
- IES 08 Shannon entropy
- IES 09 Ant colony algorithm
- IES 10 Simulated annealing

Intelligent system

Neural Networks:

- IS 01 The definition of neural networks, the structure, operation, and mathematical description of Adeline and Rosenblatt's neurons, how they differ, and what the difference results in.
- IS 02 Typical non-linear transfer functions used in neurons (6 pieces - tell us their shape, what are on the axes, the characterization of each function, what they are suitable for)
- IS 03 Multilayer perceptron (MLP): use, structure, application.
 - a. Back propagation for multi-layer perceptrons (back propagation)

- IS 04 Topology of neural networks, (what types of networks do you know, their characteristics and use, explain the components of mathematical descriptions)
- IS 05 Unsupervised learning possibilities of neural networks: description of Hebb / anti Hebb and Kohonen learning processes, rules and their mathematical description.
- IS 06 Summary of learning possibilities of neural networks: Supervised learning definition, operation and interpretation of the following concepts: (classification/segmentation; regression/qualification and error rates/distortion, variance)
- IS 07 Extreme value search procedures:
 - a. the Gradient-based procedures (Newton method, LMS algorithm)
 - b. Stochastic processes (random search)

Genetic Algorithms:

- IS 08 The possibilities of using genetic algorithms, their characteristics, their basic operations (where and why and under what conditions it is worth using them, explaining the flowchart of their structure and operation)
- IS 09 "Mathematical operations" of genetic algorithms with genes (selection, recombination, mutation), Fitness functions: their task, definition, and use. Stopping condition of the GA operation.
- IS 10 Roulette wheel method, traveling agent method, scheme theorem (operation, use, advantage, disadvantage)

Other Algorithms:

- IS 11 Any Time algorithm - operation of algorithm, characterization, 7 expected properties.
 - a. the proof of operation through an example
- IS 12 Real Time systems: definition, performance measurement, system components, system schedules (explain the operation of RM, EDF)