

# Requirements of the final exam of the Computer Science Engineering MSc

*Valid for students starting their studies in February 2023 or later*

The final exam consists of two parts:

1. The defence of the thesis, which includes the presentation of the results (15 minutes); as well as
2. a professional debate and professional dialogue based on the thesis (20 minutes).

During the professional debate and dialogue, the final examination committee also asks questions that are not closely related to the topic and criticism of the thesis but are related to the professional knowledge learned during the training, to generally evaluate the candidate's professional preparedness.

During the professional debate and dialogue, the committee primarily maps the existence of the following most important professional competences, knowledge and skills expected of final examiners:

## **I. Artificial intelligence:**

1. The student knows the types of machine learning, its main characteristics. The student is aware of the types and main algorithms of supervised learning. He/she is able to interpret the solution process of each type of task through practical tasks.
2. The student understands the structure of neural networks, the function of a neuron, the expressiveness of neural networks, including perceptron and multilayer neural networks, and the mechanism of error propagation.
3. Know the basic concepts of reinforcement learning, are able to evaluate a given strategy (policy), and know the methods that can be used to find the optimal strategy.

## **Recommended reading:**

1. Russell, Stuart J., and Peter Norvig. Artificial intelligence: a modern approach. 2nd edition. Upper Saddle River, NJ: Prentice Hall, 2003. ISBN: 0137903952. (AIMA2E).
2. David Silver: RL course by David Silver, 1-5. lecture videos
3. Richard S. Sutton and Andrew G. Barto: Reinforcement learning – An introduction
4. Supervised Machine Learning lecture slideshow

## **II. Cloud programming:**

1. The student is familiar with different levels of cloud services based on abstraction and/or functional aspects.
2. The student understands the operation of cloud-based solutions for large computing tasks, their advantages and disadvantages.
3. The student is able to demonstrate the role of service-oriented programming and Cloud Function/Lambda technology in the development of cloud applications.

### **Recommended reading:**

1. Cloud Programming Lecture notes, Moodle system

## **III. Advanced database management systems:**

1. The student understands the principles of high-performance data storage technologies: columnar, partitioning, memory-optimized data storage
2. The student is familiar with the methods and application of replication and server-side business logic implementation
3. In addition to the relational structure, the student is familiar with the structure of document libraries and graph databases, as well as the operation and principles of modern cloud database technologies.

### **Recommended reading:**

1. Advanced database management systems Lecture notes, Moodle system

## **IV. Signs and systems**

1. The student is familiar with the principles of system and control theory, the main problem classes, analysis and design methods, and their areas of application.
2. The student knows the basic methods of representation, processing of discrete-time signals, as well as the basic principles of the field.
3. The student is able to identify and apply the problem classes, principles and methods listed in points 1 and 2 in his/her narrow field of expertise.

### **Recommended reading:**

1. Cassandras, C. G., Lafortune, S.: Introduction to discrete event systems, Kluwer, 2008
2. Hangos-Bokor-Szederkényi: Computer Controlled Systems, University Press, ISBN 963 9220 94 9, VE 24/2002 (2002)

3. Thomas Holton: Digital Signal Processing, Principles and Applications, Cambridge University Press, 2021
4. Notes released in the Moodle course

**Results of the final exam:**

The grade (ZE) of the final exam is determined by the final examination committee based on the grades recommended by the supervisor and reviewer of the thesis, the oral defence and the subsequent professional debate and dialogue.