Applied Computer Science (EN)

Range of diploma examination

1. Basic digital circuits: logic gates, switches, sequence circuits.

2. Binary arithmetic, Boolean functions, Karnaugh tables.

3. Rules of structural programming. Overview of structural statements.

4. Object-oriented programming – basic concepts and their applications.

5. Basic operations on sets, functions and relations. Propositional calculus. Predicate calculus.

6. Deterministic finite automata – definitions, applications.

7. Examples of computer architectures: von Neuman, Princeton, Harvard.

8. RISC and CISC processors – characteristics, differences.

9. Graphs. Spanning trees. Euler and Hamilton cycles. Cohesion. Graph traversal algorithms.

10. Algorithm – definition. Sorting algorithms. Search algorithms.

11. Basics of algorithm analysis. Computational complexity.

12. Layered structure of the operating system. The concept of system kernel.

13. The OSI layer model.

14. Data link layer protocols. Ethernet network. TCP/IP internet protocol stack.

15. Application layer protocols.

16. Effective programming techniques – examples.

17. Memory management. Common problems. Pointers.

18. Selection of programming paradigms for solving IT problems.

19. Functional programming and imperative programming.

20. Abstract data types and their implementation in programming languages.

21. Identification algorithms of static objects. Analytical and numerical optimization methods.

22. The specificity of the Internet of Things (IoT), application areas, solving problems resulting from a large number of devices, their distribution and a number of generated data.

23. Hardware solutions supporting communication and communication protocols used in embedded systems and IoT.

24. Database models. Relational database. Normalization. Transactions.

25. SQL language. Characteristics. Sub-languages.

26. Software life cycle models.

27. Software development methodologies.

28. The use of lists, sets and dictionaries in Python.

29. Differences and similarities between Java and Python.

30. Principles of parallel programming in Python.

31. UML as a project specification language. Diagrams and their application.

32. Architectural and design patterns – classification, examples, applications.

33. Data protection methods.

34. Basic cryptographic algorithms.

35. Multidimensional data modeling (transactional and analytical data systems, types of multidimensional OLAP structures).

36. ETL process.

37. MDX expressions and directives.

38. Methods of knowledge processing in expert systems.

39. Inference in non-monotonic logic – a planning task