

## **Bachelor`s Exam Topics – Computer Science Major**

1. Real number sequences. Convergence of a sequence, Cauchy's principle.
2. Matrices. Basic matrix operations. Rank and determinant of a matrix.
3. Solving systems of linear equations.
4. Propositional calculus. Tautologies
5. Mathematical induction.
6. Permutations, variations and combinations.
7. Classical definition of probability. Geometric probability.
8. Logical and functional structure of a classical computer.
9. Number representations in a positional number system. Binary and hexadecimal systems and their applications.
10. Fixed-point and floating-point arithmetic. Representing numbers in a computer.
11. Operating system. Perception of the operating system by the application software layer.
12. Characteristics of a traditional Unix system.
13. Iteration, recursion and their implementation.
14. Structured programming mechanisms - conditional statements, loops.
15. Subroutines. Parameter passing.
16. Comparison between the object oriented and structured programming.
17. Data encapsulation – class features (variables, methods, privacy levels).
18. Method types: constructors, destructors, selectors, queries, iterators.
19. Inheritance and dynamic polymorphism.
20. Static polymorphism – templates.
21. Lists and trees and their applications. Stacks and queues.
22. Graphs and their search methods. Applications.
23. Algorithm design methods (divide and conquer, dynamic programming, greedy algorithms).
24. Elementary and non-elementary sorting methods.
25. Elementary search methods. Hash-based search.
26. Computational complexity of an algorithm.
27. Notion of a database - features and capabilities.
28. Relation and its attributes in a database.
29. Referential integrity in relational databases.
30. Database normalization – normal forms.
31. Database design – relationship types, primary and foreign keys.
32. A database index – types and applications.
33. Basic SQL language constructions.
34. Layers and functions of the ISO OSI model.
35. Logical addressing in computer networks.
36. The most important protocols of the TCP/IP family.
37. Software life cycles.
38. The process of testing and its role in software development.
39. UML, its structure and purpose.
40. Basic project team roles and responsibilities
41. Concept of Turing Machine - the idea of automaton, Church–Turing thesis.