



Master's program

Entrance examination topics

Computer Science

1. Representation of information
2. ALU (its components, functions)
3. Arithmetic operational units
4. Digital building blocks (register, ALU, MUX, encoders)
5. Process of instruction execution
6. Control units
7. Memories (types, properties)
8. Input / Output units, buses
9. RISC and CISC computer architectures
10. Basic data types (Stack (LIFO), Queue (FIFO), Priority Queue, Lists). Representation, implementation and operations.
11. Data storage and retrieving (Heap, Binary search tree, B-tree, Hash table)
12. Sorting algorithms (comparison based): Bubble sort, Insertion sort, Quicksort. Algorithms and their computational complexity
13. Basic components of programming languages: data types, control statements, function calls, and parameters. Support of parallel programming.
14. Object oriented programming: Class, Object. Creating objects, initialization, inheritance, polymorphism, dynamic binding, abstract class.
15. Software development methodologies. Design and quality aspects. The role of the UML in software design. Testing software.
16. Components and tasks of database management systems
17. Basics of relational database management systems: Concepts: entity, relationship, relational model and relational algebra.



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Recommended literature:

- Topics 1-9
 - L. Howard Pollard, *Computer design, and architecture*. Prentice Hall; 1st edition (July 1, 1997) , ISBN: 9780131672550
- Topics 10-12
 - Cormen, T. H.–Leiserson, C. E.–Rivest, R. L.–Stein,C.: *Introduction to Algorithms*. MIT Press, 2009 ISBN: 9780262033848
- Topics 13-14
 - Michael L. Scott: *Programming Language Pragmatics*. Morgan Kaufmann; 4th edition (December 25, 2015); ISBN: 9780124104099
 - Ian Sommerville: *Software Engineering (10th Edition)*. Pearson; 10th edition (April 3, 2015), ISBN: 9780133943030;
- Topics 15-17
 - Avi Silberschatz, Henry F. Korth, S. Sudarshan: *Database System Concepts*. McGraw-Hill Education; 6th edition (January 27, 2010), ISBN: 9780073523323