

DOCTORAL SCHOOL OF INFORMATICS
COMPLEX EXAM SUBJECT

Models of computation and applications

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1. Automata for recognizing/accepting languages, The Chomsky hierarchy.
2. Finite automata and their variants (deterministic, non-deterministic, alternating, two-way): power and properties. Finite automata with minimal state. Further variants of finite state machines (Mealy, Moore, Rabin-Scott automata).
3. Pushdown automata, two-pushdown automata. Deterministic and non-deterministic pushdown automata.
4. Post machine.
5. Recursive functions.
6. Turing machines, and its variants (multitape, multihead, non-deterministic).
7. Languages accepted by Turing machines, Post machines and two-pushdown automata.
8. Universal Turing machine, decidable and undecidable problems.
9. Logical circuits.
10. Cellular automata. Their relation to Turing machines.
11. Parallel computing models: PRAM, EREW, CREW, ERCW, CRCW , their properties.
12. Applications.

References:

1. M. Fernandez: Models of Computation. An Introduction to Computability Theory. Springer, 2010.
2. J. Gruska: Foundation of Computing, International Thomson Computer Press, 1997.
3. J.E. Hopcroft, R. Motwani, J.D. Ullman: Introduction to Automata Theory, Languages, and Computation. Third Edition. Pearson, 2013
4. J. E. Savage: Models of computation - exploring the power of computing. Addison-Wesley 1998.
5. M. Sipser: Introduction to the Theory of Computation. Third Edition, Cengage, 2012.