CS-251  
Theory of computation

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Summary
This course constitutes an introduction to theory of computation. It discusses the basic theoretical models of computing (finite automata, Turing machine), as well as, provides a solid and mathematically precise understanding of their fundamental capabilities and limitations.

Content
• Basic models of computation (finite automata, Turing machine)
• Elements of computability theory (undecidability, reducibility)
• Introduction to time complexity theory (P, NP and theory of NP-completeness)

Keywords
theory of computation, Turing machines, P vs. NP problem, complexity theory, computability theory, finite automata, NP-completeness

Learning Prerequisites
Required courses
• CS-101 Advanced information, computation, communication I
• CS-250 Algorithms

Learning Outcomes
By the end of the course, the student must be able to:
• Perform a rigorous study of performance of an algorithm or a protocol
• Classify computational difficulty of a decision problem
• Define the notion of NP-completeness
• Analyze various computation models
• Design a reduction between two computational problems
• Characterize different complexity classes
• Explain P vs. NP problem

Transversal skills
• Use a work methodology appropriate to the task.
• Continue to work through difficulties or initial failure to find optimal solutions.

Teaching methods
Ex cathedra with exercises

Assessment methods
Written exam and continuous control

Resources
Moodle Link
• https://go.epfl.ch/CS-251