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## Quantum algorithm

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Quantum algorithm is a very important study fields. It contains many science problems and mathematics. In this lesson, we will introduce some elementary knowledge, for example, quantum state, quantum operation, quantum measurement, quantum entropy and quantum logic gate, etc. Such that the students can get necessary knowledge for their study. This course contains overview of classical algorithms complexity theory, some important quantum algorithms.

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1	1 2  1 Turing machines	1. 2.  1		1. 2.  3.	4
2	2 Boolean circuits	1.		1.	4

		2. 2			
3	3 The class NP: Reducibility and completeness	1. 2. 3		1.	4
4	4 Probabilistic algorithms and the class BPP	1. 2. 4		1. BPP 2. —	4
5	5 The hierarchy of complexity classes	1. 2. 5		1.	4
6	6 Quantum state and tensor product	1. 2. 6		1. 2.	4
7	7 Reversible circuits	1. 2. 7		1. 2.	4

8	8 Quantum circuits	1. 2. 8		1. 2.	4
9	9 Bases for quantum circuits	1. 2. 9		1. 2.	4

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10	10 Quantum algorithms and the class BQP	2.
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13	13 Quantum algorithms for Abelian groups	1. 2. 13		1. 2.	4
14	14 The quantum analogue of NP: the class BQNP	1. 2. 14		1. 2.	4
15	15 Classical and quantum codes	1. 2. 15		1. 2.	4

Most of the material in these lecture notes is discussed in greater detail in the following books, which we recommend you study if you are interested in quantum algorithms.

[1]. M. Nielsen and I. Chuang. Quantum Computation and Quantum Information. Cambridge University Press, 2000.

[2]. A. Kitaev, A. Shen, and M. Vyalii. Classical and Quantum Computation, volume 47 of Graduate Studies in Mathematics. American Mathematical Society, 2002.

[3]. John Watrous. Theory of Quantum Information. University of Waterloo, 2006.

[4]. John Watrous. Theory of Quantum Information. University of Waterloo, 2008.

<http://www.math.zju.edu.cn/>