

QUANTUM COMPUTERS

Introduction to quantum mechanics:

Hilbert Space, Quantum Entanglement, Density Matrix Operators, Open Quantum Systems, Unitary and Stochastic Dynamics.

Quantum information:

Quantum Bits and Quantum Gates, Teleportation, No cloning, Quantum Cryptography, Quantum Error Correction.

Quantum computation:

Quantum Parallelism, Algorithms of Deutsch and Deutsch – Jozsa, Quantum Fourier Transform, Shor Factorization, Grover Search, Graph States and Codes, Fault-Tolerant Computation.

Physical realizations:

NMR, Ions in Traps, Optical Lattices, Quantum Dots, Superconducting Q-Bits, Topological Quantum Computing.

Representative Textbook References:

M.A. Nielsen and I.L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 2000.

J. Preskill, *Quantum Computation*, Notes, Caltech,
<http://www.theory.caltech.edu/people/preskill/ph229/>