



The Hebrew University of Jerusalem

Syllabus

Introduction to Quantum Computation - 67596

Last update 28-01-2025

HU Credits: 4

Degree/Cycle: 2nd degree (Master)

Responsible Department: Computer Sciences

Academic year: 2025

Semester: 2nd Semester

Teaching Languages: English and Hebrew

Campus: E. Safra

Course/Module Coordinator: Prof Michael Ben-Or

Coordinator Email: benor@cs.huji.ac.il

Coordinator Office Hours: By appointment (via email)

Teaching Staff:

Prof. Michael Ben-Or

Course/Module description:

Introduction to Quantum Computation via Quantum Circuits; Basic Quantum Algorithms including Shor's Integer Factoring and Grover's Search algorithms; Lower bounds in the Quantum Query Model; Quantum Error Correcting Codes and Quantum Fault-Tolerant Computation; Quantum Key Distribution; Quantum Communication Complexity.

Course/Module aims:

The objectives of the course are to bring graduate students up to speed with the state of the art in quantum computation, and to prepare them to work on research problems in quantum computing.

Learning outcomes - On successful completion of this module, students should be able to:

Read research articles in Quantum Computation and work on research problems in Quantum Computation.

Attendance requirements(%):

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Teaching arrangement and method of instruction: Lectures and Student's Seminar

Course/Module Content:

Introduction to Quantum Computation via Quantum Circuits; Basic Quantum Algorithms including Shor's Integer Factoring and Grover's Search algorithms; Lower bounds in the Quantum Query Model; Quantum Error Correcting Codes and Quantum Fault-Tolerant Computation; Quantum Key Distribution; Quantum Communication Complexity.

Required Reading:

Useful books for the course are Quantum Computation and Quantum Information, by Michael Nielsen and Ike Chuang; Classical and Quantum Computation by Kitaev, Shen, and Vyalys; Quantum Computing Since Democritus by Aaronson; and Quantum Information Theory by Wilde.

Additional Reading Material:

Grading Scheme:

Essay / Project / Final Assignment / Home Exam / Referat 100 %

Additional information: