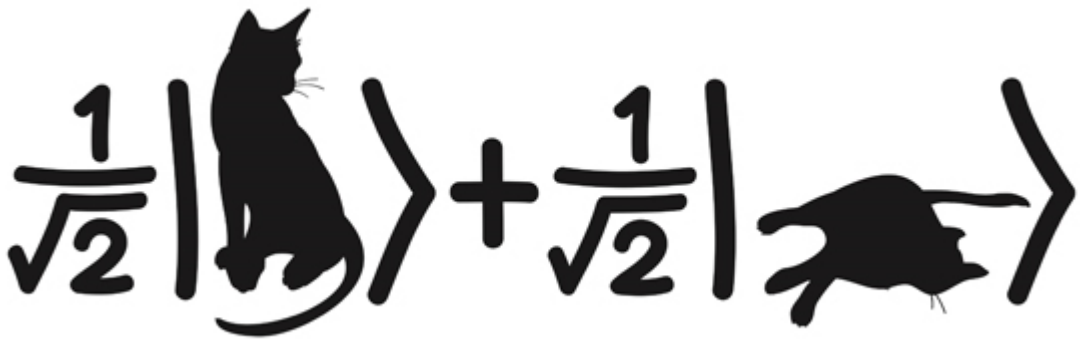
Introduction to quantum information

Lecturer: Tim Byrnes



Syllabus

Lectures
Instructor: Tim Byrnes
Times: Tue 1:45-3pm, Thu 1:45-3pm
Location: Room 528

Recitations
None (problem sets will be done in class)

Office hours
Location: 1200
Times: Everyday 3:30-5:30

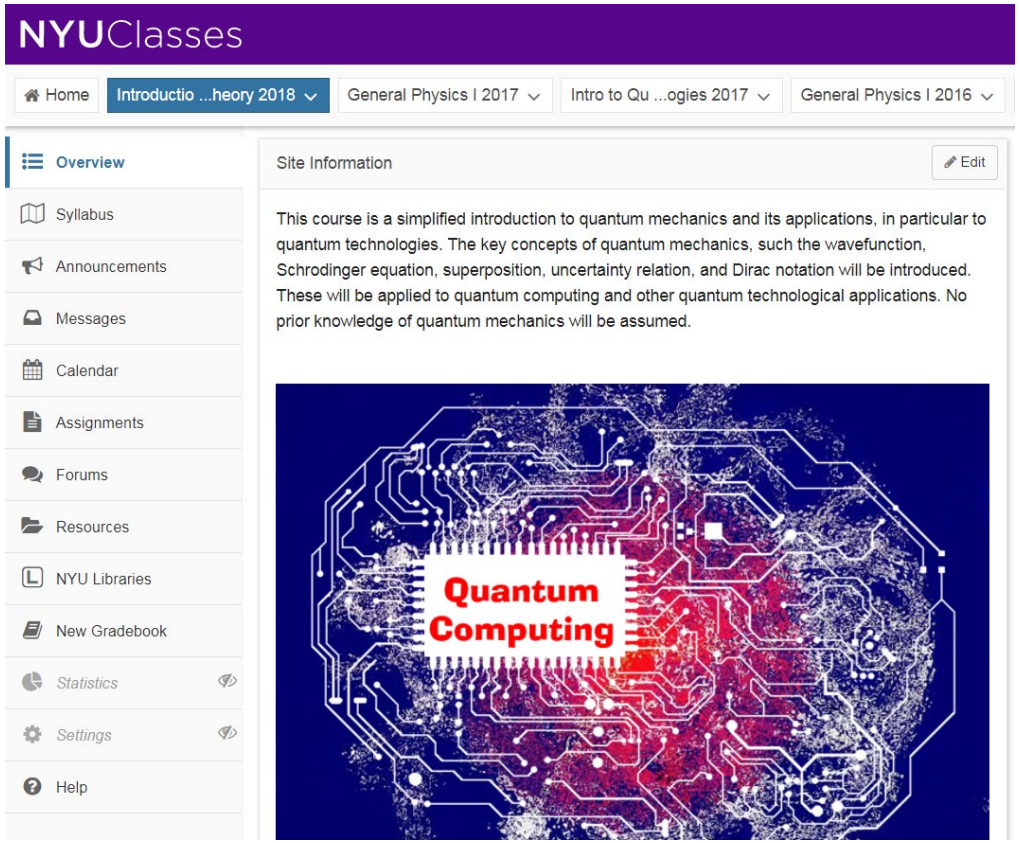
Contact for Tim Byrnes
Office: 1113
Email: tim.byrnes@nyu.edu

Course website

- URL: https://newclasses.nyu.edu
- Contains the syllabus, calendar, assignments, and other information relevant to the course.

Prerequisites

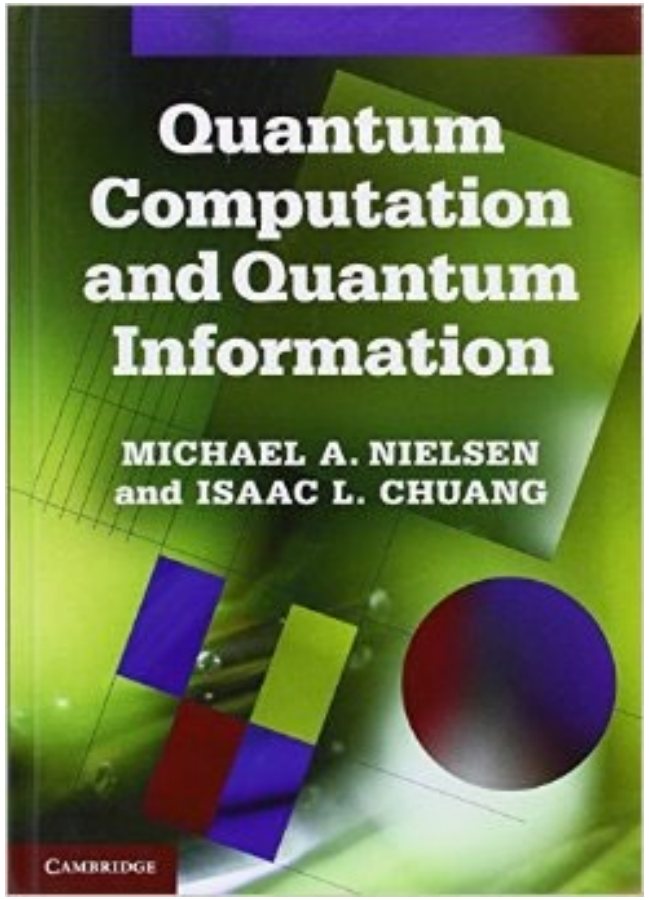
- Linear Algebra OR Honors Linear Algebra OR Linear Algebra and Differential Equations



Textbook

M. Nielsen and I. L. Chuang,
Quantum Computation and Quantum Information
ISBN: 978-1107002173

Supplementary texts:
David Griffiths,
Introduction to Quantum Mechanics, (2nd ed.)
ISBN: 0-13-191175-9
(see NYU Classes “Resources” section for relevant Sections)



- **Course Goals**

To understand and be able to perform simple quantum mechanical calculations. To have a broad understanding of the field of quantum information technology and its potential applications.

Topics

- Historical introduction of quantum theory
- Essential points of linear algebra and complex numbers
- The quantum wavefunction
- Time independent Schrodinger's equation
- Time dependent Schrodinger's equation
- Probabilistic interpretation
- Operators expectation values
- Matrix formulation of quantum mechanics
- Physical implementation of quantum systems
- Qubits and quantum gates
- Quantum measurement
- Quantum teleportation
- Quantum cryptography: the BB84 protocol
- Quantum metrology: NOON states and the Heisenberg limit
- Quantum simulation
- Quantum algorithms: Grover's algorithm

(the above list is a guide only and subject to change depending on the progress of the lectures. Before each exam the precise scope will be specified)

Grading

- Midterm exam 30%
- Final exam 35%
- Homework 15%
- Assignment 20%

Notes

- Homework will be given during the lecture and is due the following lecture (see NYU Classes “Resources” section)
- Assignments will be open-ended topics that you investigate
- The assignment will be written up and handed in towards the end of semester

Course expectations and policies

Expectations

- Attendance for lectures and recitations is mandatory
- Students are expected to participate in class, and discuss ideas
- Students should do the homework before each class

Course policies

- The final scope of the course is specified before each exam. The lectures and recitations are to assist in your learning, and not for "covering" material.
- For any late work 5% of the mark will be deducted per day
- Breaches of academic integrity (i.e. plagiarism, cheating etc.) are taken very seriously
- Adjustments to this document may be made throughout the semester