



Course Description & Syllabus

Instructor

Prof. Adrian Del Maestro
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Meeting Time

Thursday 1:15 - 2:30 PM in Layfayette L111

Office Hours

Wednesday 8:00 - 9:30 AM or by appointment.

Outline

This class aims to present an introduction to quantum theory and quantum computing at a level suitable for students with knowledge of algebra and high school physics. We will discuss recent advances in the field, including exciting announcements of quantum supremacy. When possible, we will learn about cloud-based quantum computing infrastructure.

An outline of topics that will be covered includes:

1. Spin and Projective Measurements
2. Linear Algebra
3. Probability Theory
4. Quantum Mechanics with Finite Hilbert Spaces
5. Entanglement and Bell's Inequality
6. Classical Logic Gates
7. Quantum Gates and Circuits
8. Quantum Algorithms

Assignments

Your understanding of the material covered in lectures and the assigned reading will be tested via assignments requiring complete solutions to problems. You will be graded on completeness and correctness as well as organization of your solutions.

Final Project

The final project will be assigned half-way through the course and will require research on a more advanced topic in quantum computing. You will be required to write a short paper explaining your topic and make a presentation to the class during the final exam period.

BlackBoard

All course details, assignments, lecture notes and announcements will be available on BlackBoard at <http://www.bb.uvm.edu>. You are required to be aware of anything posted to the course website.

Reference Materials

I will post my lecture notes to BlackBoard. There is no specific textbook for this course and we will take material from a variety of sources. The first two books are very inexpensive and I suggest purchasing them.

- C. Bernhardt, *Quantum Computing for Everyone*, (2019).
- Daniel F. Styer, *The Strange World of Quantum Mechanics*, (1999).
- B. Shoshany, *Thinking Quantum: Lectures on Quantum Theory*, <https://arxiv.org/abs/1803.07098>, (2018).
- J. Preskill, *Quantum Computation: Lecture Notes*, <http://www.theory.caltech.edu/people/preskill/ph229/>, (2019).

Grading

Participation	10%
5 Assignments	40%
Final Project & Presentation	50%

Student Accessibility Services

In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the office of Disability Services on campus. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged to meet with their faculty to discuss the accommodations they plan to use in each course.

Contact SAS: A170 Living/Learning Center; 802-656-7753; access@uvm.edu; or www.uvm.edu/access

Religious Holidays

Students have the right to practice the religion of their choice. If you need to miss class to observe a religious holiday, please submit the dates of your absence to me in writing by the end of the second full week of classes. You will be permitted to make up work within a mutually agreed-upon time.