Syllabus for Math 8610: Foundations in quantum information science, Autumn 2026

Professor. David Penneys
Office. Math Tower (MW) 752
Hours. By appointment
Email. penneys.2(at)osu.edu

Course website.

The course website is: https://people.math.osu.edu/penneys.2/8610/Math8610Autumn2026.html

Sources.

There is no official textbook for the course. I will provide my own personal typed notes for this course. Some material comes from the following source:

- Nielsen, Michael A.; Chuang, Isaac L. Quantum computation and quantum information. Cambridge University Press, Cambridge, 2000. xxvi+676 pp. ISBN: 0-521-63235-8

Material.

My course notes are divided into 3 modules: superposition, entanglement, and protocols.

Prerequisites.

Math 2568, 4568, or equivalent (linear algebra).

Technology.

Students are expected to have access to a computer with reasonably good internet. Use of laptops and tablets in class is permitted, but not during exams. If you think that your use of your devices may be distracting to other students, please sit towards the back of class. If you must text or surf on your phone, please keep it where no one can see it.

Homework.

Students **must** work together to solve problems in groups of 2 or 3. Ideally, students will not work with the same collaborators for the entire semester, but will try to work with everyone in the classroom at least once. However, if students develop a very good working collaboration with someone, they are encouraged to continue working with that person. Each group will write up their solutions. Groups may use whatever resources they want,

but they must cite all their sources. **Lack of citation will be regarded as academic misconduct/plagiarism.**

There is a strict format for homework. Groups should hand in a final copy of their homework on plain white paper without lines, perforations, or holes. Please use a new page for each problem. The final copy should represent the student's best effort, as homework counts for the entire class grade. Groups are encouraged to typeset their homework with LaTeX, in which case they do not need to stick to one page per problem.

In the event that homework is not completed in the required format, the homework will be directly returned to the group, who may hand it in at the next class. Homework will be due at the beginning of lecture on Mondays. Groups may choose to email me their homework before the deadline.

A perfect score on homework will earn a score of zero points. Points will be deducted for mistakes or 'hot takes' which are not sufficiently defended. If sufficiently many points are deducted, I will ask students to redo the homework.

Exams.

There will be one exam per module, which will occur **in class**.

Students may only consult a printed out copy of my course notes for the specific module they are being tested on during an exam. The printout of the notes may be annotated (typos fixed, short hints for exercises of about 3 words, etc.), but no new proofs or substantial content may be added. Accessing any other resource, including websites, books, and other students, will be considered academic misconduct.

Grading.

Groups' grades will be entirely based on homework, participation, and a final presentation. This includes participation in exams, but not scores on homework or exams. In rare circumstances, and with prior consent from me, a student may write a survey article on a topic of my choice and give a lecture to the class on their article to replace some percentage of the participation or attendance grade.

AI use policy

Students may not use AI for this class. The use of AI for any solutions to homework problems, exams, or materials for any group projects will be viewed as academic misconduct (see statement below) and referred to the Committee on Academic Misconduct.

Incomplete grades.

From https://artsandsciences.osu.edu/advising/policies
See also ORC (Faculty rule) 3335-8-21 (part G is for incompletes): https://codes.ohio.gov/ohio-administrative-code/rule-3335-8-21

An 'I' indicates that a student has completed a major portion of the work in the course in a satisfactory manner, but for reasons judged by the instructor to be legitimate, a portion of the course requirements remains to be completed. If illness or an emergency prevents you from finishing a course, you may request an 'Incomplete' from the instructor. When you receive this grade, you must consult with the instructor as soon as possible to make arrangements for completing the course requirements. Incomplete work must be completed no later than the sixth week of the following semester. If the work is not made up by the due date, the 'I' mark will be changed to the alternate grade the instructor reported.

Academic Misconduct Statement

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

Counseling and Consultation Services

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life Counseling and Consultation Services (CCS) by visiting ccs.osu.edu or calling 614-292- 5766. CCS is located on the 4th Floor of the Younkin Success Center and 4th Floor of the PAES Building. 24 hour emergency help is also available through the National 24/7 Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org.

Religious Accommodations Statement

It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief.

Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins. The instructor is then responsible for scheduling an alternative time and date for the course requirement, which may be before or after the original time and date of the course

requirement. These alternative accommodations will remain confidential. It is the student's responsibility to ensure that all course assignments are completed.

Intellectual Diversity Statement

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

Disability Services Statement

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: `slds@osu.edu`; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Links to standard syllabus statements.

General syllabus resources are here:

- Syllabus statements including Academic Misconduct, Artificial Intelligence and Academic Integrity, Religious Accommodations, Disability Statement (with Accommodations for Illness), Intellectual Diversity, Grievances and Solving Problems, and Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct can be found here: https://ugeducation.osu.edu/academics/standard-syllabus/standard-syllabus-statements
- Syllabus statements including Counseling and Consultation Services/Mental Health Statement can be found here: https://ugeducation.osu.edu/academics/standard-syllabus/optional-syllabus-statements