Syllabus: PHYS 349 Introduction to Quantum Computing

Spring 2026 | Purdue University

Course Essentials

- **Instructor:** Prof. Jonathan Hood
- **Email:** hoodjd@purdue.edu
- **Office:** BRWN B155
- **Consultation:** By email
- **Teaching Assistant:** Ishita Agarwal (agarw493@purdue.edu)
- **Lecture Notes:** https://phys349.github.io/

Logistics

Details	
Meeting Time	Tue / Thu @ 9:00 AM – 10:15 AM
Location	Physics Building 234
CRN	38950
Credits	3
Instruction Modality	Face-to-Face

Course Description

This course introduces the physics and mathematics of quantum information processing. We will bridge the gap between abstract quantum mechanics and practical quantum algorithms.

We will focus on:

- **What quantum systems do differently:** Superposition, Entanglement, and Measurement (Why these are *not* just probability or parallelism).

- **Reasoning about what is and is not possible:** Where quantum advantage plausibly exists vs. where it provably does not (Speedups ≠ magic).
- **Key technologies:** NISQ computing, Quantum simulation (huge emphasis), Communication/QKD, and Sensing (LIGO, metrology).
- **Hands-on work:** Running simple circuits and executing a real algorithm on IBM hardware.

We will avoid:

- Heavy physics formalism (ODEs, Schrödinger equation).
- Deep algorithmic proofs.

Learning Resources

Textbooks (Optional)

The primary text for this course is the Online Lecture Notes. The following are optional references:

- **Rieffel & Polak**, *Quantum Computing: A Gentle Introduction* (Balance of concepts and formalism).
- **Hidary**, *Quantum Computing: An Applied Approach*, 2nd ed. (Emphasis on algorithms/hardware).
- **Bernhardt**, *Quantum Computing for Everyone* (Great concepts at high school math level).

Python

No prior Python experience is required, but we will use it for homework. See the **Python Resources** page for setup guides.

Assessment

Grades are posted on **Brightspace**. Homework is submitted via **Gradescope**.

Task	Weight	Description
Homework	**35%**	Weekly problem sets (analytical & coding). Due Sundays at 11:59 PM.
Midterm Exam	**20%**	In-class exam covering fundamental concepts.
Final Exam	**25%**	Comprehensive final exam.

Task	Weight	Description
Projects	**10%**	End-of-semester exploration (e.g., hardware survey, algorithm demo).
Participation	**10%**	In-class work via iClicker.

Grading Scale

I reserve the right to lower these cutoffs (curve up) based on difficulty, but I will not raise them.

Grade	Percentage Range
A	85% – 100%
B	75% – 84.9%
C	65% – 74.9%
D	50% – 64.9%
F	< 50%

Course Tools & Policies

Piazza (Q&A)

We will use Piazza for class discussion. I encourage you to post questions here rather than emailing the staff.

- **Sign up:** piazza.com/purdue/spring2026/wl202620phys34900001

iClicker Cloud (Participation)

We will use iClicker Cloud for active learning polls. You can use a laptop, tablet, or smartphone.

1. **Grading:** 50% for participation, 50% for accuracy.

AI & Large Language Models

Philosophy: The "Co-Pilot" Model

I encourage you to use AI (ChatGPT, Gemini, Claude) to support your learning.

- ✅ **Approved:** Concept explanation, debugging code, active tutoring.
- ❌ **Prohibited:** Blind copy-pasting of assignment prompts.
- **Warning:** LLMs are frequently confident but wrong on technical quantum problems.

> **The "Knowledge Gap" Warning:** Homework builds intuition; exams test it. If you rely entirely on AI for homework, you will likely struggle on the exams where these tools are not available.

University Policies

For full details on **Mental Health Support (CAPS), Accessibility (DRC), Academic Integrity, and Emergency Procedures**, please refer to the dedicated resource page.