PHY 299-02: Introduction to Quantum Computing and Quantum Information

Julie Butler

Basic Course Information

- Course website: https://butler-julie.github.io/COURSES/PHY299F24/phy299.html
- Coding homeworks are to be submitted via the D2L page (d2l.mountunion.edu), conceptual homeworks are to be submitted to D2L as well
- Office hours in Bracy 141/142
  - Monday 12:30pm - 2:00pm
  - Wednesday 2:30pm - 4:30pm
  - Thursday 3:30pm - 5:00pm
  - Friday: 12:30pm - 2:00pm
  - By appointment
  - Come to my office hours!
- Contact information: butlerju@mountunion.edu; 864-993-7133

Topics

- Linear Algebra and Quantum Mechanics
- Qubits, Superposition, Quantum Measurement, Wavefunction Collapse, Quantum Entanglements
- Quantum Gates and Circuits
- Quantum Parallelism
- Deutsch-Jozsa Algorithm, Grover's Search Algorithm, Shor's Facotring Algorithm
- Quantum Key Distribution, Quantum Teleportation, Quantum Cryptography
- Quantum Simulations of Physical Systems and Variational Eigenvalue Solver
- Hybrid Quantum-Classical Algorithms
- Quantum Machine Learning
- Quantum Error and Noise, Quantum Error Correction
- Quantum Hardware, Scalability of Quantum Hardware, Using Real Quantum Computers

Grades and Assignments

- 30%: Conceptual Homework
- 30%: Coding Homework
- 15%: Pre-Class Homework
- 10% Exit Tickets
- 15%: Participation (Attendance, engagement, participation during in-class activities, seeking help during office hours, etc.)

Grading Scale

- Percentage grades can be converted to an A-B scale using the following:
  - A: 100-93
  - A-: 92-90
  - B+: 89-87
  - B: 86-84
  - B-: 83-80
  - C+: 79-77
  - C: 76-74
  - C-: 73-70
  - D+: 69-67
  - D: 66-64
  - D-: 63-60
  - F: 59 and below

Exit Tickets

- Exit Tickets are 2-4 questions assignments that will be given to you each class, due at the end of each class
- Answers should be easy to find during the lecture or in the examples
- Write any unresolved question you have on the back of the exit tickets

Conceptual Homeworks

- Conceptual homeworks can be completed solo or in pairs. If completed in pairs, each person must contribute equally and both names must be on one submission.
- Conceptual homeworks will be assigned once a week or once every other week
- All questions will have a point value, to recieve full credit all solutions must follow the guidelines provided in the syllabus (references, legible, thorough answers)

Coding Homeworks

- Coding homeworks can be completed solo or in pairs. If completed in pairs, each person must contribute equally and both names must be on one submission.
- Coding homeworks will be assigned once a week or once every other week, due to D2L by midnight on the stated due date (all Wednesdays except the last one)
- All questions will have a point value, to recieve full credit all solutions must follow the guidelines provided in the syllabus (good coding practices, comments, references, etc.)

Physics Minor (Only 4 Courses!!)

1. PHY 101N: General Physics I
2. PHY 102: General Physics II
3. 8 cr. from PHY 200+ or DSC 250 (this course counts!)

Clubs!

Society of Physics Students (SPS): Physics Club

- President: Shawn Powers

Data Science Club

- President: Texas Doehring