

# QST 205 (CS 239)

## Quantum Programming

### Contact information

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Lecture: TBA

Contact: TBA

**Course Description:** This course is about how to program quantum computers. Why is quantum computing more powerful than classical computing? The reason is that a quantum computer enables a massive state space by using a few qubits instead of many bits (0s and 1s). Qubits are better than bits because they can do exponentially more work. Indeed, a few hundred qubits may be sufficient for quantum computers to outperform all current classical computers. Quantum computers with 72 qubits exist today and people expect that larger quantum computers will achieve a quantum advantage soon. Do we have algorithms for quantum computers? Yes, we do! From the 1990s we have algorithms such as Shor's algorithm, Grover's algorithm, and Simon's algorithm. Today we have algorithms for chemistry, machine learning, and optimization, and future quantum algorithms may break cryptography.

How do we run quantum algorithms on quantum computers? Sign up for this course and learn how. We will study the foundations, algorithms, and languages of quantum computing, and we will run quantum programs on real and simulated quantum computers.

Course reader. The course reader is available for students to purchase in the Textbook location in Ackerman. The price of the course reader is \$55.

Group formation. Submit on CCLE the names of the group members and the name of the group before Apr 30, 2019 (11:55pm). The maximum group size is three people.

Grading.

- Homework due in Weeks 2–5 (done individually;  $7 \times 5$  percent) 35%
- Homework due in Weeks 7–10 (done in groups;  $5 \times 6$  percent) 30%
- Midterm exam 20%
- Participation on piazza 10%
- Quizzes Total 5%