

# UCLA CS 239 Quantum Programming: Syllabus

Jens Palsberg

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**Lectures.** Tuesday and Thursday 2–4pm on zoom.

**Course objectives.** Learn the algorithms, languages, and tools of quantum computing; implement quantum algorithms and run them on a quantum computer.

**Course description.** History of quantum computing; the notion of a qubit; the four postulates that provide the interface to quantum mechanics; the concepts of a quantum circuit and a universal gate set; quantum teleportation; superdense coding; the no-cloning theorem; a suite of fundamental quantum algorithms including Shor’s algorithm, Grover’s algorithm, and the quantum approximate optimization algorithm; several quantum programming languages and how they compare; quantum simulators; quantum compilers; quantum error correction; quantum advantage. Students will implement several quantum algorithms in multiple languages and run them on both simulators and a quantum computer.

**Reading list.** Quantum Computing: An Applied Approach, by Jack Hidary, published by Springer, 398 pages. Several papers and my lecture notes, distributed via CCLE.

## Grading.

Homework due in Weeks 2–5 (done individually; $9 \times 3$ percent)	27 percent
Homework due in Weeks 7–9 (done in groups; $2 \times 9$ percent)	18 percent
Homework due in the final exam week (done in groups)	18 percent
Midterm exam	15 percent
Participation on piazza	10 percent
Quizzes	12 percent
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Total	100 percent