FRONTIER · TAUGHT WITH QISKIT

Quantum Computing

Qubits, interference, and the algorithms built on them. You run circuits on real IBM hardware, watch noise wreck them, and learn to judge advantage claims on the evidence.

Foundational | 4 phases | 20 sessions | 30 contact hours

Syllabus

4 phases, 20 sessions. Each phase ends in something you have built.

1 Two Numbers, Not a Coin

Build the math this course actually uses and replace the pop-science qubit.

6 sessions
$72 alone

1.1 What Quantum Does Not Do

The short list of real speedups, and the much longer list of problems it leaves untouched.

FREE PREVIEW

1.2 Just Enough Complex Numbers

Magnitude and phase, and why squaring a magnitude is where probability comes from.

1.3 Just Enough Linear Algebra

A state is a column of numbers, a gate is a matrix, and that is the whole toolkit.

1.4 One Qubit as an Amplitude Table

Write superposition down as two numbers instead of describing it in words.

1.5 Measurement and Bases

Why |0é and |+é look identical in one basis and completely different in another.

1.6 Circuits in Qiskit

Build a circuit from X, H, Z and T, and match Statevector output against your hand-written table.

By the end: **A one-qubit prediction sheet: amplitudes worked out by hand, then confirmed in two measurement bases.**

2 Where the Speedup Comes From

See that the advantage is interference, not trying every answer at once.

5 sessions
$72 alone

2.1 Two Qubits and Tensor Products
Four amplitudes instead of two, and why n qubits take 2^n numbers to write down.

2.2 Entanglement Without the Telepathy
CNOT, Bell states, and the argument for why none of this sends a message.

2.3 Interference Is the Whole Trick
Deutsch-Jozsa and Bernstein-Vazirani with the cancelling amplitudes written out by hand.

2.4 Grover's Search
Amplitude amplification, a quadratic speedup, and the databases it does not actually search.

2.5 Shor, the QFT and RSA
Period finding, why RSA falls in principle, and the million-qubit price tag on doing it.

By the end: **A hand-derived amplitude table for one oracle algorithm, matched against your own simulation and a classical query count.**

3 The Machine Is Noisy

Get a circuit onto real IBM hardware and read what comes back honestly.

5 sessions
$72 alone

3.1 Accounts, Minutes and the Queue
Set up IBM Quantum Platform and plan around 10 minutes of QPU time per 28 days.

3.2 Transpilation and ISA Circuits
Use a preset pass manager to turn your circuit into the one the hardware will really run.

3.3 Primitives: Sampler and Estimator
Submit PUBs through SamplerV2 and EstimatorV2 and read a result object without guessing.

3.4 Noise You Can Simulate for Free
Build an Aer noise model from a fake backend and reproduce hardware behavior on your laptop.

3.5 Shots, Error Bars and Honest Histograms
Put an uncertainty on every bar and tell a real signal from a pretty chart.

By the end: **One circuit run three ways: ideal, noisy simulation matched to a real backend, and a QPU, with error bars on all three.**

4 What Is Actually True in 2026

Read a quantum claim, find its rebuttal, and reach your own verdict.

4 sessions
$72 alone

4.1	**Suppression, Mitigation, Correction**	Tell the three error-handling families apart and state what each one costs you.
4.2	**Error Correction and Logical Qubits**	Simulate a repetition code in Stim and count the physical qubits one logical qubit costs.
4.3	**Advantage Claims and Their Rebuttals**	Track one claim from announcement to classical counter-result on the Quantum Advantage Tracker.
4.4	**Post-Quantum Crypto and Timelines**	Name what breaks, what does not, and why ML-KEM is already shipping in production TLS.

By the end: **A written audit of one published advantage claim, its strongest classical counter-result, and your call on it.**

Tools you will use

Python | NumPy | Qiskit 2.5 | Qiskit Aer | qiskit-ibm-runtime | IBM Quantum Platform | OpenQASM 3 | Stim

What you will build

1. **Two-Basis Challenge**
   Prove |+é is not a coin flip
2. **CHSH Violation**
   Break a Bell inequality on shots you took yourself
3. **Advantage Claim Audit**
   One headline, one rebuttal, your verdict

Registration

Phase 1: Two Numbers, Not a Coin	$72
Phase 2: Where the Speedup Comes From	$72
Phase 3: The Machine Is Noisy	$72
Phase 4: What Is Actually True in 2026	$72
Whole track, all 4 phases	**$240**

Buying every phase separately costs $288, so the whole track saves $48.

No payment is taken online. Registering creates an order and payment instructions are sent with it. Access opens once payment is confirmed.