

# India Week of Quantum: Quantum Computing Opportunities at IBM

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Che Allen

Project & Events Manager, Workforce Advocacy



# Your future starts with an IBM Quantum internship



IBM has created the **largest quantum computing training program in the world**. Our internship program has grown to providing over **100 paid internship opportunities** distributed globally where we recruit the best diverse talent entering the field.

#### Areas of study:

Computer science  
Physics  
Math  
Chemistry

#### Desired skills:

Research, engineering,  
Software development.

#### IBM Quantum Interns

An IBM Quantum internship will connect you with other students, university programs, IBM Quantum Network organizations, and the quantum computing community. Gain valuable skills and experience essential for future professional opportunities and continued studies. Contribute to the open source Qiskit project, conduct fundamental research into quantum computing, and help people understand the relevance of quantum computing.

We are looking for candidates with exposure to quantum computing fundamentals through formal

internship  
IBM Research.

[See IBM Quantum internships](#)

[ibm.co/quantuminternships](http://ibm.co/quantuminternships)

# Career Roles in Quantum Computing at IBM

## STUDY

Physics  
Math  
Chemistry  
Computer Science  
Electrical Engineering  
Computer Engineering  
Mechanical Engineering

## RESEARCH

Quantum computing theory

- Error correction
- Quantum algorithms
- Quantum device and quantum operations physics

Quantum applications  
Quantum hardware and device design, including automated Hamiltonian extraction from geometry  
Optimal control theory and experiment  
Quantum verification, validation, benchmarking  
Multi-qubit gates optimization  
Quantum transduction  
Materials science and engineering  
Decoherence mechanisms  
Low-noise cryogenic amplifiers  
Experimental physics (low noise/cryogenic/RF/qubit) measurements  
Simulation of quantum systems/physical systems

## SOFTWARE

Architecture, systems software, and firmware engineering  
Scientific programming  
Programming languages such as Python, C++, and their bindings (Cython, pybind11, etc)  
Graph algorithms and data-structures  
Compiler design  
Program language design  
Qiskit  
DevOps, Security, Cloud Services & APIs  
User experience design  
Quantum applications research

## HARDWARE

Quantum engineering  
Micro fabrication (especially thin-film deposition, lithography, and Josephson junction growth)  
Packaging (bump bonding, fanout/interposers, light-tight enclosures)  
Microelectronics process development and integration  
Microwave circuit engineering  
Mechanical engineering / Thermal engineering  
Quantum control and classical electronics  
Real-time systems, including DSP and FPGAs  
RF and  $\mu$ W radio transceivers  
Low-power cryoelectronics, e.g. CryoCMOS and SFQ  
Circuit design  
Chip design and layout  
Microwave Modeling

## Learn Quantum Computation using Qiskit

### What is Quantum?

#### 0. Prerequisites

#### 1. Quantum States and Qubits

1.1 Introduction

1.2 The Atoms of Computation

1.3 Representing Qubit States

1.4 Single Qubit Gates

1.5 The Case for Quantum

#### 2. Multiple Qubits and Entanglement

2.1 Introduction

2.2 Multiple Qubits and Entangled States

2.3 Phase Kickback

2.4 More Circuit Identities

2.5 Proving Universality

2.6 Classical Computation on a Quantum Computer

#### 3. Quantum Protocols and Quantum Algorithms

3.1 Defining Quantum Circuits

3.2 Deutsch-Jozsa Algorithm

3.3 Bernstein-Vazirani Algorithm

3.4 Simon's Algorithm

3.5 Quantum Fourier Transform

3.6 Quantum Phase Estimation

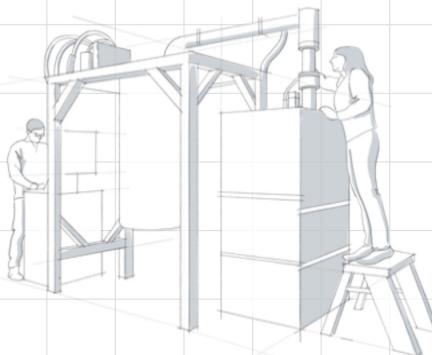
3.7 Shor's Algorithm



# Learn Quantum Computation using Qiskit

Greetings from the Qiskit Community team! This textbook is a university quantum algorithms/computation course supplement based on Qiskit to help learn:

1. The mathematics behind quantum algorithms
2. Details about today's non-fault-tolerant quantum devices
3. Writing code in Qiskit to implement quantum algorithms on IBM's cloud quantum systems



Read the textbook



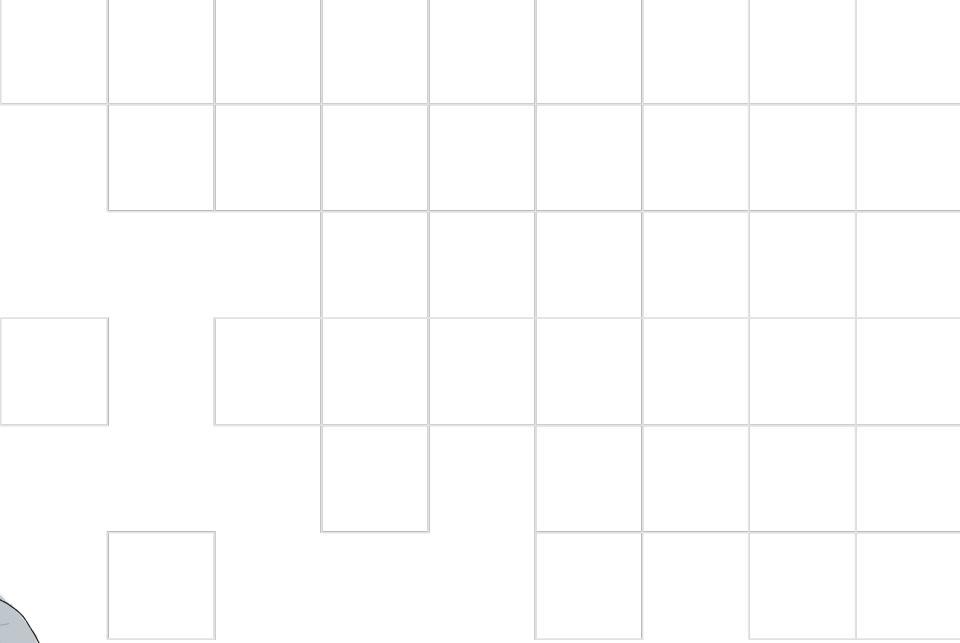
The Qiskit Textbook now has over 25,000 monthly readers.

## About the Textbook



# Qiskit

## Advocates



# Who are Qiskit Advocates?

The Qiskit advocate program is a global program that provides support to the individuals who actively contribute to the Qiskit Community.

[Qiskit.org/advocates](https://Qiskit.org/advocates)

## Mentorship

Create long-lasting and meaningful relationships with experts as you work on 3-month projects together.

## Network with experts and enthusiasts

Advocates will be added to a group of quantum experts and will be a part of regular information sharing sessions.

## Access to Qiskit core members and projects

Advocates will receive special access to core members of the Qiskit team for questions and brainstorming ideas.

## Invitation to events

Active Qiskit Advocates will be invited to attend global events created for the quantum computing community.

# How do you become a Qiskit Advocate?

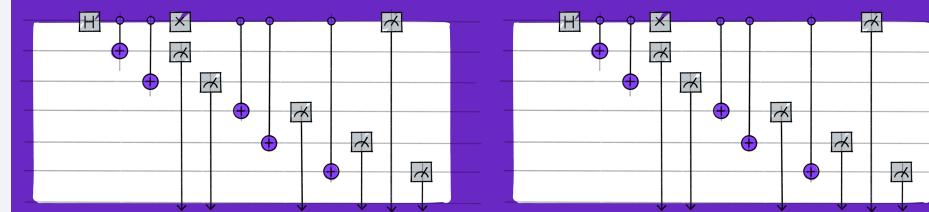
**Start preparing now to join in 2022!**

- Pass a test demonstrating your foundational Qiskit knowledge
- Be involved! You need 3+ contributions to qualify.



Want to be notified when the 2021 Qiskit Advocates application opens? Sign up here!

**<https://qiskit.org/advocates/>**



How do you get involved? Here are some ideas!

1. Making open-source contributions in the Qiskit github
2. Organize Qiskit events
3. Help to answer Qiskit questions in slack or stack exchange
4. Write a paper or blog using Qiskit

# We are now focused on planet scale quantum education...



# How to stay connected with our community?

## Qiskit.org

### Explore Qiskit.org

The single best landing spot for new and existing members of the Quantum Community. Get started here to learn more about all things Qiskit.



### Be Part of the Github Community

Learn how to write your first quantum program - by having fun! Check out the repo of community-contributed Jupyter notebooks that leverage the features of Qiskit



### Join the Qiskit Slack Community

Join the Qiskit Slack Community to connect with Advocates, IBMers, and other members of the community to ask questions and find the answers you are looking for (making connections along the way)!



### Subscribe to Qiskit YouTube

For high-quality and fun videos that are accurate, practical, and engaging. Get started with the Coding with Qiskit series.



### Learn Quantum with the Qiskit Textbook

The textbook is not only a coursework supplement: it's a comprehensive and interactive self-learner's resource for programming quantum computers using Qiskit!



### Compete in Qiskit Camps & Challenges

From virtual Quantum Challenges, university hackathons, to full-scale Qiskit Camps - join a local event to put your Qiskit skills to the test and connect in person with fellow Qiskitters, as well as IBM Quantum Researchers.



### Organize Community Events

With support from the IBM Quantum team, plan and host hackathons, meetups, or other events at your local university or community!



### Apply to be an IBM Quantum Intern

Experience contributing to Qiskit, fundamental research in quantum computing, and promoting the relevance of quantum computing while gaining valuable skills and essential experience.



### Become a Qiskit Advocate

Be a community leader focused in growing and developing open-source and Quantum communities, research, and development.



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Internship  
IBM Research.

**ibm.co/quantuminternships**

View all currently-open positions at <http://ibm.biz/quantum-careers>

# Thank you!

## Important links to bookmark:

Qiskit.org

General internship info:  
ibm.co/quantuminternships

Current open positions:  
<http://ibm.biz/quantum-careers>

Want to chat with us?

Join the Qiskit Slack:  
<https://ibm.co/joinqiskitslack>

Find us in these channels...

Connect about this event!  
[#india](#)

Internship questions?  
[#quantum-internships](#)

