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Preparing for the Qiskit developer certification exam

General Information

Instructor: James L. Weaver

Email: james.weaver@ibm.com

Preparing for the Qiskit developer certification exam

This syllabus was created to help you prepare to take the Qiskit developer certification exam, entitled Fundamentals of Quantum Computation Using Qiskit v0.2X Developer. Please check out the resources in the links in each section. Also, supplemental reading in the Qiskit textbook is noted in applicable sections under the **Chapters** heading. Additionally, this [slide deck \(https://slides.com/javafxpert/prep-qiskit-dev-cert-exam\)](https://slides.com/javafxpert/prep-qiskit-dev-cert-exam) contains a slide for many of these sections.

Chapters

- [Why quantum computing?](#)
 - [Describing quantum computers](#)
 - [The atoms of computation](#)
 - [What is quantum?](#)
-

Getting the workforce quantum-ready

Check out this [IBM Research Blog post \(https://www.ibm.com/blogs/research/2021/03/quantum-developer-certification/\)](https://www.ibm.com/blogs/research/2021/03/quantum-developer-certification/) that announces the The IBM Quantum Developer Certification.

Chapters

- [The Case for Quantum](#)
-

What to expect from the exam

Take a look at this [article that was posted on Medium \(https://medium.com/qiskit/learn-more-about-the-ibm-quantum-developer-certification-and-how-to-take-it-for-free-d237f9765dc5\)](https://medium.com/qiskit/learn-more-about-the-ibm-quantum-developer-certification-and-how-to-take-it-for-free-d237f9765dc5) when the IBM Quantum Developer Certification was first launched.

Exam objectives, and preparing for the exam

This [page on the IBM Training site \(https://www.ibm.com/training/certification/C0010300\)](https://www.ibm.com/training/certification/C0010300) provides an overview, objectives, exam preparation and registration instructions for the IBM Certified Associate Developer - Quantum Computation using Qiskit v0.2X

Leveraging the IBM Quantum Composer

Use the [IBM Quantum Composer \(https://quantum-computing.ibm.com/composer\)](https://quantum-computing.ibm.com/composer) to create quantum circuits.

Be sure to select the **Create your first circuit walkthrough** option in the **Getting started** menu for a hands-on look at creating a circuit. Also, explore the **Quantum Composer user guide**, and **Operations glossary** options to learn more about the Quantum Composer and available quantum operations.

Chapters

- [Introduction](#)
 - [Representing Qubit States](#)
 - [The Atoms of Computation](#)
-

Gain an intuitive understanding of the Bloch sphere and gate rotations with this [web-based application known as Grok the Bloch Sphere \(https://javafxpert.github.io/grok-bloch\)](https://javafxpert.github.io/grok-bloch).

Chapters

- [Single Qubit Gates](#)
-

Studying the Qiskit Textbook

Explore all of sections 1 and 2 of the Qiskit Textbook. Some of this supplemental reading in the Qiskit Textbook has already been pointed out in previous sections.

Chapters

- [Introduction](#)
 - [The Atoms of Computation](#)
 - [Representing Qubit States](#)
 - [Single Qubit Gates](#)
 - [The Case for Quantum](#)
 - [Introduction](#)
 - [Multiple Qubits and Entangled States](#)
 - [Phase Kickback](#)
 - [More Circuit Identities](#)
 - [Proving Universality](#)
 - [Classical Computation on a Quantum Computer](#)
-

Continue studying the Qiskit Textbook

Explore the Defining Quantum Circuits section of the Qiskit Textbook.

- [Defining Quantum Circuits](#)
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Leveraging the IBM Quantum Lab

Explore the Qiskit Tutorials - Circuits Jupyter notebooks in the IBM Quantum Lab. These may be accessed from the **Circuits** section of the [start here Jupyter notebook \(https://quantum-computing.ibm.com/lab/files/qiskit-tutorials/qiskit/start_here.ipynb\)](https://quantum-computing.ibm.com/lab/files/qiskit-tutorials/qiskit/start_here.ipynb).

Continue leveraging the IBM Quantum Lab

Explore the Qiskit Tutorials - Advanced circuit visualization Jupyter notebook in the IBM Quantum Lab. This may be accessed from the **Advanced Circuits** section of the [start here \(https://quantum-computing.ibm.com/lab/files/qiskit-tutorials/qiskit/start_here.ipynb\)](https://quantum-computing.ibm.com/lab/files/qiskit-tutorials/qiskit/start_here.ipynb) Jupyter notebook.

Explore the Qiskit tutorials outside of IBM Quantum Lab

Qiskit tutorials may be viewed as web pages from the [Qiskit Tutorials \(https://qiskit.org/documentation/tutorials.html\)](https://qiskit.org/documentation/tutorials.html) page.

Consulting the Qiskit API reference

Study the following pages of the Qiskit API reference:

- [Circuit Library](#)
 - [Qiskit Terra](#)
 - [Qiskit Aer](#)
-

Working with OpenQASM

Consult `qiskit.circuit.QiskitCircuit` methods for using QASM within Qiskit. For example, [from_qasm_str \(https://qiskit.org/documentation/stubs/qiskit.circuit.QuantumCircuit.from_qasm_str.html\)](https://qiskit.org/documentation/stubs/qiskit.circuit.QuantumCircuit.from_qasm_str.html).

Consulting Quantum Computing StackExchange

Learn from other Qiskit developers by viewing their questions and answers in [Quantum Computing StackExchange](https://quantumcomputing.stackexchange.com/questions/tagged/qiskit) (<https://quantumcomputing.stackexchange.com/questions/tagged/qiskit>).

For example, here's an [exchange about finding the Qiskit version](https://quantumcomputing.stackexchange.com/questions/15741/what-qiskit-version) (<https://quantumcomputing.stackexchange.com/questions/15741/what-qiskit-version>):

Detailed objectives covered by the certification exam

Each certification exam question falls into one of these objectives:

Section 1: Perform Operations on Quantum Circuits (47%)

1. Construct multi-qubit quantum registers
2. Measure quantum circuits in classical registers
3. Use single-qubit gates
4. Use multi-qubit gates
5. Use barrier operations
6. Return the circuit depth
7. Extend quantum circuits
8. Return the OpenQASM string for a circuit

Section 2: Executing Experiments (3%)

1. Execute a quantum circuit

Section 3: Implement BasicAer: Python-based Simulators (3%)

1. Use the available simulators

Section 4: Implement QASM (1%)

1. Read a QASM file and string

Section 5: Compare and Contrast Quantum Information (10%)

1. Use classical and quantum registers
2. Use operators
3. Measure fidelity

Section 6: Return the Experiment Results (7%)

1. Return and understand the histogram data of an experiment
2. Return and understand the statevector of an experiment
3. Return and understand the unitary of an experiment

Section 7: Use Qiskit Tools (1%)

1. Monitor the status of a job instance

Section 8: Display and Use System Information (3%)

1. Perform operations around the Qiskit version
2. Use information gained from `%qiskit_backend_overview`

Section 9: Construct Visualizations (19%)

1. Draw a circuit
2. Plot a histogram of data
3. Plot a Bloch multivector
4. Plot a Bloch vector
5. Plot a Q-sphere
6. Plot a density matrix
7. Plot a gate map with error rates

Section 10: Access Aer Provider (6%)

1. Access a `statevector_simulator` backend
2. Access a `qasm_simulator` backend
3. Access a `unitary_simulator` backend

Working through 20 sample questions

Please take a look at the [portion of the slide deck that works through 20 sample questions](https://slides.com/javafxpert/prep-qiskit-dev-cert-exam#/18)
(<https://slides.com/javafxpert/prep-qiskit-dev-cert-exam#/18>)

We wish you success in taking the Qiskit developer certification exam!

