

# Quantum

## PRACTITIONERS COURSE

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**Quantum computers leverage quantum mechanical phenomena to manipulate information in a way that could drive breakthroughs beyond the scope of classical computing.**

Quantum computers could spur the development of new breakthroughs in science, such as medications to save lives, machine learning methods to diagnose illnesses sooner, materials to make more efficient devices and structures, financial strategies to live well in retirement, and algorithms to quickly direct resources such as ambulances.

IBM Global University Programs



## About this course

This course explores the topics, technology and skills required to gain practice in the successful implementation of quantum computing.

**Quantum Practitioners** – Become empowered with the knowledge and tools needed to collaboratively and individually advance the field of quantum computing and drive adoption.

### Audience

Individuals with an active interest in understanding and teaching quantum computing.

Prerequisite skills for this course:

- *Basic knowledge of programming (e.g. Python 3)*
- *Fundamentals of linear algebra and physics*
- *Basic atomic theory*
- *Fundamentals of modern physics, such as the meaning of temperature*

### Journey

 75 hours

#### • 25% Concepts

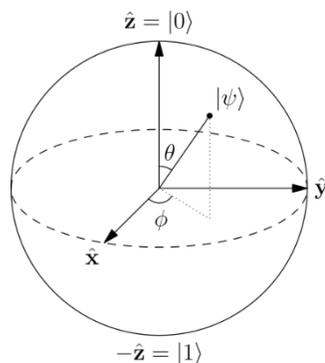
Expanding the knowledge and understanding of the topic through lecture training, examples, videos and quizzes.

#### • 35% Technologies

Actual implementation of the concepts learned through simulations, hands-on labs and games.

#### • 40% Industry Use Cases

Realization of the real-world impact of the topics covered through the exposure to industry case studies.



### Objectives

- Learn about the motivation, history and future research paths of quantum computing.
- Understand qubits: superposition, representations and mathematical view.
- Gain insight into the concepts of entanglement and representations.
- Explore the concepts of quantum volume, including gates and error rates.
- Understand the various technologies for quantum hardware.
- Perform hands on coding with Qiskit and learn programming with Aqua.
- Explore use cases for quantum in industries such as chemistry and finance.
- Learn about algorithms through projects such as:
  - Algorithms for industry applications, such as Grover, Shor

Advancing fundamental research in quantum computing is key to accelerating the application of quantum to the most challenging problems in chemistry, optimization, and machine learning.

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