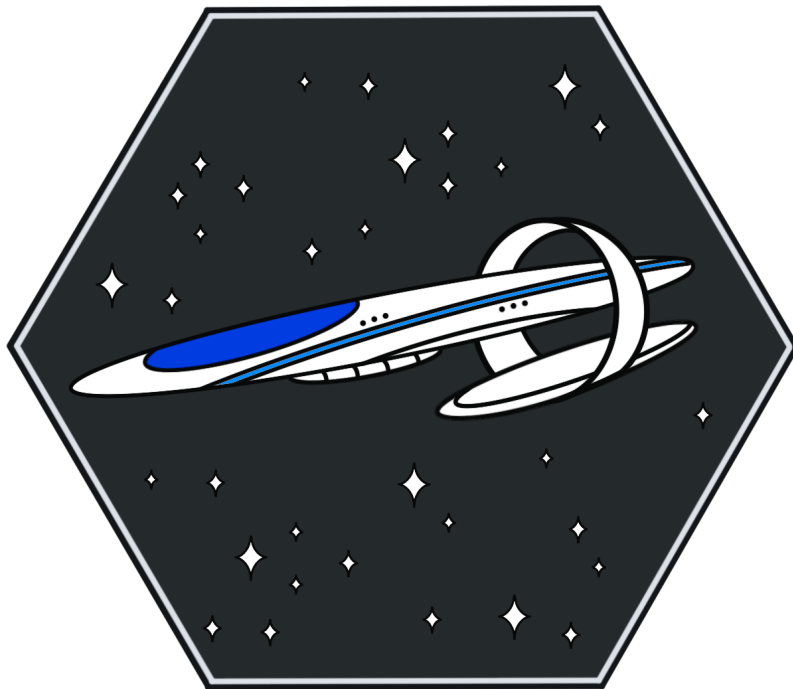


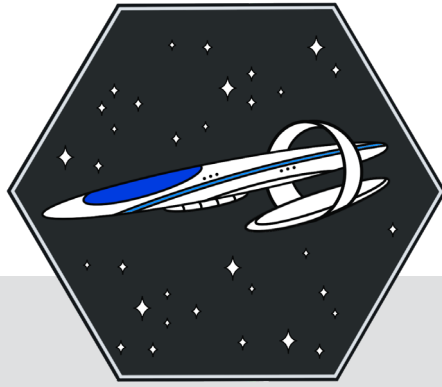
# Qiskit | Quantum Explorers

A Self-Paced Quantum Learning Journey



**Achievement:**  
**CAPTAIN**

Quantum Computing & Qiskit 101



# QUANTUM COMPUTING & QISKIT 101

## Achievement to unlock: Captain

Become the captain of Earth's first faster-than-light starship and lead humanity into interstellar exploration.

A magnificent Heron-class starship, equipped with faster-than-light travel capabilities, comfortable amenities, weapons, and an enthusiastic crew needs a captain. You are an esteemed explorer and are perfect for the job.

Your starship-to-be is called the ESS \_\_\_\_\_.

(ESS stands for "Earth Starship". Share your starship's name in the [#space-exploration](#) channel on Discord!)

Complete this module to become Captain, ensure a successful launch into space, and become humanity's leading space exploration pioneer.

### In this module you will:

- Learn quantum concepts like superposition, entanglement, and interference
- Understand how quantum gates work and how to run circuits using Qiskit and IBM Quantum Platform
- Program and run simple circuits and the quantum teleportation algorithm using Qiskit



# SYLLABUS

Checklist of tasks to complete and materials to learn

## Warm-up Activities

### **LIVE EVENT: Badge Kick-off - Quantum Computing and Qiskit 101**

Date: July 7, 2023 [[time](#)] [[video link](#)] [[demo notebook link](#)]

Note: all event recordings will be available at the links provided.

### **VIDEO: Quantum Computing Expert Explains One Concept in 5 Levels of Difficulty** [[link](#)]

WIRED Youtube video featuring IBM's Dr. Talia Gershon

### **BOOK: Quantum Kittens (Beta)** [[link](#)]

Three chapters of a non-technical book that teaches quantum computing through stories about cats

Extra help: [Quantum Computing Prerequisite Math Syllabus \(High School +\)](#)

## Main Activities

### **QISKIT COURSE: Introduction to Quantum Computing** [[link](#)]

A short online course for self-learners from all backgrounds (technical and non-technical). Please complete up to and including section ENTANGLED STATES.

### **LAB: Introduction to Qiskit** [[link](#)]

Program basic circuits using Qiskit in a jupyter notebook [[solution](#)]

### **VIDEO: Quantum Teleportation Algorithm** [[link](#)]

Qiskit Youtube Programming on Quantum Computers S1E5

### **TEXT: Quantum Teleportation** [[link](#)]

Qiskit textbook chapter with notebook demonstration

### **LAB: Teleportation tutorial with dynamic circuits** [[link](#)]

You can set hub = "ibm-q", group = "open", project = "main", and set the device which features OpenQASM3 on [device list](#)

Extra help: [Introduction to Python and Jupyter notebooks](#)

Online Version of Syllabus

# ADVANCED SYLLABUS

Optional advanced additional materials

## Qiskit textbook sections for further understanding of the basics of quantum information

■ **TEXT: Single systems - Quantum information** [\[link\]](#)

Alternative: **VIDEO: Single Systems** [\[link\]](#)

■ **TEXT: Multiple systems - Quantum information** [\[link\]](#)

Alternative: **VIDEO: Multiple Systems** [\[link\]](#)

## Grover's Algorithm

■ **VIDEO: Grover's Search Algorithm** [\[link\]](#)

Qiskit Youtube Programming on Quantum Computers S2E3

■ **QISKIT COURSE: Grover's Search Algorithm** [\[link\]](#)

A chapter of the Qiskit Introductory Course

■ **LAB: IBM Quantum Challenge 2020 Exercise** [\[link\]](#)

Jupyter notebook with an exercise related to Grover's algorithm



# RESOURCES

## Supplementary Materials

### ■ **WEB APP: Grokking the Bloch Sphere** [\[link\]](#)

Application that helps the user understand the Bloch sphere

### ■ **GAME: QiskitBlocks** [\[link\]](#)

Teaches quantum computing and Qiskit in a Minetest block world [\[Tips\]](#)

### ■ **QISKIT COURSE: Visualizing Entanglement** [\[link\]](#)

A chapter of the Qiskit Introductory Course

### ■ **LAB: Grover's Algorithm** [\[link\]](#)

In-depth, comprehensive Jupyter notebook

### ■ **VIDEO/QISKIT COURSE: Understanding Quantum Information and Computation** [\[link\]](#)

Playlist of the course by John Watrous

### **Practice Problem Sets based on the Qiskit Textbook [Chapters 1-4](#) by John Watrous**

■ [\[Problem Set 1\]](#)

■ [\[Problem Set 2\]](#)

■ [\[Problem Set 3\]](#)

■ [\[Problem Set 4\]](#)

### ■ **GAME: Quantum Odyssey by Quarks Interactive** [\[link\]](#)

Quantum Odyssey is a puzzle game that teaches gate model computing through visual cues. The demo is free to play.

[\[Windows launcher\]](#) [\[MacOS launcher\]](#)



# UNLOCK YOUR BADGE

## QUIZ

Ready to test your knowledge and unlock your achievement?

Return to the Quantum Explorers portal.

Quantum Explorers Portal

## PASSED?

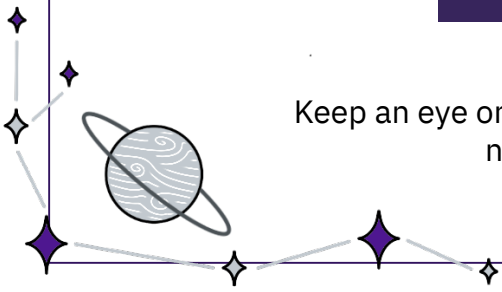
### Congratulations!

Download your badge image using the password revealed on passing the quiz.

Then share your achievement in the [#level-up](#) channel on Discord.

Badge Download

Keep an eye on the [#announcements](#) channel for details about the next modules and Badge achievements.



# NOTES

