Quantum Coding 101: Course Outline

Instructor: Dr Himadri Barman

Module 0: Introduction to Quantum Circuits

- Qubits and Quantum Principles (Superposition and Measurement)
- Quantum Gates and Matrix Representations
- Bloch Sphere
- Separable and Entangled States
- Qiskit Hands-on
- Assignment 0 & Feedback 0

Module 1: Quantum Algorithms

- Bernstein Vazirani Algorithm
- Deutsch–Jozsa algorithm
- Grover's search algorithm
- Simon's algorithm
- Shor's factoring algorithm
- HHL algorithm
- Assignment 1 & Feedback 1

Module 2: Quantum Cryptography

- Quantum Teleportation
- Superdense Coding
- Quantum Key Distribution
- Assignment 2 & Feedback 2

Module 3: Advanced Topics

- Quantum Error Correction (NISQ Model)
- Variational quantum eigensolver (VQE)
- Quantum Approximate Optimization Algorithm (QAOA)
- Quantum Machine Learning
- Project Discussion and Allotment