ALEQCG

جامعة الإسكندرية
ALEXANDRIA UNIVERSITY
Faculty of Science

CERTIFICATE OF ATTENDANCE

Awarded to

Louay Hesham Saber Mohamed Morsi, Alexandria University

For the successful completion of AlexU-QCSS19: Alexandria Quantum Computing Summer School 2019, Organized by AleQCG: Alexandria Quantum Computing Group.

Held At Faculty of Science, Alexandria University on 14-20 July 2019.

Topics:

1. Introduction to Quantum Computing
Historical Background-Why Quantum Computing?-Speed up by Quantum Algorithms-Quantum Computer Science - Essential Mathematical Topics-Quantum Computer in Industry.

2. Basics of Quantum Computing
Linear Algebra for QC-Qubit and Dirac Notations-Superposition-Entanglement-Measurements.

3. Quantum Circuits
Quantum circuit model-Quantum gates-Quantum truth table-Boolean quantum circuits-Quantum Simulation.

4. Reversible Computing
Why Reversible Computing?-Reversible vs. Irreversible Operations-Group Theory for QC-How can we use reversible Computer?-Reversible Gates-Reversible Circuits-Optimizing Reversible Circuits.

5. Quantum Communication and Cryptography
Quantum teleportation-Quantum dense coding-Quantum public key distribution

6. Quantum-dot Cellular Automata (QCA)
Basics of QCA-QCA Wires-QCA Clocking-QCA Logic Gates-QCA Circuits-QCA Fault Tolerant-QCA Designer Tool.

7. Quantum Error Correction
Classical Error Correction-Quantum Error Correction (QEC)-Challenges in QEC-General Quantum Errors-Shor's Code Algorithm.

8. Quantum Algorithms
Quantum States Marking Techniques-Deutsch algorithm-Deutsch– Jozsa algorithm-Bernstein-Vazirani Algorithm-Grover's Quantum Search Algorithm.

9. Introduction to Quantum Information Theory
Classical Information Theory- Quantum Information Theory-Two Way Communication using a Single Photon.

10. Quantum State Tomography using IBMQ
What is Quantum State Tomography-How to calculate QST using IBMQ-5qubit-Case Study on QST-Entanglement measures as an alternative for QSTs.

11. Quantum Machine Learning
Physics: Computational models in Quantum Computing. "Discrete, Continuous"-Definition of a Qumode-Historical Background about the Continuous Variable (CV) model-Have we achieved a real Photonic Quantum Computer? - Software Modelling and Applications: Xanadu's software packages. Descriptive examples of using both Strawberry Fields and Pennylane. Quantum Machine Learning (QML) using the CV model: What is ML? And what is Quantum to ML? -Historical background about the subject-Demonstrating two groundbreaking ideas using the CV model in QML.

Ahmed Younes

Prof. Dr. Ahmed Younes
Professor of Quantum Computing
Leader of AleQCG, Faculty of Science
Alexandria University

Prof. Dr. Amany Abdel-Hamid Ismael
Acting Dean of Faculty of Science
Alexandria University