ITEC (2022-2023)

TRAINING PROGRAMME IN

QUANTUM COMPUTING AND INFORMATION SCIENCE

1	Name of the Institute	Centre for Development of Advanced Computing, Mohali
2	Name of the Course	Training Programme in Quantum Computing and Information Science
3	Proposed Dates and Duration of the Course in week	17th October – 25th November, 2022 6 Week(s)
4	Mode of Training	Offline
5	Start date	17th October, 2022
6	End date	25th November, 2022
7	Eligibility Criteria for Participants:	
	A. Educational Qualification	Technical Graduate with knowledge of:- -Basic electronics, Programming languages preferably python, Matrix Algebra, and brief understanding of quantum mechanics is helpful but not mandatory.
	B. Work Experience	As per MEA guidelines
	C. Age Limit	As per MEA guidelines
	D. Target group (Level of participants and target ministry/department etc. may be identified)	Government officials, Faculty members, Programmers
8	Aims & Objectives of the Course	• To make the participants understand what quantum computers can do and how they work. • To impart knowledge about typical quantum use cases/applications. • To introduce the participants to Quantum Mechanics & Linear Algebra. • To impart understanding about quantum bits, quantum logic gates, and quantum algorithms etc. • To introduce the participants to quantum circuit simulator and python based software environment
9	Details / Content of the Course (please attach detailed Course Profile)	**The course content are :** • **Introduction to Quantum Computing** History of Quantum Computation &

		Quantum information Science, Applications & Use cases, Quantum Computing Vs. Classical Computing, Superposition & Entanglement principles, QubitTechnologies, circuit composer/Qkit, Quantum Information Science Kit (QISKIT), CIRQ Quantum Framework
		• **Introduction to Python Programming**
		Overview, Features, Installation, Data types, Strings, Operators & Expressions etc., Control Flow Instructions, Data Structures: Lists, Dictionaries, Tuples etc., Functions & Modules, Python Standard Library & External Packages, Object Oriented concepts: Classes, Methods, Inheritance, Overriding etc.
		• **Quantum Mechanics & Linear Algebra**
		State space, evolution, quantum measurement, distinguishing quantum states, projective measurements, phase, composite system, Linear operators and matrices, The Pauli matrices, inner products, Eigenvectors and eigenvalues, Adjoints and Hermitian operators, Tensor products, operator functions etc.
		• **Quantum Gates & Circuits**
		Single/Multiple Qubit Gates, Quantum Circuits, Bell states, Quantum teleportation, Quantum phase estimation.
		• **Quantum Algorithms**
		Simon's algorithm, Bernstein-Vazirani algorithm, Quantum Fourier Transform, Grover's algorithm, Shor's Algorithm etc.
		• **Project**
10	Mode of Evaluation of Performance of the ITEC Participant	Viva voce / PPTs/Practical