भारतीय प्रौद्योगिकी संस्थान तिरुपति
TIRUPATI

INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
भारतीय प्रौद्योगिकी संस्थान तिरुपति
Yerpedu-Venkatagiri Road, Yerpedu Post, Chittoor District, Andhra Pradesh - 517 619

1.	Title of the course	Basics of Quantum Computing
2.	Course number	PH515L
3.	Structure of credits (L-T-P-C)	3-0-0-3
4.	New course/modification to	New
5.	To be offered by	Physics
6.	Prerequisite	CoT
7.	**Course Objective(s):** To apply quantum theory to describe concepts in quantum computing such as qubits and entanglement. To discuss concepts of quantum measurement, algorithms, circuits, computers, and information processing.	
8.	**Course Content:** Introduction: linear algebra for matrix mechanics, quantum mechanics, Python 3; Basic Concepts: qubits, one and two-qubit gates, entanglement, measurement; Algorithms: Quantum algorithms, complexity classes, quantum computing software landscape, adiabatic quantum computation; Quantum Computers: Light-matter interactions for a 2-level system, anharmonic simple harmonic oscillator, Jaynes-Cummings Hamiltonian; Quantum Information: Qubit implementation for information processing using cold atoms, molecules, quantum dots, superconducting circuits, trapped-ions, photon, nuclear spin ensemble based on DiVincenzo criteria, state initialization, state determination using tomography, coherence time, gate operations, static qubit to flying qubit, efficiency, and fidelity.	
9.	**Textbook(s):** 1. Nielsen M A and Chuang I L, *Quantum Computation and Quantum Information*, Cambridge University Press (2010). 2. Kaye P, Laflamme R, and Mosca M, *An Introduction to Quantum Computing*, Oxford University Press (2007).	
10.	**Reference(s):** 1. Aaronson S, *Quantum Computing since Democritus*, Cambridge University Press (2013). 2. Yanofsky N S and Mannucci M A, *Quantum Computing for Computer Scientists*, Cambridge University Press (2008).	