

1.	Title of the course	Introduction to Quantum Science and Technology
2.	Course number	PH105L
3.	Structure of credits (L-T-P-C)	2-1-0-3
4.	New course/modification to	New
5.	To be offered by	Physics
6.	Prerequisite	None
7.	Course Objective(s): To formulate the basics of quantum mechanics required for engineering and technological applications. To develop a strong foundation of fundamentals in microscopic understandings of chemical bonding, molecular spectroscopy, quantum information science and quantum computation with a real-life applications.	
8.	Course Content: Introduction: importance of quantum mechanics, evolution of quantum mechanics in science and technology; Formalism: state vectors, operators, Dirac notation, eigen spectrum, dynamics, measurement and Born rule, Schrodinger equation for a particle in simple potentials and engineered potentials, tunneling, quantum harmonic oscillators, particle on a ring and sphere, hydrogen atom, quantum numbers, orbitals and electron spin; Chemical bonding: Born-Oppenheimer approximation, bonding and anti-bonding molecular orbitals, bond order and bond length, electronic structures of a few diatomic and conjugated molecules; Molecular spectroscopy: fundamentals of light-matter interaction, principles of rotational, vibrational and electronic spectroscopy; Quantum computation and quantum information technology: quantum supremacy, single and two qubits, quantum entanglement, quantum teleportation, quantum gates and Deutsch-Jozsa algorithm, quantum key distribution.	
9.	Textbook(s): 1. McQuarrie D A and Simon J D, Physical Chemistry: A Molecular Approach, University Science Books (1997). 2. David Miller, Quantum Mechanics for Scientists and Engineers, Cambridge University Press (2008)	
10.	Reference(s): 1. Levine I N, Quantum Chemistry, Pearson (2016). 2. Griffiths D J, Introduction to Quantum Mechanics, 3rd Edition, Pearson (2013) 3. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information: 10th Edition (2010) 4. Atkins P W and de Paula J, Atkin's Physical Chemistry, Oxford University Press (2010)	