	National Institute of Technology Meghalaya An Institute of National Importance	CURRICULUM

Programme	**Bachelor of Technology**	Year of Regulation	**2019-20**
Department	**Physics**	Semester	**VI**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
PH 372	**Quantum Computing and Quantum Information**	**2**	**0**	**0**	**2**	**50**	**50**	**100**	**200**

Course Objectives		Course Outcomes		
	To review quantum spins associated to modern physics.		CO1	Able to review knowledge about quantum spins.
	To introduce classical and quantum computation.		CO2	Able to acquire knowledge about classical computation.
	To develop an ability and skill to physically realize quantum computers.		CO3	Able to acquire knowledge about quantum computation.
			CO4	Able to apply quantum algorithms in physical systems for quantum computation.

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2	CO2	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3	CO3	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4	CO4	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SYLLABUS

No.	Content	Hours	COs
I	**Foundations of Quantum Physics:** Postulates, Two state quantum system, Stern Gerlach Experiment, Pauli Matrices.	**3**	**CO1**
II	**Classical Computation :** Classical computation and Classical information, Shannon entropy, classical computers and gates, computational complexity	**3**	**CO2**
III	**Quantum Computation:** Qubit Representation, Single Qubit Gates, Multiple Qubit Gates, Quantum Circuits, Bell States, Quantum Teleportation.	**6**	**CO3**
IV	**Quantum Algorithms:** Quantum algorithms, Quantum information theory, Quantum Cryptography.	**6**	**CO3**
V	**Physical Systems :** Physical realizations of quantum computers, quantum error correction, cavity based quantum computing.	**6**	**CO4**
	Total Hours	**24**	

Essential Readings

1. M. A. Nielsen and I. A. Chuang, “Quantum Computation and Quantum Information”, 1E, Cambridge University Press, New Delhi, 2002.

Supplementary Readings

1. Lajos Diosi , “A Short Course in Quantum Information Theory”, Springer, Berlin, Heidelberg, 2011.

2. R. P. Feynman , R. B. Leighton, and M. Sands, “The Feynman Lectures on Physics”, vol.3, Addison Wesley/Narosa, New Delhi, 1998.

3. R. P. Feynman, R. W. Allen, and T. Hey, “The Feynman Lectures on Computation”, Westview Press/Perseus Book Group, 1999