GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology			Branch/Spec.	Electronics and Communication Engineering
Semester	VII			Version	1.0.0.0
Effective from Academic Year	2026-27			Effective for the Batch admitted in	July 2023
Course Code	2EC71PE07	Course Name		Quantum Computing	

Teaching Scheme						Examination Scheme(Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites

Linear Algebra, Probability Theory.

Course Outcomes

On successful completion of the course, the students will be able to:

CO1	Model quantum systems using qubits and quantum states.
CO2	Apply quantum gates and measurements to solve computational problems.
CO3	Develop the digital circuits using qiskit simulator.
CO4	Implement simple quantum algorithms using simulators.

Theory Syllabus

Unit	Content	Hrs.
1	**Fundamentals of Quantum Mechanics:** Global perspectives, history of quantum computation, Qubits and quantum states, qubit sets, qubit circuits, vector spaces, basis, dimension, inner product and orthogonality,	09
2	**Quantum Operators and Measurements**: Linear operators and observables, Pauli matrices and quantum gates, Eigenvalues and eigenvectors, Hermitian and unitary operators, Projective measurements, Expectation values, Density operators: pure and mixed states.	09
3	**Multi-Qubit Systems and Entanglement:** Tensor product of states and operators, Composite quantum systems, Quantum entanglement, Bell states and Bell inequalities, Schmidt decomposition, No-cloning theorem, Quantum teleportation and super-dense coding.	09
4	**Quantum Algorithms and Quantum Circuits:** Quantum logic gates, Universal gate sets, Quantum circuits and circuit model, Deutsch and Deutsch–Jozsa algorithm, Grover's search algorithm, Overview of Shor's factoring algorithm, Complexity comparison with classical algorithms.	09
5	**Quantum Communication and Programming**: Quantum channels and noise, Introduction to quantum error correction, IBM Quantum Experience (IBMQ), Qiskit, Quantum programming using simulators, Basic quantum experiments and measurements.	09

Practical Content

Practical assignments are based on the above syllabus.

Text Books

1	Quantum Computing Explained By DAVID McMAHON, Willey-IEEE Press.

Reference Books

1	Quantum Computation and Quantum Information, By M. A. Nielsen and I. L. Chuang**,** Cambridge

	University Press.
2	An Introduction to Quantum Computing, By Phillip Kaye, Raymond Laflamme, Michele Mosca**,** Oxford University Press.
3	Quantum Computation and Quantum Information, By M. A. Nielsen &I.Chuang, Cambridge University Press (2013).
4	Quantum Computing for Everyone, By Chris Bernhardt, The MIT Press,Cambridge, 2020
ICT/MOOCs Reference	
1	https://nptel.ac.in/courses/115/104/115104102/
2	https://nptel.ac.in/courses/106/106/106106167/

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	0	0	0	0	1	0	2	2	1	1
CO2	3	3	3	2	2	0	0	0	1	1	1	2	1	2	2
CO3	2	2	1	2	1	0	0	0	0	1	0	2	2	1	1
CO4	3	1	2	2	1	0	0	0	0	1	0	3	1	2	2