



BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE (A)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
BR25 M.TECH CSE COURSE STRUCTURE AND SYLLABUS

II Semester	INTRODUCTION TO QUANTUM COMPUTING (D252BA03)	L	T	P	C
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Course Objectives: The main objectives of the course are to

- Introduce fundamental concepts of quantum mechanics and its mathematical formalism.
- Explore quantum computing and communication principles and technologies.
- Understand the physical implementation and limitations of quantum systems.
- Enable student store late quantum theory to practical applications in computing, cryptography, and sensing.
- Familiarize students with the emerging trends in quantum technologies

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level(K)#
CO1	Describe the Historical development of quantum theory and its relevance to Modern computing	K2
CO2	Define Qubits and Compare the Classical vs. quantum information	K4
CO3	Explain the Classical computing review and limitations	K3
CO4	Demonstrate the principles and techniques of Quantum error correction	K4
CO5	Discuss the working, applications and potential of Quantum sensors in real-world scenarios	K3

Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2			
CO2	2		3	3		
CO3	2		3	2		
CO4	3		3	3	2	1
CO5	2		2	2	3	2

Dr.N.Rama Krishnaiah, Professor of CSE,UCEK & Control of Examination JNTUK, Kakinada.	Dr.C.Krishna Mohan, Professor of CSE,IIT, Kandi, Hyderabad.	Dr.P.Radha Krishna, Professor of CWQSE,NI T, Warangal	Mr.Rajesh Bobburi Chief Operating Officer, HighQ Labs Private Limited, Rajahmundry	Dr.Lakshmi Haritha Medida, Associate Professor, R.M.K.Engineering College,Kavaraipettai,Tamilnadu	Dr.K.Srinivas, Professor & HoD Department of CSE, B.V.C.I.T.S, Batlapalem
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(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT-1	History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations	10Hrs
UNIT-2	Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)	12Hrs
UNIT-3	Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.	12Hrs
UNIT-4	Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm	12Hrs
UNIT-5	Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation	12Hrs
Total		58Hrs

*Note:

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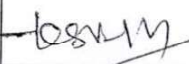
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Text Books:

1. Nielsen M.A., Quantum Computation and Quantum Information, Cambridge

Reference Books:

1. Quantum Computing for Computer Scientists by Noson S. Yan of sky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II
3. Basic Tools and Special Topics, World Scientific. Pittenger A.O., An Introduction to Quantum Computing Algorithms

					
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