

Branch Name:	Cyber Security
Program Code:	ET207
Course Title:	Introduction to Quantum computing Practical
Course Code:	2ET2070305P
Pre-requisite Course:	Programming knowledge and Linear Algebra, Prior knowledge of quantum mechanics

Course Objectives: The objective is to make the students aware about implementing various Quantum computing algorithms and acquainted them with different programming platforms of Quantum computing

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)					Evaluation Scheme (Marks)								
Credit	L	T	P	Total	Theory (Marks)				Practical (Marks)				Total (Marks)
					SEE		CCA		SEE		CCA		
					Min	Max	Min	Max	Min	Max	Min	Max	
1	-	-	2	2	-	-	-	-	10	25	10	25	50

Subject Contents:

Sr. No	Topic	Contact Hours
1	Write a program to implement Deutsch's algorithm Write a program to implement Deutsch's-Jozsa algorithm	4
2	Write a program to implement Shor factorization technique Write a program to implement Grover search technique	4
3	Prepare case study for any suitable application on quantum encryption methods for Cyber Prepare case study for any suitable application for Financial Modeling	4
4	Prepare case study for any suitable application for Traffic Optimization Prepare case study for any suitable application for Weather Forecasting and Climate Chnge	4
5	Prepare case study for any suitable application for Artificial Intelligence	2

List of Open Source Software/learning website:

- (1) <https://quantumcomputingreport.com/tools/>
- (2) <https://www.geeksforgeeks.org/introduction-quantum-computing/>
- (3) <https://thequantuminsider.com/introduction-to-quantum-computing/>
- (4) Courses by: Andrew Childs, Ronald de Wolf, and John Watrous on quantum theory and computing

References:

- (1) Quantum Computation and Quantum Information, M. A. Nielsen & I. Chuang, Cambridge University Press (2013).
- (2) Quantum Computing, A Gentle Introduction, Eleanor G. Rieffel and Wolfgang H. Polak MIT press (2014)
- (3) Quantum Computation and Quantum Information, M A Nielsen and I L Chuang, Cambridge University Press.
- (4) Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II: Basic Tools Special Topics, World Scientific.

- (5) An Introduction to Quantum Computing, Pittenger,
(6) An Introduction to Quantum Computing, P Kaye, R Laflamme and M Mosca. Linear Algebra and its Applications, G. Strang

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand Quantum computing Platforms	1 Remembering, 2 Understanding
CLO2	Implement the Deutsch's algorithm, Deutsch's-Jozsa algorithm,	3 Applying, 5 Evaluate
CLO3	Implement the Shor factorization, Grover search	2 Understanding, 3 Applying
CLO4	Perform the case study application on quantum encryption methods for Cyber, suitable application for Financial Modeling	2 Understanding, 3 Applying
CLO5	Perform the case study any suitable application for Artificial Intelligence	2 Understanding, 3 Applying, 4 Analyze

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	L	L	L	L	M	M						M	L	L		
CLO2	M	M	H	L	M	M						M	M	M		
CLO3	L	L	M	M	M	M						M	L	M		
CLO4	L	L	H	L	M	H						M	M	M	M	
CLO5	H	M	M	M	H	H						M	M	M	M	

H: High, M: Medium, L: Low