



**KAKATIYA INSTITUTE OF TECHNOLOGY AND SCIENCE,
WARANGAL**
MINOR IN COMPUTER SCIENCE AND ENGINEERING (MCS)

**URR24 CSE MINOR DEGREE CURRICULUM: QUANTUM
TECHNOLOGIES**

S.No	Course Code	Course Name	Credits
1	QT-01	Survey of Quantum Technologies & Applications	03
2	QT-02	Foundations of Quantum Technologies	03
3	QT-03	Quantum Laboratory & Programming using Qiskit and PennyLane	03
4	QT-04	Introduction to Quantum Computation & Algorithms	03
5	QT-05	Quantum Machine Learning & Hybrid AI Systems	03
6	QT-06	Quantum Hybrid Systems, Simulators & Industry Capstone	03
Total Credits			18

HANDS-ON

Students shall develop a simulation-based or application-oriented quantum technology project involving one or more of the following:

- I. Quantum Superposition, Entanglement & Quantum Gates
- II. Quantum Circuit Design using IBM Qiskit
- III. Quantum Algorithms (Deutsch-Jozsa, Grover's, Shor's)
- IV. Quantum Communication & Quantum Key Distribution (QKD)
- V. Quantum Sensing & Quantum Metrology Applications
- VI. Quantum Machine Learning using PennyLane
- VII. Variational Quantum Algorithms (VQE, QAOA)
- VIII. Hybrid Quantum-Classical AI Systems
- IX. Cloud Quantum Computing using IBM Quantum, Azure Quantum & Amazon Braket
- X. Quantum Error Mitigation & Fault-Tolerant Computing
- XI. Post-Quantum Cryptography
- XII. National Quantum Mission (NQM) Aligned Applications

Projects shall be maintained through GitHub and evaluated through demonstration, presentation, and technical report.

LEARNING PLATFORMS

- IBM Quantum & Qiskit
- Xanadu PennyLane
- Google Quantum AI (Cirq)
- Amazon Braket
- Microsoft Azure Quantum
- IBM Quantum Learning Platform
- NPTEL / SWAYAM
- QpiAI Quantum Learning Resources
- GitHub
- Python Ecosystem (NumPy, SciPy, PyTorch)

CERTIFICATIONS

- IBM Quantum
- IBM Qiskit
- Xanadu PennyLane
- Google Quantum AI
- Amazon Braket
- Microsoft Azure Quantum
- NPTEL Quantum Computing
- QpiAI Quantum Technologies

EVALUATION SCHEME

S. No.	Evaluation	Weightage/Marks
1	Internal Assessment	10
2	MSEs	30
3	Final Exam – 2 Projects (30 Marks each)	60
Total		100

Internal Assessment (10 Marks)

Average of the following three components:

S. No.	Evaluation	Marks
1	Quiz 1	10
2	Quiz 2	10
3	Interactive Animations / Demonstrations on Quantum Concepts	10
Total		10

MSE Evaluation

S. No.	Evaluation	Weightage/Marks
1	Percentage Completion of Assigned Courses/Certifications as per Schedule	10

2	Marks Obtained in Online Platforms (IBM Quantum, PennyLane, NPTEL etc.) converted to 20%	20
Total		30

Final Exam – 60 Marks (GitHub Repository Mandatory)

Group Project 1 – Given by Faculty Evaluated as Individual – 30 Marks

S. No.	Component	Marks
1	Communication & Presentation Skills	10
2	Problem Understanding & Solution Design	10
3	Outcomes, Conclusion & Learnings	10
Total		30

Group Project 2 – Selected by Students Evaluated as Group – 30 Marks

S. No.	Component	Marks
1	Problem Identification & Solution Design	10
2	Teamwork & Project Execution	10
3	Outcomes, Conclusion & Learnings	10
Total		30