

**School of Computer and Systems Sciences**  
**Jawaharlal Nehru University, New Delhi - 110067**

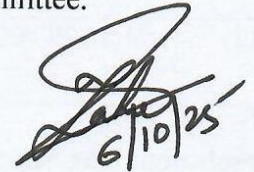
**MINUTES OF THE SPECIAL COMMITTEE WHOSE AGENDA WAS CIRCULATED  
VIA EMAIL ON OCTOBER 1, 2025 FOR CONSIDERATION AND APPROVAL  
THROUGH CIRCULATION**

**AGENDA 7:** To consider and approve the addition of the following two courses, as electives, in the curriculum of the M. Tech in Computer Science & Technology(CST) and M. Tech in Data Science(DS) (Syllabus attached as **Annexure-B**)

Sl. No.	Course Name	Programme	Course Credit	Proposed by
1.	Quantum Computing and Its Applications	M.Tech(CST & DS)	3	Dr. Karan Singh
2.	Quantum Security and Post Quantum Cryptography	M.Tech (CST & DS)	3	Dr. Karan Singh

**Resolution:** The Special Committee of SC&SS resolved to approve the above.

The Chairperson expresses sincere thanks to all the members of the Special Committee.



(Prof. Zahid Raza)  
Dean

## QUANTUM COMPUTING AND ITS APPLICATIONS

**Course Objectives:** This course provides a foundation for quantum computing, Cryptography and quantum Programming.

**Syllabus:** Fundamentals of Quantum Computing, Linear Algebra, Vectors, Vector space, Inner product, Complex Number, Qubits, Introduction to quantum mechanics and its relevance to Quantum gates, superposition principle, and entanglement Quantum parallelism and interference, No cloning theorem, quantum teleportation, Quantum Architectures, Quantum Algorithms, Quantum Cryptography, Quantum Programming, Quantum Applications.

### Reference Books and Readings:

1. Thomas G. Wong, "Introduction to Classical and Quantum Computing" Rooted Grove, Omaha, Nebraska, 2022
2. Noson S. Yanofsky and Mirco A. Mannucci. Quantum computing for computer scientists. Cambridge University Press, 2008.
3. Douglas R. Stinson and Maura B. Paterson. Cryptography, Theory and Practice, CRC Press, 2019.
4. Santanu Pattanayak. Quantum Machine Learning with Python: Using Cirq from Google Research and IBM Qiskit. Apress, 2021.

## QUANTUM SECURITY AND POST QUANTUM CRYPTOGRAPHY

**Course Objectives:** This course provides a foundation for Cryptography, post Quantum Cryptography and quantum Security

**Syllabus:** Fundamental of Security, Prime Number, Ring, Field, Multiplicative Inverse, Confidentiality, Integrity, Authentication, RSA, ECC, Digital Signature, Diffi-Hallman, Cryptography hash Algorithm, Post-Quantum Security, lattice based and Multivariate Cryptography, Kyber algorithm, Deutsch-Jozsa algorithm, Simon's algorithm, Bernstein-Vazirani, factorization attack on RSA, Shor's algorithm for integer factorization, Grover's algorithm for unstructured search, Hash preimage attack with Grover's algorithm, Quantum Fourier transform and its applications, Harrow-Hassidim-Lloyd (HHL) algorithm, Quantum attack resistant Digital Signatures, Programming of Quantum cryptography.

### Reference Books and Readings:

1. Douglas R. Stinson and Maura B. Paterson. Cryptography, Theory and Practice, CRC Press, 2019.
2. Thomas Vidick, "Introduction to Quantum Cryptography" California Institute of Technology, USA, Stephanie Wehner, Delft University of Technology, The Netherlands, 2023
3. Santanu Pattanayak. Quantum Machine Learning with Python: Using Cirq from Google Research and IBM Qiskit. Apress, 2021.