

Regulations for Minor in Quantum Technologies

Preamble:

The minor program (for B.Tech. students) is designed to enable a student with foundational knowledge in quantum computing and quantum technologies, thus providing them with the opportunity to join the global workforce in several aspects of quantum computing.

A B.Tech. student can earn a minor certification in Quantum Technologies by completing at least 20 credits. Of these, 16 credits should be from courses specified below and at least 4 credits from project or self-study courses as explained below. Credits that are counted towards the minor program cannot be counted towards the discipline credit of the graduation requirements of the respective programs of the students.

The Minor Program is owned and managed by the Department of Electronics and Communication (ECE).

Course_bucket_1: 12 credits should be earned from these core courses:

- ECExxx Quantum mechanics
- CSE422/CSE622 Introduction to quantum computing
- ECE524 Quantum materials and devices
- ECE545 Photonics: fundamentals and applications
- MTHxxx Quantum information theory

Course_bucket_2: 4 credits should be earned from these options:

- ECExxx Quantum communication and networks
- CSExxx Quantum and post-quantum cryptography
- ECE517 Introduction to Nanoelectronics
- ECE501 Information Theory
- MTH514 Coding theory
- CSE526 Lattices in Computer Science
- Advanced Solid State Devices
- Approved online courses, along with a mandatory proctored exam component, specific to quantum technologies as given below. (The existing rules of OC apply)
 - Quantum Technology and Quantum Phenomena in Macroscopic Systems
https://onlinecourses.nptel.ac.in/noc22_ph15/preview
 - Quantum Transport:
<https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-ph17/>
 - Advanced Quantum Mechanics with Applications:
<https://archive.nptel.ac.in/courses/115/103/115103104/>
 - Any new addition to NPTEL course list on relevant topics, subject to the approval of program coordinator.

Project/Self-study courses: 4 credits can be earned from Independent Study (IS), Independent Project (IP), Undergraduate Research (UR), or 8 to 12 credits can be earned from a B.Tech. project (BTP). Students have to pursue at least one of these options. The program coordinator and the BTP advisor has

to certify that the project/course is on a relevant topic. Students are encouraged to take up such projects in collaboration with the quantum technology industries in India and abroad.

Prior knowledge: This minor program requires inter-disciplinary skills and is only intended for students with a strong background in calculus, linear algebra and probability theory.

Benchmarking: A Minor program in quantum information and similar fields is not yet very common in India, or even worldwide. Wherever they are offered, they require about 4-6 courses along with a project. We have tried to retain that flavour with suitable adjustments added keeping in mind our current course offering.

Sequencing: This is the recommended sequence of courses.

Year	Monsoon	Winter
3rd	<ul style="list-style-type: none">• Quantum mechanics• Quantum materials & devices• Electives	<ul style="list-style-type: none">• Introduction to quantum computing• Electives
4th	Elective/Self-study/project courses	Elective/Self-study/project courses

Change History:

First version (AY 2022-23)

March 2023, release