

Syllabi of the courses for M. Tech. in Quantum Information & Technology

Table 1: First Semester

| Sl. No. | Course Name | Code | Type | Credit | Hours |
|----------------------|---|------|------|-----------|--------------|
| | | | | | L-T-P-S |
| 1. | Mathematical Methods for Quantum Technologies | | PCC | 4 | 3-2-0-0 |
| 2. | Quantum Mechanics | | PCC | 4 | 3-2-0-0 |
| 3. | Nanoelectronic Devices | | PCC | 4 | 3-0-2-0 |
| 4. | Programming for Quantum Technologies | | PCC | 3 | 2-0-2-0 |
| 5. | Tools for Research | | ELC | 2 | 2-0-0-0 |
| Total Credit: | | | | 17 | 21 Hrs./week |

Table 2: Second Semester

| Sl. No. | Course Name | Code | Type | Credit | Hours |
|----------------------|--------------------------------------|------|------|-----------|-------------|
| | | | | | L-T-P-S |
| 1. | Quantum Computation Essentials | | PCC | 4 | 3-1-0-0 |
| 2. | Quantum Information & Communication | | PCC | 4 | 3-1-0-0 |
| 3. | Classical & Quantum Machine Learning | | PCC | 4 | 3-0-2-0 |
| 4. | Quantum Materials | | PCC | 3 | 2-0-2-0 |
| 5. | Quantum Technology Lab | | PCC | 2 | 0-0-4-0 |
| Total Credit: | | | | 17 | 21Hrs./week |

- *** Hours to be read as Credit hours**

EXIT: After the end of the second Semester, after clearing all the papers, the M. Tech student may be eligible for a PG Diploma in Quantum Information & Technology. However, these students have to secure an **additional 4**

credits from the summer semester to be awarded a PG diploma, which is mandatory. For regular M. Tech students, there is no need for the summer semester.

Table 3: Exit Option- Summer Semester (for awarding PG-Diploma)

| Sl. No. | Course Name | Code | Type | Credit | Hours |
|----------------------|--------------------------------|------|------|----------|-------------|
| | | | | | L-T-P-S |
| 1. | Summer Project | | ELC | 2 | 0-0-4-0 |
| 2. | Quantum Error Correcting Codes | | PCCA | 2 | 2-0-0-0 |
| Total Credit: | | | | 4 | 6 Hrs./week |

Table 4: Third Semester

| Sl. No. | Course Name | Code | Type | Credit | Hours |
|----------------------|----------------------|------|------|-----------|-----------------|
| | | | | | L-T-P-S |
| 1. | Quantum Cryptography | | PCC | 4 | 3-1-0-0 |
| 2. | Program Elective I | | PEC | 3 | 3-0-0-0 |
| 3. | Program Elective II | | PEC | 3 | 3-0-0-0 |
| 4. | Project (Minor) | | ELC | 6 | 0-0-12-0 |
| Total Credit: | | | | 16 | 22 hrs/per week |

Table 5: Fourth Semester

| Sl. No. | Course Name | Code | Type | Credit | Hours |
|----------------------|-------------|------|------|-----------|--------------|
| | | | | | L-T-P-S |
| 1 | Thesis | | ELC | 14 | 0-0-28-0 |
| Total Credit: | | | | 14 | 28 Hrs./week |

Table 6: Electives basket- I
Quantum Information & Computing

| Sl. No. | Course Name | Code | Type | Credit | Hours |
|---------|-------------------------------------|------|------|--------|---------|
| | | | | | L-T-P-S |
| 1. | Quantum Algorithms in the NISQ era | | PEC | 3 | 3-0-0-0 |
| 2. | Quantum-safe Cryptography | | PEC | 3 | 3-0-0-0 |
| 3. | Advanced Quantum Information Theory | | PEC | 3 | 3-0-0-0 |
| 4. | Quantum Error Correcting Codes | | PEC | 3 | 3-0-0-0 |
| 5. | Advanced Quantum Computation | | PEC | 3 | 3-0-0-0 |
| 6. | Quantum Computing in Biology | | PEC | 3 | 3-0-0-0 |

Table 7: Electives basket- II
Quantum Science & Technologies

| Sl. No. | Course Name | Code | Type | Credit | Hours |
|---------|--------------------------------------|------|------|--------|---------|
| | | | | | L-T-P-S |
| 1. | Quantum Thermodynamics | | PEC | 3 | 3-0-0-0 |
| 2. | Quantum Optics | | PEC | 3 | 2-2-0-0 |
| 3. | Quantum Measurement and Sensing | | PEC | 3 | 3-0-0-0 |
| 4. | Photonics | | PEC | 3 | 2-0-2-0 |
| 5. | Spintronics | | PEC | 3 | 2-0-2-0 |
| 6. | Open Quantum Systems | | PEC | 3 | 3-0-0-0 |
| 7. | Quantum Many Body Physics | | PEC | 3 | 3-0-0-0 |
| 8. | Condensed Matter Physics | | PEC | 3 | 3-0-0-0 |
| 9. | Semiconductor Technology and Devices | | PEC | 3 | 2-0-2-0 |
| 10. | Black Holes and Quantum Information | | | | |

More electives may be offered from time to time as approved by the competent authority. Students can also register to courses at NPTEL or SWAYAM portal subject to approval of the competent authority.