# ACADEMIC CURRICULA

# POST GRADUATE DEGREE PROGRAMMES

## Master of Technology

**(Choice Based Flexible Credit System)**

**Regulations 2021**

**Volume – 21 Curriculum**

SRM INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University u/s 3 of UGC Act, 1956)


**SRM INSTITUTE OF SCIENCE AND TECHNOLOGY**

**(Deemed to be University u/s 3 of UGC Act, 1956)**

Kattankulathur, Chengalpattu District 603203,

Tamil Nadu, India

# 43. M.Tech in Nanotechnology

**43. (a) Department Vision Statement**

| | |
|---|---|
| Stmt - 1 | *To evolve as a world-class hub in Physics and Nanotechnology to meet the rapidly changing global scientific and technological needs for societal development.* |

**43. (b) Department Mission Statement**

| | |
|---|---|
| Stmt - 1 | *To impart quality education both in theory and experiment with state-of-the-art infrastructure to develop scientific temper in young minds.* |
| Stmt - 2 | *To carry out multidisciplinary research of fundamental and technological importance by partnering with leading global institutions and industries.* |
| Stmt - 3 | *To develop various skill sets and translate scientific ideas into product innovations to enhance the employability and serve the society.* |

**43. (c) Program Education Objectives (PEO)**

| | |
|---|---|
| PEO - 1 | *Develop strong background in nanoscience and nanotechnology by employing the scientific concepts for higher-level understanding of the matter at the nanoscale* |
| PEO - 2 | *Employ critical thinking, analytical problem-solving skills in the basic and applied areas of nanotechnology using state of the art tools.* |
| PEO - 3 | *Prepare students to work effectively in diverse teams in both class-room and laboratory with integrated, cross-disciplinary scientific knowledge and professional skills.* |
| PEO - 4 | *Equip the students with professional, scientific and computational skills for employment opportunities and self-empowering them to create job opportunities and entrepreneurships* |
| PEO - 5 | *Appreciate the need for engaging independent and life-long learning in the broadest context of technological changes and operate within the regulatory framework.* |

**43. (d) Consistency of PEO's with Mission of the Department**

| | Mission Stmt. - 1 | Mission Stmt. - 2 | Mission Stmt. - 3 |
|---|---|---|---|
| PEO - 1 | *3* | *3* | *3* |
| PEO - 2 | *3* | *3* | *3* |
| PEO - 3 | *3* | *3* | *3* |
| PEO - 4 | *3* | *3* | *3* |
| PEO - 5 | *3* | *3* | *3* |

**43. (e) PO – Program Outcomes**

| | |
|---|---|
| PO - 1 | *An ability to independently carry out research /investigation and development work to solve practical problems.* |
| PO - 2 | *An ability to write and present a substantial technical report/document.* |
| PO - 3 | *Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.* |

**43. (f) Consistency of PEO's with Program Outcomes (PO)**

| | Program Outcomes (PO) | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| PEO - 1 | *3* | *3* | *2* |
| PEO - 2 | *3* | *3* | *2* |
| PEO - 3 | *3* | *3* | *2* |
| PEO - 4 | *3* | *3* | *3* |
| PEO - 5 | *3* | *3* | *3* |

3 – High Correlation, 2 – Medium Correlation, 1 – Low Correlation

**43. (g) Programme Structure: M.Tech in Nanotechnology**

**Professional Core Courses (C)**

| Course Code | Course Title | Hours/ Week L | T | P | C |
|---|---|---|---|---|---|
| 21NTC501T | Quantum Mechanics | 3 | 0 | 0 | 3 |
| 21NTC502J [2] | Nanoscale materials: Synthesis and Characterization | 3 | 0 | 2 | 4 |
| 21NTC503J | Nanoscale Science in Biological Systems | 3 | 0 | 2 | 4 |
| 21NTC504J [2] | Physics and Chemistry of Nanomaterials | 3 | 0 | 2 | 4 |
| 21NTC505J | Spectroscopic Techniques of Nanomaterials | 3 | 0 | 2 | 4 |
| 21IPC501J [2] | Research Methodology | 2 | 1 | 2 | 4 |
| 21NTC601T [1] | Case Studies | 3 | 0 | 0 | 3 |
| **Total Credits** | | | | | **26** |

**Project Work, Internship In Industry / Higher Technical Institutions (P)**

| Course Code | Course Title | Hours/ Week L | T | P | C |
|---|---|---|---|---|---|
| 21NTP501L | Specialization Project | 0 | 0 | 40 | 20 |
| | (OR) | | | | |
| 21NTP502L | Specialization Project | 0 | 0 | 30 | 15 |
| 21NTP503L | Domain Internship | 0 | 0 | 10 | 5 |
| **Total Credits** | | | | | **20** |

**Assessment by Open Book Examination ([2])**

| Course Code | Course Title | Hours/ Week L | T | P | C |
|---|---|---|---|---|---|
| 21NTC502J [2] | Nanoscale materials: Synthesis and Characterization | 3 | 0 | 2 | 4 |
| 21NTC504J [2] | Physics and Chemistry of Nanomaterials | 3 | 0 | 2 | 4 |
| 21IPC501J [2] | Research Methodology | 2 | 1 | 2 | 4 |

**100% assessment by the Department ([1])**

| Course Code | Course Title | Hours/ Week L | T | P | C |
|---|---|---|---|---|---|
| 21NTC601T [1] | Case Studies | 3 | 0 | 0 | 3 |
| 21NTE600T [1] | Journal Publication | 0 | 0 | 0 | 3 |

**Professional Elective Courses (E)**
***(7 Course only)***

| Course Code | Course Title | Hours/ Week L | T | P | C |
|---|---|---|---|---|---|
| 21NTE509T | Carbon Nanotechnology | 3 | 0 | 0 | 3 |
| 21NTE502T [3] | Vacuum and Thin Film Technology | 3 | 0 | 0 | |
| 21NTE506T | 2D Layered Materials | 3 | 0 | 0 | 3 |
| 21NTE501T [3] | Solid State Nanofabrication | 3 | 0 | 0 | |
| 21NTE504T | Nanotoxicology | 3 | 0 | 0 | |
| 21NTE507T [3] | Micro/nano Systems and Sensors | 3 | 0 | 0 | 3 |
| 21NTE505T | Nanoelectronics | 3 | 0 | 0 | |
| 21NTE503T | Nanoscale Magnetic Materials and Devices | 3 | 0 | 0 | 3 |
| 21NTE508T [3] | Industrial applications of Nanotechnology | 3 | 0 | 0 | |
| 21NTE601T | Modelling and Computation | 3 | 0 | 0 | 3 |
| 21NTE602T | Tissue Engineering and Regenerative Medicine | 3 | 0 | 0 | |
| 21NTE603T | Nanophotonics | 3 | 0 | 0 | 3 |
| 21NTE604T | Nano Tribology | 3 | 0 | 0 | |
| 21NTE605T | Nanocomposites | 3 | 0 | 0 | |
| 21NTE600T[1] | Journal Publication | 0 | 0 | 0 | |
| 21NTE606T [3] | Nanotechnology in Energy Conversion and Storage | 3 | 0 | 0 | 3 |
| 21NTE607T | Nanomaterials for Electrochemical Storage Technology | 3 | 0 | 0 | |
| **Total Credits** | | | | | **21** |

**Open Elective Course (O)**

| Course Code | Course Title | Hours/ Week L | T | P | C |
|---|---|---|---|---|---|
| 21NTO601T | Composite Materials | 3 | 0 | 0 | 3 |
| **Total Credits** | | | | | **3** |

**Course Delivery by online mode ([3])**

| Course Code | Course Title | Hours/ Week L | T | P | C |
|---|---|---|---|---|---|
| 21NTE501T [3] | Solid State Nanofabrication | 3 | 0 | 0 | 3 |
| 21NTE502T [3] | Vacuum and Thin Film Technology | 3 | 0 | 0 | 3 |
| 21NTE507T [3] | Micro/nano systems and Sensors | 3 | 0 | 0 | 3 |
| 21NTE508T [3] | Industrial applications of Nanotechnology | 3 | 0 | 0 | 3 |
| 21NTE606T [3] | Nanotechnology in energy Conversion and Storage | 3 | 0 | 0 | 3 |

*All elective courses may be studied under MOOC platform*

*[1] 100% assessment by the Department*

*[2] Assessment by Open Book Examination*

*[3] Course Delivery through online mode*

**43. (h) Implementation Plan: M.Tech in Nanotechnology**

| Semester - I | | | | | |
|---|---|---|---|---|---|
| Code | Course Title | Hours/ Week | | | |
| | | L | T | P | C |
| 21NTC501T | Quantum Mechanics | 3 | 0 | 0 | 3 |
| 21NTC502J [2] | Nanoscale materials: Synthesis and Characterization | 3 | 0 | 2 | 4 |
| 21NTC503J | Nanoscale Science in Biological Systems | 3 | 0 | 2 | 4 |
| 21IPC501J [2] | Research Methodology | 2 | 1 | 2 | 4 |
| 21NTE509T | Carbon Nanotechnology | 3 | 0 | 0 | 3 |
| 21NTE502T [3] | Vacuum and Thin Film Technology | 3 | 0 | 0 | |
| **Total Credits** | | | | | **18** |

| Semester - II | | | | | |
|---|---|---|---|---|---|
| Code | Course Title | Hours/ Week | | | |
| | | L | T | P | C |
| 21NTC504J [2] | Physics and Chemistry of Nanomaterials | 3 | 0 | 2 | 4 |
| 21NTC505J | Spectroscopic Techniques of Nanomaterials | 3 | 0 | 2 | 4 |
| 21NTE506T | 2D Layered Materials | 3 | 0 | 0 | 3 |
| 21NTE501T [3] | Solid State Nanofabrication | 3 | 0 | 0 | |
| 21NTE504T | Nanotoxicology | 3 | 0 | 0 | |
| 21NTE507T [3] | Micro/nano Systems and Sensors | 3 | 0 | 0 | 3 |
| 21NTE505T | Nanoelectronics | 3 | 0 | 0 | |
| 21NTE503T | Nanoscale Magnetic Materials and Devices | 3 | 0 | 0 | 3 |
| 21NTE508T [3] | Industrial Applications of Nanotechnology | 3 | 0 | 0 | |
| **Total Credits** | | | | | **17** |

| Semester - III | | | | | |
|---|---|---|---|---|---|
| Code | Course Title | Hours/ Week | | | |
| | | L | T | P | C |
| | Open Elective | 3 | 0 | 0 | 3 |
| 21NTE601T | Modelling and Computation | 3 | 0 | 0 | 3 |
| 21NTE602T | Tissue Engineering and Regenerative Medicine | 3 | 0 | 0 | |
| 21NTE603T | Nanophotonics | 3 | 0 | 0 | 3 |
| 21NTE604T | Nano tribology | 3 | 0 | 0 | |
| 21NTE605T | Nanocomposities | 3 | 0 | 0 | |
| 21NTE600T [1] | Journal Publication | 0 | 0 | 0 | |
| 21NTE606T [3] | Nanotechnology in energy Conversion and Storage | 3 | 0 | 0 | |
| 21NTE607T | Nanomaterials for Electrochemical Storage Technology | 3 | 0 | 0 | 3 |
| 21NTC601T [1] | Case Studies | 3 | 0 | 0 | 3 |
| **Total Credits** | | | | | **15** |

| Semester - IV | | | | | |
|---|---|---|---|---|---|
| Code | Course Title | Hours/ Week | | | |
| | | L | T | P | C |
| 21NTP501L | Specialization Project | 0 | 0 | 40 | 20 |
| | (OR) | | | | |
| 21NTP502L | Specialization Project | 0 | 0 | 30 | 15 |
| 21NTP503L | Domain Internship | 0 | 0 | 10 | 5 |
| **Total Credits** | | | | | **20** |

*# Students must register either 21NTP501L or 21NTP502L and 21NTP503L both in fourth semester*

**43. (i) Program Articulation Matrix: M.Tech in Nanotechnology**

| Course Code | Course Name | Programme Outcomes | | |
|---|---|---|---|---|
| | | 1 | 2 | 3 |
| *21NTC501T* | *Quantum Mechanics* | *3* | *0.6* | *2.4* |
| *21NTC502J* | *Nanoscale materials: Synthesis and Characterization* | *3* | *1.8* | *1.2* |
| *21NTC503J* | *Nanoscale Science in Biological Systems* | *3* | *0.6* | *2.4* |
| *21NTC504J* | *Physics and Chemistry of Nanomaterials* | *3* | *2.4* | *0.6* |
| *21NTC505J* | *Spectroscopic Techniques of Nanomaterials* | *3* | *1.6* | *2.2* |
| *21NTC601T* | *Case Studies* | | | |
| *21NTE501T* | *Solid State Nanofabrication* | *3* | *1.8* | *2.6* |
| *21NTE502T* | *Vacuum and Thin Film Technology* | *2.4* | *0.8* | *1.8* |
| *21NTE503T* | *Nanoscale magnetic materials and devices* | *2.8* | *1* | *1.4* |
| *21NTE504T* | *Nanotoxicology* | *1* | *0.6* | *2.4* |
| *21NTE505T* | *Nanoelectronics* | *2* | *2.8* | *2.6* |
| *21NTE506T* | *2D layered materials* | *2.6* | *2.6* | *2.6* |
| *21NTE507T* | *Micro/nano systems and Sensors* | *3* | *3* | *2.4* |
| *21NTE508T* | *Industrial applications of Nanotechnology* | *2* | *2.8* | *2.8* |
| *21NTE509T* | *Carbon Nanotechnology* | *2.4* | *3* | *2* |
| *21NTE601T* | *Modelling and Computation* | *3* | *0.6* | *2.4* |
| *21NTE602T* | *Tissue Engineering and Regenerative Medicine* | *3* | *0.6* | *2.4* |
| *21NTE603T* | *Nanophotonics* | *2.4* | *1.8* | *1.8* |
| *21NTE604T* | *Nano tribology* | *3* | *3* | *0.6* |
| *21NTE605T* | *Nanocomposities* | *2.8* | *0.6* | *2.2* |
| *21NTE606T* | *Nanotechnology in energy Conversion and Storage* | *0* | *3* | *2* |
| *21NTE607T* | *Nanomaterials for Electrochemical Storage Technology* | *1.5* | *0* | *1.8* |
| *21NTE600T* | *Journal Publication* | | | |
| *21IPC501J* | *Research Methodology* | *3* | *2.6* | |
| | *Open Elective* | | | |
| *21NTP501L* | *Specialization Project* | | | |
| *21NTP502L* | *Specialization Project* | | | |
| *21NTP503L* | *Domain Internship* | | | |
| | **Program Average** | 2.76 | 2.38 | 2.58 |

3 – High Correlation, 2 – Medium Correlation, 1 – Low Correlation

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