DEPARTMENT OF NANOTECHNOLOGY

NORTHEASTERN HILL UNIVERSITY, SHILLONG

REVISED SYLLABUS

MASTER OF TECHNOLOGY (M.Tech.) IN NANOTECHNOLOGY



2022

Course Structure & Syllabus

 For

REVISED M.Tech. (NT) Program

Table of Contents

1. Objectives 5

2. Course Layout 6

3. Adopted Course Code 7

4. Course Structure of Semester I 8

5. Course Structure of Semester II 9

6. Course Structure of Semester III 41

7. Course Structure of Semester IV 11

8. Detail of Syllabus

**A. Ist semester Ist year**

i. NT-CC-500Introductionof Nanomaterials and Nanotechnology 13

ii. NT-CC-501 Nanomaterial Laboratory I 14

iii NT-DSEC-502

NT-DSEC-50201 Nanobiotechnology 15

 NT-DSEC-50202 Lithography and Nanofabrication 16

iv. NT-DSEC-503

NT-DSEC-50301Quantum Mechanics for Nanostructured systems 17

 NT-DSEC-50302Nanophotonics 18

v. NT-GEC-504

 Data Analysis of sophisticated instruments(Crystallography, microscopy

and Spectroscopy) 19

B. **IInd Semester Ist Year**

 i. NT-CC-505Mathematical Methods & Simulation for Engineers 21

 ii. NT-CC-506 Nanomaterial Laboratory II 22

 iii.NT-DSEC-507

 NT-DSEC-50701 Carbon Nanostructures and Application 23

 NT-DSEC-50702 Polymer and Nanocomposite 24

 NT-DSEC-50703 Optical Properties of nanostructured system 25

 iv. NT-DSEC-508

NT-DSEC-50801Electronics and Magnetic properties of Nanostructures 26

NT-DSEC-50802 Nanotechnology for Energy Devices 27

 v. NT-DSEC-509 Research Methodology & Proposal writing 28

 vi. NT-DSEC-510 Skill Enhancement Course (SEC)

[MOOCS I or Department course]

C. **IIIrd semester 2nd Year**

 i. NT-CC-600 Semiconductor And Nanodevices 31

ii.NT-CC-601Project Phase I 32

D. **IVth semester 2nd Year**

 i. NT-DSEC-606Project Phase II 33

 Objectives

This two years M.Tech. (NT) program aims to prepare candidates for research development as well as for future prospects of nanoscienceandnanotechnology. To provide the students stateofart knowledge of recent technologies and to develop their capacity to tackle unknown engineering problems, the syllabus has balanced the core, specialized and elective subjects, integrating the practical and field exercises with challenging research oriented project activities.

**Course Layout**

Course Composition: M.Tech. (NT)

Term Paper (11)

Theory (9)

Practical (2)

Project Phase I & II

Core Paper (5)

Elective (4)

Adopted Course Code

1. Subject coding for Core papers

XX -A B C

Subject number (however for the elective papers it is designated as XX-01,02,03 etc)

Paper designation (CC- Core Course, DSEC-Discipline specific Elective Course, etc.)

Paper code Yearly code (First Year-5, Second Year-6)

Department code

**COURSE STRUCTURE**

**TEACHING PROGRAMME FOR**

**M.TECH NANOTECHNOLOGY**

**Year: I Semester: I**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl. NO** | **Paper Code** | **Paper Name** | **Periods** | EVALUATION SCHEME | Total | Credits |
| **L** | **T** | **P** | Internal | ESE |
| **THEORY** | TA | CT | TOT |
| 1 | NT-CC-500 | Nanotechnology and Quantum Mechanics of Nanostructured systems | 4 | 0 | 0 | 10 | 15 | 25 | 75 | 100 | 4 |
| 2 | NT-CC-501 | Nanomaterial Laboratory I | 1 | 0 | 7 | 10 | 15 | 25 | 75 | 100 | 4 |
| 3 | NT-DSEC-502XX | Discipline Specific Elective Course (DSEC)-I | 3 | 0 | 1 | 10 | 15 | 25 | 75 | 100 | 4 |
| 4 | NT-DSEC-503XX | Discipline Specific Elective Course (DSEC)-II | 3 | 0 | 1 | 10 | 15 | 25 | 75 | 100 | 4 |
| 5 | NT-GEC-504 | Data Analysis of sophisticated instruments (Crystallography, microscopy and spectroscopy) | 4 | 0 | 0 | 10 | 15 | 25 | 75 | 100 | 4 |
|  |  | Total | 500 | 20 |

|  |  |  |
| --- | --- | --- |
| TA - Assessment by Teacher | CT - Class Test | ESE - End Semester Examination  |
| L - Lecture  | T – Tutorial  | P – Practical  |
| Contact Hours:300hrs | Total Marks: 500 | Total Credits: 20 |

**Discipline Specific Elective Course-I**

1. NT-DSEC-50201:Nanobiotechnology
2. NT-DSEC-50202: Lithography and Nanofabrication

**Discipline Specific Elective Course (DSEC)-II**

1. NT-DSEC-50302: Nanophotonics.
2. NT-DSEC-50303: Advanced Nanostructured Materials.

**Year: I Semester: II**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Paper Code** | **Paper Name** | **P/W** | EVALUATION SCHEME | Total | Credits |
| **L** | **T** | **P** | Internal | ESE |  |  |
| **THEORY** | TA | CT | TOT |  |  |  |
| 1 | NT-CC-505 | Mathematical Methods & Simulation for Engineers  | 4 | 0 | 0 | 10 | 15 | 25 | 75 | 100 | 4 |
| 2 | NT-CC-506 | Nanomaterial Laboratory II | 1 | 0 | 7 | 10 | 15 | 25 | 75 | 100 | 4 |
| 3 | NT-DSEC-507XX | Discipline Specific Elective Course (DSEC)-I | 3 | 1 | 0 | 10 | 15 | 25 | 75 | 100 | 4 |
| 4 | NT-DSEC-508XX | Discipline Specific Elective Course (DSEC)-II | 3 | 1 | 0 | 10 | 15 | 25 | 75 | 100 | 4 |
| 5 | NT-RM-509 | Research Methodology & Proposal Writing | 4 | 0 | 0 | 10 | 15 | 25 | 75 | 100 | 4 |
| 6 | NT-SEC-510 | Skill Enhancement Course (SEC) [MOOCS -I/Department course] | 4 | 0 | 0 | 10 | 15 | 25 | 75 | 100 | 4 |
|  |  |  |  Total | 600 | 24 |

|  |  |  |
| --- | --- | --- |
| TA- Assessment by Teacher | CT-Class Test | ESE -End Semester Examination  |
| L -Lecture  | T – Tutorial  | P – Practical  |
| Contact Hours: 360hrs | Total Marks: 600 | Total Credits: 24 |

|  |  |
| --- | --- |
| **Discipline Specific Elective Course-I** | **Discipline Specific Elective Course (DSEC)-II** |
| NT-DSEC-50701 | Carbon Nanostructures and Applications | NT-DSEC-50801 | Electronics and Magnetic properties of Nanostructures |
| NT-DSEC-50702 | Polymer and Nanocomposites | NT-DSEC-50802 | Nanotechnology for Energy Devices |
| NT-DSEC-50703 | Optical Properties of nanostructure system |  |  |

**Skill Enhancement Course:**

Department Course Courses from MOOCS- Related to Skill Development

1. NT-SEC-5101: Fabrication of Nanomaterials
2. NT-SEC-5101: Thin Film Technology

**Year: II Semester: III**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Paper Code** | **Paper Name** | **P/W** | EVALUATION SCHEME | Total | Credits |
| **L** | **T** | **P** | Internal | ESE |  |  |
| **THEORY/PROJECT** | TA | TOT |  |  |  |
| 1 | NT-CC-600 | Semiconductor and Nanodevices | 3 | 1 | 0 | 10 | 25 | 75 | 100 | 4 |
| 1 | NT-DSEC-602 | Project Phase I\*  | 0 | 0 | 30 | 125 | 125 | 375 | 500 | 20 |
|  |  | Total | 0 | 0 | 30 | 150 | 150 | 450 | 600 | 24 |

**\***Evaluation of Project Phase -I shall be a continuous assessment process comprising:

Dissertation(DSEC), Problem Identification and Review of Related Literature, Proposal writing and Presentation, Data Collection, Data analysis, Interpretation and discussion, Report Writing

|  |  |  |
| --- | --- | --- |
| TA- Assessment by Teacher | CT-Class Test | ESE-End Semester Examination  |
| L - Lecture  | T – Tutorial  | P – Practical |
| Contact Hours: 3000 | Total Marks: 600 | Total Credits: 24 |

**Year: II Semester: IV**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Paper Code** | **Paper Name** | **P/W** | EVALUATION SCHEME | Total | Credits |
| **L** | **T** | **P** | Internal | ESE |  |  |
| **THEORY/PROJECT** | TA | TOT |  |  |  |
| 1 | NT-DSEC-606 | Project Phase II\*  | 0 | 0 | 30 | 125 | 125 | 375 | 500 | 20 |
|  |  | Total | 0 | 0 | 30 | 150 | 150 | 450 | 600 | 20 |

**\***Evaluation of Project Phase -II shall be a continuous assessment process comprising:

Dissertation(DSEC), Problem Identification and Review of Related Literature, Proposal writing and Presentation, Data Collection, Data analysis, Interpretation and discussion, Report Writing

|  |  |  |
| --- | --- | --- |
| TA- Assessment by Teacher | CT-Class Test | ESE-End Semester Examination  |
| L - Lecture  | T – Tutorial  | P – Practical |
| Contact Hours: 300 | Total Marks: 600 | Total Credits: 20 |

|  |  |  |
| --- | --- | --- |
|  |  |  |

*\*\*Total Credit for M.Tech. in Nanotechnology is* ***88*** *credits.*