

## Michigan Technological University

### Interdisciplinary Minor in Nanoscale Science and Engineering (Nanotechnology)

Program Code IMNT, Academic Year 2023-24

Department of Physics

Total Credits Required: 18

#### Required Courses: 8 credits

- UN 2600 Fundamentals of Nanoscale Science and Engineering (2) *Prereqs: none*
- SS 3801 Science Technology & Society (3) *Prereqs: UN1015 and UN1025*
- Independent Study/Research/Co-op/Enterprise (3) *Must be nano-related and approved by the minor advisor*

#### Elective Courses: 10 credits

Choose at least six credits that are not in your major (as defined by the course prefix). Courses that are cross-listed with your major are considered as being in your major. At least six of the 10 credits must be taken at the 3000- or 4000- level.

\*Denotes an instrumentation-related course. Students are encouraged, though not required, to take at least one course related to instrumentation.

- BE 3800 Biomaterials II: Properties and Biological Interactions (3) *Prereqs: BE2700(C) and BE2800*
- BE 4300 Polymeric Biomaterials (3) *Prereqs: BE3800*
- BE 4330 Biomimetic Materials (3) *Prereqs: BE3350 and BE3800*
- BE 4335 Smart Polymers (3) *Prereqs: BE3350 and BE3800*
- BE 4670 Micro & Nano Technologies (3) *Prereqs: BE3700*
- BE 4700 Biosensors: Fabrication and Apps (3) *Prereqs: BE3700 and BE3701*
- BE 4800 Biomaterials Interfaces (3) *Prereqs: BE3800*
- BL 3020 Biochemistry I (3) *Prereqs: (BL1020 or BL1040 or BE2400) or (BL1200 and BL1210) or (BL1400 and BL1410) and (CH2410 or CH2420)*
- BL 4020 Biochemistry II (3) *Prereqs: BL3020*
- BL 4030 Molecular Biology (3) *Prereqs: BL1020 or BL1040 or (BL1200 and BL1210) or (BL1400 and BL1410) and (BL3020 or CH4710)*
- BL 4035 Bioimaging\* (2) *Prereqs: none*
- BL 4042 Scanning Electron Microscopy Bio Specimens\* (2) *Prereqs: BL4035*
- BL 4062 Transmission Electron Microscopy of Bio Specimens\* (2) *Prereqs: BL4035*
- CH 3520 Physical Chem II - Molecular Structure (3) *Prereqs: CH1122 or (CH1160 and CH1161) and MA3160 and PH2200(C)*
- CH 4212 Instrumental Analysis\* (5) *Prereqs: CH2212 and CH3510(C) and CH3511(C)*
- CH 4310 Inorganic Chemistry I (3) *Prereqs: CH3520*
- CH 4320 Inorganic Chemistry II (3) *Prereqs: CH4310*
- CH 4560 Computational Chemistry (3) *Prereqs: CH3520*
- CH/CM 4610 Intro to Polymer Science (3) *Prereqs: CH1122 or (CH1160 and CH1161)*
  - **or** MSE 4110 Intro to Polymer Engineering (3) *Prereqs: (MY2100 or MSE2100 or BE2800) and CH1160*
- CH 4620/CM4620 Polymer Chemistry (3) *Prereqs: CH2420 or CH2440*
- CH 4631/CM4631 Polymer Science Laboratory (2) *Prereqs: CH4610(C) or CM4610(C) or BE4300(C) or MY4600(C) or MSE4110(C)*
- CH 4640 Synthesis of Nanoparticles (3) *Prereqs: (CH2410 or CH2430) and CH2411*
- CH 4720 Biomolecular Chemistry II (3) *Prereqs: BL3020 or CH4710*
- CM/ENT 3979 Alternative Energy Technology (1) *Prereqs: CH1112 or (CH1150 and CH1151) and (MA1160 or MA1161 or MA1121)*
- CM 4710 Biochemical Processes (3) *Prereqs: BL2100 or CH2410 or BL3020*

## Elective courses continued

- EE 3290 Photonic Material Devices and Apps (4)
- EE 4231 Physical Electronics (3)
- EE/MSE 4240 Introduction to MEMS (4)
- EE 5470 Semiconductor Fabrication (3)
- EE 5840 Advanced MEMS (4)
- EET 3131 Instrumentation (3)
- FW 3075 Introduction to Biotechnology (3)
- FW 4099 Programmable Skills for Bioinformatics (3)
- MEEM 4260 Fuel Cell Technology (3)
- MEEM 4405 Intro to Finite Element Method (3)
- MEEM 4640 Micromanufacturing Processes (3)
- MEEM 5130 Nanoscale Science and Technology (3)
- MGT 3800 Entrepreneurship (3) *Prereqs: None*
- MSE 3120 Materials Characterization I\* (4) *Prereqs: MY2110 or MSE2110*
- MSE 3130 Materials Characterization II\* (4) *Prereqs: MY2110 or MSE2110 or BE2800*
- MSE 3150 Intro to Semiconductor Materials & Devices (3) *Prereqs: PH2200 and MA2160*
- MSE/EE 4240 Introduction to MEMS (4) *Prereqs: None*
- MSE/PH 4292 Light and Photonic Materials (3) *Prereqs: PH2200 or EE2190 or EE3140*
- MSE 4410 Science of Ceramic Materials (3) *Prereqs: MY2100 or MSE2100 or BE2800*
- MSE 4510 Contact Mechanics and Nanoindentation (3) *Prereqs: (MY2100 or MSE2100 or BE2800) and (MA3521 or MA3520 or MA3530) and MEEM2150*
- MSE 4530 Scanning Electron Microscopy and X-Ray Micro\* (3) *Prereqs: None*
- MSE 5580 Intro to Scanning Probe Microscopy\* (2) *Prereqs: None*
- PH 3410 Quantum Physics I (3) *Prereqs: PH2400 and (MA3520 or MA3521 or MA3530 or MA3560)*
- PH 3411 Quantum Physics II (3) *Prereqs: PH3410*
- PH/MSE 4292 Light and Photonic Materials (3) *Prereqs: PH2200(C) or EE2190 or EE3140*
- PH 5530 Selected Topics in Nanoscale Science and Tech (2) *Prereqs: None*
- SS 3650 Intellectual Property Law Management (3) *Prereqs: UN1015 and UN1025*

## Additional electives may be selected from the courses below

- BL 2100 Principles of Biochemistry (3) *Prereqs: BL1020 or BL1040 or BE2400 or (BL1200 and BL1210) or (BL1400 and BL1410) and CH1112 or (CH1150 and CH1151)*
- BL 2200 Genetics (3) *Prereqs: BL1020 or BL1040 or BE2400 or (BL1200 and BL1210) or (BL1400 and BL1410)*
- CH 2420 Organic Chemistry II (3) *Prereqs: CH2410*
- PH 2400 University Physics IV: Waves & Modern Physics (3) *Prereqs: PH2200 or PH2260*

Other appropriate electives (including those at the graduate level) may be chosen with written permission by the Nanotechnology minor faculty advisor. Graduate level courses may require department or instructor permission