

Michigan Technological University

Interdisciplinary Minor in Nanoscale Science and Engineering (Nanotechnology)

Program Code IMNT, Academic Year 2019-20

Department of Physics

Total Credits Required: 18

Required Courses: 8 credits

Course	Credits
UN 2600 Fund of Nanoscale Sci and Engr (2)	
SS 3801 Science Technology & Society (3)	
Independent Study/Research/Co-op/Enterprise (3)* Approved Courses:	

*Must be nano-related; program approval required

Electives: 10 credits

Choose at least 6 credits not in your major (as defined by the course prefix) from among the Upper- and Lower- Level Elective courses below. Courses that are cross-listed with your major are considered as being in your major.

Upper Level Electives: minimum 6 credits

Course	Course	Credits
BE 3800 Biomaterials II: Prop and Biological Interactions (3)	EE 3290 Photonic Material Devices and Apps (4)	
BE 4300 Polymeric Biomaterials (3)	EE 4231 Physical Electronics (3)	
BE 4330 Biomimetic Materials (3)	EE/MSE 4240 Introduction to MEMS (4)	
BE 4335 Smart Polymers (3)	EE 5470 Semiconductor Fabrication (3)	
BE 4670 Micro & Nano Technologies (3)	EE 5480 Advanced MEMS (4)	
BE 4700 Biosensors: Fabrication and Apps (3)	EET 3131 Instrumentation (3)	
BE 4800 Biomaterials Interfaces (3)	FW 3075 Introduction to Biotechnology (3)	
BL 4010 Biochemistry I (3)	FW 4099 Programming Skills for Bioinformatics (3)	
BL 4020 Biochemistry II (3)	MEEM 4260 Fuel Cell Technology (3)	
BL 4030 Molecular Biology (3)	MEEM 4405 Intro to Finite Element Method (3)	
BL 4035 Bioimaging (2)*	MEEM 4640 Micromanufacturing Processes (3)	
BL 4042 Scanning Electron Microscopy Bio Specimens*(2)	MEEM 5130 Nanoscale Science and Technology (3)	
BL 4062 Transmission Electron Microscopy of Bio Specimens* (2)	MGT 3800 Entrepreneurship (3)	
CH 3520 Physical Chem II - Molecular Structure (3)	MSE 3120 Materials Characterization I (4)*	
CH 4212 Instrumental Analysis (5)*	MSE 3130 Materials Characterization II (4)*	
CH 4310 Inorganic Chemistry I (3)	MSE 3150 Intro to Semiconductor Materials & Devices (3)	
CH 4320 Inorganic Chemistry II (3)	MSE/EE 4240 Introduction to MEMS (4)	
CH 4560 Computational Chemistry (3)	MSE/PH 4292 Light and Photonic Materials (3)	
CH/CM 4610 Intro to Polymer Science (3) OR MSE 4110 Intro to Polymer Engineering (3)	MSE 4410 Science of Ceramic Materials (3)	
CH 4620/CM4620 Polymer Chemistry (3)	MSE 4510 Contact Mechanics and Nanoindentation (3)	
CH 4631/CM4631 Polymer Science Laboratory (2)	MSE 4530 Scanning Electron Microscopy and X-Ray Micro* (3)	
CH 4640 Synthesis of Nanoparticles (3)	MSE 5580 Intro to Scanning Probe Microscopy* (2)	
CH 4720 Biomolecular Chemistry II (3)	PH 3410 Quantum Physics I (3)	
CM/ENT 3979 Alternative Energy Technologies and Proc (1)	PH 3411 Quantum Physics II (3)	
CM 4710 Biochemical Processes (3)	PH/MSE 4292 Light and Photonic Materials (3)	
CM 4770 Analytic Microdevice Technologies (3)	PH 5530 Selected Topics in Nanoscale Science and Tech (2)	
	SS 3650 Intellectual Property Law Management (3)	

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

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Additional Electives may be selected from the courses below to bring total elective credits to a minimum of 10.

Course	Credits
BL 2100 Principles of Biochemistry (3)	
BL 2200 Genetics (3)	
CH 2420 Organic Chemistry II (3)	
PH 2400 Univ Physics IV: Waves & Modern Physics (3)	

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 dept or instructor permission.

Course	Credits

Courses listed in this minor have the following prerequisites (shown in parenthesis). Concurrency is illustrated by the letter C: Courses listed in this minor have the following prerequisites (shown in parenthesis). Concurrency is illustrated by the letter C: BE3800 (BE2700(C) and BE2800), BE4300 (BE3800), BE4330 (BE3350 and BE3800), BE4335 (BE3350 and BE3800), BE4700 (BE 3600 or (BE 3700 and BE 3701)), BE4800 (BE3800), BL2100 ((BL1040 or BL1020) and (CH1110 or CH1100)), BL2200 ((BL1020 or BL1040) and (BL2100 or CH4710)), BL4010 ((BL1020 or BL1040 or BL2010) and BL2100 and (CH2400 or CH2420) and CH2420), BL4020 (BL4010), BL4030 ((BL1020 or BL1040) and (BL2100 or CH4710)), BL4042 (4035), BL4062 (4035), CH3501 ((CH1100 or CH1110) and (CH1120 or CH1140) and (MA2150 or MA2160)), CH3520 (CH1120 and PH2200 C and (MA3150 or MA3160) and PH2200 C), CH4212 (CH2212 and CH3510 C and CH3511 C), CH4310 (CH3520), CH4320 (CH4310), CH4560 (CH3520), CH4610 (CH1120), CM3974 (CH1100 or CH1110), CM3979 ((CH1150 and CH1151) and (MA1160 or MA1161)), CM4610 (CH1120), CM4710 (CM3110 C), EE4231 (EE3130), EE5480 (EE4240 or MSE4240), EET3353 (EET1411 or EET2220 or EET2311 or EE3010), ENG3974 (CH1100 or CH1110), MEEM4260 (MEEM3201 or CM3110), MEEM4405 (MEEM3502 and (MA2320 or MA2321 or MA2330) and (MA3520 or MA3521 or MA3530 or MA3560)), MEEM4640 (MEEM3502 C), MET3131 (EET2311 or EET2221), MSE3120 (MSE2110), MSE3130 (MSE2100 or BE2800), MSE3150 (PH2200 and MA2160), MSE4292 (PH2200 or EE2190 or EE3140), MSE4410 (MSE2100 or BE2800), MSE4510 (MSE2100 or BE2800 or MA3521 or MA3520 or (MA3530 and MEEM2150)), PH2400 (PH2200 or PH2260), PH3410 (PH2400 and (MA3520 or MA3521 or MA3530 or MA3560)), PH3411 (PH3410), PH4292 (PH2200), SS3650 (UN 1015 and (UN 1025 or Modern Language - 3000 level or higher)), SS3801 (UN 1015 and (UN 1025 or Modern Language - 3000 level or higher))