NANOENGINEERING

Requirements

Courses Taken in the Respective Departments

Subject	# Classes	Hours
Physics (PH)	11	44
Math (MA)	6	27
Chemistry (CHEM)	2	8
CSSE/ME	1	4
EM	2	4
RHIT 100	1	1
ES	1	4
HSSA	9	36
NanoEngineering (NE)	8	30
NanoEngineering Design (NE)	3	12
Electives (SEM, Eng. and Free)	6	24
Total	**50**	**194**

Summary of Graduation Requirements for Nanoengineering

1. All the courses listed above by the number.
2. The program must be approved by the NE advisor.
3. A list of the engineering electives is provided.
4. Free engineering electives are any courses in engineering.
5. SEM (Science, Engineering, Math) electives are courses that need to be taken at the 200 level (CHEM 115, ECE 180, and EM 121 are allowed) or above in biology, biomathematics, chemistry, computer science, engineering, mathematics or physics.
6. Unrestricted Free electives are any courses.

Classes by Subjects

Code	Title	Hours
Physics Coursework (8 classes)		32
Freshman Physics, Chemistry and Mathematics (11 classes)		47
Humanities, Social Science, and the Arts (Standard requirement - 9 classes)		36
EM, ES, ME, RHIT100 (5 classes)		13
NE Courses (8 classes)		30
NE Capstone Design (3 classes)		12
Approved Engineering Electives (2 classes)		8
Free Electives (8 credits Engineering, 4 unrestricted credits - 3 classes)		12
SEM Electives (1 class)		4
Total Hours		**194**

Foundation Physics Classes

Code	Title	Hours
PH 235	Many-Particle Physics	4
PH 255	Foundations of Modern Physics	4
PH 316	Electric & Magnetic Fields	4
PH 317	Electromagnetism	4
PH 325	Adv Physics Laboratory I	4
PH 327	Thermodynamics & Statistical Mechanics	4
PH 401	Introduction to Quantum Mechanics	4
PH 405	Semiconductor Materials & Applications	4

General Foundation Classes

Code	Title	Hours
PH 111	Physics I	4
PH 112	Physics II	4
PH 113	Physics III	4
MA 111	Calculus I	5
MA 112	Calculus II	5
MA 113	Calculus III	5
MA 221	Matrix Algebra & Differential Equations I	4
MA 221	Matrix Algebra & Differential Equations I	4
MA 223	Engineering Statistics	4
or MA 381	Introduction to Probability with Applications to Statistics	
CHEM 111	General Chemistry I	3
CHEM 113	General Chemistry II	3

Engineering Foundation

Code	Title	Hours
EM 104	Graphical Communications	2
NE 180	Engineering at the Nanoscale	2
NE 280	Introduction to Nanoengineering	4
NE 320	Fundamentals of Thin Films: Fabrication and Applications	4
NE 380	Nanotechnology, Entrepreneurship & Ethics	4
NE 395	Nanoscale Fabrication & Characterization Techniques	4
NE 406	Semiconductor Devices & Fabrication	4
NE 407	Nanoelectronic and Semiconductor Devices	4
NE 410	Introduction to MEMS: Fabrication & Applications	4
ES 213	Electrical Systems	3
ES 213L	Electrical Systems Lab	1
ME 123	Computer Programming	4
Engineering Elective		16

Design Sequence

Code	Title	Hours
EM 103	Introduction to Design	2
NE 415	NanoEngineering Design I	4
NE 416	NanoEngineering Design II	4
NE 417	NanoEngineering Design III	4

Approved Intermediate Engineering Electives (4 credit hours required)

Code	Title	Hours
ECE 205	Circuits and Systems	4
ES 201	Conservation & Accounting Principles	4
ES 312	Fluid Systems	4

EM 204	Statics & Mechanics of Materials II	4
OE 280	Geometrical Optics	4
NE 290	Directed Research	1-4
CHE 315	Materials Science and Engineering	4
ME 328	Materials Engineering	4
NE 490	Directed Research	1-4
Additional electives as approved by the NE Curriculum Committee		

Approved Advanced Engineering Electives (4 credits required)

Code	Title	Hours
OE 360	Optical Materials	4
OE 393	Fiber Optics and Applications	4
OE 437	Introduction to Image Processing	4
OE 450	Laser Systems & Applications	4
OE 460	Silicon Photonic Devices and Applications	4
OE 495	Optical Metrology	4
NE 330	Material Failure	4
NE 408	Microsensors and Actuators	4
NE 450	Nanomedicine	4
NE 470	Special Topics in NanoEngineering	2-4
NE 490	Directed Research	1-4
MDS 439	Advanced topics in MEMS	4
CHE 315	Materials Science and Engineering	4
ME 417	Advanced Materials Engineering	4
ME 422	Finite Elements for Engineering Applications	4
EM 403	Advanced Mechanics of Materials	4
ECE 351	Analog Electronics	4
ECE 250	Electronic Device Modeling	4
ECE 351	Analog Electronics	4
Additional electives as approved by the NE curriculum committee		