

INTERDISCIPLINARY ENGINEERING AND SCIENCE (IES) MINOR

To obtain a minor in Interdisciplinary Engineering and Science (Scieneering), a student must complete at least 18 credit hours on an A/F basis, as indicated below. A student must receive a grade of C or better for each course on this checksheet. A minimum minor GPA of 2.0 in all courses taken to fulfill the minor is required.

Code	Title	Credits
Required Common Courses		
ENGR/COS 2164	Introduction to Scieneering	1
Select one of the following:		2
ENGR 2464	Engineering Fundamentals for Scientists (For Life Science majors) ¹	
BIOL 2124	Cell and Molecular Biology for Engineers (For Physical Science or Engineering majors) ²	
ENGR/COS 4064	Scieneering Capstone	3
Subtotal		6
Elective Courses		
<i>In-Discipline Courses</i>		
Select 9 credit hours from the list based on a student's major		9
<i>Out-Of-Discipline Courses</i>		
Select 3 credit hours from the list based on a student's major ³		3
Subtotal		12
Total Credits		18

¹ Life Science majors include all CALS and CNRE majors not listed in Physical Sciences, as well as the COS majors of Biochemistry, Biological Sciences, Psychology, and Systems Biology.

² Physical Sciences include Chemistry, Economics, Environmental Sciences, Geosciences, Mathematics, Nanoscience, Neuroscience, Physics, and Statistics and Sustainable Biomaterials.

³ Pre-requisites and non-major enrollment restrictions apply and may limit courses for non-majors.

- Students completing the minor must obey all pre-requisite rules. Some courses above may have additional pre-requisites not required for minor.
- Students may "double count" up to 9 credit hours in the minor with those required for graduation in their major, provided the major has no restrictions to the contrary. Out-of-discipline elective courses chosen for the minor cannot be required courses in the student's major course of study.

Elective Courses

In-Discipline

Code	Title	Credits
A. Life Sciences Majors¹		
ALS 3104	Animal Breeding and Genetics	3
ALS 3304	Physiology of Reproduction	3
ALS/BIOL 4554	Neurochemical Regulation	3
ALS/WATR 4614	Watershed Assessment, Management, and Policy	2

BCHM 3114	Biochemistry for Biotechnology and the Life Sciences ²	3
BCHM 4115	General Biochemistry	4
BCHM 4116	General Biochemistry	3
BCHM 4784	Applications in Molecular Life Science	3
BIOL 3404	Introductory Animal Physiology	3
BIOL 3774	Molecular Biology	3
BIOL 4014	Environmental Toxicology	2
BIOL 4104	Developmental Biology	3
BIOL 4114	Global Change Ecology	3
BIOL 4564	Infectious Disease Ecology	3
BIOL 4624	Microbial Genetics	3
BIOL 4664	Virology	3
BIOL 4674	Pathogenic Bacteriology	3
BIOL 4704	Immunology	3
BIOL 4734	Inflammation Biology	3
BIOL 4824	Bioinformatics Methods	3
BIOL 4844	Proteomics and Biological Mass Spectrometry	3
BIOL 4854	Cytogenetics	3
BIOL 4874	Cancer Biology	3
BIOL 4884	Cell Biology	3
CSES/ENSC 4444	Managed Ecosystems, Ecosystem Services, and Sustainability	3
CSES 4644	Land-based Systems for Waste Treatment	3
CSES/ENSC 4854	Wetland Soils and Mitigation	3
NANO 1015 & NANO 1016	Introduction to Nanoscience and Introduction to Nanoscience	6
FST 4504	Food Chemistry	3
FST 4634	Epidemiology Foodborne Disease	3
HNFE 3804	Exercise Physiology	3
HNFE 4844	Exercise and Neuromuscular Performance	3
PPWS 4114	Microbial Forensics and Biosecurity	3
PSYC 3024	Human Behaviors and Natural Environments	3
PSYC 4074	Sensation and Perception	3
PSYC 4114	Cognitive Psychology	3
SYSB 3035	Genomics and Bioinformatics	4
SYSB 3115	Network Dynamics and Cell Physiology	4
SYSB 3116	Network Dynamics and Cell Physiology	4
B. Engineering/Physical Sciences Majors³		
BSE 3154	Thermodynamics of Biological Systems	3
BSE 3504	Transport Processes in Biological Systems	3
BSE 3524	Unit Operations in Biological Systems Engineering	3
BSE 4524	Biological Process Plant Design	3
BSE/CHE 4544	Protein Separation Engineering	3
BSE 4604	Food Process Engineering	3
CEE 3104	Introduction to Environmental Engineering	3
CEE 3684	Civil Engineering Materials	4
CEE 4104	Water and Wastewater Treatment Design	3
CEE 4114	Fundamentals of Public Health Engineering	3
CEE 4174	Solid and Hazardous Waste Management	3
CEE 4614	Concrete Materials	3
CHE 3134	Separation Processes	3
CHE 3144	Mass Transfer	3

CHE 4014	Chemical Engineering Laboratory	5	ISE 4015	Management Systems Theory, Applications, and Design	3
CHE 4104	Process Materials	3	ISE 4304	Global Issues in Industrial Management	3
CHE 4185	Process and Plant Design	4	ISE 4624	Physical Work Assessment	3
CHE 4186	Process and Plant Design	4	ISE 4644	Risk and Hazard Control	3
CHE 4214	Introduction to Polymer Materials	3	MATH 4564	Operational Methods for Engineers	3
CHE 4334	Introduction to Colloidal and Interfacial Science	3	MSE 2044	Fundamentals of Materials Engineering	4
CHE/BSE 4544	Protein Separation Engineering	3	MSE 2054	Fundamentals of Materials Science	3
CHEM 4514	Green Chemistry	3	MSE 3104/ GEOS 3504	Mineralogy	3
CHEM 4534	Organic Chemistry of Polymers	3	MSE 3134	Crystallography and Crystal Structures	3
CHEM 4554	Drug Chemistry	3	MSE 3204	Fundamentals of Electronic Materials	3
CSES 4644	Land-based Systems for Waste Treatment	3	MSE 3304	Physical Metallurgy	3
ECE 2164/ AOE 2664	Exploration of the Space Environment	3	MSE 4164	Principles of Materials Corrosion	3
ECE 4154	Space Weather: The Solar Wind and Magnetosphere	3	MSE 4304	Metals and Alloys	3
ECE 4164	Introduction to Global Positioning System (GPS) Theory and Design	4	MSE 4414	Physical Ceramics	3
ECE 4364	Alternate Energy Systems	3	MSE 4574	Biomaterials	3
ECON 4014	Environmental Economics	3	MSE 4584	Biomimetic Materials	3
ENGR 3124	Introduction to Green Engineering	3	NANO 1015 & NANO 1016	Introduction to Nanoscience and Introduction to Nanoscience	6
ENGR 4134	Environmental Life Cycle Assessment	3	NANO 3015	Nanoscale Synthesis, Fabrication, and Characterization	4
ENSC 3604	Fundamentals of Environmental Science	3	NANO 3016	Nanoscale Synthesis, Fabrication, and Characterization	4
ENSC/CSES 3634	Physics of Pollution	3	NANO 4124	Advanced Nanomaterials and Devices	3
ENSC/CSES 3644	Plant Materials for Environmental Restoration	3	NEUR 3044	Cellular and Molecular Neuroscience	3
ENSC/CSES/BIOL 4164	Environmental Microbiology	3	NEUR 3084	Cognitive Neuroscience	3
ENSC/CSES 4444	Managed Ecosystems, Ecosystem Services, and Sustainability	3	NEUR 3144	Mechanisms of Learning and Memory	3
ENSC/CHEM/ CSES 4734	Environmental Soil Chemistry	3	NEUR 3554	Neuroscience Research and Practical Experience	3
ENSC/CSES 4774	Reclamation of Drastically Disturbed Lands	3	NEUR 3914	Neuroscience of Drug Addiction	3
ESM 4105	Engineering Analysis of Physiologic Systems	3	NEUR 4034	Diseases of the Nervous System	3
ESM 4106	Engineering Analysis of Physiologic Systems	3	NEUR 4084	Developmental Cognitive Neuroscience	3
ESM 4204	Musculoskeletal Biomechanics ⁴	3	NEUR/ECON/ PSYC 4454	Neuroeconomics	3
ESM 4224	Biodynamics and Control	3	NEUR 4544	Synaptic Structure and Function	3
ESM 4234	Mechanics of Biological Systems	3	NEUR 4814	Nutritional Neuroscience	3
ESM 4304	Hemodynamics	3	PHYS 4574	Nanotechnology	3
GEOS 3014	Environmental Geosciences	3	PHYS 4714	Introduction to Biophysics	3
GEOS 3034	Oceanography	3	SBIO 3004	Sustainable Nature-Based Enterprises	3
GEOS 3104	Elementary Geophysics	3	SBIO 3444	Sustainable Biomaterials and Bioenergy	3
GEOS 3404	Elements of Structural Geology	3	SBIO 3454	Society, Sustainability Biomaterials and Energy	3
GEOS 3504/ MSE 3104	Mineralogy (with lab)	3	SBIO 3554	Sustainable Biomaterials Enterprises	3
GEOS 3604	Paleontology (with lab)	3			
GEOS 3614/ CSES 3114/ENSC 3114	Soils (with lab)	3			
GEOS/GEOG 4084	Modeling with Geographic Information Systems	3			
GEOS 4634	Environmental Geochemistry	3			
GEOS 4804	Groundwater Hydrology	3			
ISE 3614	Human Factors Engineering and Ergonomics	3			
ISE 3624	Industrial Ergonomics	3			

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² Course restricted to ESM majors/minors.

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⁴ Course restricted to ESM majors/minors.

Out-Of-Discipline

Code	Title	Credits
A. Life Sciences Majors ¹		
BIOL 4824	Bioinformatics Methods	3
BSE 3154	Thermodynamics of Biological Systems	3
CS 1044	Introduction to Programming in C	3
CS 1054	Introduction to Programming in Java	3
ECE 2164/ AOE 2664	Exploration of the Space Environment	3
ENGE 1354	Introduction to Spatial Visualization	1
ENGR 1814	Energy, Resource Development and the Environment	3
ISE 2404	Deterministic Operations Research I	3
MATH 1114	Elementary Linear Algebra ²	2
MATH 2214	Introduction to Differential Equations	3
MATH 3214	Calculus of Several Variables	3
MSE 2034	Elements of Materials Engineering	3
STAT 3615	Biological Statistics	3
STAT 3616	Biological Statistics	3
STAT 4204	Experimental Designs	3
STAT 4214	Methods of Regression Analysis	3
B. Engineering/Physical Sciences Majors ³		
ALS 2304	Comparative Animal Physiology and Anatomy	4
ALS/BIOL 2404	Biotechnology in A Global Society	3
BCHM 2024	Concepts of Biochemistry	3
BCHM 3114	Biochemistry for Biotechnology and the Life Sciences	3
BIOL 2004	Genetics	3
BIOL/HORT 2304	Plant Biology	3
BIOL 2504	General Zoology	3
BIOL 2604	General Microbiology	3
BIOL 2804	Ecology	3
NANO 1015 & NANO 1016	Introduction to Nanoscience and Introduction to Nanoscience	6
CSES 4644	Land-based Systems for Waste Treatment	3
ECON 4014	Environmental Economics	3
ENSC 3604	Fundamentals of Environmental Science	3
GEOS 3014	Environmental Geosciences	3
GEOS 3034	Oceanography	3
GEOS 3104	Elementary Geophysics	3
GEOS 3404	Elements of Structural Geology	3
GEOS/CSES 3614/ENSC 3114	Soils (with lab)	3
GEOS/GEOG 4084	Modeling with Geographic Information Systems	3
GEOS 4634	Environmental Geochemistry	3
GEOS 4804	Groundwater Hydrology	3
HNFE 3804	Exercise Physiology	3
PHYS 4574	Nanotechnology	3
PHYS 4714	Introduction to Biophysics	3
PPWS 2104	Plants, Genes, and People	3

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² Will not count towards the IES minor for students majoring in Chemistry, Geological Sciences, Mathematics, Physics or Statistics.

³ Physical Sciences include Chemistry, Economics, Environmental Sciences, Geosciences, Mathematics, Nanoscience, Neuroscience, Physics and Statistics and Sustainable Biomaterials.