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.

1. Required common courses (6 credits):

   - ENGR/COS 2164/Introduction to Scieneering (1)_______
   - ENGR 2464/Engineering Fundamentals for Scientists (for Life Science^1 majors)
     - or -
   - BIOL 2124/Cell and Molecular Biology for Engineers (for Physical Science^II or Engineering majors) (2)_______
   - ENGR/COS 4064 Scieneering Capstone (3)_______

2. Complete 9 credit hours of approved in-discipline elective courses based on a student’s major:

   A. LIFE SCIENCES^1 MAJORS (all courses are 3 credit hours unless otherwise noted):
      - ALS 3104, Animal Breeding and Genetics (2)
      - ALS 3304, Physiology of Reproduction
      - ALS/BIOL 4554, Neurochemical Regulation
      - ALS/NR 4614, Watershed Assessment, Management, and Policy (2)
      - BCHM 3114, Biochemistry for Biotechnology and the Life Sciences
      - BCHM 4115, General Biochemistry (4)
      - BCHM 4116, General Biochemistry
      - BCHM/BIOL 4784, Applications in Molecular Life Science
      - BIOL 3124, Cell Physiology
      - BIOL 3404, Introductory Animal Physiology
      - BIOL 3774, Molecular Biology
      - BIOL 4014, Environmental Toxicology (2)
      - BIOL 4104, Developmental Biology
      - BIOL 4114, Global Change Ecology
      - BIOL 4564, Infectious Disease Ecology
      - BIOL 4624, Microbial Genetics
      - BIOL 4664, Virology
      - BIOL 4674, Pathogenic Bacteriology
      - BIOL 4704, Immunology
      - BIOL 4734, Inflammation Biology
      - BIOL 4824, Bioinformatics Methods
      - BIOL 4844, Proteomics and Biological Mass Spectrometry
      - BIOL 4854, Cytogenetics
      - BIOL 4874, Cancer Biology
      - BIOL 4884, Cell Biology
      - CSES/ENSC 3634, Physics of Pollution
      - CSES/ENSC/BIOL 4164, Environmental Microbiology
      - CSES/ENSC 4444, Managed Ecosystems, Ecosystem Services, and Sustainability
      - CSES 4644, Land-Based Systems for Waste Treatment
      - CSES/ENSC 4734, Environmental Soil Chemistry
      - CSES/ENSC 4774, Reclamion of Drastically Disturbed Lands
      - CSES/ENSC 4854, Wetland Soils and Mitigation
      - NANO 1015-1016, Introduction to Nanoscience
      - FST 4504, Food Chemistry
      - FST 4634, Epidemiology Foodborne Disease
      - HNFE 3025, Metabolic Nutrition
      - HNFE 3026, Metabolic Nutrition
      - HNFE 3804, Exercise Physiology
      - HNFE 4844, Exercise and Neuromuscular Performance
      - PPWS 4114, Microbe Forensics/Biosecurity
      - PSYC 3024, Human Behaviors and Natural Environments
      - PSYC 4074, Sensation and Perception
      - PSYC 4114, Cognitive Psychology
      - SYSB 3035, Systems Biology of Genes and Proteins (4)
      - SYSB 3115; Network Dynamics and Cell Physiology (4)
      - SYSB 3116; Network Dynamics and Cell Physiology (4)
B. ENGINEERING/PHYSICAL SCIENCES MAJORS (all courses are 3 credit hours unless otherwise noted):

BSE 3154, Thermodynamics of Biological Systems
BSE 3504, Transport Processes in Biological Systems
BSE 3524, Unit Operations in Biological Systems Engineering
BSE 4524, Biological Process Plant Design
BSE 4544/CHE 4544, Protein Separation Engineering
BSE 4604, Food Process Engineering

CEE 3104, Introduction to Environmental Engineering
CEE 3684, Civil Engineering Materials
CEE 4104, Water and Wastewater Treatment Design
CEE 4114, Fundamentals of Public Health Engineering
CEE 4174, Solid and Hazardous Waste Management
CEE 4614, Advanced Civil Engineering Materials

CHE 3134, Separation Processes
CHE 4014, Chemical Engineering Laboratory (S)
CHE 4104, Process Materials
CHE 4134, Chemical Process Modeling (2)
CHE 4185, Process and Plant Design (4)
CHE 4186, Process and Plant Design (4)
CHE 4214, Introduction to Polymer Materials
CHE 4334, Introduction to Colloidal and Interfacial Science
CHE/BSE 4544, Protein Separation Engineering

CHEM 4514, Green Chemistry
CHEM 4534, Organic Chemistry of Polymers
CHEM 4554, Drug Chemistry
CSES 4644, Land-Based Systems for Waste Treatment

ECE 2164/AOE 2664, Exploration of the Space Environment
ECE 4154, Introduction to Space Weather
ECE 4164, Introduction to Global Positioning System (GPS) Theory and Design (4)
ECE 4364, Alternate Energy Systems

ECON 4014, Operational Methods for Engineers
MINE 3534, Mineral Processing (2)
MINE 3554, Resource Recovery (2)
MINE 4544, Mine Reclamation and Environmental Management

MSE 2044, Fundamentals of Materials Engineering (4)
MSE 2054, Fundamentals of Materials Science
MSE 3104/GEOS 3504, Mineralogy
MSE 3134, Crystallography and Crystal Structures
MSE 3204, Fundamentals of Electronic Materials
MSE 3304, Physical Metallurgy
MSE 4164, Principles of Materials Corrosion
MSE 4304, Metals and Alloys
MSE 4414, Physical Ceramics
MSE 4574, Biomaterials

MATH 4564, Operational Methods for Engineers

NEUR 3044, Cellular and Molecular Neuroscience
NEUR 3084, Cognitive Neuroscience
NEUR 3144, Mechanisms of Learning and Memory
NEUR 3554, Neuroscience Research and Practical Experience
NEUR 3914, Neuroscience of Drug Addiction
NEUR 4034, Diseases of the Nervous System
NEUR 4084, Developmental Cognitive Neuroscience
NEUR/ECON/PSYC 4454, Neuroeconomics

NANO 3015 Nanoscale Synthesis, Fabrication, and Characterization (4)
NANO 3164 Nanoscale Synthesis, Fabrication, and Characterization (4)

SBIO 3004 Sustainable Nature-based Enterprise
SBIO 3444 Sustainable Biomaterials and Bioenergy
SBIO 3454 Society, Sustainable Biomaterials and Energy
SBIO 3554 Sustainable Biomaterials Enterprises
3. Complete 3 credit hours of approved out-of-discipline elective courses based on a student’s major: pre-
requisites and non-major enrollment restrictions apply and may limit courses for non-majors.

A. LIFE SCIENCES' MAJORS (all courses are 3 credit hours unless otherwise noted):

- BIOL 4824, Bioinformatics Methods
- BSE 3154, Thermodynamics of Biological Systems
- CS 1044, Introduction to Programming in C
- CS 1054, Introduction to Programming in Java
- CS 1124, Introduction to Media Computation
- ECE 2164/AOE 2664, Exploration of the Space Environment
- ENGE 1354, Introduction to Spatial Visualization (1)
- ENGE 2514, Introduction to Engineering Computation and Control with LABVIEW (2)
- ENGR 1814, Energy, Resource Development and the Environment
- ISE 2404, Deterministic Operations Research
- MATH 1114iv, Elementary Linear Algebra (2)
- MATH 2214v, Introduction to Differential Equations
- MATH 2224, Multivariable Calculus
- MATH 3214, Calculus of Several Variables
- MSE 2034v, Elements of Material Engineering
- STAT 3615, Biological Statistics
- STAT 3616, Biological Statistics
- STAT 4204, Experimental Designs
- STAT 4214, Methods of Regression Analysis

B. ENGINEERING/PHYSICAL SCIENCESii MAJORS (all courses are 3 credit hours unless otherwise noted):

- ALS 2304, Comparative Animal Physiology and Anatomy (4)
- ALS/BIOL 2404, Biotechnology in a Global Society
- BCHM 2024, Concepts of Biochemistry
- BCHM 3114, Biochemistry for Biotechnology and the Life Sciences
- BIOL 2004, Genetics
- BIOL/HORT 2304, Plant Biology
- BIOL 2504, General Zoology
- BIOL 2604, General Microbiology
- BIOL 2804, Ecology
- NANO 1015-1016, Introduction to Nanoscience
- CSES 4644, Land-Based Systems for Waste Treatment
- ECON 4014, Environmental Economics
- ENSC 3604, Fundamentals of Environmental Science
- GEOS 3014, Environmental Geosciences
- GEOS 3034, Oceanography
- GEOS 3104, Elementary Geophysics
- GEOS 3404, Elements of Structural Geology
- GEOS 3614/ CSES/ ENSC 3114, Soils (with lab)
- GEOS/GEOG 4084, Modeling with Geographic Information Systems
- GEOS 4634, Environmental Geochemistry
- GEOS 4804, Groundwater Hydrology
- HNFE 3804, Exercise Physiology
- PHYS 4574, Nanotechnology
- PHYS 4714, Introduction to Biophysics
- PPWS 2104, Plants, Genes, and People

4. Students completing the minor must obey all pre-requisite rules. Some courses above may have additional 
pre-requisites not required for minor.

5. 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.

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

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

iii Course restricted to ESM majors/minors.

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