EARTH AND ATMOSPHERIC SCIENCES (EASEN-BS)

College of Engineering

Program Website (https://www.engineering.cornell.edu/eas/majors/ba-bs-earth-atmospheric-sciences/)

CIP: 40.0699 | **HEGIS:** 1999.10 | **NYSED:** 39364

Program Description

The global-scale environmental challenges our society faces today demands a new generation of earth scientists who want to join in the effort to make a more sustainable planet. We work at spatial scales from atoms to solar systems and time scales from seconds to billions of years. Our aim is to understand the fundamental dynamics of our earth, ocean, and atmosphere in sufficient detail to fully reveal our planet's past and to reliably predict its future. We study a wide range of topics that include paleontology, earthquakes, volcanos, geophysics, climate change, melting ice sheets and changes in global ocean ecosystems. EAS faculty members and graduate students carry out cutting-edge research on subjects as diverse as satellite monitoring of volcanic activity, the deep structure of the Andes Mountains and Tibetan Plateau, natural and man-made earthquakes, the nature of the earth's ionosphere, global ocean ecosystems and climate change.

The Earth and Atmospheric Sciences (EAS) major is the undergraduate program offered by the Department of Earth and Atmospheric Sciences to Cornell students in the College of Engineering, the College of Arts and Sciences, and the College of Agriculture and Life Sciences. We offer four concentrations within the EAS major: Environmental Science, Geological Science, Atmospheric Science and Ocean Science. Each concentration will prepare students with a tailored set of skills and provide the flexibility to choose different pathways depending on their interests.

An abundance of opportunities exists for geological, oceanographic, and climate research in the field and for nationwide and international travel as well as paid research experience. Students have worked with faculty members in the Andes, the Aleutians, the Rocky Mountains, the Atacama Desert, the Caribbean, Tibet, and Hawaii, and have spent a semester at sea in the Sea Semester Program. Students are also able to probe the ionosphere of Earth and the surface of Mars by utilizing techniques in remote sensing.

The EAS major provides a strong preparation for graduate school in any one of the earth sciences, such as climate science, geological science, geophysics, geochemistry, oceanography, hydrology, biogeochemistry, and environmental science. Students seeking employment with the B.A. or B.S. degree will have many options in a wide variety of careers related to energy, the environment, and critical resources in both the private sector and government. Students with the strong science background provided by the EAS major are also highly valued by graduate programs in environmental law, public affairs, economics, and public policy.

Academic Standards

The criteria for good standing in the Earth and Atmospheric Sciences major are as follows:

- Semester GPA ≥ 2.0
- Cumulative GPA ≥ 2.3
- At least C- in all required courses
- A minimum of 12 credit hours per semester

Please note: students must take all required courses for a letter grade.

Honors Program

An honors program is offered by the Department of Earth and Atmospheric Sciences for qualified students. Students interested in applying should contact the Director of Undergraduate Studies during the second semester of their junior year or very early in the first semester of their senior year.

Program Information

- Instruction Mode: In Person
- Location: Ithaca, NY
- Minimum Credits for Degree: 124

Program Requirements

In addition to the major requirements indicated below, students must meet the College of Engineering graduation requirements.

Basic Math and Sciences

This part of the EAS curriculum builds a strong and diverse knowledge of fundamental science and mathematics, providing the student with the basic tools needed in upper-level science classes.

Code	Title	Hours
Mathematics		
MATH 1910 & MATH 1920	Calculus for Engineers and Multivariable Calculus for Engineers	8
Students in the College of Engineering are additionally required to take the following courses:		
MATH 2930 & MATH 2940	Differential Equations for Engineers and Linear Algebra for Engineers	8

Code	Title	Hours
Physics		**7-8**
PHYS 2207	Fundamentals of Physics I	4
or PHYS 1112	Physics I: Mechanics and Heat	
PHYS 2208	Fundamentals of Physics II	4
or PHYS 2213	Physics II: Electromagnetism	

Code	Title	Hours
Chemistry		
Select one of the following options:		4
CHEM 2070 & CHEM 2071	General Chemistry I and General Chemistry I Laboratory	
CHEM 2090 & CHEM 2091	Engineering General Chemistry and Engineering General Chemistry Laboratory	
Select one of the following:		3-4
CHEM 2080 & CHEM 2081	General Chemistry II and General Chemistry II Laboratory	
CHEM 1570	Introduction to Organic and Biological Chemistry	
PHYS 2214	Physics III: Oscillations, Waves, and Quantum Physics [1]	

Code	Title	Hours
Biology		
Select one of the following:		3-5
BIOG 1140	Foundations of Biology	
BIOG 1440	Introductory Biology: Comparative Physiology	
BIOEE 1610	Introductory Biology: Ecology and the Environment	
BIOEE 1780	An Introduction to Evolutionary Biology and Diversity	
BIOMG 1350	Introductory Biology: Cell and Developmental Biology	
BIOSM 1610	Ecology and the Marine Environment	
BIOSM 1780	Evolution and Marine Diversity	
Complete one Advisor-Approved Course in Mathematics, Statistics, Computer Science, or Natural Science		
In addition to the math, physics, chemistry, and biology requirements listed above, students are required to take an advisor-approved course in statistics, computer science, mathematics, or natural science (including, but not limited to, a course in astronomy, a second course in biology, or an additional course in physics or chemistry). Students in the College of Agriculture and Life Sciences must select a second course in biology.		

[1] PHYS 2214 may only be substituted for a second semester of Chemistry if student has taken PHYS 1112 Physics I: Mechanics and Heat and PHYS 2213 Physics II: Electromagnetism

Code	Title	Hours
Required introductory course		
EAS 2250	The Earth System	4

Focused Electives in the EAS Major

Climate Science Focused Elective

The curriculum in Climate Science focused elective emphasizes the scientific study of the behavior of climate and applications to the important practical problems of understanding how humans are modifying the climate system, the changing hazards caused by climate change, and the impacts of proposed mitigation efforts on the climate system. Students develop a fundamental understanding of the climate system, focused on the atmosphere and ocean, and develop skills to allow the analysis of changes in climate and their impacts on hazards such as extreme precipitation, drought, air quality, and the interactions with renewable energies. The curriculum includes a strong foundation in basic mathematics and science courses; core courses in atmospheric thermodynamics, atmospheric dynamics, and climate dynamics among a variety of Climate Science electives, including electives that teach students about how science and policy interact, as well as understanding the controversies and conclusions from the United Nations Intergovernmental Panel on Climate Change.

Code	Title	Hours
Climate Science Focused Elective Core Required Courses		
EAS 3050	Climate Dynamics	3
EAS 3410	Atmospheric Thermodynamics and Hydrostatics	3
EAS 3420	Atmospheric Dynamics	3

Code	Title	Hours
Climate Science Focused Elective Courses (5 courses)		
Students must complete 5 focused elective courses at the 3000-level or above. Students should speak with their advisor about which focused elective courses are most appropriate for their program of study:		
EAS 3010	Evolution of the Earth System	4
EAS 3030	Introduction to Biogeochemistry	4
EAS 3340	Microclimatology	3
EAS 3530	Physical Oceanography	3
EAS 4350	Statistical Methods in Meteorology and Climatology	3
EAS 4470	Physical Meteorology	3
EAS 4720	Fundamentals of Glaciology	3
EAS 4800	Atmospheric Chemistry: From Air Pollution to Global Change	3
EAS 5555	Numerical Techniques for Weather and Climate Modeling	2

Climate Science focused elective Field Course

Exposure to the basic observations of earth science in the field is necessary to fully understand the chosen area of focused elective in the major. A minimum of 3 credits of appropriate coursework is required, although more experience with fieldwork is encouraged. The following field course is recommended:

- EAS 2500 Meteorological Observations and Instruments

Other field options:

- Field courses offered by another college or university[1]
- Experience gained participating in field research with Cornell faculty (or REU at another institution)[1]
- 3-semester credits of advisor-approved Independent Research (EAS 4910 Undergraduate Research /EAS 4920 Undergraduate Research). Independent research must conclude with formal paper describing results and conclusions or else a poster or oral presentation of results presented at a public venue.

[1] Require pre-approval by the faculty advisor and the EAS Curriculum Committee. These courses/internships/REUs should require observations to be taken in the field and interpreted by the student. Field courses should generally require 40+ hours of active observation and data collection in the field. Students using a non-credit research option for the field course requirement are required to complete an additional EAS concentration course.

Environmental Science Focused Elective

The curriculum in the Environmental Science focused elective focuses on the scientific study of the environment. Students in the Environmental Science focused elective of Earth and Atmospheric Sciences develop knowledge and understanding necessary to characterize environmental conditions, make informed predictions about the future, and prevent or address environmental problems. Environmental problems can involve physical, chemical, and biologic processes within the air, water, rock, and soil, and thus often require multidisciplinary solutions. The curriculum for the Environmental Science focused elective in Earth and Atmospheric Sciences prepares students to tackle these challenges through a strong foundation in basic math and science courses; core courses in Earth materials, environmental geophysics, and biogeochemistry; as well as

elective focused elective courses involving the fields of groundwater and surface water hydrology, biogeochemistry, the geology sediments and soils, and geophysical methods of characterization; and includes field course options that focus on building practical experience. Beyond coursework, students also often take advantage of opportunities for work experience through internships, undergraduate research projects, and environmental-themed project teams.

Code	Title	Hours
Environmental Science Focused Elective Core Required Courses		
EAS 3090	Earth Materials	3
EAS 3030	Introduction to Biogeochemistry	4
EAS 3450	Environmental Geophysics	3

Code	Title	Hours
Environmental Science Focused Elective Courses (5 courses)		
Students must complete 5 focused elective courses at the 3000-level or above. Students should speak with their advisor about which focused elective courses are most appropriate for their program of study:		
BEE 4270	Water Measurement and Analysis Methods	3
BEE 4730	Watershed Engineering	4
BEE 4750	Environmental Systems Analysis	3
EAS 3010	Evolution of the Earth System	4
EAS 3530	Physical Oceanography	3
EAS 3540	Ocean Satellite Remote Sensing	3
PLSCI 3650	Environmental Chemistry: Soil, Air, and Water	3
EAS 4190	Geofluids	3
EAS 4710	Introduction to Groundwater	3
EAS 4720	Fundamentals of Glaciology	3
EAS 4740	Quantitative Data Analysis for the Geosciences	3
EAS 4870	Introduction to Radar Remote Sensing	3

Environmental Science focused elective Field Courses

Exposure to the basic observations of earth science in the field is necessary to fully understand the chosen area of focused elective in the major. A minimum of 3 credits of appropriate coursework is required, although more experience with fieldwork is encouraged. The following field course is recommended:

- EAS 4370 Field Geophysics

Other field options:

- Field courses offered by another college or university[1]
- Experience gained participating in field research with Cornell faculty (or REU at another institution)[1]
- 3-semester credits of advisor-approved Independent Research (EAS 4910 Undergraduate Research / EAS 4920 Undergraduate Research). Independent research must conclude with formal paper describing results and conclusions or else a poster or oral presentation of results presented at a public venue.

[1] Require pre-approval by the faculty advisor and the EAS Curriculum Committee. These courses/internships/REUs should require observations to be taken in the field and interpreted by the student. Field courses should generally require 40+ hours of active observation and data collection in the field. Students using a non-credit research option for the field course requirement are required to complete an additional EAS concentration course.

Geological Sciences Focused Elective

Geological Science studies processes involved in Earth's origin and evolution, its relationship with the solar system, and its structure and composition. Geological Science is also interconnected to society's needs, including the responsible use of natural resources, preserving the environment, and studying and mitigating natural hazards (earthquakes, volcanic eruptions, landslides, etc.). With exponential population growth, we face the challenge of securing resources (water, minerals, food) sustainably. The focused elective on Geological Science focused elective focuses the Earth's fundamental processes with numerical, analytical, field, and communications skills needed to conduct scientific research and work on solving some of the most critical challenges of the 21st century. The focused elective requirements and flexibility to design your curriculum with many specialized focused elective courses to choose from, and field and lab opportunities provide excellent preparation for graduate school and careers in the geoscience industry, sustainable use of resources, land use planning, material science, remote sensing, law, etc. The gorgeous landscape of New York's Finger Lakes and the proximity to the Adirondack mountains provide natural laboratories to study geologic processes in the field as well as field opportunities abroad. The program features small classes with personalized mentorship offered by our world-class faculty.

Code	Title	Hours
Geological Sciences Focused Elective Core Required Courses		
EAS 3090	Earth Materials	3
EAS 3880	Global Geophysics	3
EAS 3010	Evolution of the Earth System	4

Code	Title	Hours
Geological Science Focused Elective Courses (5 courses)		
Students must complete 5 focused elective courses at the 3000-level or above. Students should speak with their advisor about which focused elective courses are most appropriate for their program of study:		
EAS 4010	Fundamentals of Energy and Mineral Resources	3
EAS 4040	Geodynamics	3
EAS 4050	Active Tectonics and Structural Geology	3
EAS 4060	Geodesy	3
EAS 4550	Geochemistry	3
EAS 4561	Isotope Geochemistry	3
EAS 4580	Volcanology	3
EAS 4720	Fundamentals of Glaciology	3
EAS 4740	Quantitative Data Analysis for the Geosciences	3
EAS 4790	Paleobiology	4
EAS 4840	Inverse Methods in the Natural Sciences	3
EAS 5770	Planetary Surface Processes	3

Geological Science focused elective Field Courses

Exposure to the basic observations of Earth science in the field is necessary to fully understand the chosen area of focused elective in the major. A minimum of 3 credits of appropriate coursework is required, although more experience with fieldwork is encouraged. The following field course is recommended:

- EAS 4370 Field Geophysics
- Field courses offered by another college or university with pre-approval by the faculty advisor
- Experience gained participating in field research with Cornell faculty (or REU at another institution) with pre-approval by the faculty advisor.

Other field options:

- Field courses offered by another college or university[1]
- Experience gained participating in field research with Cornell faculty (or REU at another institution)[1]
- 3-semester credits of advisor-approved Independent Research (EAS 4910 Undergraduate Research / EAS 4920 Undergraduate Research). Independent research must conclude with formal paper describing results and conclusions or else a poster or oral presentation of results presented at a public venue.

[1] Require pre-approval by the faculty advisor and the EAS Curriculum Committee. These courses/internships/REUs should require observations to be taken in the field and interpreted by the student. Field courses should generally require 40+ hours of active observation and data collection in the field. Students using a non-credit research option for the field course requirement are required to complete an additional EAS concentration course.

Ocean Sciences Focused Elective

The field of ocean science encompasses four subdisciplines covering marine geology, marine chemistry, physical oceanography, and biological oceanography. There is a strong interdisciplinary overlap among all four of these sub-disciplines. An EAS focused elective in ocean sciences touches on all four subdisciplines but is often tailored to emphasize one of the sub-disciplines over the other three. Marine geology often involves the study of seafloor processes associated with plate tectonic motion (e.g., spreading centers and seafloor subduction). It may also address the issue of coastal erosion and the impact of sea-level rise on coastline stability. Marine chemistry involves the study of global-scale cycles of the major elements on earth such as carbon or nitrogen. Or it might involve the use of chemical tracers to delineate deep ocean water mass movements. More recently, this discipline has been in a race to understand human-caused ocean acidification and ocean de-oxygenation resulting from global warming. Physical oceanography is the study of fluid dynamics at geophysical scales. This involves the study of coastal wave dynamics, coastal upwelling, open-ocean eddies, air-sea exchanges of heat, freshwater and momentum or global-scale heat transport via meridional overturning circulation (aka, conveyor belt circulation). Biological oceanography is the study of marine food webs and their role in the global biogeochemical cycling of major elements. More recently, biological oceanographers have been in a race to understand the impacts of global warming and ocean acidification on marine ecosystems.

Code	Title	Hours
Ocean Sciences Fcused Elective Core Required Courses		
EAS 3050	Climate Dynamics	3
EAS 3530	Physical Oceanography	3
EAS 3030	Introduction to Biogeochemistry	4

Code	Title	Hours
Ocean Sciences Focused Elective Courses (5 courses)		
Students must complete 5 focused elective courses at the 3000-level or above. Students should speak with their advisor about which focused elective courses are most appropriate for their program of study:		
BIOSM 3210	Anatomy and Function of Marine Vertebrates	3
BIOEE 4570	Limnology: Ecology of Lakes, Lectures	3
BIOEE 4780	Ecosystem Biology and Global Change	4
BIOEE 6680	Principles of Biogeochemistry	4
EAS 3010	Evolution of the Earth System	4
EAS 3420	Atmospheric Dynamics	3
EAS 3540	Ocean Satellite Remote Sensing	3
EAS 3555	Marine Microbes and Disease in a Changing Ocean	3
EAS 4720	Fundamentals of Glaciology	3

Ocean Sciences Field Courses

Exposure to the basic observations of earth science in the field is necessary to fully understand the chosen area of focused elective in the major. A minimum of 3 credits of appropriate coursework is required, although more experience with fieldwork is encouraged. Students can choose from the following course options.

- Shoals Marine Lab Courses
- Sea Education Association Courses
- Woods Hole Oceanographic Courses

Other field options:

- Field courses offered by another college or university[1]
- Experience gained participating in field research with Cornell faculty (or REU at another institution)[1]
- 3-semester credits of advisor-approved Independent Research (EAS 4910 Undergraduate Research/EAS 4920 Undergraduate Research). Independent research must conclude with formal paper describing results and conclusions or else a poster or oral presentation of results presented at a public venue.

[1] Field course options marked by an asterisk (*) require pre-approval by the faculty advisor and the EAS Curriculum Committee. These courses/internships/REUs should require observations to be taken in the field and interpreted by the student. Field courses should generally require 40+ hours of active observation and data collection in the field. Students using a non-credit research option for the field course requirement are required to complete an additional EAS concentration course.

University Graduation Requirements Requirements for All Students

In order to receive a Cornell degree, a student must satisfy academic and non-academic requirements.

Academic Requirements

A student's college determines degree requirements such as residency, number of credits, distribution of credits, and grade averages. It is the student's responsibility to be aware of the specific major, degree, distribution, college, and graduation requirements for completing their chosen program of study. See the individual requirements listed by each college or school or contact the college registrar's office (https://

registrar.cornell.edu/service-resources/college-registrar-directory/) for more information.

Non-academic Requirements

Conduct Matters. Students must satisfy any outstanding sanctions, penalties or remedies imposed or agreed to under the Student Code of Conduct (Code) or Policy 6.4. Where a formal complaint under the Code or Policy 6.4 is pending, the University will withhold awarding a degree otherwise earned until the adjudication process set forth in those procedures is complete, including the satisfaction of any sanctions, penalties or remedies imposed.

Financial Obligations. Outstanding financial obligations will not impact the awarding of a degree otherwise earned or a student's ability to access their official transcript. However, the University may withhold issuing a diploma until any outstanding financial obligations owing to the University are satisfied.

Additional Requirements for Undergraduate Students

The University has two requirements for graduation that must be fulfilled by all undergraduate students: the swim requirement, and completion of two physical education courses. For additional information about fulfilling University Graduation Requirements, see the Physical Education website (https://scl.cornell.edu/pe/).

Physical Education

All incoming undergraduate students are required to take two credits (two courses) of Physical Education prior to graduation. It is recommended they complete the two courses during their first year at Cornell. Credit in Physical Education may be earned by participating in courses offered by the Department of Athletics and Physical Education (https://catalog.cornell.edu/courses/pe/) and Cornell Outdoor Education, by being a registered participant on a varsity athletic team, or performing in the marching band.

Students with medical concerns should contact the Office of Student Disability Services (http://sds.cornell.edu/).

Swim Requirement

The Faculty Advisory Committee on Athletics and Physical Education has established a basic swimming and water safety competency requirement for all undergraduate students. Normally, the requirement is taken during the Fall Orientation process at Helen Newman Hall or Teagle Hall pools. The requirement consists of the following: jump or step feet-first into the deep end of the pool, float or tread for one minute, turn around in a full circle, swim 25 yards using any stroke(s) of choice without touching the bottom or holding on to the sides (there is no time limit) and exit from the water. Students who do not complete the swim requirement during their first year, during a PE swim class or during orientation subsequent years, will have to pay a $100 fee. Any student who cannot meet this requirement must register for PE 1100 Beginning Swimming as their physical education course before electives can be chosen.

If a student does not pass the swim requirement in their first Beginning Swimming PE class, then the student must take a second Beginning Swimming PE class (PE 1100 or PE 1101). Successful completion of two Beginning Swimming classes (based on attendance requirements) with the instructor's recommendation will fulfill the University's swim requirement.

Students unable to meet the swim requirement because of medical reasons should contact the Office of Student Disability Services (http://sds.cornell.edu/). When a waiver is granted by the Faculty Committee on Physical Education, an alternate requirement is imposed. The alternate requirement substitute is set by the Director of Physical Education.

College of Engineering Graduation Requirements

Undergraduate Study

Students in the College of Engineering spend most of their first two years of undergraduate studies in the Common Curriculum, which is administered by the College Curriculum Governing Board (CCGB) through the associate dean for undergraduate programs and Engineering Advising. By the end of their third semester, they typically apply to affiliate with an Engineering major and must be affiliated by the start of their fifth semester.

Criteria for affiliation with the majors are described in this section under "Affiliation with a Major". The Undergraduate Engineering Majors are listed on the College of Engineering Programs page (https://catalog.cornell.edu/engineering/#programstext).

Many of the majors have a corresponding minor, in which the student can pursue a secondary interest if eligible. In addition, there are minors that cut across majors including applied mathematics, engineering management, engineering statistics, game design, artificial intelligence, information science, and business. See Engineering Minors section of the College of Engineering Programs page (https://catalog.cornell.edu/engineering/#programstext) for a listing of Undergraduate Minors.

Engineering Core Requirements - Engineering Major

Engineering Majors

To receive the bachelor of science degree, students must meet the requirements of the Common Curriculum (outlined below) as set forth by the College of Engineering, including the requirements of their chosen major, as established by the school or department that administers the major. (Further explanation of the revised Common Curriculum and major flow charts are provided in the *Engineering Undergraduate Handbook*.)

Course Category	Credits
Mathematics (major-specific)	14-16
Physics (major-specific)	8-13
Chemistry (major-specific)	4-8
First-year writing seminars	≥6
Engineering Communication[1]	1-3
Computing	4
Engineering Distribution	
a. One introduction to engineering (ENGRI)	3-4
b. Two engineering distributions (ENGRD)	6-8
Liberal studies distribution (6 courses min.)	≥18
Advisor Approved electives	≥6
Major program	
a. Major-required courses	≥30
b. Major-approved electives	≥9
c. Courses outside the major	≥9

Two semesters of physical education and demonstration of proficiency in swimming (university requirement)	

[1] Engineering-communication courses may simultaneously fulfill another requirement.

Total credits required for graduation vary by major (see Engineering Majors).

Mathematics

The normal program in mathematics includes MATH 1910, MATH 1920, MATH 2930 or MATH 2940 depending on the major), and a major-specific math course for some majors. At least C– must be attained in these courses; if not, the course must be repeated immediately before the next course in the sequence is taken. Failure to achieve at least C– the second time will result in, at minimum, an automatic required leave of absence for one semester from the College of Engineering. Courses that are taken a second time do not yield additional credit toward a degree.

Physics

The normal program in physics includes PHYS 1112, PHYS 1110, PHYS 2213, and PHYS 2214 or the corresponding honors courses (PHYS 1116, PHYS 1110, PHYS 2210, PHYS 2217, and PHYS 2218). Engineering students should attain at least C– in each math prerequisite of a physics course before taking the physics course (e.g., C– in MATH 1910 before taking PHYS 1112 and C– in MATH 1920 before taking PHYS 2213). Substitutions for PHYS 2214 are possible in certain majors. Please consult the Engineering Undergraduate Handbook (https://cornellengineeringhandbook.freeflowdp.com/cornellengineeringhandbook/library/) for details.

Chemistry

CHEM 2090 and CHEM 2091 is required. While the content of CHEM 2090 and CHEM 2091is the same as that of CHEM 2070 and span class="structuredcontent" college="all" contenteditable="false" department="CHEM" id="courseinline24" title="Inline Course - Double Click to Edit">CHEM 2071, Engineering students are expected to take CHEM 2090 and CHEM 2091.

Typically, CHEM 2090 and CHEM 2091 is taken during the first year, but students who wish to first complete the physics sequence (PHYS 1112, PHYS 1110, PHYS 2213, and PHYS 2214, depending on the major) may postpone CHEM 2090 and CHEM 2091 until the sophomore year.

Students considering chemical engineering or a health-related career such as medicine must take CHEM 2090 and CHEM 2091 in the fall of their first year and CHEM 2080 and CHEM 2081 in the spring semester.

Computing

Students must complete one Introduction to Computing course during either semester of the first year. Students can take either CS 1110 or CS 1112. Some majors may have a preference of either CS 1110 or CS 1112, however, either one will count toward the degree requirement.

First-Year Writing Seminars

Each semester of their first year, students choose a first-year writing seminar from courses offered by over 30 different departments across the university. These courses offer the student practice in writing English prose and college level discourse within a small class (<20) setting.

Engineering Communications

Students can fulfill the Engineering Communications Requirement using one of the options below. See the Engineering Communications Program website (https://www.engineering.cornell.edu/courses-requirements/bachelor-science-requirements/engineering-communications-requirement/) for more information.

Category A: Via the Engineering Communications Program Courses and Opportunities

1. **Engineering Communication Program Courses**
   Courses in this category, offered by the Engineering Communications Program (ECP), develop communication skills in a variety of genres, including writing, presenting, multimodal forms, graphics, charts, posters, and other. These courses fulfill the Engineering Communication Requirement for Cornell's College of Engineering.

Code	Title	Hours
ENGRC 3025	Creating and Communicating Your Digital Professionalism	1
ENGRC 3026	Engineering Presentations and Expert Presence	1
ENGRC 3027	Cross-cultural Communications and Ethics in the Workplace	1
ENGRC 3340	Independent Study in Engineering Communications	1-3
ENGRC 3350	Organizational Communications for Engineers	3
ENGRC 3500	Engineering Communications	3
ENGRC 3700	Communications Consulting for Engineers	3

2. **Complete a Communication-Intensive Co-op, listed as ENGRC 3024**
   This is an opportunity to combine work and academics. Some co-op students do a significant amount of writing and other communicative work on the job; under certain circumstances, a set of authentic work artifacts combined with on-site manager reviews and guide, reflective summary assignments with an ECP instructor will satisfy the Engineering Communications Requirement. This option does not count toward the Liberal Studies requirements for engineers. Students should begin organizing this request the semester prior to being on-site for the co-op or internship. Not offered AY 2025-2026.
3. **Enroll in and pass** ENGRC 3023
   A one credit attachment to an engineering course that is not one of the officially designated W-I or C-I courses. CE instructors may occasionally wish to extend communication competencies with added work inside their course for a given semester so that it will fulfill the Engineering Communications Requirement. With approval from the College Curriculum Governing Board (CCGB) Subcommittee on Engineering Communications, instructors may have students co-register in ENGRC 3023, which may be taken more than once with different courses by permission of the engineering instructors. This option does not count toward the Liberal Studies requirement for engineers, even via petition. More information can be found at the Cornell Engineering website (https://www.engineering.cornell.edu/courses-requirements/bachelor-science-requirements/engineering-communications-requirement/engrc-3023/).
   To begin,& send an email to engrcomm_info@cornell.edu, requesting the full ENGRC 3023 information packet. Please insert "3023 request" in the subject line.
   Paperwork is due by the last Wednesday in January for the Spring semester.
4. **Complete and Pass a One Credit Partner Course**
   The current options are below, and they require enrollment in the departmental course (usually three credits) and its corresponding ENRGRC course (one credit). The below courses do not count toward the Liberal Studies requirement for engineers, even via petition:

Code	Title	Hours
ENGRC 3120	Communications for Practical Tools for Operations Research, Machine Learning and Data Science [1]	1
ENGRC 3152	Communication for Game Development [2]	1
ENGRC 3610	Communication for Transportation Engineering [3]	1
ENGRC 4152	Communication for Advanced Game Development [4]	1
ENGRC 4590	Communications for Physical Design in Biological Engineering [5]	1

1. 1cr partnered with ORIE 3120 Practical Tools for Operations Research, Machine Learning and Data Science
2. 1cr partnered with CS 3152 Introduction to Computer Game Architecture/INFO 3152 Introduction to Computer Game Design
3. 1cr partnered with CEE 3610 Introduction to Transportation Engineering
4. 1cr partnered with CS 4152 Advanced Topics in Computer Game Architecture/INFO 4152 Advanced Topics in Computer Game Design
5. 1cr partnered with BEE 4590 Physical Design in Biological Engineering

5. **Apply for** ENGRC 3341 Guided Fieldwork for Engineering Communications
   Occasionally, a student will be doing a significant amount and variety of engineering or technical communication elsewhere in the College of Engineering, usually as part of a research team, as part of leadership in a project team, and the like. It may be appropriate to petition the CCGB's Subcommittee on Engineering Communications for permission to use as ENGRC 3341 as an option for upcoming projects (not past ones) to meet the Engineering Communications Requirement. This option does not count toward the Liberal Studies requirement for engineers, even via petition. It is essential for students and their mentoring Engineering faculty to prepare well in advance for this option.Request the information packet and form by emailing engrcomm_info@cornell.edu with "3341 request" in the subject line. This option is not to be used for work done by teaching assistants, nor is it to be used to finish up work from prior semesters in another course. More information can be found at the Cornell Engineering website (https://www.engineering.cornell.edu/courses-requirements/bachelor-science-requirements/engineering-communications-requirement/engrc-3341/).
   Paperwork is due by the last Wednesday in August for the Fall semester and the last Wednesday in January for the Spring semester.

Category B: Via Other Paths

1. **Take an officially designated Writing-Intensive (W-I) or Communication-Intensive (C-I) engineering course.**

- Note: The following course list is not comprehensive, as different engineering departments may offer W-I or C-I courses on an ad-hoc basis. Indeed, these offerings can change each semester. Students need to check with their major advisors each semester to confirm if a course will fulfill the Engineering Communications Requirement; curriculum approvals are made by each major via CCGB approval. W-I or C-I courses are based in a major, as part of that major's regular core offerings to its declared/affiliated undergraduate majors.
  This option does not count toward the Liberal Studies requirement for engineers, even via petition. See also the CE Undergraduate Handbook (https://www.engineering.cornell.edu/engineering-undergraduate-handbook/).
- It's important to note that these options usually only fulfill the Engineering Communications Requirement for their own majors. Students, advisors, and departments need to cross check against each student's major requirements for graduation. The Engineering Communications Program does not control, monitor, or assess for these courses. This option does not count toward the Liberal Studies requirement for engineers, even via petition.

Code	Title	Hours
BEE 4530	Computer-Aided Engineering: Applications to Biological Processes (crosslisted)	3
BEE 4730	Watershed Engineering	4
BEE 4590	Physical Design in Biological Engineering	3
BME 4190	Laboratory Techniques for Molecular, Cellular, and Systems Engineering	3
BME 4390	Circuits, Signals and Sensors: Instrumentation Laboratory	3
BME 4490	Biomechanics Laboratory (crosslisted)	3
CHEME 4320	Chemical Engineering Laboratory	4
ECE 4920	ECE Technical Writing	1
MAE 4272	Fluids and Heat Transfer Laboratory	3
MSE 4030	Senior Materials Laboratory I	4
ORIE 4100	Manufacturing Systems Design: A Consulting Boot Camp	4

2. **Enroll in and Pass** COMM 3020 or COMM 3030

- Enroll in and pass COMM 3020 or COMM 3030 taught by the Department of Communication (in the College of Agriculture and Life Sciences). The Engineering Communications Program does not control, monitor, or assess for these courses. This option does not count toward the Liberal Studies requirement for engineers, even via petition. See also the CE Undergraduate Handbook (https://www.engineering.cornell.edu/students/undergraduate-students/curriculum/engineering-undergraduate-handbook/).

  Introduction-to-Engineering Course:

  An introduction-to-engineering course (designated ENGRI) is expected to be completed by the end of a student's first year. This course introduces students to the engineering process and provides a substantive experience in an open-ended problem-solving context. See the Introduction-to-Engineering course listing for current course offerings.

3. **Enroll in and pass HADM 3670, taught through the Nolan School**

- The Engineering Communications Program does not control, monitor, or assess for these courses. This option does not also fulfill the Liberal Studies requirement, even via petition. See also the Engineering Undergraduate Handbook (https://www.engineering.cornell.edu/engineering-undergraduate-handbook/).

Engineering Distribution

Two engineering distribution (ENGRD) courses (6–8 credits) must be selected from two different categories listed below. A student may use any one of the possible substitutions described.

1. **Scientific computing:**

Code	Title	Hours
ENGRD 2110	Object-Oriented Programming and Data Structures (crosslisted)	4
ENGRD 2112	Object-Oriented Design and Data Structures - Honors (crosslisted)	4
ENGRD 2140	Computer Systems Programming (crosslisted)	4
ENGRD 3200	Engineering Computation (crosslisted)	4

2. **Materials Science:**
   ENGRD 2610 Mechanical Properties of Materials: From Nanodevices to Superstructures
   ENGRD 2620 Electronic Materials for the Information Age
3. **Mechanics:**
   ENGRD 2020 Statics and Mechanics of Solids
   Note: Majors in Engineering Physics may use AEP 3330 as an ENGRD in this category.
4. **Probability and statistics:**
   ENGRD 2700 Eng Probability and Statistics: Modeling and Data Science
   Note: Majors in Engineering Physics may substitute MATH 4710 for ENGRD 2700. Majors in Civil Engineering, Biological Engineering, and Environmental Engineering may substitute CEE 3040 for ENGRD 2700.
   ENGRD 2720
5. **Electrical sciences:**

Code	Title	Hours
ENGRD 2100	Introduction to Circuits for Electrical and Computer Engineers (crosslisted)	4
ENGRD 2300	Digital Logic and Computer Organization (crosslisted)	4
ENGRD 2550	Engineering Quantum Information Hardware (crosslisted)	3

6. **Thermodynamics and energy balances:**

   ENGRD 2111 Biomolecular Thermodynamics
   ENGRD 2190 Chemical Process Design and Analysis
   ENGRD 2210 Thermodynamics

1. **Earth and life sciences:**

Code	Title	Hours
ENGRD 2250	The Earth System (crosslisted)	4
ENGRD 2510	Engineering Processes for Environmental Sustainability (crosslisted)	3
ENGRD 2600	Principles of Biological Engineering (crosslisted)	3

2. **Biology and chemistry:**

Code	Title	Hours
ENGRD 2202	Biomedical Transport Phenomena (crosslisted)	3
CHEM 3890	Honors Physical Chemistry I	4
ENGRD 2520	The Physics of Life (crosslisted)	3
BIOMG 3300	Principles of Biochemistry, Individualized Instruction	4
or BIOMG 3310	Principles of Biochemistry: Proteins and Metabolism	
or BIOMG 3350	Principles of Biochemistry: Proteins, Metabolism, and Molecular Biology	

Additional Information
Some majors may require completion of 9 specific engineering distribution courses for affiliation (acceptance into the major), or as a prerequisite for upper-class courses. For complete information, please see Affiliation with a Major and the flow charts for each major in the Engineering Undergraduate Handbook (https://www.engineering.cornell.edu/engineering-undergraduate-handbook/).

Note: Some majors require additional distribution courses after affiliation.

Liberal Studies Distribution

Global and diverse societies require that engineers have an awareness of historical patterns, an appreciation for different cultures, professional ethics, the ability to work in multifaceted groups, and superior communication skills. Cornell has a rich curriculum in the humanities, arts, and social sciences, enabling every engineering student to obtain a truly liberal education. The rationale for these distribution courses is discussed in the Requirements for Graduation section of the *Engineering Undergraduate Handbook* and these courses should be chosen with as much care and foresight as courses from technical areas.

Requirements:

- At least six courses (totaling at least 18 credits)
- The six courses must be chosen from the categories listed and come from at least three different groups outlined in the following section
- At least 3 or more credits must be chosen from Group 7
- No more than two courses may be chosen from Group 6 (CE)
- At least two courses must be at the 2000 level or higher

The categories outlined above have been organized into seven Groups based on common themes in content. Those Groups are as follows:

Group 1. Cultural Analysis, Literature and the Arts, Social Differences
- Cultural Analysis (CA)
- Literature and the Arts (LA)
- Literature, the Arts and Design (LAD)
- Arts, Literature, and Culture (ALC)
- Social Difference (SCD-HA only. SCD-AS not allowed in this group.)

Group 2. Historical Analysis
- Historical Analysis (HA/ HST)

Group 3. Ethics, Cognition, and Moral Reasoning
- Knowledge, Cognition, and Moral Reasoning (KCM)
- Ethics and the Mind (ETM)

Group 4. Social Science and Global Citizenship
- Social and Behavioral Analysis (SBA)
- Social Sciences (SSC)
- Global Citizenship (GLC)

Group 5. Foreign Languages (not literature courses) (FL)
- Courses teaching language skills, inclusive of reading, writing, listening, and spoken non-English languages, at beginning to advanced levels.

Group 6. Communications in Engineering (CE)
- Engineering specific courses exploring communication as a way of acting in the world

- Courses must be specifically designated by CCGB as satisfying the CE category (no petitions)
- No more than two courses from this category may be used to satisfy the liberal studies requirement

Group 7. Race and Equity

- Social Difference (SCD-AS only. SCD-HA not allowed in this group)
- Diversity (D-AG only. D-HE not allowed in this group)

Students should utilize the current Courses of Study as the master list of approved liberal studies courses. Refer to Cornell Engineering Advising's Liberal Studies Policies (https://liberal-studies.engineering.cornell.edu/) webpage for complete lists of additional approved courses and unacceptable courses. Please direct any questions to Engineering Advising, 180 Rhodes Hall.

Electives

- **Advisor-Approved electives:** 6 credits required (approved by the faculty advisor[1]). Because these courses should help develop and broaden the skills of the engineer, faculty advisors generally accept the following as approved electives (as long as they are not being used elsewhere toward degree requirements):
- One additional introduction-to-engineering course (ENGRI)
- Engineering distribution courses
- Courses stressing written or oral communication
- Upper-level engineering courses
- Advanced courses in mathematics
- Rigorous courses in the biological and physical sciences
- Courses in business, economics, or language (when they serve the student's educational and academic objectives)
- Courses that expand the major or another part of the curriculum, including liberal studies electives not already being used toward the Liberal Studies Distribution requirement.
- Up to 6 credits of approved electives may come from ROTC courses at the 3000-level or higher.
- **Major-approved electives:** 9 credits (approved by the major and faculty advisors in the major). Refer to the major curricula for descriptions of courses in this category.
- **Outside-the-major electives:** 9 credits of courses outside the major to ensure breadth of engineering studies; these courses may be subject to major specific requirements for appropriateness.

[1] In the event a student and their faculty advisor disagree regarding the suitability of an approved elective, the student may appeal the decision to the Director of Undergraduate Studies (Associate Director) for their major department or to the Associate Dean for Undergraduate Programs.

First-Year Requirements

During the first year, engineering students are expected to complete (or receive credit for) the following core requirements:

Code	Title	Hours
MATH 1910 & MATH 1920	Calculus for Engineers and Multivariable Calculus for Engineers	4
Select two of the following:		4-8
CHEM 2080	General Chemistry II	
CHEM 2081	General Chemistry II Laboratory [1]	1
CHEM 2090	Engineering General Chemistry	
PHYS 1112	Physics I: Mechanics and Heat	
PHYS 1110	Introduction to Experimental Physics	
PHYS 2213	Physics II: Electromagnetism	
PHYS 2214	Physics III: Oscillations, Waves, and Quantum Physics (or the Honors equivalent) [2]	
One of: CS 111X		
Two first-year writing seminars		
One introduction to engineering (ENGRI) course		
Two physical education courses and the university swim test		

[1] Depends on the major.

[2] Depending on the major, students interested in chemical engineering, pre-med, or other health-related careers should enroll in the CHEM 2090 and CHEM 2091- CHEM 2080 and CHEM 2081 sequence during their first year.
Students interested in biomedical engineering should additionally complete BIOMG 1350 during the first year.

Affiliation with a Major

Students are encouraged to apply for affiliation with a major during the first semester of their sophomore year, although earlier affiliation may be granted at the discretion of the major. This is done by completing the Application for Major Affiliation via the Engineering Registrar's website. To affiliate, students must:

1. make good progress toward completing required courses in the common curriculum,
2. have a GPA ≥ 2.0, and
3. have satisfied the major's course and grade requirements as specified below:

Students must be affiliated or conditionally affiliated with a major by the beginning of their fifth semester or they will be withdrawn from the College of Engineering, and therefore Cornell.

Biological Engineering [1]

Minimum cumulative GPA of 2.5 and at most one grade below C– in any math, chemistry, physics, and engineering courses: CS 1110 , CS 1112, ENGRI, ENGRD, and any engineering course cross-listed with ENGRI or ENGRD. Completion of BEE 2600/ENGRD 2600 or ENGRD 2510 with at least C–,and one year of Introductory Biology (two lectures and a lab) with grades of at least C–. Allowable courses include BIOMG 1350, BIOG 1440, BIOG 1445 BIOG 1500, and BIOEE 1610. No more than two credits of research/project team and two credits of arts performance courses will count toward the cumulative GPA required for affiliation.

Biomedical Engineering

Minimum GPA of 2.4 in designated math, science, and engineering courses completed with grades of C- or higher.

To apply for affiliation in the third semester, a student must be on track to complete the following requirements by the end of the third semester: BIOMG 1350 (or a score of 5 on the CEEB AP Exam (or equivalent)), MATH 1910, MATH 1920, MATH 2930, PHYS 1112, PHYS 1110, PHYS 2213, CHEM 2090 CHEM 2091, ENGRD 2111, CS 111X, and any ENGRI. BIOG 1440 cannot be used to satisfy this requirement for students entering Fall 2017 and after.

To apply for affiliation in the fourth semester, a student must be on track to complete the above courses plus the following additional courses by

the end of the fourth semester: MATH 2940, ENGRD 2020, BME 2000, and BME 2010.

Chemical Engineering
At most one grade below C- in chemistry, math, physics, and chemical engineering courses, and a GPA ≥2.2 in math, science, and engineering courses (except independent study, seminar, research, or project teams).

To apply for affiliation in the third semester, a student must be on track to complete the following requirements by the end of the semester:

- Mathematics: MATH 1910 , MATH 1920 , and MATH 2930
- Chemistry: CHEM 2090 & CHEM 2091 , and CHEM 2080 & CHEM 2081 (or a score of 5 on the CEEB Advanced Placement exam for Chemistry and CHEM 2150 or CHEM 2080 & CHEM 2081)
- Physics: PHYS 1112 , PHYS 1110 , and PHYS 2213
- Computing: CS 111X
- Engineering Distribution: One Introduction to Engineering course (ENGRI 1XXX), ENGRD 2190 , and CHEM 3890
- Two First-Year Writing Seminars
- One Liberal Studies Distribution course

Students applying in the fourth semester must be on track to complete the following prerequisites for junior year as well as the core requirements listed above: MATH 2940 or CEE 3040 or ENGRD 2700 , CHEM 2900 , CHEME 2200 , CHEME 3230 , and additional Liberal Studies Distribution course.

Civil Engineering
GPA ≥ 2.0 in all engineering, math, and science courses that have been completed at the time of affiliation. C grade or higher in ENGRD 2020.

Computer Science
At least C (not C-) in all completed CS courses and all critical math courses. GPA ≥ 2.5 in CS 2110/ CS 2112 and CS 2800/ CS 2802, or ECE 2400/ENGRD 2140 and CS 2800/CS 2802 and CS 3110. CS GPA calculation may be supplemented by the following courses: CS 3110 and CS 3410/ CS 3420. GPA ≥ 2.3 between MATH 1920 and any other completed critical math course(s): MATH 2940, MATH 4710, BTRY 3080/STSCI 3080, CS 4850, ECON 3130, ECE 3100, ENGRD 2700. If only AP/CASE credit appears, then another Cornell critical math course must be taken to affiliate. Qualifying courses must be taken at Cornell for a letter grade. A required supplemental application must be submitted along with the College of Engineering Application for Major Affiliation.

Earth and Atmospheric Sciences
The following courses must be completed or currently enrolled in at the time of affiliation: MATH 1910, MATH 1920, MATH 2930, MATH 2940, PHYS 1112, PHYS 1110, PHYS 2213, CHEM 2090 & CHEM 2091, CHEM 2080 & CHEM 2081 (or CHEM 2150), Must have at least a C- in all courses taken and a cumulative GPA of 2.3 or higher.

Electrical and Computer Engineering
At least C+ in: MATH 2930 or MATH 2940, PHYS 2213, and one of ECE 2100/ENGRD 2100, ECE 2720 or ECE 2300/ENGRD 2300.

Must have a GPA ≥ 2.5 in (if completed):
MATH 1920, MATH 2930, MATH 2940,
PHYS 2213, ENGRD 2110, ECE 2400/ENGRD 2140, ECE 2300/ENGRD 2300, ECE 2100/ENGRD 2100, ECE 2720/ENGRD 2720,

Engineering Physics
At least B– in all required math and physics courses: MATH 1910, MATH 1920, MATH 2930, MATH 2940, PHYS 1110, PHYS 1112 / PHYS 1116, PHYS 1110, PHYS 2213 / PHYS 2

Environmental Engineering1
f

GPA ≥ 2.0 in all math, science, and engineering courses. At least C– in BEE 2510/ENGRD 2510.

Independent Major
Students must submit, and receive approval for, a proposed program including endorsement from advisors for a primary and secondary area. See the IM website (https://www.engineering.cornell.edu/independent-major/) for specific requirements and deadlines.

Information Science Systems, and Technology
At least a C in two of MATH 2940, CS 2110/ENGRD 2110, and ENGRD 2700 (must have taken at least two of these courses at time of affiliation). GPA ≥ 2.5 between CS 2110/ENGRD 2110,ENGRD 2700, and all completed MATH and ISST Major core courses. Qualifying courses must be taken at Cornell, and for a letter grade. A required supplemental application (https://affiliations.coecis.cornell.edu/is/) must be submitted to ISST in addition to the College of Engineering's Application for Major Affiliation.

Students in their senior year of study intending to change majors to ISST or add ISST as a second major must submit a course plan to demonstrate they can complete all degree requirements by their current expected graduation date.

Materials Science and Engineering
On track to complete by the end of the fourth semester the following required courses, and completion of at least 24 credits from these courses, when applying for affiliation: MATH 1910, MATH 1920, MATH 2930, MATH 2940 (all with a minimum grade of C),PHYS 1110, PHYS 1112/PHYS 1116, PHYS 2213/PHYS 2213, CHEM 2090 & CHEM 2091, and CS 1110/CS 1112.

Additionally, cumulative GPA ≥2.0 in the completed required math, physics, and chemistry courses (including MSE 3010 if taken) and at least C in ENGRD 2610 or ENGRD 2620.

For any course that is repeated, the most recent grade will be used for affiliation requirements. However, repeated grades will be included for GPA calculations.

Students who will not satisfy these requirements by the end of the fourth semester should contact the MSE department about alternative paths to affiliation.

Mechanical Engineering
At least C– in ENGRD 2020 and all completed required math, physics, chemistry, and computer science courses. ENGRD 2210 is recommended prior to affiliation. GPA > 2.5 in these courses: ENGRD 2210 (if taken), MATH 2930, PHYS 2213, and ENGRD 2020.

Operations Research and Engineering
At least C in each of ENGRD 2700 and MATH 2940. GPA ≥ 2.2 in math, science, and engineering courses (both overall and in the term immediately before affiliation). At least C– in all ORIE courses completed thus far. Good academic standing in the College of Engineering.

[1] Students may major in biological engineering and environmental engineering through the College of Engineering or the College of Agriculture and Life Sciences (CALS). Students who do so through the College of Agriculture and Life Sciences are jointly administered by the College of Engineering and the College of Agriculture and Life Sciences.

Honors Program Within Majors

Many of the engineering majors supplement the major with an honors program.

Eligibility

The B.S. degree with honors is granted to engineering students who, in addition to having completed the requirements for a B.S. degree in a major, satisfactorily complete the honors program in the major and are recommended for the degree by the honors committee of that major. To enter an honors program, the student must be on track to graduate with distinction, and a student who does not stay on track to graduate with distinction is will be dropped from the honors program.

At least 9 extra credit hours are required for the honors degree, and a student must be in the program for at least two semesters before graduation. Courses taken to satisfy the honors requirement may not be used to satisfy any other B.S. degree requirements.

No research, independent study, or teaching for which the student is paid may be counted toward the honors program.

Procedures

An applicant to the honors program in a major must have an honors advisor: a faculty member from that major who will supervise the honors program and direct any research or project. The honors advisor need not be the student's advisor in the major.

The application for the honors program should be a letter from the student that describes the proposed honors program in detail and includes the explicit approval of the honors advisor.

Students must complete a written application no later than the beginning of the first semester of their senior year, but they are encouraged to make arrangements with the honors advisor during the second semester of their junior year. Each major may place further constraints on timing.

Major-Specific Information

Each major defines the content of the honors program and may also place other requirements on the program, in terms of timing, content, and procedures. Information is given within the description of the individual majors.

Learning Outcomes

Earth and Atmospheric Science students learn to:

- Obtain working knowledge of scientific method.
- Discover the way that data are collected.
- Construct and evaluate scientific hypotheses from Earth sciences data.
- Design, conduct and analyze experiments to test hypotheses.
- Collect, analyze, and interpret field and laboratory data.
- Identify, formulate, and solve scientific problems using appropriate mathematical tools.
- Compile and interpret spatial and temporal earth science data.
- Explain and assess important concepts in the chosen concentration.
- Utilize computer systems and programming to find, analyze and present data and evaluate hypotheses.
- Communicate the earth sciences effectively in written and oral mediums.
- Demonstrate the ability to work in teams.
- Have a broad education, including liberal studies.