EARTH AND ATMOSPHERIC SCIENCES (BA)

College of Arts and Sciences

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

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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: 120

Program Requirements

In addition to the major requirements indicated below, students must meet Arts and Sciences 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 [1]		
MATH 1910 & MATH 1920	Calculus for Engineers and Multivariable Calculus for Engineers	8
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	
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 [2]	
Biology		
Select one of the following:		3-5
BIOG 1140	Foundations of Biology (or)	
BIOG 1440	Introductory Biology: Comparative Physiology (or)	
BIOEE 1610	Introductory Biology: Ecology and the Environment (or)	
BIOEE 1780	An Introduction to Evolutionary Biology and Diversity (or)	

	BIOMG 1350	Introductory Biology: Cell and Developmental Biology (or)
	BIOSM 1610	Ecology and the Marine Environment (or)
	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] Students in the College of Engineering are additionally required to take MATH 2930 Differential Equations for Engineers and MATH 2940 Linear Algebra for Engineers.

[2] 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] 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 focused elective 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] 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 focused elective 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] 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 focused elective 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 focused elective course.

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.

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://courses.cornell.edu/preview_program.php?catoid=60&poid=30232) 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 Arts and Sciences Graduation Requirements

Undergraduate Degrees

Graduation Requirements for the Bachelor of Arts Degree

Credit Requirement: 120 academic credits are required, 100 of which must be taken in the College of Arts & Sciences. 100 credits in Arts & Sciences is a minimum number, as is the 120 credit total. A minimum of 80 credits must be in courses for which a letter grade was received. AP, IB, CASE and A-Level credits count toward the 120 total credits but not toward the 100 A&S credits. Transfer credits for non-transfer students cannot count towards the 100 A&S credits. (See list of courses (https://as.cornell.edu/registrar/courses-that-dont-count/) that do not count as academic credit.)

Residency Requirement: eight full-time semesters in residence (in person) are expected to complete degree requirements with a minimum of six full-time semesters being required. External transfer students must complete a minimum of four full-time residence semesters.

First-year Writing Seminar (FWS) Requirement: two courses are required. A 5 on either the AP English Composition or Literature exam, or a 7 on the IB HL English Literature or Language exam will count towards one of these seminars. First-year students should take an FWS during their first semester at Cornell and are required to complete two by the end of their sophomore year.

Foreign Language Requirement: a student must either pass an intermediate Cornell language course at the 2000-level or above (Option 1) or complete at least 11 credits in a single foreign language at Cornell (Option 2). AP and IB credits cannot complete this requirement, but usually indicate that a student can place into a higher level course. Note: Native speakers of a foreign language may be exempted from this requirement. For a list of language offerings and placement, see Language Study at Cornell.

Distribution Requirement: Must take a minimum of 8 courses of at least 3 credits to fulfill 10 distribution categories. How an individual course is categorized is indicated with the appropriate abbreviation in its course description. It is important to recognize that only courses with the proper designation in the catalog can be used toward fulfilling the distribution requirements in Arts and Sciences. Unless otherwise specified, variable

credit courses, including independent study courses, may not be used for distribution credit.

Arts & Sciences Distribution Requirement Categories:

- Arts, Literature, and Culture (ALC-AS)
- Biological Sciences (BIO-AS)
- Ethics and the Mind (ETM-AS)
- Global Citizenship (GLC-AS)
- Historical Analysis (HST-AS)
- Physical Sciences (PHS-AS)
- Social Difference (SCD-AS)
- Social Sciences (SSC-AS)
- Statistics and Data Science (SDS-AS)
- Symbolic and Mathematical Reasoning (SMR-AS)

Distribution Requirement Definitions

Arts, Literature, and Culture (ALC-AS)
Courses in this area examine arts, literature, and culture in various contexts. Students gain insights into the interplay of individual or collaborative creativity and social practice, and understand the complexities of the expression of the human condition. Topics include the analysis of artworks and literary texts, and the belief systems of social groups, cultures, and civilizations; they also focus on artistic expression itself (in creative writing, performing arts, and media such as film and video).

Biological Sciences (BIO-AS)
Courses in this area focus on understanding a wide range of life forms, from single cells to plants, animals, and their ecosystems. Topics include the molecular and biochemical makeup of life, the sub-cellular, cellular and organismal structures of life, and the evolutionary relatedness of all life forms. Students learn to describe how organisms are connected to each other and to their physical environment. Many courses address how genetic information is expressed from DNA, and how this expression leads to complex function and behavior.

Ethics and the Mind (ETM-AS)
Courses in this area investigate the human mind and its capacities, ranging from cognitive faculties shared by humans and animals such as perception, to language and abstract reasoning, to the ability to form and justify ethical values. Courses investigating the mind may use the methodologies of psychology, linguistics, or philosophy. Those focusing on ethics explore ways of reflecting on questions that concern the nature of justice, the good life, or human values in general. Many courses combine these topics and methodologies.

Global Citizenship (GLC-AS)
Courses in this area examine the history, culture, politics, religion, and social relations of peoples in different parts of the world, as well as their interactions. They encourage students to think broadly about the global community and their place within it, beyond the boundaries of their particular national or cultural group, and cultivate skills of intercultural engagement that are vital to their role as global citizens. These courses introduce students to global challenges such as war and peace, social and economic inequalities, international migration, and environmental sustainability, and encourage students to think critically about international responses to these challenges.

Historical Analysis (HST-AS)
Courses in this area train students in the analysis of documentary, material, and oral evidence about social phenomena, institutions, events and ideas of the past. Students learn to evaluate and critically assess differing analyses and interpretations of former times so that they may acquire a better understanding of the origins and evolution of the present. Questions addressed in HA courses include why and under what circumstances changes have occurred in how people have interacted with one another and with the environments in which they live.

Physical Sciences (PHS-AS)
Courses satisfying this requirement provide an appreciation of how science generates and categorizes enduring knowledge of our physical world. This includes the physics, chemistry, and technology involved, of everything from light to atoms, DNA molecules, Earth science, our Solar system, and to the Cosmos. These courses expose students to both the process and some of the substance of science. By learning the universal aspects of scientific enquiry, students will be better equipped to form opinions on scientific issues that affect the world.

Social Difference (SCD-AS)
Courses in this area examine social differences relevant to the human experience. Social categories include class, race, ethnicity, indigeneity, nationality, language, religion, gender, sexuality, and ability as objects of study. Students develop a deeper understanding of these categories and their intersections. Topics may include: how hierarchies in power and status shape social differences; how social, economic and political systems can impact the interpretation of social differences; and how differences attributed to various groups are explained.

Social Sciences (SSC-AS)
Courses in this area examine social, economic, political, psychological, demographic, linguistic, and relational processes. Topics include understanding how different social contexts, for example neighborhoods, families, markets, networks, or political organizations, shape social life. Students learn to identify, describe, and explain the causes and consequences of social phenomena using quantitative and/or qualitative evidence based on systematic observation of the social world. They also learn to link evidence to theory through rigorous and transparent reasoning, and/or reflect critically on the concepts through which people make sense of the social world.

Statistics and Data Science (SDS-AS)
Courses in this area develop data literacy, essential to be an informed citizen in today's world. Students learn and apply statistical and computational techniques to effectively collect, visualize, analyze and interpret data, and present conclusions. Applications span a wide variety of contexts: providing a better understanding of the communities in which we live, guiding and enriching our lives, and driving forward scientific inquiry. Students gain an appreciation of how to ask the right questions, and how statistics can depend on the context, assumptions, and limitations of data.

Symbolic and Mathematical Reasoning (SMR-AS)
Courses satisfying this requirement help students develop the skills to solve problems through understanding abstract, logical relationships. Such skills include mathematical analysis of patterns and phenomena, modeling natural and technological systems, and creating algorithms essential to computation. These courses explore specific quantitative and symbolic methods, strategies for applying logical reasoning in diverse areas, and the intrinsic elegance of mathematics.

Major Requirement: students must complete the requirements for at least one major in A&S. See individual major listings for major requirements.

Physical Education Requirement: completion of the university requirement of two PE courses and passing the swim test. Note: physical

education credit is not academic credit and does not count toward the 120 credits needed to graduate.

Policies on Applying Cornell and Non-Cornell Courses and Credits to Distribution Requirements

Restrictions on Applying AP/Test Credit and Courses from Other Institutions to the Distribution Requirements

- Students may not apply AP/test credit or transfer credit from another institution to the distribution requirements.
- Students who transfer to the college from another institution are under the above rules for advanced placement credit, but are eligible to have credit for post–high school course work taken during regular full-time semesters (not summer terms) at their previous institution count toward all distribution requirements. Transfer students receive a detailed credit evaluation when they are accepted for admission.

Restrictions on Applying Cornell Courses to the Distribution Requirements

- First-year writing seminars and ENGL 2880 Expository Writing or ENGL 2890 taken to satisfy a first-year writing seminar requirement may not count toward any other college or major requirement.
- Only courses with the proper designation in the Courses of Study can be used toward fulfilling the distribution requirements in Arts and Sciences.
- Students may not petition to change the category of any given course, nor may any faculty member change the category of a course for an individual student. Faculty members wishing to change the category for a course in which they are the primary instructor must petition the Educational Policy Committee for a change in category. If granted, the new category must be applied to the course as a whole and not for an individual student.

Courses That May Fulfill More Than One Requirement

- A course may fulfill more than one college requirement in any of the following situations:
- A course may be used to fulfill distribution and a major requirement (except if prohibited by one of the restrictions noted on applying AP/test credit, transfer credit, and Cornell courses to distribution requirements).
- A course may satisfy a maximum of two distribution categories. Students can only double-count distribution requirements on a maximum of two courses.
- A one-semester course in foreign literature (not language) or culture that is acceptable for certifying option 1 in that language may also be applied to the relevant distribution requirement.
- Courses may count toward any other requirement except first-year writing seminars.

Credit Requirement

Credits and Courses: Students must earn a minimum of 120 academic credits (which may include AP/test credits). Of the 120, a minimum of 100 must be from courses taken in the College of Arts and Sciences at Cornell.

Courses that do not count toward the 120 credits required for the degree. The College of Arts and Sciences does not grant credit toward the degree for every course offered by the university. Courses in military training, service as a teaching assistant, physical education, remedial or developmental training, precalculus mathematics, supplemental science and mathematics, offered by the Learning Strategies Center, and English as a second language are among those for which degree credit is not awarded. Students can view the list of courses that do not count for academic credit here (https://as.cornell.edu/registrar/courses-that-dont-count/).

Other cases in which a course may not receive credit include the following:

- A course identified as a prerequisite for a subsequent course may not be taken for credit once a student completes that subsequent course.
- A repeated course. (For more information, see "Repeating courses," below.)
- A "forbidden overlap," that is, a course with material that significantly overlaps with material in a course a student has already taken. Students should consult the list of Forbidden Overlaps for more information.

Courses that count toward the 100 required Arts and Sciences credits may include liberal arts courses approved for study abroad during a semester or academic year of full-time study (not summer abroad study), courses taken in certain off-campus Cornell residential programs, and a maximum of three courses that majors may accept from other colleges at Cornell as fulfilling major requirements. A&S courses taken in Cornell's summer session may count towards the 100 A&S credits.

Courses that do not count toward the 100 required Arts and Sciences credits include credits earned in other colleges at Cornell (except in the cases specifically noted in this section), transfer credits earned in any subject at institutions other than Cornell, and advanced placement/test credits. AP/test credits count as part of the 120 credits required for the degree but not as part of the 100 Arts and Sciences credits and may not be applied to distribution requirements. AP credits are posted on the transcript. If, subsequently, a student takes the course out of which they had placed, the AP credit will be removed because of the overlap in content.

Repeating Courses

Students occasionally need to repeat courses. Some courses, such as independent study, some music and performance courses, and specific topical seminars, in which content is significantly different, do grant credit when the course is taken more than once. For all repeated courses, both grades appear on the transcript and are included in both the term and cumulative GPA. For repeated courses that do not grant credit more than once, only one instance counts toward degree credits and requirements.

Residency Requirement

The College of Arts & Sciences is a residential community and students typically spend eight semesters of full-time study in residence to earn the B.A. degree.

The completion of a fall or spring term as a full-time registered student at Cornell counts as a semester in residence. Summer and winter terms at Cornell, study in Cornell's School of Continuing Education and at other institutions do not count as semesters of residence.

The residency requirement has two components: a minimum number of semesters in residence and a requirement to spend the last full-time semester of study in residence.

Students matriculating into the College of Arts & Sciences as first-year students must have a minimum of six semesters in residence before graduating. First-year matriculants into A&S can count up to two semesters in an approved off-campus program as semesters in residence. Approved off-campus programs include A&S approved study abroad programs, Cornell in Washington, Cornell in Rome, and the Cornell-China & Asia-Pacific Studies (CAPS) Program.

Students who transfer into the College of Arts & Sciences after matriculating in their first-year in another Cornell college (internal transfers) must have a minimum of six semesters in residence, and a minimum of two semesters in the College of Arts and Sciences before graduating. Internal transfers can count up to two semesters in an approved off-campus program as semesters in residence.

Students who transfer into Cornell from another institution (external transfers) must have a minimum of four semesters in residence, and a minimum of two semesters in the College of Arts & Sciences, before graduating. External transfers can count up to one semester in an approved off-campus program as a semester in residence.

In addition to the minimum number of semesters in residence, all students must complete their final full-time semester of study (i.e., the last semester in which at least 9 academic credits are needed to meet graduation requirements) in residence. Students who have fewer than 9 credits to complete degree requirements, and have met the minimum number of semesters residency requirement, may elect to complete their degree requirements during Cornell summer and winter terms registered as an A&S student or at another institution with approved transfer credit. Students cannot meet final degree requirements registered as an extramural student at Cornell.

Exceptions to the residence requirement are not petitionable.

Foreign Language Requirement

The faculty considers competence in a foreign language essential for an educated person. Studying a language other than one's own helps students understand the dynamics of language, our fundamental intellectual tool, and enables students to understand another culture. The sooner a student acquires this competence, the sooner it will be useful. Hence, work toward the foreign language requirement should be undertaken in the first two years. Students postponing the language requirement for junior and senior years risk not graduating on time. Courses in foreign languages and/or literature are taught in the College of Arts and Sciences by the following departments: Africana Studies and Research Center, Asian Studies, Classics, Comparative Literature, German Studies, Linguistics, Near Eastern Studies, and Romance Studies. For a list of languages and placement see Language Study at Cornell.

The language requirement may be satisfied in one of the following ways:

Option 1 (FLOPI): Passing (a) a non-introductory foreign language course of 3 or more credits at Cornell at the 2000-level or above or (b) any other non-introductory course at the 2000-level or above conducted in a foreign language at Cornell. OR

Option 2: Passing at least 11 credits of study in a single foreign language (taken in the appropriate sequence) at Cornell.

Any exceptions to these rules will be noted elsewhere in individual department descriptions.

Students whose speaking, reading, and writing competence in a language other than English is at the same level we would expect our entering first-year students to have in English (as shown by completing high school in that language or by special examination during their first year here at Cornell) are exempt from the college's language requirement.

Major Requirement

Most departments and programs specify certain prerequisites for admission to the major; they are found on the pages for each department and program available at Degree Programs.

Students may apply for acceptance into the major as soon as they have completed the prerequisites and are confident of their choice. This may be as early as the second semester of their first year, and must be no later than the end of the second semester of sophomore year. A student without a major at the beginning of the junior year is not making satisfactory progress toward the degree and risks not being allowed to continue in the college. Undeclared first-term juniors must file a Late Declaration of Major form with Student Services and may be placed on a leave of absence during their junior year if they have not yet declared a major.

Double Majors

Completion of one major is required for graduation. Some students choose to complete more than one major. No special permission or procedure is required; students simply become accepted into multiple majors and are assigned to an advisor in each department. All completed majors are posted on the official transcript. Students are not allowed to continue their studies past their eighth semester to complete additional majors.

Early and Delayed Graduation

Graduating Early

A student may elect to graduate early if they are able to complete all graduation requirements in fewer than eight semesters.

Students must still satisfy the college's residency requirement as part of the graduation requirements. This residency requirement requires that students who are first-year matriculants into Cornell spend a minimum of six semesters in residence, external transfers must spend a minimum of four. To request an early graduation, students must notify the A&S Registrar's Office in KG 17 Klarman Hall or at as-studentservices@cornell.edu (as-studentservices@cornell.edu?subject=Early%20Graduation%20Request).

The earliest a student can request to graduate early and officially change their graduation date is immediately following the pre-enrollment period for their anticipated final semester. The student should have pre-enrolled in the classes required to meet the graduation requirements by the requested graduation date. The student must then complete Part I in DUST and have Part II completed by their major advisor.

Graduating Late: Ninth Term Enrollment

The Bachelor of Arts degree is expected to be completed in eight terms. If degree requirements cannot be completed in eight terms, students may seek permission to continue their studies. Requests will only be granted for students who have found themselves in emergent circumstances beyond their control which have prevented them from completing the degree in eight terms. Requests cannot be made until a student's final expected graduation term and will not be reviewed and approved until after the university drop deadline for that semester. Study beyond the eighth term is not automatically granted for the purposes of changing a major. Such requests must be discussed with a college academic advisor

and require registrar approval. Requests to add an additional major or minor will not be approved for study beyond the eighth term.

If approved, students in the ninth and tenth term will be on a conditional status and will have restrictions placed on their enrollment to ensure successful completion of their degree. To request a ninth term, students must have their faculty advisor update Part II for any remaining major requirements. They will also need to submit a study plan to their college advisor listing the specific courses that will meet degree requirements for one major.

Student may elect to prorate credits if enrolling in 9 or fewer credits or take a full-time load if they desire. However, enrollment will be limited to 18 credits for the term so students can focus on their remaining required courses. In the rare case where a student may need to enroll in a tenth term to complete their degree, they will be required to prorate tuition and their enrollment will be limited to only the courses/credits needed for successful completion of one major. Additional enrollments will not be allowed.

Graduation Procedures

Application to Graduate

In the first semester of their senior year, students are prompted by Arts & Sciences Student Services to complete an online application to graduate. The application is intended to help seniors identify problems early enough in the final year to make any necessary changes in course selection to satisfy those requirements. Nonetheless, ensuring graduation requirements are fully met is the student's responsibility and any problems that are discovered, even late in the final semester, must be resolved by the student before the degree can be granted. Students are responsible for checking their DUST (https://data.arts.cornell.edu/as-stus/degree_reqts.cfm) reports and transcripts each term and alerting Student Services of any problems with their academic record. To check on their progress in the major, students should consult with their major advisors.

Degree Dates

Cornell has three official degree conferral dates in the year: December, May, and August. Students who plan to graduate in August may attend commencement ceremonies in the preceding or subsequent May. Students graduating in December are invited to a special recognition ceremony in December and may also attend Commencement the following May. All academic work must be complete by the official conferral date in order to receive a degree on that date. Incomplete academic work will result in a later conferral date.

Honors

Notice: beginning with the December 2026 conferral date, Cornell University will institute a standardized Latin Honors system based solely on final cumulative undergraduate GPA. The Latin Honors categories include: Summa Cum Laude (top 5%), Magna Cum Laude (next 10%), and Cum Laude (next 15%).

The student's cumulative undergraduate GPA percentile at the time of degree conferral will be computed with respect to the student's particular college. Existing college-specific Latin Honors systems not based upon the new standardized criteria will be discontinued at the end of Summer 2026. This will apply to all major honors in Arts & Sciences as they will no longer use Latin Honors and will award "Honors in X" (e.g. Honors in Chemistry, Honors in English, etc.) Please see Graduation and Academic Honors for more information.

Bachelor of Arts with Honors

Almost all departments offer honors programs for students who have demonstrated exceptional accomplishment in the major and succeeded in research. The conferring of honors, and the requirements for conferral (cum laude, magna cum laude, or summa cum laude) are set by the departments for each major, the Independent Major Program, or the College Scholar Program. Minors do not offer honors programs. Students should contact the Director of Undergraduate Studies (https://as.cornell.edu/about/directors-undergraduate-study/) with questions about honors in the respective program.

Bachelor of Arts with Distinction

The degree of Bachelor of Arts with distinction in all subjects will be conferred on students who have completed the requirements for the degree of Bachelor of Arts, if they have met the following requirements by the end of their final semester:

1. completed at least 60 credits while registered in regular sessions at Cornell;
2. achieved a GPA in the upper 30 percent of their class at the end of the seventh semester, or next-to-last semester for transfers and accelerants;
3. received a grade below C– in no more than one course;
4. received no failing grade (excluding PE);
5. have no frozen Incompletes on their records; and
6. maintained good academic standing, including completing a full schedule of at least 12 academic credits, in each of their last four semesters. (Students who have been approved to have prorated tuition for their final semester are considered to be in good academic standing).

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.