ATMOSPHERIC AND OCEANIC SCIENCES - BACHELOR OF ARTS (BA)

The atmospheric and oceanic sciences (ATOC) Bachelor of Arts degree is the first of its kind at CU Boulder for students interested in an in-depth understanding of the physical basis for the role of the atmosphere and oceans in Earth's climate system. An ATOC degree will prepare students to pursue a wide range of careers in areas as diverse as the energy sector, insurance, military, air and water quality monitoring, weather and aerospace industries. It will provide a solid foundation for advanced degrees in the atmospheric and oceanic sciences, and for professions in scientific research and academia.

ATOC's curriculum responds to demands of current students for more interactive learning opportunities and to demands of employers for graduates who have been trained to provide quantitative solutions to real-world problems. It is designed to provide students with a core set of knowledge and skills related to atmospheric and oceanic sciences, and to engage students in hands-on, interactive learning early and often. To that end, it requires students to take several "methods" courses that emphasize quantitative problem-solving by focusing on some combination of data analysis, observations and/or modeling; all of these courses will incorporate some level of computer programming or scientific computing. ATOC strongly recommends that every student have a laptop computer if it is financially feasible. Students who intend to purchase a computer and wish to have its cost included in their financial aid calculations are strongly encouraged to consult the Office of Financial Aid before purchase.

ATOC's curriculum is also designed to take advantage of our unique position as a university in the center of a world-renowned mecca for earth system science. Scientists from the local community contribute their expertise to the ATOC curriculum, particularly in the interactive methods courses, and mentor seniors in their thesis research.

Contact Information

Director of Undergraduate Education: Dr. Derek Brown (derek.brown@colorado.edu)

Academic Advising Center First-Year Liaison: Gretchen Lang (gretchen.lang@colorado.edu)

Academic Advising Center for ATOC majors beyond first year: Tabs Lannom (tabitha.lannom@colorado.edu)

For further information concerning undergraduate studies, contact ATOC's graduate and undergraduate program assistant, Laurie Conway (laurie.conway@colorado.edu).

Requirements

Students receiving a BA in atmospheric and oceanic sciences (ATOC) must satisfy the basic requirements of the College of Arts and Sciences (General Education, graduation, and credit requirements) and fulfill the requirements listed below.

Students are required to complete 45 credits in lower and upper-division ATOC coursework, including 21 credits of core ATOC courses, 12 credits of methods in ATOC, and 12 credits of designated upper-division ATOC electives. The requirements for the ATOC major also include 32–37 hours of ancillary science and mathematics. All required major courses and all required ancillary courses must be passed with a C- or better.

Under normal circumstances, no more than 45 credits in ATOC may be used toward a student's total University of Colorado graduation requirements. However, up to 6 hours of designated department honors courses are exempted from this credit-hour maximum. Students must have a grade point average of at least 2.000 in the major in order to graduate.

Required Courses and Credits

ATOC Major Requirements

Code	Title	Credit Hours
Introductory Atmospheric and Oceanic Sciences Requirement		
Select one of the following:		3
ATOC 1050	Weather and the Atmosphere	
ATOC 1060	Our Changing Environment: El Nino, Ozone, and Climate	
ATOC 2050	Introduction to Atmospheric Research	
ATOC 2500	Special Topics in Atmospheric and Oceanic Sciences - Lower Division	
FYSM 1000	First Year Seminar (ATOC offered sections)	
Core Atmospheric and Oceanic Sciences Requirements		
Select three of the following courses:		9
ATOC 3050	Principles of Weather	
ATOC/GEOL 3070	Introduction to Oceanography	
ATOC 3300	Analysis of Climate and Weather Observations	
or ATOC 3700	Course-Based ATOC Research Experience	
ATOC 3500/ CHEM 3151	Air Chemistry and Pollution	
ATOC 3600	Principles of Climate	
Fundamentals of Atmospheric and Oceanic Sciences		
Select three of the following courses:		9
ATOC 4200	Biogeochemical Oceanography	
ATOC 4710	Introduction to Atmospheric Physics	
ATOC 4720	Atmospheric Dynamics	
ATOC 4730	Physical Oceanography and Climate	
Methods in Atmospheric and Oceanic Sciences		
Select 12 credit hours of the following, 6 of which can be from independent research (ATOC 4900, ATOC 4950 or ATOC 4990). Some courses offered as ATOC 4500 Special Topics may satisfy this requirement.		12
ATOC 4500	Special Topics in Atmospheric and Oceanic Sciences - Upper Division (Choose from the following: topics: Weather Modeling Lab, Instrument Lab, Remote Sensing, Field Observations and Measurements, Numerical Methods and Modeling, Objective Data Analysis, Synoptic Dynamic Meteorology, and Applications of Numerical Models)	
ATOC 4700	Weather Analysis & Forecasting	

ATOC 4815	Scientific Programming, Data Analysis and Visualization Laboratory	
ATOC 4830	Remote Sensing Lab	
ATOC 4840	Field Observations and Measurements Laboratory	
ATOC 4850	Numerical Methods Laboratory	
ATOC 4860	Data Science Lab	
ATOC 4870	Climate Modeling Laboratory	
ATOC 4875	Weather Modeling Laboratory	
ATOC 4890	Synoptic Dynamic Meteorology	
ATOC 4900	Independent Study	
ATOC 4950	Honors Thesis	
ATOC 4990	Internship	
ATOC Electives		
(At least 12 credit hours in ATOC courses not used to fulfill a requirement above.)		
Upper-Division ATOC Electives		9
Upper- or Lower-Division ATOC Elective		3
Total Credit Hours		**45**

Required Ancillary Coursework from Outside ATOC

Code	Title	Credit Hours
Ancillary Science and Mathematics Requirements		
The field of atmospheric and oceanic sciences is highly interdisciplinary; therefore, students must develop a basic understanding of physics, chemistry, and mathematics to be successful. The required courses in the physical sciences and math departments outside of ATOC are a critical part of the major; they are needed to build a strong foundation upon which the remaining curriculum is based. All courses must be passed with a grade of C- or better required.		
APPM 1350	Calculus 1 for Engineers	4-5
or MATH 1300	Calculus 1	
APPM 1360	Calculus 2 for Engineers	4-5
or MATH 2300	Calculus 2	
APPM 2350	Calculus 3 for Engineers	4-5
or MATH 2400	Calculus 3	
APPM 2360	Introduction to Differential Equations with Linear Algebra (Or MATH 2130 and MATH 3430)	4-6
CHEM 1113	General Chemistry 1	4
CSCI 1200	Introduction to Computational Thinking	3
PHYS 1110	General Physics 1	4
PHYS 1120	General Physics 2	4
Total Credit Hours		**31-36**

Graduating in Four Years

Consult the Four-Year Guarantee Requirements for information on eligibility. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in ATOC, students should meet the following requirements:

- In the first semester, declare the Atmospheric and Oceanic Sciences major.

Students must consult with a major advisor to determine adequate progress toward completion of the major.

Sample Four-Year Plan of Study

Through the required coursework for the major, students will complete all 12 credits of the Natural Sciences area of the Gen Ed Distribution Requirement and the QRMS component of the Gen Ed Skills Requirement.

Not all ATOC 4500 courses satisfy all requirements. See department for more information.

Year One		
Fall Semester		**Credit Hours**
FYSM 1000 or ATOC 1050 or ATOC 1060 or ATOC 2050 or ATOC 2500	First Year Seminar (ATOC section) or Weather and the Atmosphere or Our Changing Environment: El Nino, Ozone, and Climate or Introduction to Atmospheric Research or Special Topics in Atmospheric and Oceanic Sciences - Lower Division	3
APPM 1350	Calculus 1 for Engineers	4
PHYS 1110	General Physics 1	4
Gen. Ed. Skills course (example: Lower-division Written Communication)		3
	Credit Hours	**14**
Spring Semester		
APPM 1360	Calculus 2 for Engineers	4
PHYS 1120	General Physics 2	4
Gen. Ed. Distribution/Diversity course (example: Arts & Humanities/US Perspective)		3
Gen. Ed. Distribution course (example: Social Sciences)		3
	Credit Hours	**14**
Year Two		
Fall Semester		
CHEM 1113	General Chemistry 1	4
CHEM 1114	Laboratory in General Chemistry 1	1
APPM 2350	Calculus 3 for Engineers	4
Core ATOC course (see requirements)		3
CSCI 1200	Introduction to Computational Thinking	3
	Credit Hours	**15**
Spring Semester		
APPM 2360	Introduction to Differential Equations with Linear Algebra	4
Core ATOC course (see requirements)		6
Gen. Ed. Distribution/Diversity course (example: Social Sciences/Global Perspective)		3
Gen. Ed. Distribution course (example: Arts & Humanities)		3
	Credit Hours	**16**
Year Three		
Fall Semester		
Fundamentals ATOC course (see requirements)		3
Fundamentals ATOC course (see requirements)		3
ATOC Methods course (see above)		3
Gen. Ed. Distribution course (example: Social Sciences)		3

Gen. Ed. Distribution course (example: Arts & Humanities)	3
Credit Hours	**15**
Spring Semester	
Fundamentals ATOC course (see requirements)	3
ATOC Methods course (see requirements)	3
ATOC Upper-division Elective	3
Gen. Ed. Skills course (example: Upper-division Written Communication)	3
Elective	3
Credit Hours	**15**
Year Four	
Fall Semester	
ATOC Methods Course (see requirements)	3
ATOC Upper-division Elective	3
Gen. Ed. Distribution course (example: Arts & Humanities)	3
Elective or Upper-division Elective (if needed)	3
Elective	3
Credit Hours	**15**
Spring Semester	
ATOC Methods Course (see requirements)	3
ATOC Upper-division Elective	3
ATOC Upper-division Elective	3
Gen. Ed. Distribution course (example: Social Sciences)	3
Elective	4
Credit Hours	**16**
Total Credit Hours	**120**

Learning Outcomes

ATOC's curriculum responds to demands of current students for more interactive learning opportunities and to demands of employers for graduates who have been trained to provide quantitative solutions to real-world problems. It is designed to provide students with a core set of knowledge and skills related to atmospheric and oceanic sciences, and to engage students in hands-on, interactive learning early and often.

To that end, it requires students to take several "methods" courses that emphasize quantitative problem-solving by focusing on some combination of data analysis, observations, and/or modeling; all of these courses will incorporate some level of computer programming or scientific computing.

ATOC course learning goals include graphical literacy, investigative thinking, societal and personal relevance, and knowledge of the physical processes of weather and climate. In addition, ATOC majors should demonstrate skill in communication scientific concepts elegantly and clearly.