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

ATOC Undergraduate Advisors:

- Associate Professor Katja Friedrich (katja.friedrich@colorado.edu), SEEC N241B
- Associate Professor John Cassano (john.cassano@colorado.edu), SEEC C279

Academic Advising Center for first year students in physical sciences:

- Laura Gonzalez (laura.gonzalez@colorado.edu)
- Christopher Swenson (christopher.swenson@colorado.edu)

Academic Advising Center for ATOC majors beyond first year:

- Brendan Griffiths (brendan.griffiths@colorado.edu)
- Gretchen Lang (gretchen.lang@colorado.edu)

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

Requirements

Program Requirements

Students receiving a BA in atmospheric and oceanic sciences (ATOC) must satisfy the basic requirements of the College of Arts and Sciences (MAPS, Gen Ed requirements and credits) 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

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>ATOC 1060</td>
<td>Our Changing Environment: El Nino, Ozone, and Climate</td>
<td>3-6</td>
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<tr>
<td>ATOC 1050</td>
<td>Weather and the Atmosphere</td>
<td>3-6</td>
</tr>
<tr>
<td>ATOC 2500</td>
<td>Special Topics in Atmospheric and Oceanic Sciences - Lower Division</td>
<td>3-6</td>
</tr>
<tr>
<td>FYSM 1000</td>
<td>First Year Seminar (Stratospheric Explorations)</td>
<td>3-6</td>
</tr>
<tr>
<td>ATOC 3050</td>
<td>Principles of Weather</td>
<td>3-6</td>
</tr>
<tr>
<td>ATOC/GEOL 3070</td>
<td>Introduction to Oceanography</td>
<td>3-6</td>
</tr>
<tr>
<td>ATOC 3500/ CHEM 3151</td>
<td>Air Chemistry and Pollution</td>
<td>3-6</td>
</tr>
<tr>
<td>ATOC 3600</td>
<td>Principles of Climate</td>
<td>3-6</td>
</tr>
<tr>
<td>ATOC 4200</td>
<td>Biogeochemical Oceanography</td>
<td>3-6</td>
</tr>
<tr>
<td>ATOC 4710</td>
<td>Introduction to Atmospheric Physics</td>
<td>3-6</td>
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<tr>
<td>ATOC 4720</td>
<td>Introduction to Atmospheric Dynamics</td>
<td>3-6</td>
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<tr>
<td>ATOC 4730</td>
<td>Physical Oceanography and Climate</td>
<td>3-6</td>
</tr>
<tr>
<td>ATOC 4500</td>
<td>Special Topics in Atmospheric and Oceanic Sciences - Upper Division (Scientific Programming and Data Visualization)</td>
<td>3-6</td>
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<tr>
<td>ATOC 4500</td>
<td>Special Topics in Atmospheric and Oceanic Sciences - Upper Division (Instrument Lab)</td>
<td>3-6</td>
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</tbody>
</table>
ATOC 4500 Special Topics in Atmospheric and Oceanic Sciences - Upper Division (Remote Sensing)

ATOC 4500 Special Topics in Atmospheric and Oceanic Sciences - Upper Division (Field Observations and Measurements)

ATOC 4500 Special Topics in Atmospheric and Oceanic Sciences - Upper Division (Numerical Methods and Modeling)

ATOC 4500 Special Topics in Atmospheric and Oceanic Sciences - Upper Division (Objective Data Analysis)

ATOC 4500 Special Topics in Atmospheric and Oceanic Sciences - Upper Division (Applications of Numerical Models)

ATOC 4700 Weather Analysis & Forecasting

ATOC 4900 Independent Study

ATOC 4950 Honors Thesis

**ATOC Upper-division Electives**

At least 9 credit hours in ATOC not used to fulfill a requirement above; all courses offered as ATOC 4500 “Special Topics” will satisfy this requirement.

**Total Credit Hours** 45

1 No more than 6 lower division ATOC credits can be applied to the major.

**Required ancillary coursework from outside ATOC**

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<thead>
<tr>
<th>Code</th>
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<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>APPM 1350</td>
<td>Calculus 1 for Engineers</td>
<td>4-5</td>
</tr>
<tr>
<td>or MATH 1300</td>
<td>Calculus 1</td>
<td></td>
</tr>
<tr>
<td>APPM 1360</td>
<td>Calculus 2 for Engineers</td>
<td>4-5</td>
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<tr>
<td>or MATH 2300</td>
<td>Calculus 2</td>
<td></td>
</tr>
<tr>
<td>APPM 2350</td>
<td>Calculus 3 for Engineers</td>
<td>4-5</td>
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<tr>
<td>or MATH 2400</td>
<td>Calculus 3</td>
<td></td>
</tr>
<tr>
<td>APPM 2360</td>
<td>Introduction to Differential Equations with Linear Algebra (Or MATH 2130 and MATH 3430)</td>
<td>4-6</td>
</tr>
<tr>
<td>CHEM 1113</td>
<td>General Chemistry 1</td>
<td>4</td>
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<tr>
<td>CSCI 1300</td>
<td>Computer Science 1: Starting Computing</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1110</td>
<td>General Physics 1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1120</td>
<td>General Physics 2</td>
<td>4</td>
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</tbody>
</table>

Total Credit Hours 32-37

**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.

### Course | Title | Credit Hours
--- | --- | ---
**Year One**

**Fall Semester**

- FYSM 1000 or ATOC 1050 or ATOC 1060 or ATOC 2500 First Year Seminar (ATOC section) or Weather and the Atmosphere or Our Changing Environment: El Nino, Ozone, and Climate or Special Topics in Atmospheric and Oceanic Sciences - Lower Division 1-3

| 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 12-14

**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 above) 3
- Gen. Ed. Distribution/Diversity course (example: Social Sciences/Global Perspective) 3

Credit Hours 15

**Spring Semester**

- APPM 2360 Introduction to Differential Equations with Linear Algebra 4
- Core ATOC course (see above) 6
- CSCI 1300 Computer Science 1: Starting Computing 4
- Gen. Ed. Distribution course (example: Arts & Humanities) 3

Credit Hours 17
Year Three
Fall Semester
Fundamentals ATOC course (see above) 3
Fundamentals ATOC course (see above) 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 above) 3
ATOC Methods course (see above) 3
ATOC Upper-division Elective 3
Gen. Ed. Skills course (example: Upper-division Written Communication) 3
Elective/MAPS 3
Credit Hours 15

Year Four
Fall Semester
ATOC Methods Course (see above) 3
ATOC Upper-division Elective 3
Gen. Ed. Distribution course (example: Arts & Humanities) 3
Elective or Upper-division Elective (if needed) 3
Elective/MAPS 3
Credit Hours 15

Spring Semester
ATOC Methods Course (see above) 3
ATOC Upper-division Elective 3
ATOC Upper-division Elective 3
Gen. Ed. Distribution course (example: Social Sciences) 3
Elective/MAPS 3
Credit Hours 15

Total Credit Hours 118-120

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.