

ATMOSPHERIC SCIENCE, BS

Atmospheric Science is the study of short-term weather and long-term climate, involving activities such as weather forecasting, climate projections, air quality modeling, data analysis, and basic and applied research.

Some universities may call this major "Meteorology." We call it Atmospheric Science because our program is much broader than just weather forecasting. Students in our program will obtain a solid foundation in the mathematical modeling that forms the basis of analysis not just of tomorrow's expected weather but also long-term climate change, storm impact and predictability, pollution patterns and impact, and the consequences of weather to people and organizations.

While TV weather forecasters may be the most visible job outcome for an Atmospheric Science major, the fact is that there are a very limited number of these jobs nationally. Most majors work in other areas of the field such as research, government agencies such as NASA and NOAA, consulting firms, and schools. As more and more companies realize the impact weather can have on business operations, more job opportunities are opening in the private sector, and this is the sector with the greatest projected job growth.

Atmospheric Science students at UWM have unique opportunities not found at any other university in the state or region. Our Innovative Weather program (<http://innovativeweather.com/>) is hired by numerous businesses such as the Milwaukee Brewers and We Energies that need to make decisions based on the weather, and students work to provide these clients with customized forecasts and risk analyses. Our program also offers students research internships in areas such as cloud modeling, weather analysis, and data science. Our program is also home to the first-of-its-kind faculty-led Mexico "Air Pollution and Ancient Cultures" Study Abroad program and an active student-led club. Finally, the Atmospheric Science major provides distinct tracks that help prepare students for careers in weather forecasting, natural hazard risk assessment, and data analytics, or for graduate study.

Requirements

Course of Study – Bachelor of Science Degree

Complete 120 credits including 90 credits in the College of Letters & Science and with 36 of the 90 credits in L&S upper-level (numbered above 300) courses and 30 of those 36 credits in designated Advanced Natural Science courses (<https://uwm.edu/letters-science/advising/degree-requirements/advanced-natural-science-approved-courses-list/>). The College requires that students must complete in residence at UWM at least 15 credits in upper-division (numbered 300 or above) courses in their major. Students are also required to complete University-wide General Education Requirements and the specific L&S requirements listed below.

To complete a major, students must satisfy all the requirements of the major as stated in this catalog. Students who declare their majors within five years of entering the UW System as a degree candidate may satisfy the requirements outlined in any catalog issued since the time they entered. Credits used to satisfy the major also may be used to satisfy other degree requirements.

University General Education Requirements (GER)

Code	Title	Credits
Oral and Written Communication		
<i>Part A</i>		
Achieve a grade of C or better in the following course:		
ENGLISH 102	College Writing and Research (or equivalent)	
<i>Part B</i>		
Course designated as OWC-B; may be completed through a major-specific course requirement		
Quantitative Literacy		
<i>Part A</i>		
Earn at least 3 credits with a grade of C or higher in one of the following courses or an equivalent course, or achieve a placement code of at least 30 on the mathematics placement test (or other appropriate test, as determined by the Mathematical Sciences Department)		
MATH 102	Mathematical Literacy for College Students II	
MATH 103	Contemporary Applications of Mathematics	
MATH 105	Introduction to College Algebra	
MATH 108	Algebraic Literacy II	
MATH 111	Introduction to Logic - Critical Reasoning ¹	
or PHILOS 111	Introduction to Logic - Critical Reasoning	
MATH 116	College Algebra	
Or equivalent course		
<i>Part B</i>		
Course designated as QL-B; may be completed through a major-specific course requirement		
Arts		
Select 3 credits		3
Humanities		
Select 6 credits		6
Social Sciences		
Select 6 credits		6
Natural Sciences		
Select 6 credits (At least two courses including one lab)		6
UWM Foreign Language Requirement		
Complete Foreign Language Requirement through:		
Two years (high school) of a single foreign language		
Two semesters (college) of a single foreign language		
Or equivalent		
UWM Cultural Diversity Requirement		
One course from the Arts, Humanities, or Social Sciences must also satisfy UWM's Cultural Diversity requirement		

¹ Math 111 and Philosophy 111 are jointly offered and count as repeats of one another. Students cannot receive credit for both courses.

College of Letters & Science Requirements

I. English Composition Requirement

Students must satisfy the English Composition Requirement with one of the following options:

- 1) Completing ENGLISH 102 with a grade of C or higher; or
- 2) placing beyond English 102 on the English Placement Test (EPT) (or other assessment as determined by the English Department); or
- 3) transferring a course of at least 2.5 equivalent credits from another institution that is equivalent to English 102, or a UWM higher-level expository writing course, with a grade of C or higher.

Note: This requirement is the same as the University General Education Requirement for Oral and Written Communication Part A. The College of Letters & Science does not have a specific requirement for a writing course beyond English 102, but students must complete the university-wide requirement for Oral and Written Communication Part B listed above.

II. Mathematics and Formal Reasoning

To satisfy the Mathematics and Formal Reasoning Requirement, Bachelors of Sciences degree students must satisfy the following two requirements:

1. Complete one of the following courses or an equivalent course:

Code	Title	Credits
MATH 211	Survey in Calculus and Analytic Geometry I	4
MATH 213	Calculus with Life Sciences Applications	4
MATH 221	Honors Calculus I	5
MATH 231	Calculus and Analytic Geometry I	4

2. Complete one course (at least 3 credits) at the 200 level or above chosen from courses in Mathematics, PHILOS 211, or Letters and Science statistics courses:

Code	Title	Credits
Complete one of the following:		
3 or more credits in any 200-level or above Math course		
AFRIC 220	Introduction to Statistics in African and African Diaspora Studies	
ANTHRO 568	Introduction to Anthropological Statistics	
ATM SCI 500	Statistical Methods in Atmospheric Sciences	
BIO SCI 465	Biostatistics	
ECON 210	Economic Statistics	
GEOG 247	Quantitative Analysis in Geography	
HIST 595	The Quantitative Analysis of Historical Data	
MTHSTAT 215	Elementary Statistical Analysis	
PHILOS 211	Elementary Logic	
POL SCI 390	Political Data Analysis	
POL SCI 392	Survey Research	
PSYCH 210	Psychological Statistics	

SOCIOL 261	Introduction to Statistical Thinking in Sociology
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Note: This requirement is NOT the same as the University General Education Requirement for Quantitative Literacy Part B. To complete the BS, students must take one of the L&S approved courses. **Not all of the courses listed here will satisfy the QL-B requirement.**

III. Foreign Language Requirement

Two courses (minimum of 6 credits) in a language (including American Sign Language) other than English at the 100 level or above are required.

Placement testing may be used to satisfy all or part of this requirement. Language courses (including American Sign Language) other than English taken in high school may be used to satisfy all or part of this requirement. One year of high school language equates to one semester of college work.

Completion of the L&S Language Requirement also satisfies the university-wide Foreign Language GER, but not vice versa.

IV. International Requirement

See Approved Courses for the L&S International Requirement (<http://catalog.uwm.edu/letters-science/approved-courses-international-requirement/>) for course options.

Code	Title	Credits
Completed in one of the following ways:		9
Complete 3 courses (min. 9 cr) in a single foreign language (not including literature-in-translation or American Sign Language) at the 3rd semester level and above		
Complete 3 non-language courses (min. 9 credits) with an international content chosen from at least 2 curricular areas.		
Complete 9 credits in combination of the two options above.		

V. Breadth Requirement

Along with completing the University General Education Requirements of 3 credits in the Arts (A); 6 credits in the Humanities (HU), Social Sciences (SS), and Natural Sciences (NS/NS+); and a course with the Cultural Diversity (CD/+) designation, L&S students must complete the Breadth requirement.

Code	Title	Credits
Arts		
Select 3 credits		3
Humanities		
Complete 12 credits of L&S courses with Humanities Breadth designation; no more than 6 credits from a single subject area. *		12
Social Sciences		
Complete 12 credits of L&S Courses with Social Science Breadth designation; no more than 6 credits from a single curricular area. *		12
Natural Sciences		
Complete 12 credits of L&S Courses with Natural Sciences Breadth designation, including laboratory or field courses from three different curricular areas. *		12
Cultural Diversity		
Complete 3 credits in a course with Cultural Diversity (CD) designation. **		3

* Students should check their course selections carefully with the list of approved L&S Breadth Courses (<http://catalog.uwm.edu/letters-science/breadth-requirement-course-list/>). Students are advised to select at least 6 credits worth of courses in each of the Humanities, Social Science, and Natural Sciences areas that can satisfy both the campus-wide General Education Requirements and the L&S Breadth requirement.

** Students are advised to select a course that satisfies the Cultural Diversity requirement as well as a Humanities or Social Science breadth/GER requirement.

VI. The Major

The College requires that students attain at least a 2.0 GPA in all credits in the major attempted at UWM. In addition, students must attain a 2.0 GPA on all major credits attempted, including any transfer work. Individual departments or programs may require higher GPAs for graduation. Some departmental majors require courses from other departments. Contact your major department for information on whether those credits will count as part of the major GPA. The College requires that students must complete in residence at UWM at least 15 credits in upper-division (numbered 300 or above) courses in their major.

Research Requirement

Within their majors, students must complete a research experience approved by the L&S faculty. A list of courses satisfying the research requirement in each major can be found here (<http://catalog.uwm.edu/letters-science/approved-courses-research-requirement/>).

VII. The Minor

The College requires that students attain at least a 2.0 GPA in all credits in the minor attempted at UWM. In addition, students must attain a 2.0 GPA on all minor credits attempted, including any transfer work. Individual departments or programs may require higher GPAs for graduation.

Atmospheric Science (BS) Major Requirements

Preparatory Curriculum

Students in this major must complete MATH 231, MATH 232, and MATH 233 (or equivalents). MATH 221 and MATH 222 are equivalent to the sequence of MATH 231, MATH 232, and MATH 233. All majors must take either MATH 234 or MATH 240. Atmospheric Science majors must complete additional preparatory curricula, as indicated below.

Capstone Experience

Students in all majors and major options in the Department of Mathematical Sciences must complete a "Capstone Experience." The aim of the department's capstone experience is to encourage independent learning. Students complete a research paper in the context of this course, which satisfies the L&S research requirement. For Atmospheric Science majors, the capstone is ATM SCI 599. Students must obtain consent of a professor to enroll in ATM SCI 599.

Requirements

Students must complete at least 15 upper-division (numbered 300 and above) credits in the major in residence at UWM. The College of Letters & Science requires that students attain at least a 2.0 GPA on all credits in the major attempted at UWM. In addition, students must attain a 2.0 GPA on all major credits attempted, including any transfer work. The following courses are required for the atmospheric science major.

Code	Title	Credits
Additional Preparatory Curriculum ¹		
CHEM 102	General Chemistry	5
PHYSICS 209 & PHYSICS 214	Physics I (Calculus Treatment) and Lab Physics I (Calculus Treatment)	5
PHYSICS 210 & PHYSICS 215	Physics II (Calculus Treatment) and Lab Physics II (Calculus Treatment)	5
COMPSCI 202	Introductory Programming Using Python	3
Core		
ATM SCI 240	Introduction to Meteorology	3
ATM SCI 330	Air-Pollution Meteorology	3
ATM SCI 350	Atmospheric Thermodynamics	3
ATM SCI 351	Dynamic Meteorology I	3
ATM SCI 352	Dynamic Meteorology II	3
ATM SCI 360	Synoptic Meteorology I	4
ATM SCI 361	Synoptic Meteorology II	4
ATM SCI 464	Physical Meteorology: Cloud Physics	3
ATM SCI 511	Seminar in Atmospheric Radiation and Remote Sensing	3
ATM SCI 599	Capstone Experience	1
MATH 320	Introduction to Differential Equations	3
Electives		
Select at least 9 credits of the following:		9
ATM SCI 460	Mesoscale Circulations	
ATM SCI 470	Tropical Meteorology	
ATM SCI 480	The General Circulation and Climate Dynamics	
ATM SCI 497	Study Abroad:	
ATM SCI 500	Statistical Methods in Atmospheric Sciences	
ATM SCI 505	Micrometeorology	
ATM SCI 600	Data Analytics	
ATM SCI 690	Seminar in Atmospheric Sciences:	
MATH 313	Linear Programming and Optimization	
MATH 315	Mathematical Programming and Optimization	
MATH 321	Vector Analysis	
MATH 322	Introduction to Partial Differential Equations	
MATH 405	Mathematical Models and Applications	
MATH 413	Introduction to Numerical Analysis	
MATH 415	Introduction to Scientific Computing	
MATH 417	Computational Linear Algebra	
MATH 521	Advanced Calculus I	
MATH 522	Advanced Calculus II	
MATH 535	Linear Algebra	
MATH 571	Introduction to Probability Models	
MATH 581	Introduction to the Theory of Chaotic Dynamical Systems	
MATH 601	Advanced Engineering Mathematics I	
MATH 602	Advanced Engineering Mathematics II	
MATH 615	Numerical Solution of Partial Differential Equations	

MATH 617	Optimization
MTHSTAT 361	Introduction to Mathematical Statistics I
MTHSTAT 362	Introduction to Mathematical Statistics II
MTHSTAT 467	Introductory Statistics for Physical Sciences and Engineering Students
MTHSTAT 563	Regression Analysis
MTHSTAT 564	Time Series Analysis
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Total Credits	60

¹ In addition to the preparatory curriculum required of all mathematical sciences majors, these courses are required, but do not count in calculating the major GPA.

Atmospheric Science Advising

Students considering a major in Atmospheric Science need to contact the Atmospheric Science Program Chair (<https://uwm.edu/math/undergraduate/resources/advising/>) to declare their major and be assigned a faculty advisor. All courses selected for the major must be approved by the advisor, and students should check regularly (at least once per semester) with their faculty advisor to plan their courses of study in a coherent and timely fashion.

Letters & Science Advising

The College of Letters and Science provides general academic advising for all students with a major in the College, particularly as it relates to campus' general education requirements and the College's degree requirements. We also provide specialized advising for pre-professional students (pre-med, pre-dental, pre-pharmacy, etc.) regardless if their major is in Letters and Science or not. Prospective students, including high school students and students seeking to transfer to a program in Letters and Science may also receive advising from our admissions counselors.

Upon admission, students are assigned an advisor in the College advising office. Academic advising is available Monday through Friday from 8:30 a.m. to 4:30 p.m. by appointment. Appointments outside of these times may be available and phone appointments are available for online students. The advising office (<https://uwm.edu/letters-science/advising/contact-advising/>) is located on the first floor of Holton Hall. Current students should call (414) 229-4654 to schedule an appointment or use the Navigate website (<https://uwmilwaukee.campus.eab.com>) to make an appointment with your assigned advisor; online scheduling is only available if you already have a Letters & Science advisor assigned to you. Prospective students should call (414) 229-7711 or email let-sci@uwm.edu.

When students declare a major, they will receive an additional faculty advisor located within the major department who will assist with requirements for that major. Students should read the "Declaration of Major" information on the website of the major that they are interested in. In some cases, the student will need to choose a faculty advisor as part of the declaration process.

All students are cautioned to consult their Letters & Science academic advisor AND their major advisor prior to each registration period to ensure they understand all requirements. Do not rely on pre-printed sample plans, as they are intended to be samples only and may not be right for your particular situation.

Honors in the Major

Students in Atmospheric Sciences who meet all of the following criteria can be awarded honors in the major upon graduation:

1. A 3.000 cumulative GPA in all UWM graded credits;
2. A 3.500 GPA over all UWM courses counting toward the Atmospheric Sciences major;
3. A 3.500 GPA over all upper-division UWM courses counting toward the Atmospheric Sciences major; and
4. Successful completion of at least two semesters of research and/or internship experiences. The research and internship experiences can include one or more of the Capstone Experience (ATM SCI 599), a directed independent study for credit (ATM SCI 699), an internship for credit (ATM SCI 695), the Atmospheric Sciences Study Abroad course (ATM SCI 297/ATM SCI 497), undergraduate research for compensation, and participation in the Innovative Weather program at the staff level. The staff level of Innovative Weather is the third level of participation, coming after a pre-internship (several weeks in one semester) and an internship (one semester at 5-10 hours per week). Staff positions are paid, and staff members typically work around 10 hours per week during the fall or spring semesters, more in the summer session.

Students who believe they may qualify for honors in Atmospheric Sciences should apply to the Department of Mathematical Sciences during their last semester of study.

Honors in the College of Letters and Science

Dean's Honor List

GPA of 3.750 or above, earned on a full-time student's GPA on 12 or more graded credits in a given semester.

Honors College Degree and Honors College Degree with Distinction

Granted to graduating seniors who complete Honors College requirements, as listed in the Honors College (<http://catalog.uwm.edu/opportunities-resources/honors-college/>) section of this site.

Commencement Honors

Students with a cumulative GPA of 3.500 or above, based on a minimum of 40 graded UWM credits earned prior to the final semester, will receive all-university commencement honors and be awarded the traditional gold cord at the December or May Honors Convocation. Please note that for honors calculation, the GPA is **not** rounded and is truncated at the third decimal (e.g., 3.499).

Final Honors

Earned on a minimum of 60 graded UWM credits: Cum Laude - 3.500 or above; Magna Cum Laude - 3.650 or above; Summa Cum Laude - 3.800 or above.

Contact Information

Current Students contact the Program Coordinator, atmo-chair@uwm.edu
Prospective Students contact a Letters & Science Admissions Counselor at
(414) 229-7711 or let-sci@uwm.edu

<http://uwm.edu/atmospheric-science/undergraduate/>