

## Atmospheric Sciences Minor



### Contact Information

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### Faculty

Professor Hjelmfelt, Chair; Professors Detwiler, and Helsdon; Associate Professor Capehart; Assistant Professor Sundareshwar; Instructor Benson and Adjunct Professor Zimmerman.

The purpose of the atmospheric sciences curriculum is to educate students to the level of scientists and engineers who are capable of developing and applying knowledge concerning physical, dynamical, and chemical processes in the atmosphere.

### Undergraduate minor in Atmospheric Sciences

A minor in atmospheric sciences is offered to any student enrolled in any undergraduate degree program that allows minors at the School of Mines. For some majors this would require an additional semester or more of study beyond the normal four years. A minimum of eighteen (18) credits in atmospheric science coursework must be earned. Two courses, Introduction to Atmospheric Sciences (ATM 301) and Global Environmental Change (ATM 406) are required for the minor.

### **Specialization in Atmospheric Sciences within the Bachelor of Science in Interdisciplinary Sciences degree program**

Students in the Bachelor of Science in Interdisciplinary Sciences (IS) degree program may choose a specialization in atmospheric sciences. The successful student is expected to be capable of independent and critical thinking in the areas of physical, synoptic, and dynamic meteorology; remote sensing; and global atmospheric change. As such, he or she should be qualified for employment where expertise in atmospheric sciences is a primary requirement, though need not necessarily qualify as a meteorologist by the federal government's criteria. The curriculum also is suitable for preparation toward graduate study at the M.S. and Ph.D. level.

The IS Bachelor of Science degree program offers a specialization in atmospheric sciences. General requirements for a B.S. in Interdisciplinary Sciences are described on p.149. Required course work for the atmospheric sciences specialization includes the following:

#### **Degree: meteorology, atmospheric science, or other natural science major that includes:**

- 1) All courses and other curriculum requirements for the general IS degree requirement.
- 2) The atmospheric sciences undergraduate core: ATM 301, ATM 404, ATM 406, ATM 450, ATM 450L
- 3) The following mathematics and science courses (which may require additional prerequisites): CHEM 114, CHEM 114L, CSC 150, PHYS 213, PHYS 213L, MATH 225, BIOL 311
- 4) 12 hours of additional ATM or ATM-directed cooperative education (CP) credits
- 5) 12 Hours of additional professional development credits from ATM, BIOL, CHEM, CEE, CSC, CP, ENVE, GEOE, GEOL, MATH, or PHYS, within the requirements of the IS program. (Engineering course credits cannot be counted toward IS degree requirements but can be

counted as general electives.)

### **Federal Certifications as a Meteorologist**

Students in the undergraduate minor or IS programs desiring to be qualified for federal employment as meteorologists (with the National Weather Service or other federal government agencies employing meteorologists) should contact a Department of Atmospheric Sciences advisor to ensure that their plan of study meets the strictly enforced civil service requirements. The basic requirements for federal civil service qualification as a meteorologist (as dictated by the United States Office of Personnel Management) are listed below:

#### **Degree: meteorology, atmospheric science, or other natural science major that includes:**

- A. At least twenty-four (24) semester hours (36 quarters) of credit in atmospheric science/meteorology including a minimum of:
1. Six (6) semester hours of atmospheric dynamics and thermodynamics
  2. Six (6) semester hours of analysis and prediction of weather systems (synoptic/mesoscale)
  3. Three (3) semester hours of physical meteorology and
  4. Two (2) semester hours of remote sensing of atmosphere and/or instrumentation
- B. Six (6) semester hours of physics, with at least one course that includes laboratory sessions
- C. Three (3) semester hours of ordinary differential equations
- D. At least nine (9) semester hours of course work appropriate for a physical science major in any combination of three or more of the following: physical hydrology, statistics, chemistry, physical oceanography, physical climatology, radiative transfer, aeronomy, advanced thermodynamics, advanced electricity and magnetism, light and optics,

and computer science.

**OR:** Combination of education and experience-course work as shown in A above, plus appropriate experience or additional education.

**Note:** There is a prerequisite or corequisite of calculus, physics, and differential equations for course work in atmospheric dynamics and thermodynamics. Calculus courses must be appropriate for a physical science major.

### **Atmospheric sciences undergraduate curriculum scheduling**

It is the student's responsibility to check with his or her advisor in the atmospheric sciences department for any course offering or other program modifications that may occur after the publication of this catalog. Most courses are offered only every other year. Attention must be paid to this two-year cycle in planning a program of study.

### **Master of Science Graduate Degree Program**

A master of science graduate program in the atmospheric sciences is offered to students with undergraduate degrees in atmospheric sciences or meteorology, physics, mathematical sciences, biology, chemistry, or engineering. A resident undergraduate student in any of these fields may take as electives upper-division courses in meteorology, either as part of the minor or otherwise, and proceed directly to graduate work in meteorology upon receipt of the bachelor's degree. In addition to meeting the goals listed above for undergraduate minor and IS atmospheric science graduates, the master of science graduate will be able to review the literature; devise strategies for attacking a problem in atmospheric sciences; acquire, organize, and interpret data; and prepare results for both oral and written presentation. He or she is expected to be able to carry out such original investigations both individually and as a member of a team.

A master of science degree requires twenty-four (24) credit hours of course work, with an additional six (6) semester hours of research credit for completing a thesis. There are two

specializations in the program, meteorology and earth systems, with a common core of three courses shared by both specializations. See pages 190-192 for more details. A properly-prepared undergraduate science or engineering graduate with minimal meteorological background may use the M.S. program to complete sufficient course work to satisfy the federal civil service requirements for employment as a meteorologist. The M.S. program can be a stepping-stone to Ph.D. work in the atmospheric and environmental sciences, as well as a terminal degree leading to employment in private industry or government.

### **Atmospheric and Environmental Sciences Interdisciplinary Ph.D. Graduate Program**

In addition to the M.S. program in atmospheric sciences, the atmospheric sciences department participates in the Atmospheric and Environmental Sciences (AES) Ph.D. program. Faculty in several departments are involved in delivering the program, including chemistry and chemical engineering, civil and environmental engineering, mining and engineering management, geology and geological engineering, and atmospheric sciences. Degree candidates are expected to complete courses in a broad range of topics selected from these disciplines. For complete information on the AES program, please refer to the AES section of this catalog beginning on page 190.

