

## Assessment plan for the M.S. in Atmospheric and Environmental Sciences (AES)

### 1. Introduction

While the Atmospheric Sciences track within the Interdisciplinary Sciences B.S. is guided by American Meteorological Society policy and the Federal Government's OPM GS 1340 Meteorology Series, the MS Degree (AES) is focused on research and split into two "tracks":

- *The Meteorology Specialization* (i.e., Meteorology, Weather and Climate Science)
- *The Earth Systems Specialization* (focused on Ecology)

Expectations and course requirements for enrolling students are detailed below.

### OBJECTIVES & OUTCOMES

OBJECTIVE 1: Students will have comprehensive knowledge of Atmospheric and Environmental Sciences.

Outcomes:

1. Meteorology Specialization M.S. graduates should have deep knowledge of principals the physics and dynamics of the atmosphere, including the weather and climate system.
2. Environmental Sciences Specialization M.S. graduates should have deep knowledge of principals the principles of ecology and the earth system, including the climate system.

OBJECTIVE 2: Students will be able to perform effective research in Atmospheric and Environmental Sciences.

Outcomes:

1. All Atmospheric and Environmental Sciences M.S. graduates are expected to be able to formulate scientific hypothesis of atmospheric & environmental phenomena, and test those hypotheses through the integration of observation, theory and, where appropriate, simulation.
2. All Atmospheric and Environmental Sciences M.S. graduates are expected to be prepared for career paths in research, operations or educational within the Atmospheric and Environmental Sciences, and adjacent disciplines.

OBJECTIVE 3: Students will communicate effectively.

Outcomes

1. Students will communicate in writing about scientific and technical concepts concisely and completely.
2. Students will organize and communicate ideas using words, mathematical equations, tables, graphs, pictures, animations, diagrams, and other visualization tools.

## **ASSESSMENT OF OBJECTIVES AND OUTCOMES**

**OBJECTIVE 1:** Students will have comprehensive knowledge of Atmospheric and Environmental Sciences.

Assessment:

1. Assessment in Objective 1 (both 1.1 and 1.2) is primarily done through coursework, determined through program policy and expectations provided by the candidate's graduate committee. There is no additional written comprehensive or qualifying exam. Continued enrollment without probationary status and eligibility for graduate assistantships requires the maintenance of at least a 3.00 grade point average. Course instructors are expected to evaluate student abilities in a given course using rubrics based on exams, homework assignments, and projects. In all courses, student opinion surveys (IDEA) and formative assessment measures such as open-ended questions and in-class discussions, analogy prompts, and feedback will be employed to assist faculty in continuous improvement of the curriculum.

**OBJECTIVE 2:** Students will be able to perform effective research in Atmospheric and Environmental Sciences.

Assessment:

1. All Atmospheric and Environmental Sciences M.S. candidates must complete a research project. For Thesis Track candidates, a M.S. thesis expected. For the Non-Thesis Track candidates, a detailed paper discussing their research project is expected. When deemed necessary, committee members can recommend additional coursework to demonstrate proficiency in any areas deemed lacking.
2. Exit interviews of graduating students, tracking of job placement, and alumni surveys will provide additional assessment. In all courses, student opinion surveys (IDEA) and formative assessment measures such as open-ended questions and in-class discussions, analogy prompts, and muddiest-point feedback will be employed to assist faculty in continuous improvement of the curriculum. Students are expected through help of their advisors to integrate into professional organizations (e.g., American Meteorological Society, Ecological Society of Society) and should attend at least one national-scale conference to begin the process of professional networking.

**OBJECTIVE 3:** Students will communicate effectively.

Assessment:

1. Communication skills are evaluated primarily through a combination of the Seminar Course (taken twice by each M.S. student) and individual work with the student's major advisor as part of the student's research thesis or paper. In the seminar course, a set of rubrics will be used to assess these learning outcomes. Students are strongly encouraged to present their research at least one nationally-recognized conference.

2. Communication quantitative data and abstract concepts are evaluated through relevant coursework, seminar and the candidate's research thesis or paper.

### **Expectations of Inbound Students:**

The Meteorology Specialization expects inbound students to have a general background in Meteorology or Physical Science. Students not having classes in Synoptic Meteorology, Atmospheric Physics, and Atmospheric Dynamics, are expected to take those classes at SD Mines.

The Environmental Sciences Specialization expects students to have differential calculus before arrival or take it at SD Mines. They are also expected to have a strong background in biology, chemistry and or physics.

### **Course Requirements for the MS in Atmospheric and Environmental Sciences**

The Meteorology Specialization, in addition to any remedial classwork (above), requires AES 506 (Global and Environmental Change), AES 519 (Computing Methods in Atmospheric Sciences), and other coursework commensurate with their thesis (for thesis track candidates), or master's thesis project. Additionally, non-thesis candidates are expected to take AES 501 (Atmospheric Physics), AES 530 (Radar Meteorology), AES 555 (Synoptic Meteorology 2) and AES 560 (Atmospheric Dynamics 2) to being MS candidates towards compliance to the US OPM GS 1340 Meteorology Series.

The Environmental Sciences Specialization, requires AES 506 (Global and Environmental Change) and other coursework commensurate with their thesis (for thesis track candidates), or master's thesis project. Non-thesis candidates are also expected to take AES 503 (Biogeochemistry), AES 775 (Applied Freshwater Science).

Both programs are also required to take 2 semesters of AES 690 (Seminar).