**Program Materials for InTeGrate Workshop on
Geoscience and the 21st Century Workshop**submitted by
Kate C. Miller, Dean *May 14, 2013*

**Atmospheric Sciences:** Undergraduate Program

**Program Title:** Meteorology

**Degree:** Bachelors of Science

**Website:** http://www.met.tamu.edu/

**BRIEF OVERVIEW**

The undergraduate curriculum in meteorology emphasizes weather and weather forecasting, but also includes courses in climatology, atmospheric chemistry, cloud physics and remote sensing of the atmosphere with radar and satellites. Study of these subjects relies on a foundation of physics, chemistry and mathematics.

**Design and Assessment:**

**Particular strengths of the program. What can others learn from our design?**

Students in the Department of Atmospheric Sciences enjoy low student-to-teacher ratios and small classes. Undergraduates have opportunities for individual study and participation in faculty research projects, including regional, national and international field programs.

A unique strength of our program is the introduction of major courses earlier in the curriculum. Sophomores may take as many as five ATMO courses, which have been flexibly scaled to varying levels of mathematical and physical maturity. Typical peer curricula have very little coursework in the major until the junior year. Keeping students engaged in meteorology throughout their program is resulting in deeper understanding and practical ability at graduation.

The Department has a history of providing high quality High Impact Learning Experiences (HILE) and the number of these experiences has increased in recent years. Many individual faculty members provide one-on-one research experiences and opportunities to participate in field and laboratory measurements, satellite observations, and atmospheric models on a number of scales. Thus, motivated students leave our program with significant research experience. Coupled with outstanding facilities, including the Aggie Doppler Radar (ADRAD), two portable upper-air weather balloon systems, a science-grade Mesonet observing site, TV and radio broadcasting studios, and the 16-monitor Texas A&M Weather Center, students are more prepared than ever for careers in operations and/or research.

Our undergraduate curriculum (and faculty) is one of the strongest amongst our peers in Atmospheric Chemistry. Students are required to take additional basic chemistry, and have a required majors course in atmospheric chemistry. Electives offered in air pollution meteorology and in air chemistry laboratory methods prepare our students for the expanding field of environmental air quality.

Our curriculum is designed to meet or exceed National Weather Service and American Meteorological Society standards.

**What types of students are served by your program?**

The Department of Atmospheric Sciences offers undergraduate students a B.S. in Meteorology. We also serve students in other disciplines through survey courses, which give students a better understanding of nature and of scientific methods, and through specialized courses for students in fields that require applied knowledge of meteorology. The Department of Atmospheric Sciences provides students with a wide variety of courses designed to fully prepare students for their chosen careers.

**What are the program level learning goals or outcomes? Please write your learning outcomes in a list form.**

Our students develop a better understanding of nature and of scientific methods through specialized courses for students in fields that require applied knowledge of meteorology.

Specific learning outcomes are as follows:

* Communicate effectively:
	+ Graduates will be able to express concepts and ideas in a clear and logical manner, both orally and in writing.
* Master meteorological knowledge
	+ Students will be able to describe the fundamental processes of the atmospheric sciences.
* Acquire advanced technical and mathematical skills that will be useful for careers and/or advanced studies in atmospheric sciences and related disciplines
	+ Graduates will be able to apply mathematics to describe atmospheric phenomena and use computer software to analyze atmospheric data,.

**What resources informed the development of your learning outcomes?**

Our learning outcomes were informed by University-wide learning outcomes and have been refined and tailored to meet the specific goals of our program.

**How do you assess the extent to which your program is meeting its goals?**

In 2013 and beyond, specific aspects of our program will be assessed as follows:

* Writing assignments
	+ Writing abilities will be assessed using assignments from upper-level writing intensive courses; the courses evaluated will rotate annually. Writing skills will be evaluated using a common rubric.
* Forecast discussions (senior students)
	+ Student forecast discussions in Practical Weather Forecasting (ATMO 456) and in weekly briefings in the Weather Center will be evaluated using a rubric. The clarity of the presentation and the meteorological content of the discussions will be evaluated.
	+ The students demonstrated proficiency (A/B) in preparing and presenting a meteorological briefing, but we continue to have few volunteers. Better coordination with instructors teaching practical forecasting courses is needed. Evaluations in other settings (Fall weather briefings; Aggie Storm Chasers) were also added this year.
* Forecast discussions (early courses)
	+ Weather analysis skills of new majors will be evaluated in the entry-level laboratory course for majors. The final version of a forecast discussion will be evaluated for its meteorological content using a rubric. By evaluating students at the beginning of their course of study, we can assess the success of our program in improving their skills in future years.
* Sample of student assignments
	+ The ability to apply mathematics to atmospheric problems will be assessed using samples of student exams from atmospheric dynamics courses (ATMO 336, 435) that are required for all majors. Evaluation will focus on skills in embedded test questions.
	+ Adequate mathematics and programming proficiency shall be demonstrated by a 70% score on evaluated student materials from classes in which mathematics and/or programming are essential tools. Math evaluation will focus on a sample of assignments from ATMO 336 and ATMO 435. Programming skills will be focused on a sample of assignments from ATMO 321 and other appropriate upper level courses.
* Exit interviews
	+ The Undergraduate Committee will evaluate graduating students' exit surveys, which are designed to assess the students' career preparation and program satisfaction. Self-reported GRE scores are collected from those who took the exam, as well as data on graduate school applications and admissions. Students are asked to evaluate their comfort level with work requiring computer programming, weather forecasting, and other specific skills.
	+ Students will, on average, "agree" that they acquired sufficient professional knowledge to be successful in their future graduate study or degree-related occupation.

**Are there important design features of your program that allow it to meet its goals?**

As stated above, a strength of our program is the introduction of major courses earlier in the curriculum. Sophomores may take as many as five ATMO courses, which have been flexibly scaled to varying levels of mathematical and physical maturity. High Impact Learning Programs (HILP) are characterized by out-of-classroom, hands-on, and field experiences. Many individual faculty members provide one-on-one research experiences and opportunities to participate in field and laboratory measurements, satellite, and atmospheric models on a number of scales. Thus motivated students leave our program with significant research experience and are more prepared than ever for careers in operations and/or research.

**How many students graduate from your program per year? Either provide an average or specific number(s) of graduates and the year(s) those numbers are from.**

2008: 27; 2009: 34; 2010: 26; 2011: 24

**What do your alumni do upon completion of your program? What careers and fields of employment do they enter into?**

National Weather Service or similar organization

Broadcast journalist

Graduate School

Environmental consulting or related government position

**Course Diagram**

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