

# Two examples of accreditation: **ABET** ..... and **AMS**

*ABET (excerpted from [www.abet.org](http://www.abet.org) Note: bolding and ellipses are mine -- pennington)*

## GENERAL CRITERIA FOR BACCALAUREATE LEVEL PROGRAMS

### Criterion 1. Students

The program must evaluate student performance, advise students ...

### Criterion 2. Program Educational Objectives

... must have in place:

- (a) published educational objectives .. consistent with the mission of the institution
- ...
- (b) ... periodically ... demonstrate[s] that the objectives are based on the needs ...
- (c) an assessment and evaluation process ...

### Criterion 3. Program Outcomes

Engineering programs must demonstrate that their students attain the following outcomes:

- (a) an ability to apply knowledge of **mathematics, science, and engineering**
- (b) an ability to design and conduct **experiments**, as well as to analyze and interpret data
- (c) an ability to **design a system**, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary **teams**
- (e) an ability to **identify, formulate, and solve engineering problems**
- (f) an understanding of professional and **ethical responsibility**
- (g) an ability to **communicate effectively**
- (h) the broad education necessary to understand the impact of engineering solutions in a **global, economic, environmental, and societal context**
- (i) a recognition of the need for, and an ability to engage in **life-long learning**
- (j) a knowledge of **contemporary issues**
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for **engineering practice**.

... There must be an assessment and evaluation process that **periodically** documents and demonstrates the degree to which the program outcomes are attained.

### Criterion 4. Continuous Improvement

... show evidence ... based on available information, ... [assessment]

### Criterion 5. Curriculum

The curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution. The professional component must include:

- (a) one year of a combination of college level **mathematics** and basic sciences (some w/ experimental experience)
- (b) one and one-half years of engineering topics, consisting of **engineering sciences and engineering design** appropriate to the student's field of study. ... Engineering design is the process of devising a system, component, or process to meet desired needs.
- (c) a **general education** component that complements the technical content of the curriculum and is consistent with the program and institution objectives.

Students must be prepared for engineering practice through a curriculum **culminating in a major design experience** based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints.

### Criterion 6. Faculty

The faculty must be of sufficient **number** and must have the **competencies** to cover all of the curricular areas of the program. There must be sufficient faculty ...

The program faculty must have appropriate **qualifications** ...

### Criterion 7. Facilities

Classrooms, laboratories, and associated equipment must be adequate ...

### Criterion 8. Support

**Institutional support, financial resources, and constructive leadership** must be adequate to assure the quality and continuity of the program. Resources must be sufficient to attract, retain, and provide for the continued professional development of a well-qualified faculty. Resources also must be sufficient to acquire, maintain, and operate facilities and equipment appropriate for the program. In addition, support personnel and **institutional services must be adequate to meet program needs.**

### Criterion 9. Program Criteria

Each program must satisfy applicable Program Criteria (if any). ...

## PROGRAM CRITERIA FOR GEOLOGICAL

### AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Society for Mining, Metallurgical, and Exploration

... apply to engineering programs that include "geological" and similar modifiers in their titles.

#### 1. Curriculum

The program must demonstrate that graduates have:

- (1) the ability to **apply mathematics** including differential equations, calculus-based physics, and chemistry, to geological engineering problems;
- (2) proficiency in geological science topics that emphasize **geologic processes** and the **identification of minerals and rocks**;
- (3) the ability to **visualize and solve geological problems** in three and four dimensions;
- (4) proficiency in the **engineering sciences** including statics, properties/strength of materials, and **geomechanics**;
- (5) the ability to apply principles of geology, elements of **geophysics, geological and engineering field methods**; and
- (6) **engineering knowledge to design solutions** to geological engineering problems, which will include **one or more of the following** considerations: the distribution of physical and chemical properties of earth materials, including **surface water, ground water** (hydrogeology), and fluid hydrocarbons; the effects of surface and near-surface natural processes; the **impacts of construction projects; the impacts of exploration, development, and extraction of natural resources, and consequent remediation; disposal of wastes; and other activities of society** on these materials and processes, as appropriate to the program objectives.

#### 2. Faculty

Evidence must be provided that the program's faculty members understand professional engineering practice and maintain currency in their respective professional areas. The program's **faculty must have responsibility and authority to define, revise, implement, and achieve program objectives.**

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AMS (excerpted from [www.ametsoc.org](http://www.ametsoc.org) Note: bolding and ellipses are mine – pennington)

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## 1. Introduction:

The primary purpose of this statement is to provide **guidance to university faculty and administrators** who are seeking to establish and maintain undergraduate programs in atmospheric science. This statement describes the **minimum curricular composition, faculty size, and facility requirements recommended** by the American Meteorological Society for an undergraduate degree program in atmospheric science<sup>1</sup>.

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## 2. Attributes of bachelor's degree programs

### a. General objectives

The objectives ... include strong preparation for: a successful career ...; or... graduate study ....

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### b. Course offerings

A curriculum ... should contain

1) at least 24 semester hours<sup>2</sup> of credit in atmospheric science courses that include the following:

- 12 semester hours of lecture and laboratory courses, with calculus as a prerequisite or corequisite<sup>3</sup>, in atmospheric thermodynamics and dynamic, synoptic, and mesoscale meteorology that collectively provide a broad treatment of atmospheric processes at all scales;
- 3 semester hours of atmospheric physics, with emphasis on cloud/precipitation physics and solar and terrestrial radiation<sup>3</sup>;
- 3 semester hours of atmospheric measurements, instrumentation, or remote sensing, including both lecture and laboratory components;
- at least 3 semester hours in applied/specialty ... topics such as:
- advanced dynamics, agricultural meteorology, air pollution meteorology, applied climatology, aviation meteorology, broadcast meteorology, hydrology or hydrometeorology, physical oceanography, tropical meteorology, and weather forecasting;
- up to 3 semester hours of a synthesizing experience<sup>4</sup> such as
  - an undergraduate research project
  - a capstone course;
  - an internship ...; or
  - work experience closely related to the atmospheric sciences;

- 2) a minimum of a three-semester sequence of calculus that includes vector calculus and ordinary differential equations, in courses designed for majors in either mathematics, physical sciences or engineering;
- 3) a one-year sequence in physics lecture and laboratory courses, with calculus as a prerequisite or corequisite;
- 4) at least one course (3 semester hours) in chemistry appropriate for physical science majors;
- 5) a course with a multi-disciplinary and/or integrative approach to an environmental topic, such as a course on climate change;
- 6) an appropriate level of coursework or demonstrated competency in the following areas:

- computer science or information technology appropriate for physical science majors, including a course that teaches scientific, structured programming skills;
- statistics appropriate for physical science majors;
- technical, scientific, and professional writing, and oral communication;

Whenever possible and where appropriate, course requirements should include components that utilize modern computer and instrumentation labs and facilities.

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### c. Faculty

There should be a minimum of three full-time regular faculty with expertise sufficiently broad to address the subject areas ...

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### d. Facilities

There should be sufficient and coherent space for the atmospheric science program and its students. Contained within this space should be instructional labs and ....

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### e. Student recruitment and retention

The number of students from traditionally underrepresented groups in the atmospheric sciences continues to be alarmingly low. Ideally, atmospheric science programs should reflect the full diversity of the general population. To that end, atmospheric science programs should work with their institutions, community colleges, and secondary schools ...

**ABET-Accredited Geological Eng'g Programs:  
16 programs in 14 schools (2008)**

**University of Alaska Fairbanks**

Geological Engineering(BS) [1941]

**University of Arizona**

Geological Engineering(BS) [1950]

**Colorado School of Mines**

Geological Engineering(BS) [1936]

Geophysical Engineering(BS) [1953]

**Michigan Technological University**

Geological Engineering(BS) [1951]

**University of Minnesota-Twin Cities**

Geological Engineering(BGeoE) [1950]

**University of Mississippi**

Geological Engineering(BS) [1987]

**Missouri University of Science and Technology**

Geological Engineering(BS) [1973]

**Montana Tech of the University of Montana**

Geological Engineering(BS) [1972]

Geophysical Engineering(BS) [1978]

**University of Nevada-Reno**

Geological Engineering(BS) [1958]

**University of North Dakota**

Geological Engineering(BS) [1986]

**South Dakota School of Mines and Technology**

Geological Engineering(BS) [1950]

**University of Texas at Austin**

Geosystems Engineering and Hydrogeology(BS) [2000]

**University of Utah**

Geological Engineering(BS) [1952]

**University of Wisconsin-Madison**

Geological Engineering(BS) [1995]