

What is ABET?

Conrad M. Zapanta

Associate Dean of Undergraduate Studies, College of Engineering

Teaching Professor, Department of Biomedical Engineering

Carnegie Mellon University

Disclaimer

- The views and opinions expressed in these slides are those of Dr. Zapanta and do not necessarily reflect the views or positions of ABET or Carnegie Mellon University.

What is ABET?

- Used to be **A**ccreditation **B**oard for **E**ngineering and **T**echnology
- Accredits college and university programs in applied and natural science, computing, engineering and engineering technology at the associate, bachelor and master degree levels
- 4,674 programs at more than 920 colleges and universities in 42 countries have received ABET accreditation (September 2023)
- Approximately 175,000 students graduate from ABET-accredited programs each year, and millions of graduates have received degrees from ABET-accredited programs since 1932

What is ABET?

- 185 Bioengineering and Biomedical Engineering Programs are currently accredited
- 165 in United States and 20 in other countries
 - United Arab Emirates
 - Mexico
 - Columbia
 - Georgia
 - Jordan
 - Lebanon
 - Saudi Arabia
 - Vietnam
 - India
 - Thailand
 - Spain

<http://www.abet.org/accreditation/>

Why is It Important?

- Graduation from an ABET-accredited program increasingly a required minimum credential for professional recognition
 - Professional Engineer (PE)
 - Many states require graduation from an ABET-accredited undergraduate-level engineering curriculum in the United States as requirements for taking PE exam
- Quality control for engineering education through peer-review

What is Being Evaluated?

- General Criteria
 - All programs seeking accreditation from the Engineering Accreditation Commission of ABET must demonstrate that they satisfy all of these criteria
- Program Criteria
 - Each program at the Bachelor's or Master's level must satisfy applicable Program Criteria (if any).
 - Program Criteria provide the specificity needed for interpretation of the general criteria as applicable to a given discipline.
 - Requirements stipulated in the Program Criteria are limited to the areas of curricular topics and faculty qualifications.

ABET Definitions

- Concern
 - Statement that a program currently satisfies a criterion, policy, or procedure, but the potential exists for the situation to change such that the criterion, policy, or procedure may not be satisfied
- Weakness
 - Statement that a program lacks strength of compliance with a criterion, policy, or procedure to ensure that the quality of the program will not be compromised. Remedial action is required to strengthen compliance with the criterion, policy, or procedure prior to the next review.
- Deficiency
 - Statement that a criterion, policy, or procedure is not satisfied. The program is not in compliance with the criterion, policy, or procedure.

<http://www.abet.org/network-of-experts/for-current-abet-experts/training/glossary/>

Criterion 1. Students

- Student performance must be evaluated.
- Student progress must be monitored to foster success in attaining student outcomes, thereby enabling graduates to attain program educational objectives.
- Students must be advised regarding curriculum and career matters.
- The program must have and enforce policies for accepting both new and transfer students, awarding appropriate academic credit for courses taken at other institutions, and awarding appropriate academic credit for work in lieu of courses taken at the institution.
- The program must have and enforce procedures to ensure and document that students who graduate meet all graduation requirements.

Criterion 2. Program Educational Objectives

Broad statements that describe what graduates are expected to attain within a few years of graduation.

Program educational objectives are based on the needs of the program's constituencies.

- The program must have published program educational objectives that are consistent with the mission of the institution, the needs of the program's various constituencies, and these criteria.
- There must be a documented, systematically utilized, and effective process, involving program constituencies, for the periodic review of these program educational objectives that ensures they remain consistent with the institutional mission, the program's constituents' needs, and these criteria.

<http://www.abet.org/network-of-experts/for-current-abet-experts/training/glossary/>

<https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2022-2023/>

Criterion 3. Student Outcomes

Statements that describe what students are expected to know and be able to do by the time of graduation.

These relate to skills, knowledge, and behaviors that students acquire as they progress through the program.

- The program must have documented student outcomes that support the program educational objectives.
- Attainment of these outcomes prepares graduates to enter the professional practice of engineering.
- Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.

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<https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2022-2023/>

Criterion 3. Student Outcomes

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.

Criterion 3. Student Outcomes

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Criterion 4. Continuous Improvement

- The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained.
- The results of these evaluations must be systematically utilized as input for the program's continuous improvement actions.
- Other available information may also be used to assist in the continuous improvement of the program.

Criterion 5. Curriculum

- The curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses.
- The program curriculum must provide adequate content for each area, consistent with the student outcomes and program educational objectives, to ensure that students are prepared to enter the practice of engineering.
- The curriculum must include (see next two slides):

Criterion 5. Curriculum

- a minimum of 30 semester credit hours (or equivalent) of a combination of college-level mathematics and basic sciences with experimental experience appropriate to the program.
- a minimum of 45 semester credit hours (or equivalent) of engineering topics appropriate to the program, consisting of engineering and computer sciences and engineering design, and utilizing modern engineering tools.

Criterion 5. Curriculum

- a broad education component that complements the technical content of the curriculum and is consistent with the program educational objectives.
- a culminating major engineering design experience that
 - 1) incorporates appropriate engineering standards and multiple constraints, and
 - 2) is based on the knowledge and skills acquired in earlier course work.

Criterion 6. Faculty

- The program must demonstrate that the faculty members are of sufficient number and they have the competencies to cover all of the curricular areas of the program.
- There must be sufficient faculty to accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students.

Criterion 6. Faculty

- The program faculty must have appropriate qualifications and must have and demonstrate sufficient authority to ensure the proper guidance of the program and to develop and implement processes for the evaluation, assessment, and continuing improvement of the program.
- The overall competence of the faculty may be judged by such factors as education, diversity of backgrounds, engineering experience, teaching effectiveness and experience, ability to communicate, enthusiasm for developing more effective programs, level of scholarship, participation in professional societies, and licensure as Professional Engineers.

Criterion 7. Facilities

- Classrooms, offices, laboratories, and associated equipment must be adequate to support attainment of the student outcomes and to provide an atmosphere conducive to learning.
- Modern tools, equipment, computing resources, and laboratories appropriate to the program must be available, accessible, and systematically maintained and upgraded to enable students to attain the student outcomes and to support program needs.

Criterion 7. Facilities

- Students must be provided appropriate guidance regarding the use of the tools, equipment, computing resources, and laboratories available to the program.
- The library services and the computing and information infrastructure must be adequate to support the scholarly and professional activities of the students and faculty.

Criterion 8. Institutional Support

- Institutional support and leadership must be adequate to ensure the quality and continuity of the program.
- Resources including institutional services, financial support, and staff (both administrative and technical) provided to the program must be adequate to meet program needs.

Criterion 8. Institutional Support

- The resources available to the program must be sufficient to attract, retain, and provide for the continued professional development of a qualified faculty.
- The resources available to the program must be sufficient to acquire, maintain, and operate infrastructures, facilities, and equipment appropriate for the program, and to provide an environment in which student outcomes can be attained.

Accreditation Policy and Procedure Manual (APPM)

- I.A.4 Accreditation status represented unambiguously
- I.A.6 Accreditation, PEOs, SOs, enrollment, & graduation data properly publicized
- I.C.4 Program names must meet ABET requirements
- I.D.1.g Documentation in English

Accreditation Policy and Procedure Manual (APPM)

- I.E.1 All paths in the curriculum are accreditable
- I.E.5.a Team able to interview appropriate individuals during visit
- I.E.5.b.(1) Facilities adequate and safe for intended purposes
- I.E.5.b.(2) Supporting materials adequate for visiting team to perform its review

Program Criteria for Bioengineering and Biomedical and Similarly Named Engineering Programs

1. Curriculum

The structure of the curriculum must provide both breadth and depth across the range of engineering and science topics consistent with the program educational objectives and student outcomes.

The curriculum must include experience in:

- (a) Applying principles of engineering, biology, human physiology, chemistry, calculus-based physics, mathematics (through differential equations) and statistics;
- (b) Solving bio/biomedical engineering problems, including those associated with the interaction between living and non-living systems;
- (c) Analyzing, modeling, designing, and realizing bio/biomedical engineering devices, systems, components, or processes; and
- (d) Making measurements on and interpreting data from living systems.