



October 15, 2015

TO: Engineering Area Delegation
FROM: Sarah A. Rajala, Chair, Engineering Accreditation Commission
Subject: Proposed Revisions to the *Criteria for Accrediting Engineering Programs*
General Criteria Introduction, Criterion 3. Student Outcomes, and
Criterion 5. Curriculum – First Reading

RECOMMENDED MOTION:

That the Engineering Area Delegation approves the attached *Proposed Revised Criteria for Accrediting Engineering Programs General Criteria Introduction, Criterion 3. Student Outcomes, and Criterion 5. Curriculum* at the first reading in the 2016-17 accreditation cycle.

BACKGROUND:

Since 2008 the Engineering Accreditation Commission (EAC) has been engaged in an on-going discussion regarding the potential need to revise Criterion 3. Student Outcomes. This initiative has been based on lessons learned as the EAC gained experience with outcomes-based accreditation through two six-year review cycles. The Criteria, referred to initially as EC2000, have matured such that the EAC deemed an examination of the relevance of the original outcomes as the appropriate next step for continuous improvement.

Through a deliberative process, the EAC has engaged multiple constituents through a variety of methodologies. The result is the proposed attached package of revisions to the General Criteria Introduction, Criterion 3. Student Outcomes, and Criterion 5. Curriculum. The EAC presents the revisions as one motion due to the interconnectedness of Criterion 3 and Criterion 5. In order to streamline the wording in Criterion 5. Curriculum, the EAC has expanded the Criteria introduction to include the definitions that were previously in the body of Criterion 5. No change is allowed in the harmonized portion of the introduction that includes the definitions used by all four Commissions.

With the Area Delegation approval at the first reading, the EAC will seek formal review and comment by major constituent groups for one year.

PROPOSED REVISIONS TO

Criteria for Accrediting Engineering Programs Effective for Reviews during the 20XX-20YY Accreditation Cycle

Definitions

While ABET recognizes and supports the prerogative of institutions to adopt and use the terminology of their choice, it is necessary for ABET volunteers and staff to have a consistent understanding of terminology. With that purpose in mind, the Commissions will use the following basic definitions:

Program Educational Objectives – Program educational objectives are 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.

Student Outcomes – Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program.

Assessment – Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the outcome being measured. Appropriate sampling methods may be used as part of an assessment process.

Evaluation – Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which student outcomes are being attained. Evaluation results in decisions and actions regarding program improvement.

This document contains three sections:

The first section includes important **definitions** used by all ABET commissions.

The second section contains the **General Criteria for Baccalaureate Level Programs** that must be satisfied by all programs accredited by the Engineering Accreditation Commission of ABET and the **General Criteria for Masters Level Programs** that must be satisfied by those programs seeking advanced level accreditation.

The third section contains the **Program Criteria** that must be satisfied by certain programs. The applicable Program Criteria are determined by the technical specialties indicated by the title of the program. Overlapping requirements need to be satisfied only once.

~~These criteria are intended to assure quality and to foster the systematic pursuit of improvement in the quality of engineering education that satisfies the needs of constituencies in a dynamic and competitive environment. It is the responsibility of the institution seeking accreditation of an engineering program to demonstrate clearly that the program meets the following criteria.~~

These criteria are intended to provide a framework of education that prepares graduates to enter the professional practice of engineering who are (i) able to participate in diverse multicultural workplaces; (ii) knowledgeable in topics relevant to their discipline, such as usability, constructability, manufacturability and sustainability; and (iii) cognizant of the global dimensions, risks, uncertainties, and other implications of their engineering solutions. Further, these criteria are intended to assure quality to foster the systematic pursuit of improvement in the quality of engineering education that satisfies the needs of constituencies in a dynamic and competitive environment. It is the responsibility of the institution seeking accreditation of an engineering program to demonstrate clearly that the program meets the following criteria.

The Engineering Accreditation Commission of ABET recognizes that its constituents may consider certain terms to have certain meanings; however, it is necessary for the Engineering Accreditation Commission to have consistent terminology. Thus, the Engineering Accreditation Commission will use the following definitions:

Basic Science – Basic sciences consist of chemistry and physics, and other biological, chemical, and physical sciences, including astronomy, biology, climatology, ecology, geology, meteorology, and oceanography.

College-level Mathematics – College-level mathematics consists of mathematics above pre-calculus level.

Engineering Science – Engineering sciences are based on mathematics and basic sciences but carry knowledge further toward creative application needed to solve engineering problems.

Engineering Design – Engineering design is the process of devising a system, component, or process to meet desired needs, specifications, codes, and standards within constraints such as health and safety, cost, ethics, policy, sustainability, constructability, and manufacturability. It is an iterative, creative, decision-making process in which the basic sciences, mathematics, and the engineering sciences are

applied to convert resources optimally into solutions.

Teams – A team consists of more than one person working toward a common goal and may include individuals of diverse backgrounds, skills, and perspectives.

One Academic Year – One academic year is the lesser of 32 semester credits (or equivalent) or one-fourth of the total credits required for graduation with a baccalaureate degree.

Criterion 3. Student Outcomes

~~The program must have documented student outcomes that prepare graduates to attain the program educational objectives.~~

~~Student outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.~~

- ~~(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.~~

The program must have documented student outcomes. 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.

1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.

2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
4. An ability to communicate effectively with a range of audiences.
5. 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.
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

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 with experimental experience) appropriate to the discipline. Basic sciences are defined as biological, chemical, and physical sciences.

(b) one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study. The engineering sciences have their roots in mathematics and basic sciences but carry knowledge further toward creative application. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other. Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated 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.

One year is the lesser of 32 semester hours (or equivalent) or one-fourth of the total

~~credits required for graduation.~~

The curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The curriculum must support attainment of the student outcomes and must include:

(a) one academic year of a combination of college-level mathematics and basic sciences (some with experimental experience) appropriate to the program.

(b) one and one-half academic years of engineering topics, consisting of engineering sciences and engineering design appropriate to the program and utilizing modern engineering tools.

(c) a broad education component that includes humanities and social sciences, complements the technical content of the curriculum, and is consistent with the program educational objectives.

Students must be prepared to enter the professional practice of engineering 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 constraints.