Graduates of programs accredited by the EAC must be prepared for professional practice of engineering, and engineering is evolving to meet continually emerging demands. Criterion 3, Student Outcomes, as published in *Criteria for Accrediting Engineering Programs* was written 20 years ago in preparation for outcomes-based education. Over a period of several years, the EAC has been engaged in a process of review and improvement of Criterion 3, and has sought input from a broad variety of sources concerning skills and attributes needed for entry into the professional practice of engineering. The EAC used the input received and developed proposed revisions to the *Criteria for Accrediting Engineering Programs*. Revisions are to Criterion 3, framing student outcomes that address relevant topic areas and moving some items into Criterion 5, Curriculum. Definitions and explanations currently in Criterion 5 were moved to a revised introductory section to the *Criteria for Accrediting Engineering Programs* after the harmonized ABET definitions and before *Section I. General Criteria for Baccalaureate Level Programs*.

The intent of the proposed changes is to clarify outcomes that historically programs had difficulty assessing, allow for more efficient assessment processes, emphasize applications in an engineering context, and add some elements of project management. Furthermore, the proposed changes align ABET criteria more closely to Washington Accord graduate attributes referencing project management and finance.

Proposed changes are extensive in Criterion 3, and less so in Criterion 5. The proposed introductory section contains definitions that currently are embedded in Criterion 5; hence, the proposed Criterion 5 is shortened. The proposed changes are significant in configuration and grouping, but modest in content. The EAC recognizes that programs will be forced to reconfigure assessment tools and practices to map course content to the proposed organizational structure of Criterion 3 and to a lesser extent of Criterion 5. Because of the magnitude of change that has been proposed, a phase-in period for compliance following adoption of the proposed changes would be reasonable and appropriate.

The proposed changes to the criteria are presented in three tables, one for the introductory section (Table 1) and each of the two criteria (Criterion 3 in Table 2 and Criterion 5 in Table 3), containing columns of the current elements, the proposed changes, and a description of the effect of the proposed change. Definitions currently included in Criterion 5 and clarifications in Criterion 3 are collected in a new definitions section for ease of reference and to streamline Criterion 5. Definitions of terms that generated repeated questions to ABET headquarters were added.

Table 1. Changes in Introduction

Current Wording	Proposed Wording	Effect
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.	Adds aspirational description of graduate that criteria should produce when taken holistically.
Currently in Criterion 5: Basic sciences are defined as biological, chemical, and physical sciences.	<u>Basic Science</u> – Basic sciences consist of chemistry and physics, and other biological, chemical, and physical sciences, including astronomy, biology, climatology, ecology, geology, meteorology, and oceanography.	Eliminate confusion caused when PEVs assume that physics is the only physical science.
	<u>College-level Mathematics</u> – College-level mathematics consists of mathematics above pre-calculus level.	This is an addition to eliminate confusion as to whether or not pre-calculus classes are considered college-level mathematics.
Currently in Criterion 5: 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.	<u>Engineering Science</u> – Engineering sciences are based on mathematics and basic sciences but carry knowledge further toward creative application needed to solve engineering problems.	This change is to group all definitions together for ease of reference.
From Criterion 3. …-within realistic constraints such	<u>Engineering Design</u> – Engineering design is the	The attempt is to gather all

as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability From Criterion 5: 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.	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.	definitions relevant to engineering design into one place. Specifications, codes, and standards are emphasized. Examples of possible constraints are expanded. Creative is added as a modifier.
	<u>Teams</u> – A team consists of more than one person working toward a common goal and may include individuals of diverse backgrounds, skills, and perspectives.	This definition is added for clarification.
From Criterion 5: One year is the lesser of 32 semester hours (or equivalent) or one-fourth of the total credits required for graduation.	<u>One Academic Year</u> – 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.	This change is to group all definitions together for ease of reference. Added the word academic for clarity and baccalaureate to indicate undergraduate level rather than graduate level.

Table 2. Changes in Criterion 3 - Student Outcomes

Current Wording	Proposed Wording	Effect
(a) an ability to apply knowledge of mathematics, science, and engineering (e) an ability to identify, formulate, and solve engineering problems	1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.	Combines two outcomes to allow for more efficient assessment.
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	Emphasizes that experimentation, analysis, and interpretation are performed in an engineering context.
(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	2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.	Emphasizes that design must contain both analysis and synthesis. Definitions are moved to the introduction.
(d) an ability to function on multidisciplinary teams	7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.	Adds project management, risk, and uncertainty to scope of teamwork.
(f) an understanding of professional and ethical responsibility (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (j) a knowledge of contemporary issues	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.	Requires students to make informed judgments in an engineering situation while considering ethical and professional responsibilities as well as the global, economic, environmental, and societal contexts.
(g) an ability to communicate effectively	4. An ability to communicate effectively with a range of audiences.	Adds the stipulation of a range of audiences.
(i) a recognition of the need for, and an ability to engage in life-long learning	6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.	Clarifies the components of life-long learning that can be demonstrated and assessed at graduation.
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	Implied in 1, 2, and 3	Moved to Criterion 5

Table 3. Changes in Criterion 5 - Curriculum

Current Wording	Proposed Wording	Effect
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:	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:	Reference to outcomes and objectives of the program and institution were removed. This reference was deemed redundant because the program must demonstrate that program educational objectives are consistent with the mission of the institution in Criterion 2 and that the program must also demonstrate that the student outcomes prepare graduates to attain the program educational objectives in Criterion 3.
(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.	(a) one academic year of a combination of college-level mathematics and basic sciences (some with experimental experience) appropriate to the program.	Moved definition of basic science to definitions section.
(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	(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.	Moved definitions of engineering science and engineering design to the definitions section. Added the requirement to utilize modern engineering tools in the curriculum.

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.	(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.	On many campuses, the term "general education" has a specific meaning. The intent here is emphasize the importance of humanities and social sciences in providing engineering students a broad education.
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.	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.	Emphasizes professionalism.