April 8, 2019

FAQs for EAC C3 & C5 Criteria Changes

ABET will update these FAQs periodically and as necessary. If you would like to see other questions answered or would like to provide feedback on these FAQs, please email the Engineering Accreditation Commission at accreditation@abet.org with the subject "EAC C3-C5 Transition".

1. **Why did ABET change the criteria? (What was the rationale?)**
   In 2009, the Criteria Committee received several requests from member societies of ABET to add elements to the ABET Criterion 3 (a)-(k). A task force was formed to look at all of the requests and make suggestions to the full Criteria Committee. After an extensive literature review, discussions with stakeholders, and surveying PEVs, the Task Force brought their ideas to the Criteria Committee. The Criteria Committee asked for feedback from all professional societies and the general public. After three rounds of gathering feedback, the Criteria Committee proposed the new Criterion 3 [with student outcomes (1)-(7)] and Criterion 5 to the EAC. A more in-depth description of the rationale can be found here: http://www.abet.org/rationale-for-revising-criteria-3-and-5/

2. **Where can I find the new criteria?**
   The 2019-20 EAC Criteria are published at: https://www.abet.org/wp-content/uploads/2018/11/E001-19-20-EAC-Criteria-11-24-18.pdf

3. **What is the timeline for implementing these changes?**
   The changes will be in effect for the first time in the 2019-20 accreditation cycle. All programs scheduled for a General Review in the 2019-20 and following cycles (except for those scheduled for an Interim Review or Visit as described below) should begin transitioning to the new criteria as needed to assure as much implementation as practical for the next General Review.

4. **Our institution was evaluated in 2018-19. If a program received an IR or IV, which criteria should we use in preparing for the report/visit?**
   When responding to an IR or IV received before the 2019-20 cycle, a program has the option of using either the criteria in effect when the IR or IV was received OR using the current criteria in effect. However, ALL PROGRAMS AT AN INSTITUTION MUST USE THE SAME CRITERIA FOR THE REVIEW. (refer to Section I.E.2.b of the 2019-2020 APPM)

5. **Our program must respond to an IR or IV action in the 2019 – 2020 or later cycle that was received before the 2019-20 accreditation cycle. Which criteria should we use in preparing for the report/visit?**
   A program has the option of using either the criteria in effect when the IR or IV was received OR using the current criteria in effect. ALL PROGRAMS AT AN INSTITUTION MUST USE THE SAME CRITERIA FOR THE REVIEW. (refer to Section I.E.2.b of the 2019-2020 APPM)

6. **If our program is being visited in 2019-20 or 2020-21 and we have only one year or less of data from the new outcomes and older data from the (a)—(k) outcomes, how can we aggregate the results?**
   It is not necessary to aggregate data from student outcomes (a)-(k) and (1)-(7), UNLESS THE PROGRAM FINDS THE AGGREGATION USEFUL. Presumably, each program has followed its continuous improvement process for the five prior years and has

evidence of the degree to which outcomes (a)-(k) were obtained during that period, and how that assessment data was used as input to the program's continuous improvement process. PEVs will expect to see the plans for assessing and evaluating attainment of student outcomes (1)-(7) and implementation of these plans as much as practical, including the assessment data collected for (1)-(7), the degree to which (1)-(7) have been attained, and the manner in which evaluations of the assessment data have been used as input to the continuous improvement process.

7. **Can we add our own student outcomes?**
   Yes, programs have always had the ability to incorporate additional outcomes. If they do so, these additional outcomes must be assessed and evaluated as required by Criterion 4.

8. **What are the impacts of these changes on Master's programs?**
   For students who have graduated from a baccalaureate program accredited by EAC of ABET, we presume that they have completed a curriculum that supported the attainment of the then-current Criterion 3 student outcomes, whether those outcomes were (a)-(k) or (1)-(7).

   For students who are not graduates from a baccalaureate program accredited by EAC of ABET, the master's program must ensure that each student has completed the experiences required by the criteria (https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2019-2020/)

   > The master's program must have and enforce procedures for verifying that each student has completed a set of post-secondary educational and professional experiences that:
   >
   > (a) Supports the attainment of student outcomes of Criterion 3 of the general criteria for baccalaureate level engineering programs, and
   >
   > (b) Includes at least one year of math and basic science (basic science includes the biological, chemical, and physical sciences), as well as at least one-and-one-half years of engineering topics and a major design experience that meets the requirements of Criterion 5 of the general criteria for baccalaureate level engineering programs.

   The student outcomes referenced in (a) and the curriculum requirements referenced in (b) are those in effect at the time of the review; thus, outcomes (1)-(7) are required for reviews in the 2019-20 review cycle and beyond.

9. **What should we be giving special attention in the criteria that will be applied in the 2019-20 cycle and beyond?**
   It is the responsibility of each program to conduct its assessment process against the criteria that are in effect at the time of the review. For the 2019-20 cycle this will be the new criteria.
   Some elements to consider in the definitions:

   Basic Science: The EAC considers computer science to be engineering science, and NOT basic science. It is therefore an engineering topic.
   College-Level Mathematics: Pre-calculus and remedial math do not count as college-

level mathematics.
Complex Engineering Problems: It is important to pay attention to the complexity of problems used to develop and assess students' ability to solve problems.
Engineering Design: Consideration of risk has been added to the definition. It is expected that the listed characteristics and phases of the design process will be incorporated somewhere in the curriculum. It is not necessary that all phases be contained in the major design experience. The phrase "for illustrative purposes only" introduces a list of example topics, which are neither mandatory nor comprehensive.
Team: Indicates the importance of considering the team backgrounds, skills, and perspectives. It does NOT prescribe a mandatory make-up of a team, such as requiring students on team to come from two or more engineering programs.

Some elements to consider in Student Outcomes:

*Student Outcome #1 requires that students have the ability to solve **complex** problems. Programs will want to ensure that their problems are complex.*

*Student Outcome #2 requires that students have the 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. This does not mean that each of these elements must have a significant effect on the design — it just means that the program must show that students **consider** these elements as they engage in design.*

Student Outcome #3 requires that students have the ability to communicate with a range of audiences. It is the program's responsibility to determine the range of audiences. For example, if a program stresses preparing students for graduate school, it might have students prepare a journal paper. There are many other possible audiences: faculty, students, non-technical, the public sector, etc. For example, students in biomedical engineering programs might communicate with physicians, nurses, or other medical personnel. In the major design experience, students might communicate with external clients. It is the program's responsibility to determine the most meaningful audiences for its students.

*Student Outcome #4 requires in part that students have the ability to make informed judgments that consider the impact of engineering solutions in global, economic, environmental, and societal contexts. It is not necessary for every engineering situation to require that each of these contexts be a major consideration. **Consideration** of the impact as the judgment is made is key.*

Student Outcome #5 requires that students be able to function effectively on collaborative and inclusive teams as well as carry out project management tasks. Programs have a variety of methods for developing and assessing these abilities. There are many texts on project management available for use. Gantt charts, schedules, scrum, goal setting, and decision matrices might be useful as project management tools and techniques. Inclusiveness and collaboration can be characterized using existing instruments in the literature.

Student Outcome #6 requires in part that students have the ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering

judgment to draw conclusions. There is no requirement that students be able to design an experiment.

Student Outcome #7 requires that students be able to acquire and apply new knowledge as needed, using appropriate learning strategies. The ABET Industrial Advisory Council indicated that it is important for students to take responsibility for their own learning. There are many ways a student can demonstrate this ability. For example, students could engage in such activities as identifying needed information for a project, examining sources for the information, determining an appropriate source and applying the information.

10. **What is the general guidance on level of shortcoming versus degree to which assessment and evaluation of the extent to which the Criterion 3 Student Outcomes (1)-(7) are attained have been implemented in the 2019-20 cycle?**
These decisions will be TEAM decisions made during the visit. As a minimum, a plan for implementing assessment and evaluation of attainment for student outcomes (1)-(7) should exist and programs should be as far along as practical in assessing and evaluating elements of (1)-(7). PEVs will examine the robustness of a program's continuous improvement process.

11. **What are the expectations for programs in the 2019-20 cycle regarding mapping, assessing and evaluating Criterion 3 Student Outcomes (1)-(7)?**
Many programs use performance indicators to describe (a)-(k). Many of these performance indicators should be directly applicable for (1)-(7). It is likely that some programs will make only minor adjustments to their assessment processes. In these cases, transition to (1)-(7) may well be fully implemented during the 2019-20 cycle. If major changes to the assessment and evaluation processes are required, it is expected that a plan for the change will be fully developed and significant elements of the plan will be implemented.

12. **For student outcomes such as Student Outcome 4, which states "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", how should programs handle the list of contexts? Is it expected each problem address all contexts, not necessarily in a single problem but strategically covered throughout the entire program? Or, are programs allowed to choose the contexts relevant to the program?**
It is expected that programs assess the ability of students to consider all impacts listed. How a program chooses to address the requirement is the responsibility of the program.

13. **Student Outcome 5 requires that members of a team be able to create a collaborative and inclusive environment. Does ABET have suggestions for the measurement of student attainment for this element of the outcome through direct measures?**
An abundance of literature is available on creating collaborative and inclusive environments. (reworkwithgoogle.com)

Several methods for measuring attainment of this ability have been used by programs:

a. *Videotaping a team meeting and evaluating the team performance using a rubric.*
b. *Students write descriptions of their contributions and their team members' contributions indicating how they collaborated and were inclusive. A rubric is often used to evaluate the description.*
c. *External clients meet with students over a period of time and evaluate their contributions and inclusiveness.*
d. *Use of web-based peer evaluations such as CATME.org or TEAMMATES. The peer evaluations include specific questions about collaboration and inclusiveness.*
e. *Verbal feedback from course TAs or instructors about a team's collaboration and inclusiveness. Students take notes and give evidence to support or refute the feedback.*

Programs are expected to develop assessment methodologies that are meaningful for their students.

14. **According to the definition in the Criteria, "Complex engineering problems include one or more of the following characteristics: involving wide-ranging or conflicting technical issues, having no obvious solution, addressing problems not encompassed by current standards and codes, involving diverse groups of stakeholders, including many component parts or sub-problems, involving multiple disciplines, or having significant consequences in a range of contexts." Do programs need to include all of these characteristics at various assessment points in the program?**
*To satisfy the definition of "complex", the problem only has to have **one** of the above characteristics. There is no requirement that programs have to develop problems that incorporate all of these characteristics.*

15. **Similar to complex engineering problems, engineering design includes a long definition that says, "Engineering design is a process of devising a system, component, or process to meet desired needs and specifications within constraints. It is an iterative, creative, decision-making process in which the basic sciences, mathematics, and engineering sciences are applied to convert resources into solutions. Engineering design involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade-offs, for the purpose of obtaining a high-quality solution under the given circumstances." To what extent does a program need to incorporate all of these elements?**
Different curricular areas emphasize different phases and aspects of the design process. The program should emphasize those that are essential for its students. It is expected that all elements of the design process will be included to some extent.

16. **Student Outcome 4 states that students will have "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." Since the informed judgments must consider the impacts of global, economic, environmental, and societal contexts, do we have to find a case where all four elements are major considerations?**

The emphasis for informed judgments is the ability of the student to consider impacts in all four contexts. When considering actual engineering situations, it is possible that only one or two impacts are major. Students must be able to consider all four, but it is acceptable to state that an impact is minor.

17. **Student Outcome 6 states students will have "An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions." Must all of these components be done in series (i.e. develop and conduct an experiment, then interpret the data, and then use judgment to draw conclusions) or can you do these three aspects independently. For example, can you develop and design an experiment by itself, interpret data from a different system that is not related (e.g. an industrial set of data), and draw conclusions in another homework problem using data that isn't even connected to the first two?**
Programs have the ability to organize the development and assessment of outcomes to maximize student learning. The components of Outcome 6 do not have to be addressed in series, and the outcome may be satisfied in the context of more than one system. It is, of course, expected that each component is incorporated at a realistic level of complexity and applicability to the discipline.

18. **Criterion 5 (b) requires the curriculum to include "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." Does this mean that an engineering curriculum must include explicit "computer science" courses?**
The intent of this language is to make clear that the current engineering criteria consider computer science and computing to be engineering topics rather than basic science. The criteria do not require a curriculum to include courses that are explicitly titled "computer science". As a practical matter, though, it is difficult to find a contemporary engineering program that does not incorporate computer/computing sciences in some form or another. Computing and software tools, languages, principles, and techniques have become essential to the practice of engineering, whether one builds software, uses software applications, or collaborates with software developers on projects. Computer-based systems and hence software are integral to almost every engineering project today, so it would seem unlikely that an engineering curriculum would fail to address these topics in a manner appropriate to the discipline.

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