Anticipating Transition: Engineering Criteria Revisions Coming in 2019-20

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There are changes for the EAC that will be implemented in the 2019-20 Accreditation Cycle.

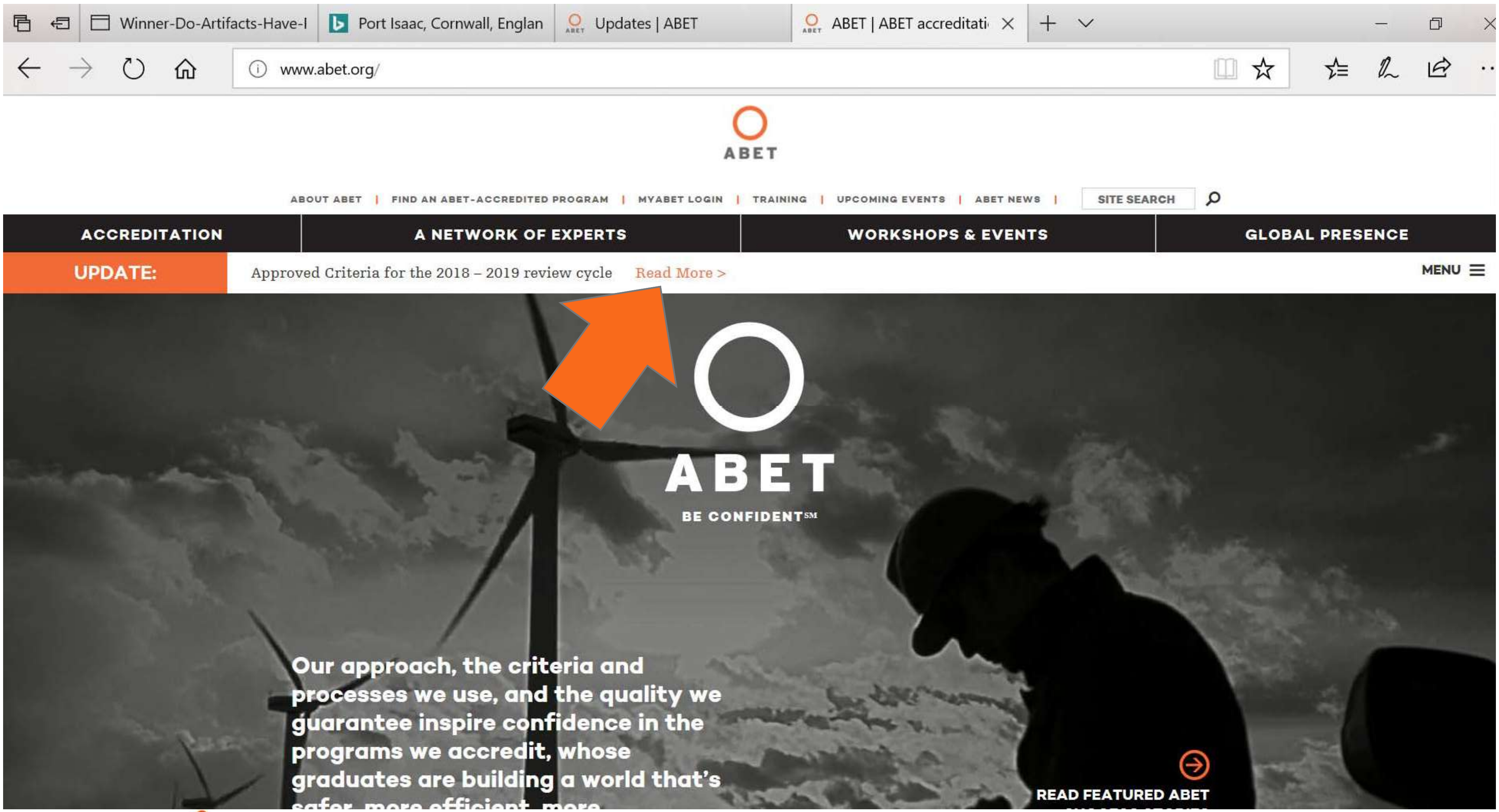
> This presentation will discuss the following elements:

- New definitions
- Changes to Criterion 3: New Student Outcomes
- Changes to Criterion 5: Curriculum

> We will suggest two approaches for making your transition:

- Use what you are already doing and make modifications
- Start from scratch

The handout contains the new definitions and C3 and C5.



SUSTAINABILITY

#ABET18

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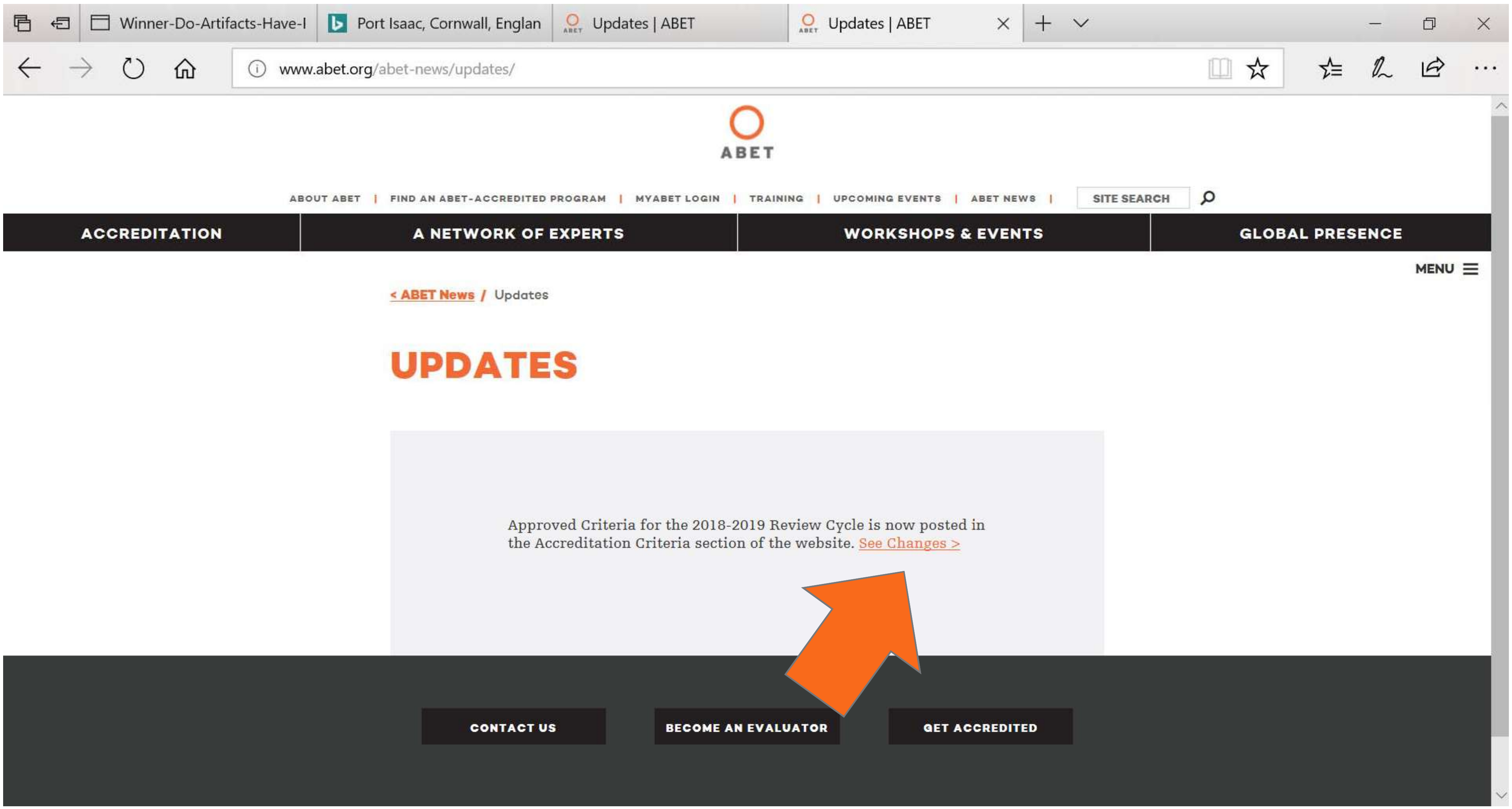

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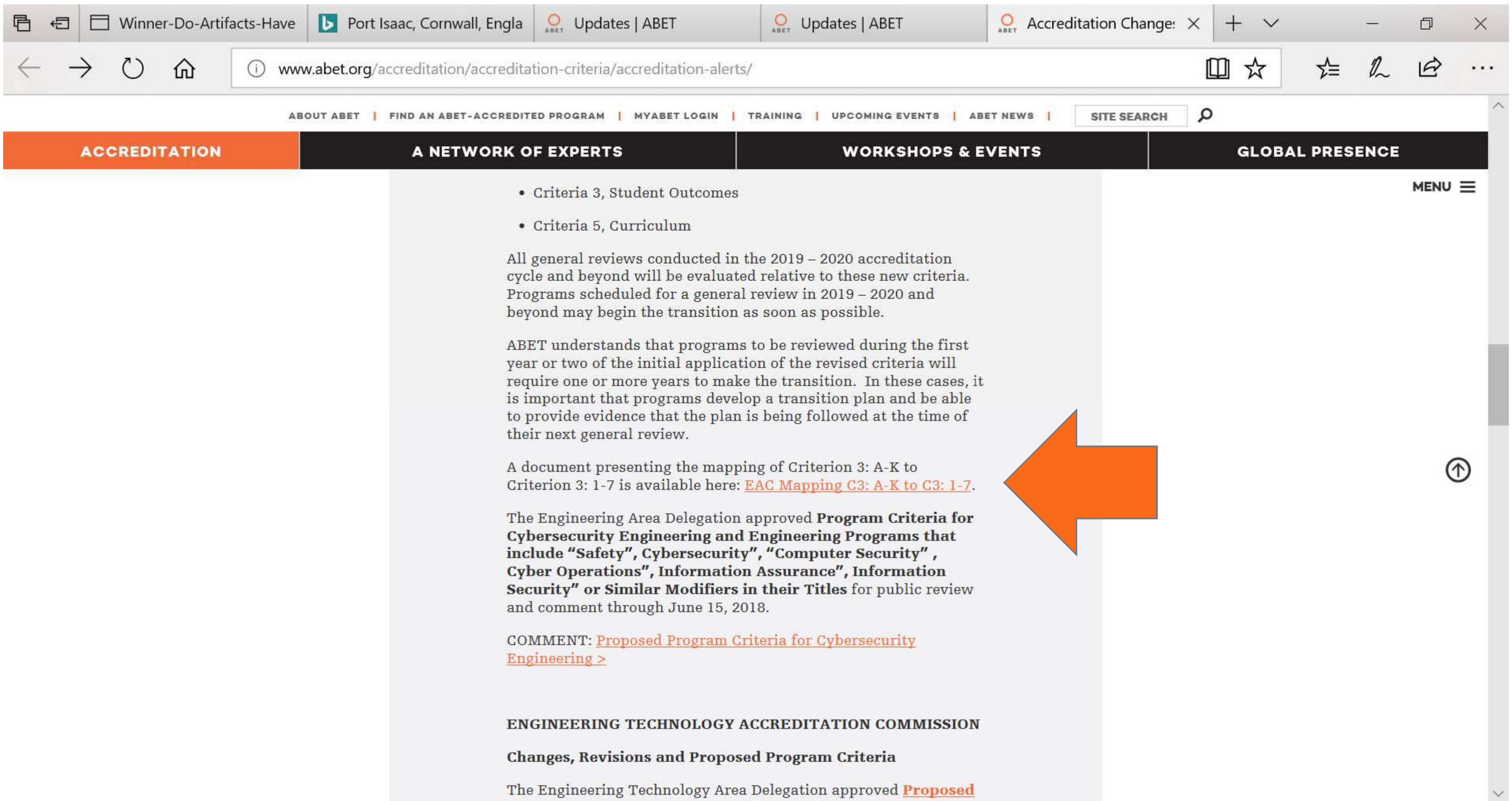

Introduction

ROW 1.1 New:

These criteria apply to all accredited engineering programs. Furthermore, these criteria are intended to foster the systematic pursuit of improvement in the quality of engineering education that satisfies the needs of its 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.

ROW 1.2 New:

Definitions

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 in applying the criteria:

ROW 1.3 New:

Basic Science – Basic sciences are disciplines focused on knowledge or understanding of the fundamental aspects of natural phenomena. Basic sciences consist of chemistry and physics and other natural sciences including life, earth, and space sciences.

[Important Note: Computer Science is not a basic science. Computer Science is an engineering topic.]

Row 1.4 NEW:

College-Level Mathematics – College-level mathematics consists of mathematics that requires a degree of mathematical sophistication at least equivalent to that of introductory calculus. For illustrative purposes, some examples of college-level mathematics include calculus, differential equations, probability, statistics, linear algebra, and discrete mathematics.
[Important note: Pre-calculus and remedial math do not count as college-level math.]

ROW 1.5 New:

Complex Engineering Problems – 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.
[It is important to pay attention to the complexity of problems given in the problem solving examples.]

ROW 1.6 New:

Engineering Design – 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 ind, 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. For illustrative purposes only, examples of possible constraints include accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy, regulations, schedule, standards, sustainability, or usability.

[Note: Considering risks has been added to the description. The phrase "*for illustrative purposes only*" is for the purpose of giving examples and is not mandatory.]

ROW 1.7 New:

Engineering Science – Engineering sciences are based on mathematics and basic sciences but carry knowledge further toward creative application needed to solve engineering problems. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other.

ROW 1.8 New:

Team – A team consists of more than one person working toward a common goal and should include individuals of diverse backgrounds, skills, or perspectives.
[Indicates importance of considering the team background, skills, and perspectives.]

Row 2.1 New

Criterion 3. Student Outcomes

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.

Row 2.2 New

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

[combined applying principles of engineering, science, and mathematics to *complex* problems.]

Criterion 3. Student Outcomes (continued)

Row 2.4 New:

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
[Designs must consider public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. Does not mean that all elements are significant in all designs.]

Criterion 3. Student Outcomes (continued)

ROW 2.7 New:

3. an ability to communicate effectively with a range of audiences

[Note: It is the program's responsibility to determine the range of audiences. For example, if a program stresses preparing students for graduate school, they might have them prepare a journal paper.]

Criterion 3. Student Outcomes (continued)

ROW 2.6 NEW:

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
[Requires students to make a judgement that considers the impact of engineering solutions. It is not necessary for every engineering situation to require that global, economic, environmental, and societal contexts be major considerations.]

Criterion 3. Student Outcomes (continued)

ROW 2.5 NEW:

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
[Programs must demonstrate how their teams meet the requirements given.]

Criterion 3. Student Outcomes (continued)

ROW 2.6 New:

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
[Requires students to draw conclusions and explain. The requirement to Design the Experiment has been removed.]

Criterion 3. Student Outcomes (continued)

ROW 2.8 New:

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

[Discussions with ABET's IAC indicated that they wanted students to take initiative for their learning.]

Criterion 5. Curriculum

ROW 3.1 New:

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:

ROW 3.2 New:

(a) 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. **[Note: All programs now have the same minimum credit hour requirements for math-science topics.]**

Criterion 5. Curriculum (continued)

<u>ROW 3.1 New:</u>

(b) 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.

[Note 1: Indicates that computer sciences are considered engineering topics.]

[Note 2: Programs must indicate their use of modern engineering tools.]

[Note 3: All programs now have the same minimum credit hour requirements for engineering topics.]

Criterion 5. Curriculum (continued)

ROW 3.5 New:

(d) 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.
[Note: Makes clear that the intent is to include both item 1 and 2.]

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

1. Problem statement shows understanding of the problem
2. Solution procedure and methods are defined.
3. Problem solution is appropriate and within reasonable constraints
4. Selects appropriate techniques and tools for a specific engineering task and compares results with results from alternative tools or techniques
5. Uses computer-based and other resources effectively in assignments and projects
6. Chooses a mathematical model of a system or process appropriate for required accuracy
7. Applies mathematical principles to achieve analytical or numerical solution to model equations
8. Examines approaches to solving an engineering problem in order to choose the more effective approach

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

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- Pr…
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- Us… projects
- Ch… quired ac…
- Ap… tion to mo…
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Programs need to ensure that they are evaluating COMPLEX engineering problems and that they are applying principles of engineering, science, and mathematics.

Eight performance indicators may be too many.

Streamlining what you are doing and writing focused performance indicators may be worthwhile.

Additions might be appropriate.

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

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

1. Produces a clear and unambiguous needs statement in a design project
2. Identifies constraints on the design problem, and establishes criteria for acceptability and desirability of solutions
3. Carries solution through to the most economic/desirable solution and justifies the approach
4. Evaluates and analyzes the economics of an engineering problem solution
5. Identifies the environmental and social issues involved in an engineering solution and incorporates that sensitivity into the design process
6. Identifies the current critical issues confronting the discipline
7. Evaluates alternative engineering solutions or scenarios taking into consideration current issues

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

1. Produces a clear and unambiguous needs statement in a design pr
2. Id ... ishes cr
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4. Ev ... pr
5. Id ... n an engineering solution and incorporates that sensitivity into the design process
6. Identifies the current critical issues confronting the discipline
7. Evaluates alternative engineering solutions or scenarios taking into consideration current issues

Programs should include RISK and also look at the definition of design. Seven performance indicators may be too many. Streamlining what you are assessing may be worthwhile. Writing new, directed performance indicators. may be easier.

Some additions may be necessary.

3. an ability to communicate effectively with a range of audiences

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1. Writing conforms to appropriate technical style format appropriate to the audience
2. Appropriate use of graphics
3. Mechanics and grammar are appropriate
4. Oral: Body language and clarity of speech enhances communication

3. an ability to communicate effectively with a range of audiences

1. Writin … rmat approp
2. Appro
3. Mecha
4. Oral: I … s communication

Be sure to document the range of audiences.

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

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1. Knows code of ethics for the discipline
2. Able to evaluate the ethical dimensions of a problem in the discipline
3. Evaluates conflicting/competing social values in order to make informed decisions about an engineering solution.

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

1. Kn
2. Ab e dis
3. Ev make informed decisions about an engineering solution.

Evaluate your current performance indicators to ensure that the outcome is described.
You may need to make additions.

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

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1. Recog … lfills appro…
2. Integr … decisions in relati…
3. Impro … s for feedb…
4. Expre … sibility
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6. Engag…

Review the teaming definition to ensure that you have the necessary elements.
Also, six performance indicators may be too many.
It may be easier to streamline and focus your performance indicators.
Some additions in your indicators may be appropriate.

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

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1. Observes good lab practice and operates instrumentation with ease
2. Determines data that are appropriate to collect and selects appropriate equipment, protocols, etc. for measuring the appropriate variables to get required data
3. Uses appropriate tools to analyze data and verifies and validates experimental results including the use of statistics to account for possible experimental error

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

1. Obser… …ntation with ease
2. Deterr… …d selects appro… …ng the appro…
3. Uses a… …s and valida… …f statistics to account for possible experimental error

Review current performance indicators to ensure compliance with the student outcome.
It is possible that what you are currently doing is sufficient.
Some additions may be appropriate.

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

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1. Expresses an awareness that education is continuous after graduation
2. Able to find information relevant to problem solution without guidance

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

1. Expr ... s after grad
2. Able ... n without guid

Review current performance indicators to ensure compliance with the student outcome.
It is possible that what you are currently doing is sufficient.
Some additions may be appropriate

Let’s start the process from scratch!

- Gather your assessment team.
- Write down what you want to know about your students in performance indicator form.
- Record each performance indicator on a separate sheet of paper or post-it note.
- Look at ABET 1-7
- Map what you want to know to ABET 1-7
- Fill in gaps (if any)
- Decide where to take data on each performance indicator.
- Please do not take data on each performance indicator in EVERY class – be strategic.
- Gather data in the courses that will give you the most relevant information.

How do we transition?

> Gather your assessment team
> Create your map (from what you are doing now to 1-7)
> Create your assessment plan NOW!
> Implement your assessment plan in 2018-19
  - If you are visited in 2019-20, you are only expected to have one year of data for your new PIs
  - Report years prior to 2018-19 as usual.
> Report the results that you have at your next visit.


Thanks for your attention!
Are there any questions?