A conversation with ECE Department Heads about ABET Criteria Changes

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- Not an official ABET presentation
- Just a collegial conversation about what I learned through some 23 years of engagement with engineering accreditation from multiple perspectives.

Department head of Electrical Engineering 1991-2001

ROCHESTER INSTITUTE OF TECHNOLOGY

R·I·T

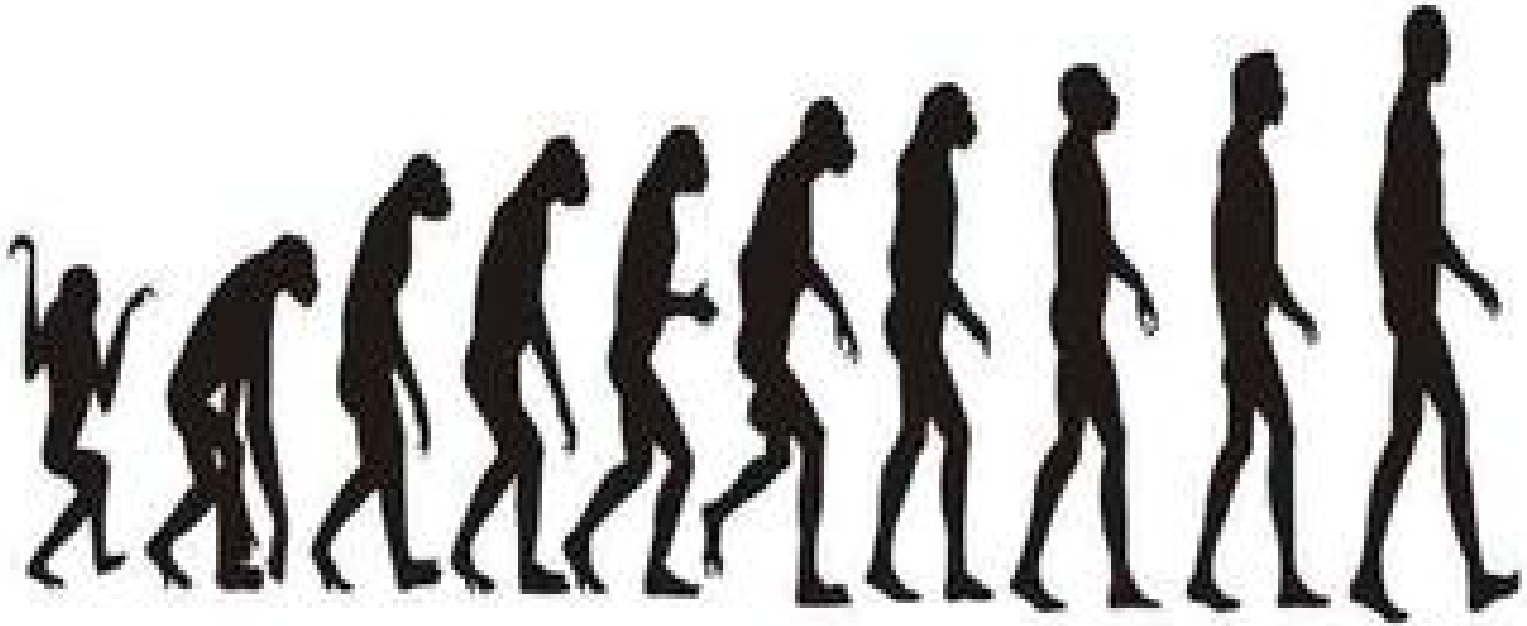
1829

Spent 15 years on the dark side

Lots of experience with ABET

- Multiple roles

Changes in EAC General Criteria



Summary of changes

- **Definitions** became important; they now contain most of the descriptions of important terms used later in the criteria.
- Changes to Criterion 5, **Curriculum**
- Criterion 3 **Student Outcomes** were reduced to SEVEN from 11

Definitions: Basic Science and Mathematics

- **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.
- **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.

Definitions: Complex Engineering Problems

- 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.

Definitions: Engineering Design

- 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 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. 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.

Definitions: Engineering Science

- 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.

- Team – A team consists of more than one person working toward a common goal and should include individuals of diverse backgrounds, skills, or perspectives.

Criterion 3 Student Outcomes-1

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.

Old: (a) an ability to apply knowledge of mathematics, science, and engineering

New

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

Criterion 3 Student Outcomes-2

Old

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

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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

Some of the details are now moved to definitions…

Criterion 3 Student Outcomes-3

Old

(g) an ability to communicate effectively

New

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

Criterion 3 Student Outcomes-4

Old

- (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
- (f) an understanding of professional and ethical responsibility

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

Criterion 3 Student Outcomes-5

Old

(d) an ability to function on multidisciplinary teams

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

Criterion 3 Student Outcomes-6

Old

- (b) an ability to design and conduct experiments, as well as to analyze and interpret data

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New

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

Criterion 3 Student Outcomes-7

Old

- (i) a recognition of the need for, and an ability to engage in life-long learning

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New

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

Criterion 5 Curriculum- Math and Science

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:

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.

Criterion 5 Curriculum- Engineering topics

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.

Old

(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.

Criterion 5 Curriculum- Engineering topics

New

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.

Criterion 5 Curriculum- Broad education

Old

(c) a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.

New

a broad education component that complements the technical content of the curriculum and is consistent with the program educational objectives.

Criterion 5 Curriculum

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.

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.

Effective date

The Engineering Accreditation Commission requested that these changes in the Engineering General Criteria and supporting text be approved by the Engineering Area Delegation for implementation in the 2019-20 accreditation cycle.

In October, 2017 EAD approved the request.

Dealing with Change

- **Map (a)-(k) to (1) thru (7)**
- **Create new assessment techniques for the new SO's**