

ABET 101

ABET Accreditation

<http://www.abet.org>

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Fall 2019



UNIVERSITY OF
Nebraska
Lincoln

Welcome to ABET 101.

The purpose of this presentation is to educate the College of Engineering faculty on fundamentals of ABET accreditation.

CoE Curriculum and Academic Standards Subcommittee on Continuous Improvement of Teaching and Learning (CITL)

Scope:

The CITL subcommittee shall develop, implement, and monitor faculty-driven, short-and long-term continuous improvement processes pertaining to teaching, pedagogy, and outcome-driven **student learning and success**.

Faculty members

(2019-2020):

Yasar Demirel, Chemical and Biomolecular Engineering
Heidi Diefes-Dux, Biological Systems Engineering
Alisa Gilmore (Chair), Electrical and Computer Engineering
Kelli Herstein, Durham School of Architectural Engineering and Construction
Witawas Srisa-an (Witty), Computer Science and Engineering
Benjamin Terry, Mechanical and Materials Engineering
David Yuill, Durham School of Architectural Engineering and Construction
Richard Wood, Civil Engineering
Sohrab Asgarpoor, Associate Dean, College of Engineering



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This presentation is on behalf of the College of Engineering subcommittee on Continuous Improvement of Teaching and Learning, known by the acronym CITL, which is part of the College of Engineering Curriculum and Academic Standards Committee.

The scope of the CITL is to develop, implement, and monitor faculty-driven, short- and long-term continuous improvement processes pertaining to teaching, pedagogy, and outcome-driven **student learning and success**.

The faculty serving on the CITL during the 2019-2020 academic year are shown here.

This committee was founded in Fall of 2012 and we hold meetings once a month during fall and spring semesters.

Changes to ABET

- There have been substantial changes to key parts of ABET accreditation in recent years.
 - New definitions (slides 13-22)
 - Revised Student Outcomes
 - Changes to Criteria 3 (slides 28-31)
 - Revised Curriculum Requirements
 - Changes to Criteria 5 (slides 33-36)
- This presentation is based on information available from ABET as of the fall of 2019.



Before we cover anything else, I would like to point out that there have recently been substantial changes to key parts of ABET accreditation.

Of greatest note, changes have been made to the definitions of several key terms, and many student outcomes have been revised. The changes to student outcomes, which pertain to Criteria 3, have also resulted in changes to criteria 5, which applies to curriculum requirements. For your reference, information related to these parts of ABET accreditation can be found on the slides indicated here. The content of this presentation is based on information available from ABET as of the fall of 2019.

What is Accreditation?

The goal of accreditation is to ensure that education provided by institutions of higher education meets acceptable levels of quality.

U.S. Department of Education

- Institutional Accreditation
- Specialized/Programmatic Accreditation



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The goal of accreditation according to the U.S. department of Education is to ensure that education provided by institutions of higher education meets acceptable level of quality.

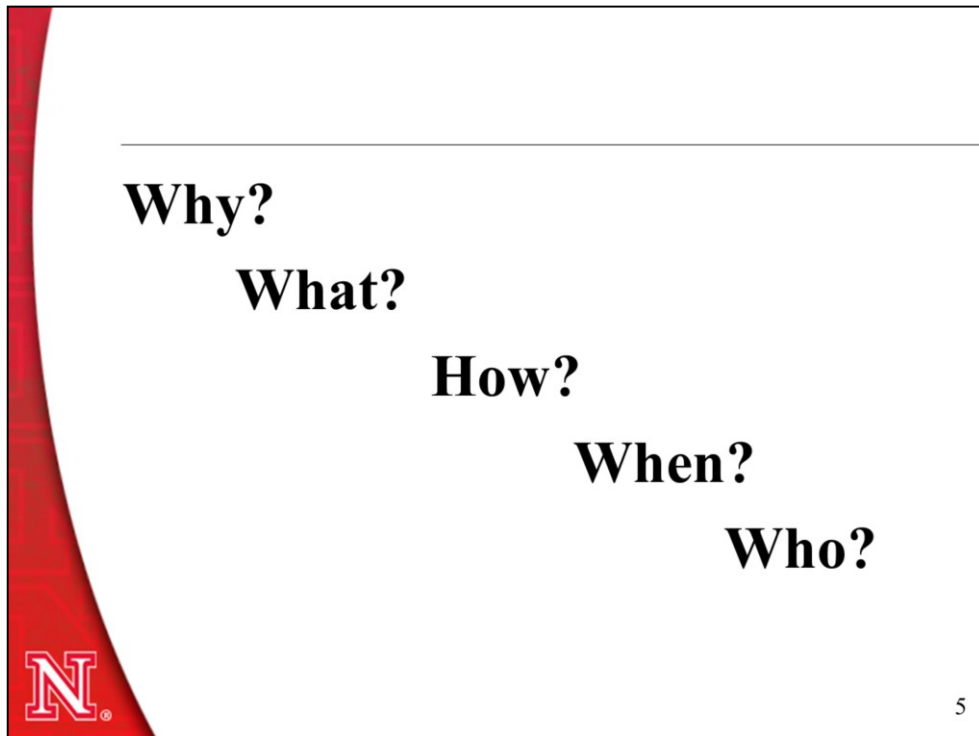
There are two types of accreditation :

1) *(Institutional Accreditation)*

Institutional accreditation examines the quality of an institution as a whole. UNL is accredited by the Higher Learning Commission or HLC which is an independent corporation.

2) *(Specialized or Programmatic accreditation)*

Specialized or programmatic accreditation examines specific programs of study, rather than an institution as a whole. Specific programs (e.g. Engineering) are often evaluated through specialized accreditation such as ABET.



The following slides are divided into several categories covering the Why, What, How, When, and Who of ABET accreditation.

For example,

Why does accreditation matter?

What is ABET?

How do we demonstrate our commitment to the continuous improvement of our programs in a way that meets accreditation requirements?

When do we assess and evaluate students, make decisions about improving the program, and submit documentation for accreditation purposes?

Who is in charge of documenting everything related to ABET assessment and accreditation?

Why?
What?
How?
When?
Who?

N

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We'll start with WHY accreditation matters.

Why does accreditation matter?

It offers proof that a program has met certain standards to produce graduates.

- Serves to notify Parents, Prospective Students, Employers, Faculty, Deans, Administrators, Taxpayers, and the Public
- **State licensing boards** and certification programs may require graduating from an ABET-accredited program as the first step in the registration process for professional practice.



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Accreditation is one way of showing that a program has met certain minimum standards to produce graduates.

Accreditation also serves to notify

- parents and prospective students that a program has met professional standards;
- employers that graduates are prepared to begin professional practice;
- faculty, deans and administrators of a program's strengths and weaknesses and of ways to improve the program;
- Taxpayers and the public that their funds are spent well; and that graduates are aware of public health and safety considerations

In short, it provides assurance that a program is what it claims to be.

ABET accreditation can also affect the first step in the registration process for professional licensure.

Why?

What?

How?

When?

Who?

N

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We already touched on the question of why.

Now we start discussing the question of What. Specifically:

What is ABET?

What are the roles and responsibilities of faculty in accreditation?

What ABET-specific jargon do I need to know?

What are the criteria for accreditation?

What is ABET?

- ABET is recognized as the worldwide leader in assuring quality and stimulating innovation in **applied & natural science, computing, engineering**, and engineering technology education.
- Currently, ABET accredits over 4,000 programs at more than 790 colleges and universities in 32 countries.
- Each year, 2,200 experts from 35 member societies contribute to ABET goal of assuring confidence in STEM education.



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ABET is a nonprofit, non-governmental organization recognized worldwide.

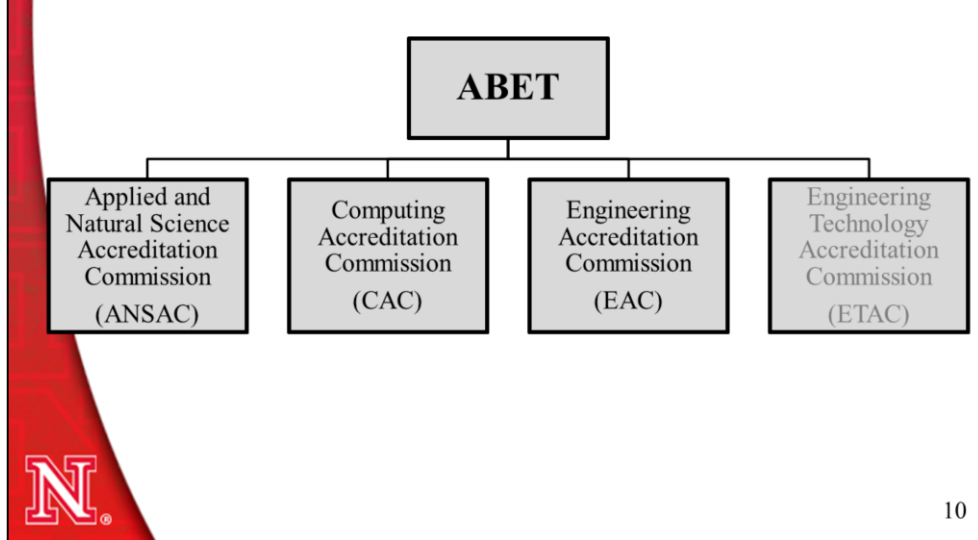
ABET is the primary organization responsible **for monitoring, evaluating, and certifying** the quality of engineering, engineering technology, applied and natural science, and computer science education in the United States and abroad.

ABET accredits over 4,000 programs at over 790 colleges and universities in 32 countries worldwide.

Over 100,000 students graduate from ABET-accredited programs each year.

Each year, over 2,200 volunteers from 35 Member Societies contribute to ABET's goals of leadership and quality assurance in the disciplines it covers by serving as program evaluators, committee and council members, commissioners, and members of the Board of Directors.

ABET's Accreditation Commissions



The 4,000+ programs that are accredited by ABET come from a range of disciplines. These disciplines fall into 4 groups that each have their own accreditation commission. These commissions cover programs in

- applied and natural sciences
- computing
- engineering
- and engineering technology

In the University of Nebraska College of Engineering, most programs fall under the purview of the EAC, but we also have programs accredited by ANSAC and the CAC.

There are differences between the different accreditation commissions, and some of them will come up later in this presentation.

What are Faculty Roles and Responsibilities?

- **Understanding the ABET process**
- Engaging in the Continuous Improvement process
 - Contributing to data collection, assessment, evaluation, and decision making (as requested)
- Assisting Department Chair and ABET coordinator when requested (e.g., in preparing the self-study)



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What are the faculty roles and responsibilities for accreditation?

First, understanding the ABET process and terminologies for accrediting an undergraduate program is a must for all faculty. Also, faculty should realize that accreditation is a part of the overall continuous improvement process.

Our continuous improvement processes help verify that the programs meet a certain level of quality and help us to ensure that we are adequately training our students.

Most, if not all, faculty should be involved in the Continuous Improvement process by

- Gathering data and perform assessment (as requested),
- documenting the continuous improvement process,
- making recommendations for improvements based on data,
- documenting any recommendations and changes made to a course, and
- ensuring there is documentation of recommendations and changes made at broader levels, such as a faculty group, committee or department.

Finally

Faculty are expected to assist the department Chair and ABET coordinator when requested. This includes submitting syllabi and curricula vitae and preparing the self-study. The self-study is a large task and is typically divided across several groups of faculty.

What ABET-specific jargon do I need to know?



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Now we are going to review some of the terms and definitions used by ABET.

What are PEOs?

PEOs = Program Educational Objectives

Program educational objectives are broad statements that describe what graduates are expected to attain within a few years of graduation.

PEOs are based on the needs of the program's constituencies.



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Program educational objectives, or PEOs, are broad statements that describe what graduates are expected to attain **within a few years of graduation**.

PEOs are based on the needs of the program's constituencies.

Program's constituents might include: students, faculty, alumni, employers, industry.

PEOs typically reflect broad outcomes related to expertise, employment, professional engagement, continuing education, leadership, and teamwork.

What is an SO?

SO = Student Outcome

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.**



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Student outcomes, or SO's, describe what students are expected to know and be able to do by the time of graduation.

The SOs related to the skills, knowledge, and behaviors that students acquire as they progress through the program.

I mentioned SOs earlier in this video as part of the recent changes to ABET accreditation.

What is Assessment?

Assessment:

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.



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Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of SO's.

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, meaning that it is not necessary to collect data from every student or in every year, so long as the sampling process leads to a sample that is representative of the whole program.

What is Evaluation?

Evaluation:

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.



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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 by comparing assessment data to some pre-determined criteria.

Evaluation results in decisions and actions regarding program improvement.

What is a Team?

Team:

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



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ABET defines a team as consisting of more than one person working toward a common goal and should include individuals of diverse backgrounds, skills, or perspectives.

ABET does not prescribe any mandatory factors should be used to ensure “diverse backgrounds, skills, or perspectives.”

What is College-level Mathematics?

EAC	ANSAC	CAC
<p>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.</p>	<p>College level Mathematics consists of mathematics that requires a degree of mathematical sophistication at least equivalent to that of college algebra. For illustrative purposes, some examples of college-level mathematics include college algebra, precalculus, calculus, differential equations, probability, statistics, linear algebra and discrete mathematics.</p>	<p>Mathematics: At least 15 semester credit hours (or equivalent) that must include discrete mathematics and must have mathematical rigor at least equivalent to introductory calculus. The additional mathematics might include course work in areas such as calculus, linear algebra, numerical methods, probability, statistics, or number theory.</p>

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What constitutes “College-level mathematics” differs according to the different accreditation commissions within ABET.

This slide shows what the different accreditation commissions say within Criterion 5 about college-level mathematics:

For the EAC, college-level math is at or above the level of calculus. For ANSAC, college-level math is at or above the level of college algebra. The CAC does not use the term “college-level mathematics, but it does specify that students are expected to take math courses at or above the introductory calculus level.

What are Complex Engineering Problems? (EAC)

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.



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The term “complex engineering problem” is used in the EAC Criterion 3 on Student Outcomes.

The full definition is given here. You may pause the presentation to read it in full. Please note, to satisfy the ABET definition of "complex", the problem only has to have one of the listed characteristics. It is not required that programs develop problems that incorporate all the characteristics.

What is Engineering Design? (EAC)

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.



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The term “engineering design” is used in the EAC Criterion 3 on Student Outcomes and Criterion 5 on Curriculum.

The full definition is given here. You may pause the presentation to read it in full.

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.

What is Basic Science? (EAC)

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.

The EAC considers computer science to be an engineering science and not a basic science.



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The term “basic science” is used in the EAC Criterion 5 on Curriculum.

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.

For ABET purposes, computer science does not count as a basic science.

What is Engineering Science? (EAC)

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.



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The term “engineering science” is used in the EAC Criterion 5 on Curriculum.

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.

What are the Criteria for Accreditation?

1) General Criteria:

- All programs seeking accreditation from an ABET Commission must demonstrate that they satisfy ALL of the General Criteria listed for that Commission.

2) Program Criteria:

- Program Criteria provide discipline specific accreditation criteria.
- Programs must show that they satisfy all of the specific Program Criteria implied by the program title. Any overlapping requirements need be satisfied only once.



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Next we will look at the criteria for accreditation.

The criteria are in two sections.

1) General Criteria apply to all programs accredited by an ABET commission. Each program accredited by an ABET commission must satisfy every Criterion that is in the General Criteria for that commission.

2) Program Criteria provide discipline specific accreditation criteria. Programs must show that they satisfy all of the specific Program Criteria implied by the program title. Any overlapping requirements need be satisfied only once.

It is the responsibility of the program seeking accreditation to demonstrate clearly that the program meets the general criteria and any program criteria that apply.

What are ABET General Criteria?

- **Criterion 1. Students**
- **Criterion 2. Program Educational Objectives**
- ***Criterion 3. Student Outcomes**
- **Criterion 4. Continuous Improvement**
- ***Criterion 5. Curriculum**
- ***Criterion 6. Faculty**
- **Criterion 7. Facilities**
- **Criterion 8. Institutional Support**



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The requirements for the general criteria are listed here. The labels for the general criteria are the same for all the accreditation commissions, but the details within some of the criteria differ. The eight criteria relate to:

- Students
- PEOs
- SO's
- Continuous Improvement
- Curriculum
- Faculty
- Facilities
- Institutional Support

The Criteria marked with an asterisk are the ones that differ across the accreditation commissions. We will go over all of the criteria in the next slides.

Criterion 1. Students

- Student performance must be **evaluated**.
- Students must be **advised**.
- Student progress must be **monitored**.
- The program must have and enforce **policies** for accepting academic credits.
- The program must have and enforce **procedures** to meet all graduation requirements.



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There are several requirements for this criteria:

- Student performance must be **evaluated**.
- Students must be **advised** regarding curriculum and career matters.
- Student progress must be **monitored** to foster success in attaining student outcomes, thereby enabling graduates to attain program educational objectives.
- The program must have and enforce **policies** for accepting both new and transfer students, awarding appropriate academic credit for courses taken at other institutions, and awarding appropriate academic credit for work in lieu of courses taken at the institution.
- The program must have and enforce **procedures** to ensure and document that students who graduate meet all graduation requirements.

Criterion 2. Program Educational Objectives - PEOs

- The program must have published program educational objectives that are consistent with the mission of the institution, the needs of the program's various constituencies, and these criteria.
- There must be a **documented, systematically utilized**, and effective process, involving program constituencies, for the **periodic review** of these program educational objectives **that ensures they remain consistent with the institutional mission, the program's constituents' needs, and these criteria.**
- PEOs are documented on department webpages.



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We already discussed the definition of PEOs in previous slides.

The program must have published PEOs that are consistent with the mission of the institution, the needs of the program's various constituencies, and the criteria.

There must be a documented, systematically utilized, and effective process, involving program constituencies, for the **periodic review** of these PEOs that ensures they remain consistent with the institutional mission, the program's constituents' needs, and these criteria.

All of our programs publically document their PEOs on their department webpages.

Criterion 3. Student Outcomes - SOs

- The program must have documented SOs that support the PEOs.
- Attainment of these outcomes prepares graduates to enter professional practice.
- Several SOs are dictated by ABET, and programs may articulate additional outcomes if desired.
- The ABET-given SOs differ across the accreditation commissions.

	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5
Student Outcome 1	X	X	X	X	X
Student Outcome 2	X		X	X	X
Student Outcome 3		X	X	X	
Student Outcome 4	X	X			X
Student Outcome 5	X		X		X
Student Outcome 6	X	X	X	X	
Student Outcome 7		X	X	X	X

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For this requirement, programs must document how the SOs prepare graduates to attain the PEOs. The alignment can be mapped and documented in a table like the one shown here.

The alignment is critical, because the attainment of SOs prepares our students to enter professional practice and sets them on track to attain the PEOs within a few years of graduation.

Programs must demonstrate that their students attain the SOs. The process of demonstrating student attainment of the SOs is relevant for Criterion 4 as well.

Each of the accreditation commissions dictates a set of SOs, and programs are able to articulate additional outcomes if desired.

Next, we'll look at the ABET-given SOs for the three commissions relevant to our College of Engineering. All of our programs also document their SOs on their department webpages and you can access them anytime on your department's ABET Accreditation page.

ANSAC SOs

1. An ability to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline
2. An ability to formulate or design a system, process, procedure or program to meet desired needs
3. An ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions
4. An ability to communicate effectively with a range of audiences
5. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts
6. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty



Programs that fall under the purview of ANSAC must demonstrate that their students attain the following 6 outcomes. All faculty in those programs should be familiar with these SOs. You may pause the presentation so that you have time to read all the outcomes.

CAC SOs

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline
3. Communicate effectively in a variety of professional contexts
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline



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Programs that fall under the purview of the CAC must demonstrate that their students attain the following 5 outcomes. All faculty in those programs should be familiar with these SOs. You may pause the presentation so that you have time to read all the outcomes.

EAC SOs

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
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
3. An ability to communicate effectively with a 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
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
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.



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Engineering programs must demonstrate that their students attain the following 7 outcomes. All faculty in those programs should be familiar with these SOs. You may pause the presentation so that you have time to read all the outcomes.

SOs across Accreditation Commissions

Topic	EAC	ANSAC	CAC
Apply technical knowledge	1	1	1
Use design process to meet needs	2	2	2
Develop experiment and interpret data	6	3	--
Communication	3	4	3
Professional/ethical responsibilities	4	5	4
Teamwork	5	6	5
Learning strategies	7	--	--



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As this table indicates, the SOs that have been put forth by the different accreditation commissions overlap considerably on a conceptual level even though they differ in their wording and discipline-specific elements.

All of our graduates across the college are expected to build and be able to apply technical knowledge, be able to use the design process to meet specific needs, communicate effectively, adhere to professional and ethical responsibilities, and work effectively as part of a team.

Criterion 4. Continuous Improvement

- The program **must** regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained.
- The results of these evaluations **must** be systematically utilized as input for the continuous improvement of the program. Other available information may also be used to assist in the continuous improvement of the program.



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Criterion 4 pertains to continuous improvement. The requirements for this criterion are:

- 1) The program **must** regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained.
- 2) The results of these evaluations **must** be systematically utilized as input for the continuous improvement of the program. Other available information may also be used to assist in the continuous improvement of the program.

Criterion 5. Curriculum

For all accreditation commissions, the curriculum requirements...

- DO NOT prescribe specific courses
- Provide sufficient depth and breadth for all required subject areas or topics
- Must be consistent with PEOs and SOs



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Across all the accreditation commissions, the curriculum requirements specify subject areas appropriate to the discipline, but do not prescribe specific courses.

The faculty must ensure that the program curriculum devotes adequate attention and time to each component, and that it is consistent with the outcomes and objectives of the program and institution.

On the next 3 slides, we will look at the commission-specific requirements of Criterion 5. Remember, the different commissions have different standards for what constitutes college-level math.

Criterion 5. Curriculum - ANSAC

For ANSAC, the curriculum must include...

- a combination of college-level mathematics and sciences (some with laboratory and/or experimental experience) appropriate to the discipline;
- advanced technical and/or science topics appropriate to the program;
- a general education component that complements the technical and scientific content of the curriculum and is consistent with the program and institution objectives.
- Students...must also be prepared for practice in a field of applied or natural sciences through a curriculum culminating in comprehensive projects or experiences based on the cumulative knowledge and skills acquired in earlier course work.



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The curriculum requirements specific to ANSAC are shown here. They are:

- A combination of college-level mathematics and sciences;
- Advanced technical and/or science topics appropriate to the program;
- A general education component.

Additionally, ANSAC dictates that programs must culminate in comprehensive projects or experiences based on the cumulative knowledge and skills acquired in earlier course work.

Criterion 5. Curriculum - CAC

For CAC...

The program must include **mathematics appropriate to the discipline** and **at least 30 semester credit hours** (or equivalent) of **up-to-date coverage of fundamental and advanced computing topics** that provide both breadth and depth. The computing topics must include:

- Techniques, skills, and tools necessary for computing practice.
- Principles and practices for secure computing.
- Local and global impacts of computing solutions on individuals, organizations, and society.



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The curriculum requirements specific to the CAC are shown here. They are:

- Mathematics appropriate to the discipline
- At least 30 semester credit hours of up-to-date coverage of fundamental and advanced computing topics.
- The computing topics must include
 - Techniques, skills, and tools necessary for computing practice;
 - Principles and practices for secure computing; and
 - Local and global impacts of computing solutions on individuals, organizations, and society.

Criterion 5. Curriculum - EAC

For EAC, the curriculum must include...

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



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The curriculum requirements specific to the EAC are shown here. They are:

- a minimum of 30 semester credit hours of a combination of college-level mathematics and basic sciences with experimental experience.
- a minimum of 45 semester credit hours of engineering topics, consisting of engineering and computer sciences and engineering design.
- a broad education component.
- a culminating major engineering design experience.

Criterion 6. Faculty ANSAC & CAC

- Each faculty member teaching in the program must have **expertise and educational background consistent with the contributions to the program** expected from the faculty member.
- The competence of faculty members must be demonstrated by such factors as education, professional credentials and certifications, professional experience, ongoing professional development, contributions to the discipline, teaching effectiveness, and communication skills.
- Collectively, the faculty must have the **breadth and depth to cover all curricular areas of the program**.
- The faculty serving in the program **must be of sufficient number to maintain continuity, stability, oversight, student interaction, and advising**.
- The faculty must have **sufficient responsibility and authority** to improve the program through **definition and revision of program educational objectives and student outcomes** as well as through the implementation of a **program of study that fosters the attainment** of student outcomes.



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For Criterion 6, the requirements set forth by ANSAC and the CAC are identical. The EAC's requirements are slightly different.

The requirements for ANSAC and the CAC are shown here.

Overall, the requirements dictate that faculty must have relevant expertise, be of sufficient number and sufficiently diverse to cover the curriculum requirements and the needs of students, and have sufficient responsibility and authority to make any needed changes to the program or the continuous improvement process.

You may pause the presentation to read the requirements more closely.

Criterion 6. Faculty EAC

- The program must demonstrate that the faculty members are of sufficient number and have the competencies to cover all of the curricular areas of the program.
- There must be sufficient faculty to accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students.
- The program faculty must have appropriate qualifications and must have and demonstrate sufficient authority to ensure the proper guidance of the program and to develop and implement processes for the evaluation, assessment, and continuing improvement of the program.
- The overall competence of the faculty may be judged by such factors as education, diversity of backgrounds, engineering experience, teaching effectiveness and experience, ability to communicate, enthusiasm for developing more effective programs, level of scholarship, participation in professional societies, and licensure as Professional Engineers.



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The Criterion 6 requirements set forth by the EAC are shown here.

Although the wording is slightly different, the EAC requirements similarly dictate that faculty must have relevant expertise, be of sufficient number and sufficiently diverse to cover the curriculum requirements and the needs of students, and have sufficient responsibility and authority to make any needed changes to the program or the continuous improvement process.

You may pause the presentation to read the requirements more closely.

Criterion 7. Facilities

- Classrooms, offices, laboratories, and associated equipment **must be adequate to support attainment of the student outcomes** and to provide an **atmosphere conducive to learning**.
- Modern tools, equipment, computing resources, and laboratories appropriate to the program **must be available, accessible, and systematically maintained and upgraded** to enable students to attain the student outcomes and to support program needs.
- **Students must be provided appropriate guidance** regarding the use of the tools, equipment, computing resources, and laboratories available to the program.
- The library services and the computing and information infrastructure **must be adequate to support** the scholarly and professional activities of the **students and faculty**.



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The Criterion 7 requirements are the same for all three commissions. They are shown here. You may pause the presentation to read the requirements more closely.

Overall, facilities, tools, and resources must be adequate, accessible, maintained, and upgraded as appropriate. Students must be provide guidance in using the facilities, tools, and resources, and the library and computing infrastructure must be adequate for faculty and students.

Criterion 8. Institutional Support

- Institutional support and leadership must be adequate to ensure the quality and continuity of the program.
- Resources including institutional services, financial support, and staff (both administrative and technical) provided to the program must be adequate to meet program needs.
- The resources available to the program must be sufficient to:
 - attract, retain, and provide for the continued professional development of a qualified faculty.
 - acquire, maintain, and operate infrastructures, facilities, and equipment appropriate for the program, and to provide an environment in which student outcomes can be attained.



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The Criterion 8 requirements are also the same for all three commissions.

They are shown here. You may pause the presentation to read the requirements more closely.

Institutional support and leadership must be adequate to ensure the quality and continuity of the program. This includes sufficiently supporting existing needs related to faculty, facilities, and equipment.

Program Criteria for Accreditation

Each program seeking accreditation from an ABET Commission must demonstrate that it satisfies all Program Criteria implied by the program title.

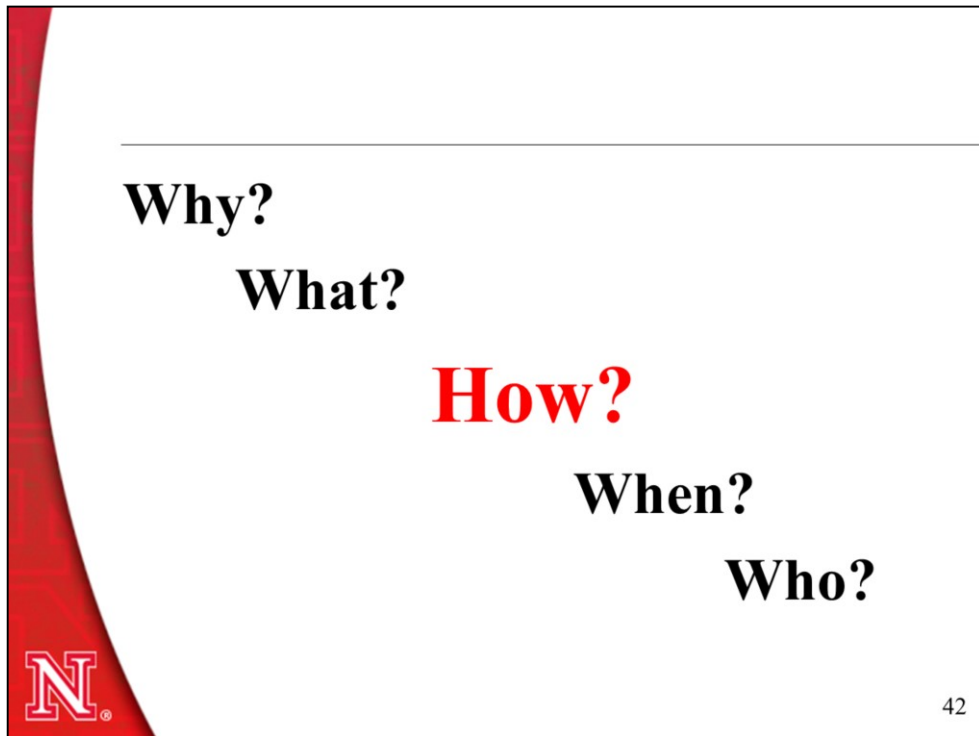
- Program Criteria provide discipline specific accreditation criteria.
- Requirements stipulated in the Program Criteria are limited to the areas of curricular topics and faculty qualifications.



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In addition to the General Criteria, ABET specifies Program Criteria that programs must meet. Program Criteria are discipline specific. Programs must show that they satisfy all of the specific Program Criteria implied by the program title. Any overlapping requirements need be satisfied only once.

Program Criteria provide the specificity needed for interpretation of the baccalaureate level criteria as applicable to a given discipline. Requirements stipulated in the Program Criteria are limited to the areas of curricular topics and faculty qualifications.



We will now address the questions related to the “How” of accreditation:
How do we demonstrate our commitment to the continuous improvement
of our programs in a way that meets accreditation requirements?

This question relates most directly to Criterion 4: Continuous
Improvement.

How do we demonstrate continuous improvement?

By developing and **documenting** a systematic and repeatable process that **produces actionable information**:

- Determine what should students know and be able to do.
- Ensure the curriculum is aligned with SOs.
- Determine (a) how to assess, (b) where to gather data, (c) evaluation criteria.
- Determine how often to assess/evaluate.
- Assess and evaluate.
- Identify actions to take based on data.
- Take identified actions.



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How do we demonstrate continuous improvement?

By developing and documenting a systematic and repeatable process that produces actionable information

The components of the continuous improvement process are to

- Determine what students should know and be able to do. This is stated in the SOs and PEOs.
- Ensure the curriculum is aligned with SOs. This alignment should be documented.
- Determine how students progress in attaining the SOs will be assessed, where the data will be gathered, and the criteria that assessment data will be evaluated against. The next few slides will cover assessment methods and evaluation criteria.
- Determine how often to assess and evaluate the SOs. We will cover this topic more when we get to the section about “when” questions.
- Assess and evaluate the extent to which students are attaining the SOs according to the established cycle.
- Based on the data and the evaluation criteria, identify what actions should be taken to improve the program.
- Take any actions that are identified based on evaluation of the data.

When considering improvement actions that could be taken, you should ask, is this action likely to improve learning and attainment of the SOs?

After implementing improvement actions, you should ask and answer the question, what was the actual impact of the action that was taken?

Assessment Tools

Direct Assessment Tools

- Coursework using rubrics
- Exit and other interviews*
- Performance appraisal
- Standardized exams
- Locally developed exams
- Portfolios
- External examiner
- Oral exams and presentations
- Observations

Indirect Assessment Tools

- Surveys and questionnaires
- Data from employers
- Exit and other interviews*
- Alumni surveys and interviews
- Advisory Board recommendations
- Archival records
- Focus groups

***Direct or indirect depends on the nature of what is being measured and how the method is being used.**



There are often also questions around *how* we assess students' attainment of the outcomes and what tools we can and should use. Assessment tools can be categorized into two groups:

1. Direct Assessment tools involve direct examination or observation of student knowledge or skills against measurable learning outcomes. Examples of direct assessment tools are shown in the box on the left:

- The most straightforward example of Direct Assessment is using a rubric to assess student work (perhaps an exam, report, paper)
- Assessment for accreditation purposes is not the same as grading, but rubrics with the same performance criteria can be used for grading and accreditation purposes.

Other forms of direct assessment include:

- National Standardized Test Scores, such as the Fundamentals of Engineering exam.
- Portfolios of student work, and
- Appraisals of a Performance, such as a capstone project presentation. This kind of assessment would likely make use of a rubric.

2. Indirect Assessment tools ascertain how students perceive the extent or value of learning experiences. Indirect measures are shown in the box on the right and include:

- Focus Groups
- Employer and/or Alumni Surveys
- Graduate School Placement Rates and
- Student perception surveys. Items in these surveys will often be something like, “On a scale of 1-5, rate your abilities....” or “how confident are you in your ability to...”

Notice that Exit and Other Interviews appears on both lists. This is because the label of “direct” or “indirect” applies to the nature of what is being measured and how the method is used—not just the format used to collect data.

Table 1 Assessment of Student Outcomes – Spring 2019

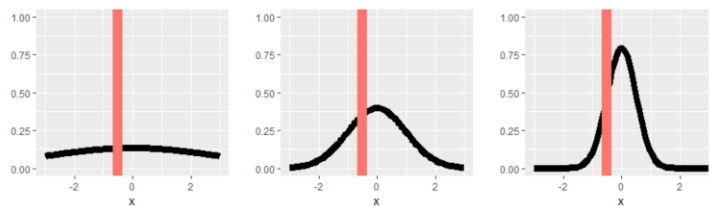
Tool Name	AREN	AGEN	BSEN	CHME	CEE	CSCE	CEEN CENG	CNST	CONE	ECEN	MECH
Course Assignments/Projects	X	X	X	X	X		X	X	X	X	X
Other Course-level Assessment				X		X					
Capstone Course Work		X	X	X	X		X	X	X	X	X
Standardized Exam (FE for most)	X	X	X		X			X	X		X
Course Tests				X	X		X	X		X	
Performance Appraisal (class presentation)	X	X	X		X						X
Exit Survey/Interview		X	X	X		X		X	X		X
Other Survey/Self-report	X			X							
Writing Sample (Capstone report for most)	X	X	X								X
Alumni Surveys					X	X					
Employer Surveys					X						
Department/External Advisory Board						X		X	X		
Academic Program Reviews								X			
Professional Activities Checklist	X										

Here is a chart indicating the range assessment tools used in various engineering programs, as of the spring semester of 2019.

As you can see, there is no single tool that is used by all programs, but all programs use a wide range of assessment tools.

How do we use assessment data for continuous improvement?

- Data are only useful if they can be interpreted.
- Evaluation criteria help make the data useful for decision making related to the program.
- Criteria should be based on proportion of students attaining expected performance.
 - Means do not tell how many students are or are not meeting the standard.
 - Example criterion: 75% of students will be at or above “proficient,” as scored by the SO 1 rubric.



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Next we'll consider how we use assessment data for continuous improvement.

Data are only useful if they can be interpreted.

In the continuous improvement process, evaluation criteria help make the data useful for decision making related to the program.

When using data to assess an academic program, evaluation criteria should be framed in terms of the proportion of students meeting the desired level of performance—not something like mean scores for a class or mean ratings on survey items.

- Group means do not tell us anything about whether all of our students are meeting our expectations for performance, or how close we are to having all students meet our expectations. The three graphs shown here all have the same mean, but they differ greatly in the proportions of the distribution that are above and below that mean. With program assessment and continuous improvement, we care less about the average performance and more about the percentage of our students performing at the desired level.

An example of an evaluation criterion phrased in terms of the proportion of students attaining the expected performance is given here: 75% of students will be at or above “proficient,” as scored by the SO 1 rubric.

After assessment data are gathered and analyzed, results are compared against the evaluation criteria in order to determine whether improvement actions need to be taken. If a criterion is exceeded, no action is necessary. If a criterion is clearly not met, improvement actions should be discussed, adopted, and enacted. If student performance is near a criterion, especially when performance is typically above the criterion level, a decision could be made to closely monitor future performance, perhaps by collecting data more frequently or by collecting additional data through a different method.



Next we will address the “when” questions: When do we assess and evaluate students, make decisions about improving the program, and submit documentation for accreditation purposes? Part of the “when” of ABET accreditation is decided and managed at the program level and part is set by ABET and the College of Engineering leadership.

First, programs decide how often to review PEOs, SOs, and their alignment with the curriculum, as well as how often to collect and analyze student outcome data. It is common to review PEOs, SOs, and curriculum alignment once every two or three years. Depending on the assessment method and context in which it is collected, data might be collected once a semester, once a year, or once every two or three years. What is important is that your continuous improvement cycle be planned, adhered to, and provide sufficient information to make changes as the need arises. If assessment takes place irregularly or infrequently, deficiencies in students’ training might go unnoticed and become problematic.

Second, ABET does general reviews for program re-accreditation every 6 years, and the College of Engineering has established an internal timeline that will ensure our programs are prepared for the re-accreditation process every time it comes up.

ABET Timelines for 2019-2024 (1) – WHEN?

Tasks & Responsibilities	2019	2020	2021	2022	2023	2024
Progress Reports	Progress Report for (2017-2018)	Progress Report for 2019	Progress Report for 2020	Progress Report for 2021		
Start working on the Program Self-Study				May – Dec.		
Self-Study (First Draft)				Dec. 1		
Request for Evaluation (RFE) by UNL					By Jan. 30	
Self-Study (Second Draft)					Mar. 1	
ABET teams selected					Apr. – May	

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The next two slides show the tasks and timelines for preparing the College of Engineering for the next ABET visit in Fall of 2023. Items shown in left-most column that most directly apply to our faculty are bolded and larger than items that are less directly applicable.

Annual progress reports are due each year following the spring semester. These reports serve as an accountability check to ensure all programs are adhering to their continuous improvement cycles and documenting any changes or decisions relevant to ABET accreditation.

A major part of the re-accreditation process is the completion of the Self-Study. The Self-Study results in a long report that requires the input of several people. Programs will be tasked with working on their Self-Study starting in May of 2022, and completing the first draft by December of 2022.

In order to go through the re-accreditation process, a formal request for evaluation must be submitted to ABET by January 30 of 2023.

The deadline for a revised second draft of the Self-Study is March 1, 2023.

Between March and June of 2023, ABET will select evaluation teams for the institutions that will be having site visits during the fall of 2023.

ABET Timelines for 2019-2024 (2) – WHEN?

	2019	2020	2021	2022	2023	2024
Finalize the Program Self-Study					May 15	
Submit Self Study to CoE					May 31	
Self-Study due to ABET					July 1	
ABET invites institution representatives to meet with the team chair in Washington, DC					July	
ABET visits (usually Sunday-Tuesday)					Sept. – Dec.	
The Program provides the ABET team with any error of fact					One week after the on-site visit	
ABET mails draft report						Jan. – Feb.
Review and respond to draft report						Mar. – Apr.
Make changes to report						May-June
ABET Accreditation announced						Aug. 31 or sooner

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Many more things will happen during 2023 and 2024. Programs are to finalize their Self-studies by May 15, 2023 and submit them to the College of Engineering by May 31, 2023. The Self-studies must be submitted to ABET by July 1, 2023.

Also in July, ABET will invite institution representatives to meet with the chair of the evaluation team in Washington, DC.

The ABET site visit will take place some time between September and December of 2023. The visit typically begins on a Sunday and ends on a Tuesday. During the visit, the team will review materials, interview students, faculty, staff, and administrators, and hold an exit meeting where they will present their findings. One week after the site visit, programs must provide the ABET team with any errors of fact resulting from the exit meeting.

Early in 2024, we will receive a draft report of the findings of the evaluation team.

Following the submission of the draft report, there is an opportunity to review and respond to any shortcomings identified in the report. After those responses are submitted, there is time for the evaluation team to make changes to their report. Finally, the ABET commissions meet in July, and formal notification of accreditation actions are made by August 31.

ABET Reviews

- **General Reviews** – Every Six Years
- **Interim Reviews (Focused Review)** – Occur Two Years After General Review
 - Shortcomings Trigger Interim Review
 - Interim Visit
 - Interim Report



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As was previously mentioned, General Reviews are done Every Six Years.

If needed, Interim Reviews (also referred to as Focused Reviews) take place two years after the General Review.

If a General Review identifies shortcomings, an Interim Review is required.

Interim reviews involve both an interim visit and an interim report.



Finally, we will look at some “who” questions.

Specifically:

Who is responsible for developing and maintaining a continuous improvement process for the program?

Who is responsible for assessing and evaluating students’ attainment of SOs and making decisions from that evaluation?

Who is in charge of documenting everything related to ABET assessment and accreditation?

Who?

- Program faculty!
- Within your unit, faculty must:
 - Identify who is responsible for collecting, analyzing, and evaluating the results of assessment
 - Identify who is responsible for the improvement process (closing the loop)
 - Identify who is responsible for documenting processes and decisions
 - Work together to generate the self-study report



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The short answer to those questions is program faculty.

Typically the continuous improvement process is managed and documented by a committee. Data collection for ABET purposes often takes place in a variety of courses and non-course contexts, and a larger group of faculty are involved in those processes. Decision making related to students' attainment of SOs should involve all faculty. And, as was previously stated, creating the Self-Study report is a large task, and several faculty will need to work together to complete it.

Useful links:

- <http://www.abet.org/>
- <http://www.abet.org/accreditation/accreditation-criteria/>
- <https://www.aacu.org/value-rubrics>
- <https://engineering.unl.edu/ecec/abet-assessment-resources/>



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Here are some useful links regarding ABET accreditation. The first two will take you to information made available by ABET. The third has information about developing rubrics for course assessment. The fourth link will take you to the College of Engineering, Engineering and Computing Education Core's webpage of accreditation and assessment resources.

This concludes the presentation, and I'd like to thank you for watching this video. If you have questions or would like assistance with your department's ABET accreditation activities, you may contact me at the email address listed at the start of this video.