# Engineering Technology Program

# Assessment

# California State University Los Angeles

# Los Angeles, California


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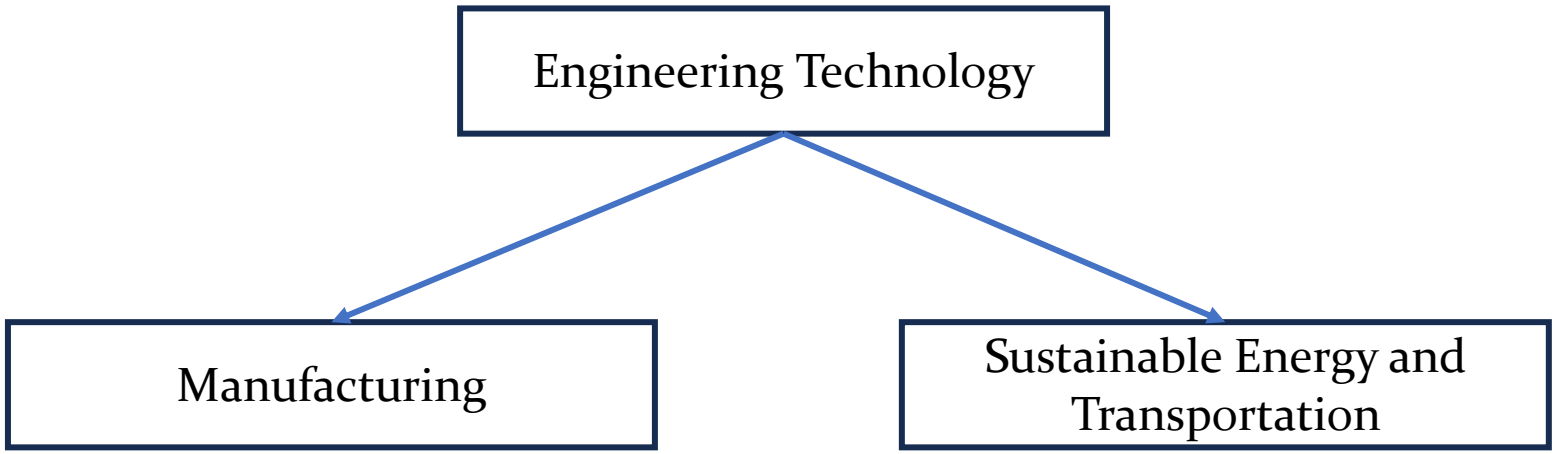
**Michael Thorburn**

# Engineering Technology – A New Program

**began in Fall 2022**

- Transitioned from **Industrial** Technology to **Engineering** Technology
- This transition involved changes to the curriculum to align with the requirements and standards of the Engineering Technology discipline. Calculus 1 (MATH 2110 required)
- Mapping Courses to Meet Engineering Technology Program Needs.

# Engineering Technology Program




- Built on Fundamentals of

i) Algebra, trigonometry, and calculus (Calculus 1 at Cal State LA)

ii) Physics (PHYS 1560/1570)

iii) Chemistry (CHEM 1000)

**To change their major from Industrial Tech to Engineering Tech students must:**

Pass **MATH 2110**, **CHEM 1000** (CHEM 1100 or CHEM 1040 acceptable), and **PHYS 1560/1570** (PHYS 2100 acceptable) with C-or better by 60 completed units

# Program Assessment

## to ensure continuous improvement

- The Engineering Technology program is seeking ABET accreditation for the **first time** to validate the quality and effectiveness

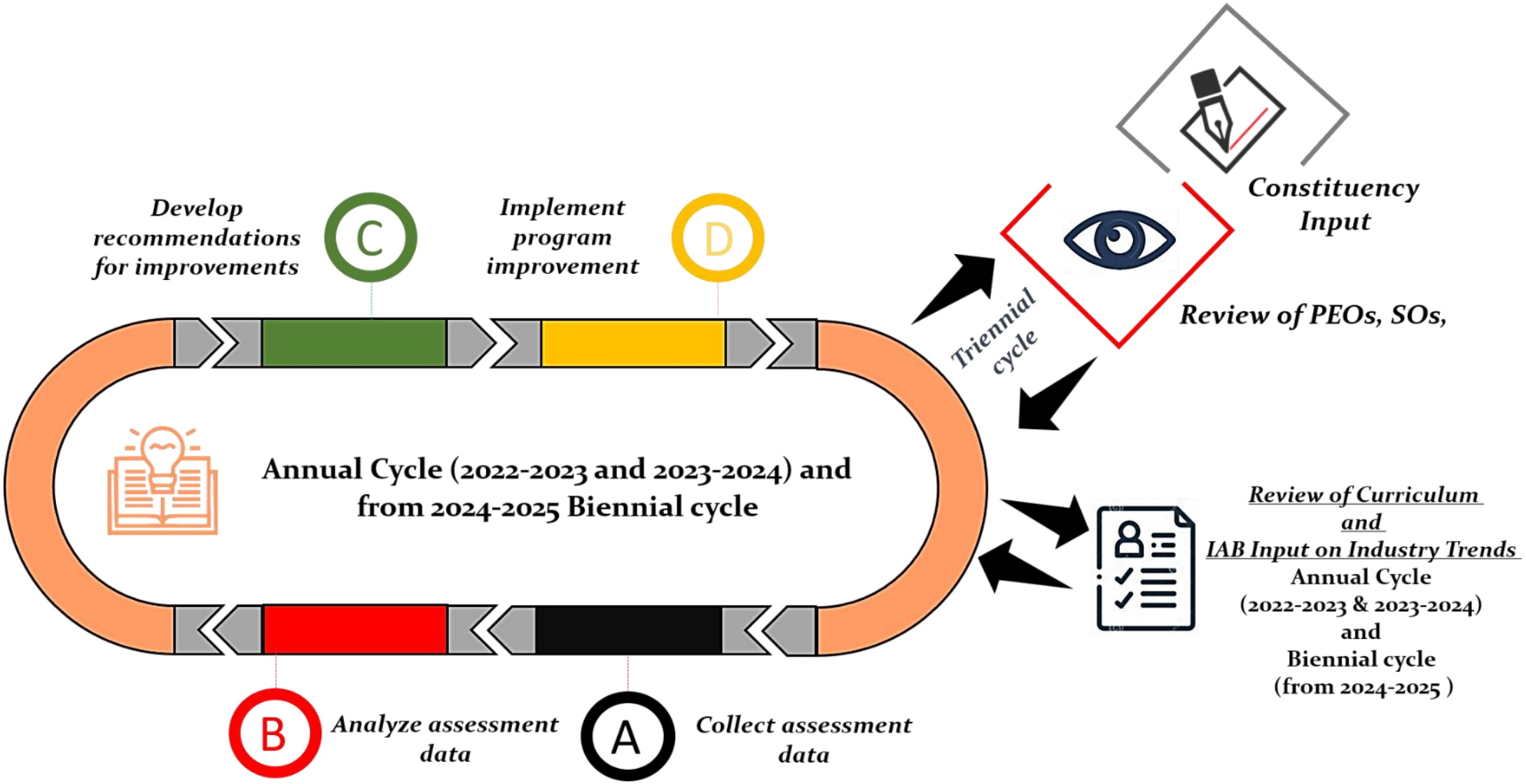
- **Program Education Objectives (PEOs)** –What graduates are expected to do in 3-5 years after graduation

- **Student Outcomes (SOs)** – What students are expected to do at the time of graduation. Tied to PEOs
- **Continuous Improvement** with input from **Program Constituents** (Faculty and Industrial Advisory Board (IAB))

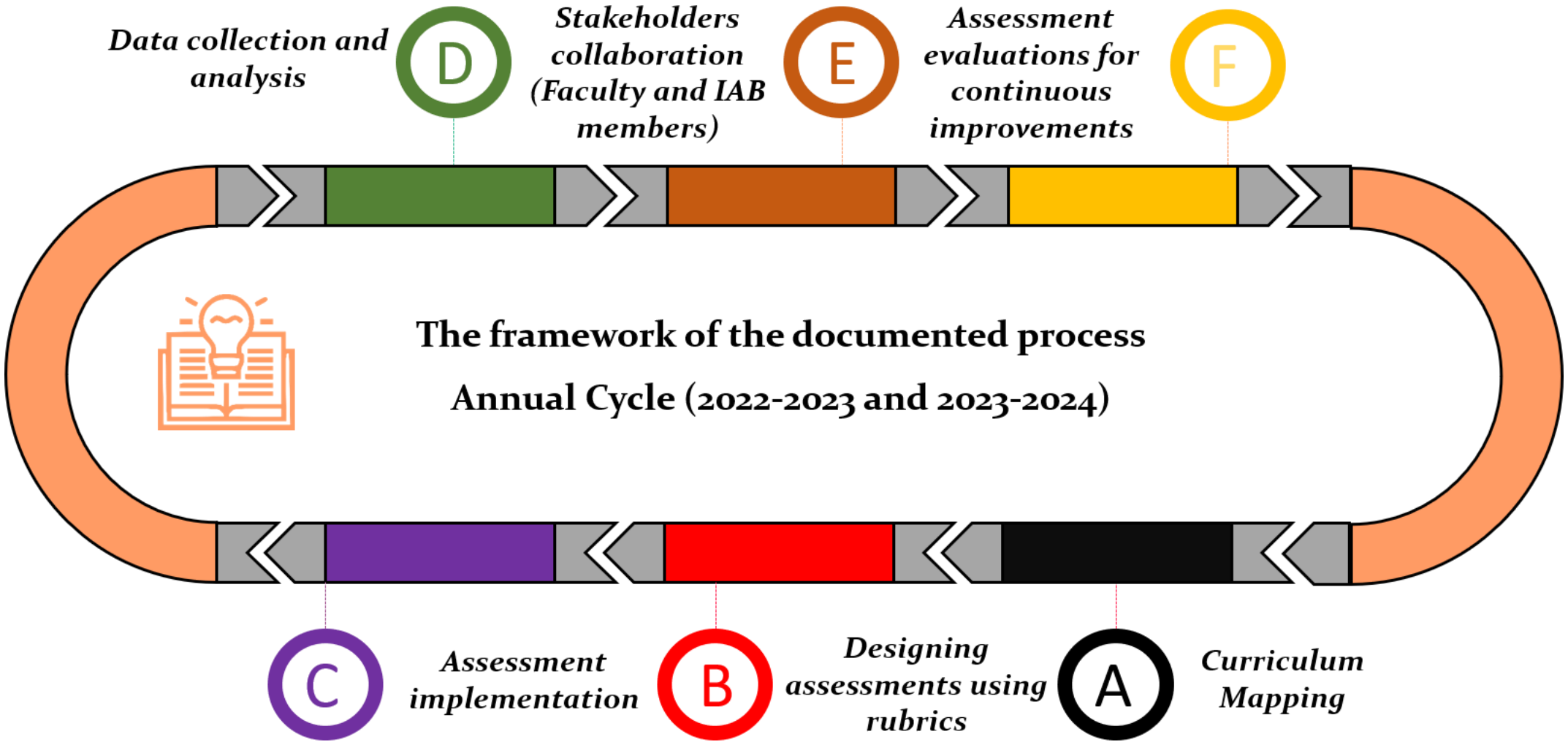
# Student Outcomes

1. An ability to apply knowledge, techniques, skills, and modern tools of **mathematics, science, engineering**, and technology to solve broadly-defined engineering problems.
2. An ability to **design systems, components, or processes** meeting specified needs for broadly-defined engineering problems appropriate to the discipline.
3. An ability to apply **written, oral, and graphical communication** in broadly defined technical and non-technical environments and an ability to identify and use appropriate technical literature.
4. An ability to **conduct standard tests, measurements, and experiments** and to analyze and interpret the results to improve processes.
5. An ability to function effectively as a **member as well as a leader on technical teams**.

# Program Assessment and Improvement Process



# Framework of documented process



# Performance indicators per student outcomes

**Table 1:** Performance indicators per student outcomes

| Engineering Technology Program Student Outcomes | Performance Indicators |
|---|---|
| **Student Outcome 1:**<br><br>An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline; | 1.1 Ability to apply fundamental knowledge, techniques, and skills to identify engineering problems<br><br>1.2 Ability to decompose/formulate engineering problems using mathematics, scientific, and engineering principles<br><br>1.3 Ability to solve engineering problems using mathematics, science, and engineering analysis<br><br>1.4 Ability to use modern engineering tools on a broad range of engineering problems |

**Table 2:** Division of Performance indicators into 4 segments

| Performance Indicator | Score (1-4) | | | |
|---|---|---|---|---|
| | **4-exceeding standard** | **3-satisfactory** | **2-progressing to standard** | **1-below standard** |
| 1.1 Ability to apply fundamental knowledge, techniques, and skills to identify engineering problems | Effectively applied fundamental knowledge, techniques, and skills to identify and describe the engineering problem. | Consistently applied fundamental knowledge, techniques, and skills with a minor issue in identifying the problem | Partially applied fundamental knowledge, techniques, and skills. Some issues in identifying the problem. | Insufficient application of fundamental knowledge, techniques, and skills. Major issues in identifying the problem. |

# Evaluation

**OUTCOME 1:**

***An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline.***

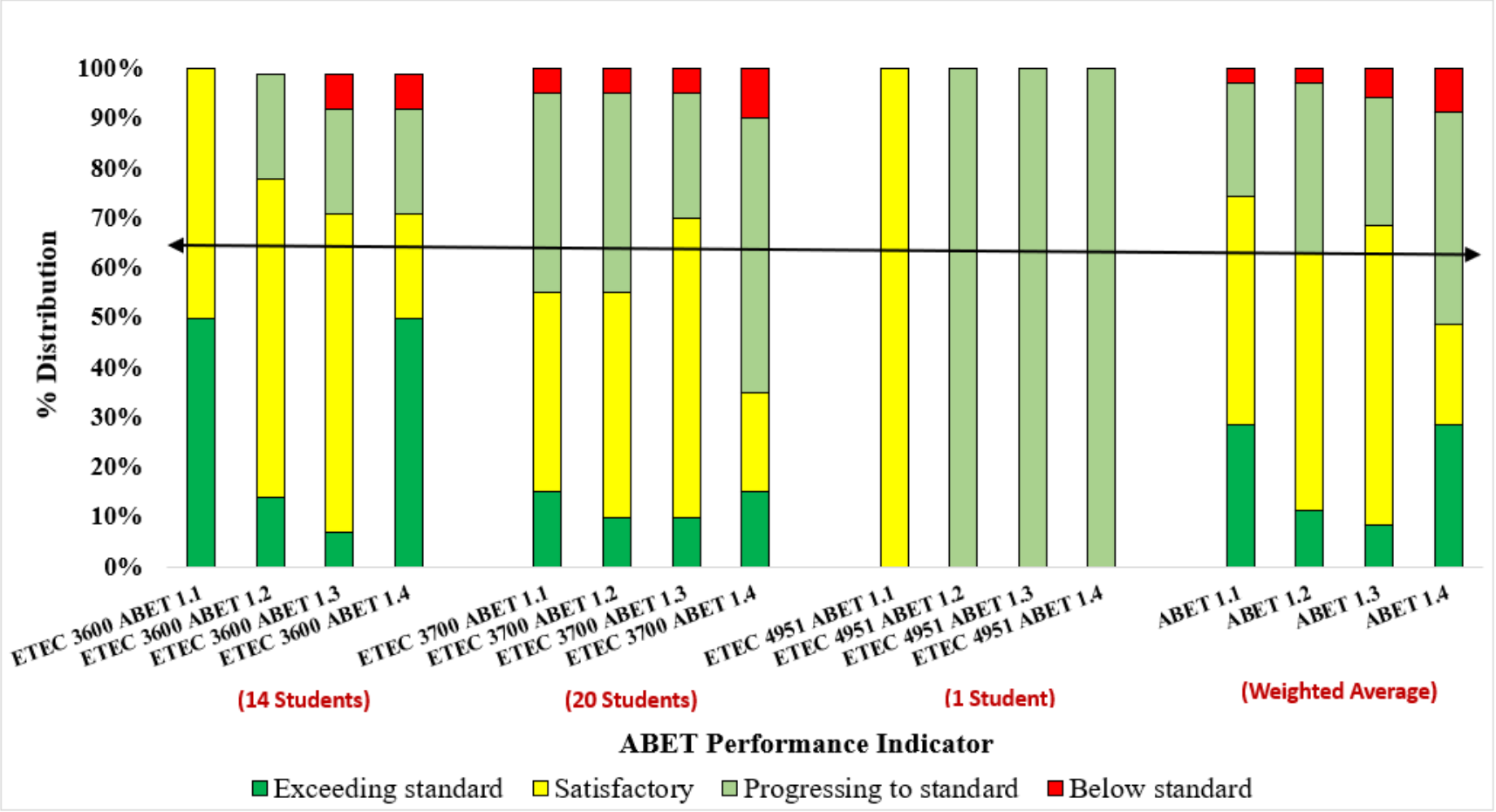



**Figure 3:** The assessment results of the performance indicators for the Spring 2023

**(Based on Course Instructor Input only)**

# Results discussions with IAB members and Faculty

| Performance Indicators | Achieved | Target | ETEC faculty input/Suggested improvements | IAB member input/Suggested improvements |
|---|---|---|---|---|
| **OUTCOME 1:** An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline. | | | | |
| **ABET 1.1:** Ability to apply fundamental knowledge, techniques, and skills to identify engineering problems | 55% | 65% | i) Students should strengthen their problem-solving skills, particularly in decomposing and formulating engineering problems and solving them.<br><br>(i) There is no Computer Literacy course such as CIS 1200 in the program (while other TECH majors like Aviation have this. Can we incorporate it into the program?<br><br>(ii)Figure out where to incorporate advanced CAD simulations (such as Ansys) in the program. Perhaps in senior design.<br><br>(iii) Students need to focus on gaining proficiency in using modern engineering tools (ANSYS, DELMIA or other simulation tools<br><br>(iv) Encourage and incorporate SolidWorks Associate certification in ETEC 1100 course. | (i) Teach specific courses relevant to the industries<br><br>(ii) Put more emphasis on software tools<br><br>(iii) Faculty should also have an expertise<br><br>(iv) Case studies representative of real life may be helpful. Conduct in-class exercises with full class participation in addition to taking home assignments. |
| **ABET 1.2:** Ability to decompose/formulate engineering problems using mathematics, scientific, and engineering principles | 55% | 65% | | |
| **ABET 1.4:** Ability to use modern engineering tools on a broad range of engineering problems | 35% | 65% | | |

# Assessment Results and Continuous Improvement Actions

| Performance Indicators | Course | Achieved (Target = 65%) | Suggested improvements |
|---|---|---|---|
| ABET 1.1:<br>Ability to apply fundamental knowledge, techniques, and skills to identify engineering problems | ETEC 3700 | 55% | 1. To improve students' mastery of mathematical concepts, we will introduce four extra supplementary classes focusing on fundamental topics like differentiation and integration in ETEC 3600. |
| | ETEC 3700 | 55% | 2. Collaborate with other engineering disciplines to create interdisciplinary senior design projects. This approach will challenge students to utilize a broader range of mathematical, scientific, and engineering principles. |
| ABET 1.2:<br>Ability to decompose/formulate engineering problems using mathematics, scientific, and engineering principles | ETEC 3700 | 35% | 3. Design assignments that require students to apply engineering principles to real-world engineering problems related to sustainable engineering and transportation.<br><br>4. Embed advanced engineering tools, including ANSYS, DELMIA, or other simulation tools, NREL SAM program for forecasting work, and printout of predicted cash flows, into the ETEC 3700 course. This integration should occur at relevant stages of the course/project, allowing students to apply these tools in solving real-world engineering problems. |
| ABET 1.4:<br>Ability to use modern engineering tools on a broad range of engineering problems | | | 5. The Engineering Technology program is also incorporating industry-relevant simulation software into certain electives, such as ANSYS in the ETEC 4660 Additive Manufacturing course and Mastercam in the ETEC 4670 Emerging Manufacturing Technologies course, to enhance students' proficiency in modern engineering tools |

# Acknowledgements


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# Thank you

# Questions ?

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