Discussing Ethics for SO 4 - Assessment and Evaluation in the Classroom

SEVAN GOENEZEN, Texas State University

Dr. Sevan Goenezen received his BS/MS degree (called Diplom in Germany) in Aeronautical Engineering from the "Rheinisch-Westfaelische Technische Hochschule Aachen (RWTH)" in Germany in December 2006. He completed his PhD program at Rensselaer Polytechnic Institute (RPI) in May 2011. He became a finalist for the $30,000 Lemelson-MIT-RPI Prize with his findings on breast cancer diagnosis using nonlinear elasticity imaging. After his PhD program, Dr. Goenezen was a postdoctoral researcher in the Biomedical Engineering Department at Oregon Health & Science University (OHSU) from 2011 to 2013. At OHSU his research focused on congenital heart defects of the embryonic chicken heart and risk of rupture of abdominal aortic aneurysms using fluid-structure-interaction computations. Afterwards, he became a faculty in the Department of Mechanical Engineering at Texas A&M University in 2013 and lead an active research program, advising PhD, MS and BS students until May of 2020. His research was supported by the ASME Research Initiation Grant for young faculty sponsored by the Haythornthwaite Foundation, the National Science Foundation, and the National Institutes of Health. He developed and tested a novel technology that views the interior of a heterogeneous solids using digital camera images and the mechanical behavior of solids. He termed this invention "Mechanics Based Tomography". During his time at Texas A&M University, Dr. Gonezen advised 1 PhD student who is currently an Associate Professor at the prestigious Dalian University in China. He also advised 5 students in their MS thesis. From 2020 to 2023, Dr. Gonezen pursued a startup company to further develop "Mechanics Based Tomography." Dr. Gonezen joined the Ingram School of Engineering at Texas State University in 2023.

Dr. Austin Talley, Texas State University

Dr. Austin Talley is an Associate Professor of Practice in the Ingram School of Engineering at Texas State University. Prior to joining the faculty at Texas State University, Dr. Austin Talley worked as a manufacturing quality engineer for a test and measurement company, National Instruments, in Austin, TX. Dr. Austin Talley is a licensed by state of Texas as a Professional Engineer. Both of Dr. Austin Talley's graduate degrees, a doctorate and masters in Mechanical Engineering, manufacturing and design area, are from the University of Texas at Austin. Additionally, Dr. Austin Talley holds an undergraduate degree from Texas A&M University in Mechanical Engineering. His research is in engineering design theory and engineering education. He has published over 30 papers in engineering education journals and conference proceedings. He has worked to implement multiple National Science Foundation (NSF) grants focused on engineering education. He has been an instructor in more than ten week long summer K-12 teach Professional Development Institutes (PDI). He has received multiple teaching awards. He has developed design based curriculum for multiple K-12 teach PDIs and student summer camps.

Dr. Christine E. Hailey, Texas State University

Christine Hailey is a Professor in the Ingram School of Engineering and past Dean of the College of Science Engineering at Texas State University. Prior to coming to TXST, she was Dean of the College of Engineering at Utah State University.

Discussing Ethics for SO 4 – Assessing and Evaluating in the Classroom

Abstract

The paper describes the assessment and evaluation process for a new mechanical engineering program seeking initial ABET accreditation. For the case of Student Outcome 4 (SO 4), three courses were identified as good opportunities to introduce students to engineering ethics and professionalism as well as the broader impacts of engineering solutions. The selected courses were ME 3330, Engineering Thermodynamics, a second-year course; ME 3311, Mechanics of Solids, a third-year course; and ME 4390, Mechanical Engineering Design I, a first-semester senior-level course. SO 4 is a complicated outcome to assess and evaluate. Definitions of the terms "global, economic, environmental, and societal" are left to the program as well as decisions regarding the appropriate professional and ethical codes used to make informed judgements. At some level, each program might have a unique assessment process depending on their interpretation of the expectations and terms described by SO 4. The paper describes the development of the key performance indicators for SO 4 and the process for assessing and evaluating the outcome using case studies and multiple answer quizzes. The Code of Ethics of the National Society of Professional Engineers and their Board of Ethical Review cases were used in the assessment process as well as the case study video "Incident at Morales," made by the National Institute for Engineering Ethics. Preliminary assessment results showing levels of student attainment for SO 4 are presented.

Introduction

ABET accredits over 4700 programs at 930 colleges and universities in 42 countries. ABET accreditation sets education standards to prepare students to enter technical fields in engineering, engineering technology, computing, and applied and natural sciences. Relative to engineering, ABET accredits individual programs by requiring attainment of eight general criteria and one program-specific criteria that is defined by the appropriate engineering professional society or societies [1].

The ABET Engineering Accreditation Commission general criterion four describes what students are expected to know and be able to do by the time of graduation. These expectations are described by a minimum of seven required student outcomes (SO). As part of the quality improvement process, engineering programs are required to assess and evaluate the extent to which SOs are being attained. The focus of this paper will be on SO 4, "students will recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts" [2]. SO 4 is a complicated outcome to assess and evaluate. Definitions of the terms "global, economic, environmental, and societal" are left to the program as well as decisions regarding the appropriate professional and ethical codes used to make informed judgements. This paper will present an interpretation of SO 4 and the process for assessing and evaluating the outcome in a new mechanical engineering (ME) program seeking initial accreditation.

Literature Review

In 1997, ABET provided a dramatic shift in accreditation criteria, moving to EC2000 which focused on what students learned rather than what was taught in the classroom. This shift provided an opportunity for employers and other program constituents to describe what technical and professional skills their future employees needed to support their rapidly changing technologies [3]. Initially the EC2000 accreditation criteria described eleven SOs which were subsequently revised to seven SOs. The revised seven SOs were implemented in the 2019 – 2020 ABET cycle. Pfluger, Butkus, and Wallen provide a brief history of this transition and a linguistic crosswalk of terminology used in the original eleven SOs compared with the seven SOs in use today [4]. Of interest to this paper was the development of SO 4 which Pfluger, et al., describe as a merger of older outcomes (f) an understanding of professional and ethical responsibilities, (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context, and (j) a knowledge of contemporary issues. Because of the merger, SO 4 is a compound sentence that captured much of the previous SO (f), (h), and (j), which requires interpretation of all sentence elements to establish key performance indicators, assessment processes, and evaluation processes.

Kumpaty, Reichl, and Vyas [5] selected the National Society of Professional Engineers (NSPE) site’s Code of Ethics [6] as an example of ethical and professional responsibilities required for achievement of SO4. Further, they note that the NSPE site provides Board of Ethical Review cases with real-world case studies for examination of engineering solutions [7]. Washuta, Eggleston, et al. [8] noted that assessing SO 4 can be complicated because the context terms “global”, “environmental”, “societal”, and “economic” are vague and often semantically overlap. They argue that it is important to have a clear definition of these terms and to introduce them to students. To help develop clearer definitions, they relied on the expertise of one of the paper’s co-authors with a background in technical communication.

In recent years, generative AI tools have shown promise in program assessment. ABET’s position is clear that AI should augment, not substitute, human judgment in education and assessment [9] In particular, AI tools provide another approach to brainstorming definitions of the broad impact terms in SO 4 [10].

Assessment Methodology: Key Performance Indicators and Measurement of Success

In this section, we describe our process for defining a continuous improvement process for a new mechanical engineering program at Texas State University. The mechanical engineering faculty held numerous meetings to describe the improvement process as well as the mapping of courses to student outcomes. For the case of SO 4, three courses were identified as good opportunities to introduce students to engineering ethics and professionalism as well as the broader impacts of engineering solutions. The selected courses were ME 3330, Engineering Thermodynamics, a second-year course; ME 3311, Mechanics of Solids, a third-year course; and ME 4390, Mechanical Engineering Design I, a first-semester senior-level course. Enrollment in ME 3330 averaged around 100 students each semester and enrollment in ME 3311 averaged around 75 students each semester. The capstone design course, ME 4390, was offered for the first time in Fall 2025 and had around 20 students. We anticipated students would show growth in their understanding of SO 4 as they progressed through the curriculum.

For each of the required student outcomes, we defined key performance indicators (KPIs). The three KPIs for SO 4 are listed in Table 1 below. For the assessments of KPI 1 and KPI 2, students were asked to review the Code of Ethics by the National Society of Professional Engineers (NSPE) [6]. For the assessment of KPI 3, we carefully defined global, economic, environmental, and societal impacts as a consequence of engineering solutions by utilizing artificial intelligence (AI), here Google Gemini. Further, we measure student success for each KPI using the categories of “Does Not Meet”, “Meet”, and “Exceeds” expectations. In the following, we discuss each KPI that was assessed in ME 3330, ME 3311, and ME 4390. We note that the assessment activities for KPIs 4.1 - 4.3 were the same for ME 3311 and ME 3300. In ME 4390, KPIs 4.2 and 4.3 were only assessed and the assessment activities differed from the other courses.

Table 1: SO4 KPIs

KPI		Does Not Meet	Meets	Exceeds
4.1	Recognize engineering ethical and professional responsibilities.	The student recognizes fewer than 70% of statements from an engineering code of ethics.	The student recognizes between 70% and 90% of statements from an engineering code of ethics.	The student recognizes more than 90% of statements from an engineering code of ethics.
4.2	Identify the ethical and professional responsibilities in an engineering situation.	After reviewing an engineering solution, the student is able to identify fewer than 70% of the appropriate ethical and professional responsibilities from a list of potential responsibilities.	After reviewing an engineering solution, the student is able to identify between 70% and 90% of the appropriate ethical and professional responsibilities from a list of potential responsibilities.	After reviewing an engineering solution, the student is able to identify more than 90% of the appropriate ethical and professional responsibilities from a list of potential responsibilities.
4.3	Consider global, economic, environmental, and societal impacts as a consequence of engineering solutions.	After reviewing an engineering solution, the student is able to identify fewer than 70% of the appropriate global, economic, environmental, and societal consequences from a list of potential consequences.	After reviewing an engineering solution, the student is able to identify between 70% and 90% of the appropriate global, economic, environmental, and societal consequences from a list of potential consequences.	After reviewing an engineering solution, the student is able to identify more than 90% of the appropriate global, economic, environmental, and societal consequences from a list of potential consequences.

KPI 4.1 Assessment Methodology

KPI 4.1 requires students to “Recognize engineering ethical and professional responsibilities. “ To this end, students in ME 3311 and ME 3330 were given a True/False ethics assignment to assess their knowledge of the NSPE Code of Ethics. Given the large enrollment in these classes, the True/False assignment was provided through the learning management system Canvas. The True/false questions were selected from the NSPE website and modified with the help of Google Gemini. More precisely, we asked Google Gemini to rephrase those True/False questions. Google Gemini suggested multiple rephrased versions from which we selected the most suitable one that contextually was closest aligned with the original. In some cases, we made further manual changes to the True/False questions prior to implementing them in Canvas for auto-grading. As an example, let’s look at the True/False question: “Engineers utilizing client provided designs acknowledge the designs’ ownership by the client and understand that duplicating them for others requires explicit client permission.” Google Gemini rephrased this statement as follows:

1) Formal/Contractual: "Engineers using client-supplied designs acknowledge the client’s exclusive intellectual property rights and agree that any third-party reproduction requires prior written authorization."

2) Concise: "Engineers must respect the client's ownership of provided designs; duplication for others is prohibited without explicit permission."

3) Direct: "By using a client's designs, engineers accept that the client owns the work and that these designs cannot be copied for other projects without the client's approval."

We observe that Google Gemini does an excellent job in rephrasing this True/False question. Further it categorizes each suggestion as formal/contractual, concise, and direct for this example. We note that for some True/False statements (not shown here), Google Gemini provided several more rephrased options to choose from. Using this methodology, twenty True/False statements were prepared to assess KPI 4.1.

KPI 4.2 Assessment Methodology

KPI 4.2 requires students to "Identify the ethical and professional responsibilities in an engineering situation." Students in ME 3311 and ME 3330 were asked to read a case study that we selected from the NSPE website [7] and to complete a multiple answer question following the case study (shown below). Again, the multiple answer question assignment and scoring were provided through Canvas. The solution to this multiple answer question has been omitted here in order to potentially reuse them in future assessments. Also, students were not given any of the solutions for this KPI nor the other KPIs, but were given the opportunity to discuss their solution and grade during office hours. A total of 7 possible answers are provided, implying that the probability to get all questions answered correctly by chance, i.e. guessing, is $(1/2)^7$ x 100% = 0.78%. It is worth noting that multiple answer questions are significantly harder than multiple choice questions in general. In contrast, a multiple choice question with 7 possible answers would result in a (1/7) x 100% = 14% probability to get the right solution by chance.

Case study: To reduce municipal expenditures and lower water rates, the Public Water Commission (PWC) considered changing its water source to the local river. Professional Engineer Howard serves as the superintendent and chief engineer for the Commission. Engineer Smith, a consulting engineer retained by the PWC, is hired to evaluate water treatment needs for the change in water source. Engineer Smith determined changing water sources would necessitate substantial capital investments and a three-year evaluation period to address water treatment needs, particularly corrosion control to prevent lead leaching from aging pipes at levels in excess of drinking water standards. Engineer Smith provided a report to Engineer Howard. Both Engineers Howard and Smith met with the PWC at a meeting sparsely attended by the public and recommended that the change in water source be substantially delayed until improvements could be completed. Despite those recommendations, the PWC voted to proceed simultaneously with the accelerated evaluation and design of needed water treatment improvements and the change in water source.

Multiple Answer Question: Which of the following NSPE standards describe the ethical obligations of Engineers Howard and Smith?

II.1.a. If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.

III.9.d. Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. The employer should indemnify the engineer for use of the information for any purpose other than the original purpose.

I.1. Engineers, in the fulfillment of their professional duties, shall hold paramount the safety, health, and welfare of the public.

III.1.b. Engineers shall advise their clients or employers when they believe a project will not be successful.

III.1.e. Engineers shall not promote their own interest at the expense of the dignity and integrity of the profession.

III.2.c. Engineers are encouraged to extend public knowledge and appreciation of engineering and its achievements.

III.5.a. Engineers shall not accept financial or other considerations, including free engineering designs, from material or equipment suppliers for specifying their product.

In ME 4390 – Mechanical Engineering Design I, a similar assessment was used. The students watched the video "Incident at Morales," made by the National Institute for Engineering Ethics. A synopsis of the video story taken from the website is provided below.

> "Incident at Morales involves a variety of ethical issues faced by a company that wants to quickly build a plant in order to develop a new chemical product to gain a competitive edge over the competition. Phaust Chemical manufactures Old Stripper, a paint remover that dominates the market. On learning that Phaust's competitor Chemitoil plans to introduce a new paint remover that may capture the market, executives at Phaust decide to develop a competing product. To save money in manufacturing the product, Phaust decides to construct a new chemical plant in Mexico. [11]"

Following watching the video, the students were given a quiz with a multi-answer question similar to the previous classes, but this one had eight possible answer choices. The course ME 4390 was offered for the first time in Fall 2025 with enrollment much smaller than in ME 3330 and ME 3311. Consequently, students completed a paper-based quiz which was graded by the instructor. The students in ME 4390 were asked the following question:

For the case study "Incident in Morales," which of the following NSPE Standards describes the ethical obligations that Fred Martinez was dealing with in the case study?

II. 1. Engineers shall hold paramount the safety, health, and welfare of the public.

II 2. c. Engineers shall not reveal facts, data, or information without the prior consent of the client or employer except as authorized or required by law or this Code.

III 1. b. Engineers shall advise their clients or employers when they believe a project will not be successful.

II. 4. a. Engineers shall disclose all known or potential conflicts of interest that could influence or appear to influence their judgment or the quality of their services.

III. 5. a. Engineers shall not accept financial or other considerations, including free engineering designs, from material or equipment suppliers for specifying their product.

III. 3. b. Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others without express permission.

III. 6. c. Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.

III. 2. e. Engineers shall continue their professional development throughout their careers and should keep current in their specialty fields by engaging in professional practice, participating in continuing education courses, reading in the technical literature, and attending professional meetings and seminars.

KPI 4.3 Assessment Methodology

KPI 4.3 requires students to "Consider global, economic, environmental, and societal impacts as a consequence of engineering solutions." ABET does not define global, economic, environmental, and societal impacts, thus, these definitions may slightly vary between institutions. We utilized Google Gemini to clearly define these impacts and list them below:

- Global impacts – broad, world-wide effects that include international markets, global sustainability, cultural considerations, technological advances across different regions
- Economic impacts – how decisions affect financial systems, production and operation costs, job market impact, market competitiveness, long-term economic stability
- Environmental impacts – resource depletion (overuse of nonrenewable materials), pollution & waste, climate change, ecosystem disruption (harm to biodiversity, deforestation, water contamination)
- Societal impacts – impact on communities, culture, public health and safety, overall quality of life, ethical and legal considerations, accessibility and equity

We assessed KPI 4.3 in ME 3311 and ME 3330 using two case studies from the NSPE website followed by multiple answer questions for each impact (global, economic, environmental, and societal). Canvas was used for the multiple answer questions and for scoring the results. As an example, one of the case studies is provided below followed by one multiple answer question.

Case Study : Engineer Jaylani is a firm principal for Cutting Edge Engineering and is under contract to complete the mechanical, electrical, and plumbing work for a new resort that will be located in a semi-arid region of the southwestern United States. The project's landscape architect specifies a traditional lawn irrigation system for the resort's golf course as part of the project. Engineer Intern Wasser is a new employee at Cutting Edge, and Engineer Jaylani assigns Wasser the task of sketching out details for the irrigation system.

Wasser refuses to perform the task and says the traditional irrigation system will waste fresh water, cites a recent hydrogeological study indicating that the proposed use would lower the water table, and asserts that Cutting Edge should not do this kind of work. In a formal memorandum to Jaylani, Wasser argues the proposed lawn irrigation system is not consistent with several United Nations sustainable development goals including but not limited to Goal 6– Ensure availability and sustainable management of water and sanitation for all, Goal 11– Make cities and human settlements inclusive, safe, resilient and sustainable, and Goal 15– Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation, and halt biodiversity loss.

Further, Wasser points to NSPE Code of Ethics Professional Obligation III.2.d, "Engineers are encouraged to adhere to the principles of sustainable development," and claims the proposed lawn irrigation system does not conform to sustainability principles.

Answer the questions following below.

What are the potential global impacts of the traditional lawn irrigation system from the perspective of Intern Wasser?

- *No global impacts.*
- *The depletion of water will affect the worldwide availability of water.*
- *Wasser's refusal could result in other engineers world-wide refusing to conduct assignments.*
- *The traditional lawn irrigation system uses too much water which results in a global increase in the price of water.*
- *The irrigation system is a waste of water and this outcome might be carried by national and international newspapers.*

As mentioned earlier for KPI 4.2, the multiple answer question creates a significantly greater challenge for students than multiple choice questions. Many students selected "the depletion of water will affect the worldwide availability of water" as well as "Wasser's refusal could result in other engineers world-wide refusing to conduct assignments" as global impacts which is not the case for this local irrigation problem. Roughly half of the students correctly identified there were no global impacts for this particular case study. We relied on Canvas to score the results. A student received 100% if they selected “no global impacts”, the single correct answer. A student received 0% if they selected any other answer.

For ME 4390, a similar assessment method was used. For ME 4390 multiple answer questions about the four impacts were assigned for the same video case study that was used for the assessment of KPI 4.2.

An example KPI 4.3 impact question for ME 4390 is described below.

For the case study “Incident in Morales,” what are the environmental impacts?

- *The new stripper product could harm the individual applying the product*
- *More ships could be traveling on the ocean*
- *Unlined evaporation ponds could contaminate the drinking water in Morales*

Results and Discussion

Table 1 summarizes the competency measurements for each KPI for the second-year and third-year courses ME 3330 and ME 3311, respectively. We report 3 assessment outcomes for each KPI: Does Not Meet Expectations, Meets Expectations, and Exceeds Expectations. A student “Does Not Meet Expectations” if they receive a score of less than 70%, “Meets Expectations” if their score is between 70% and 89%, and “Exceeds Expectations if they score 90% or more.

Table 2 summarizes the assessment outcomes for KPI 4.1 – 4.3 for the combined courses of Thermodynamics (2 sections of ME 3330) and Mechanics of Solids (2 sections of ME 3311) with a total of 175 students. Students are doing exceptionally well in KPI 4.1 with 99% of students either “Meet” or “Exceed” expectations. Surprisingly, for KPI 4.2 none of the students “Meet” expectations, while 75% “Exceed” and 25% “Do Not Meet” expectations. The reason for this discrepancy is that most students that did not meet expectations barely missed the threshold of 70 points with 67 points in order to “Meet” expectations. This outcome is a result of the number of statements in the multiple answer question and the Canvas scoring rubric. It is notable that 84% “Do Not Meet” expectations for KPI 4.3 and only 26% “Meet” or “Exceed” expectations.

KPI 4.3 has been the most challenging due to the complexity of the definitions of global, economic, environmental, and societal impacts. Students across ME 3311 and ME 3330 scored an average of 64% for global, 68% for economic, 55% for environmental, and 28% for societal impacts. Students appear to struggle with the definitions of engineering impacts.

Students performed much better on the multiple answer quizzes given in ME 4390, the senior design class, as shown in Table 3. This is in great part due the way the quizzes were graded in ME 4390 versus ME 3330 and ME 3311. The multiple answer quizzes in ME 4390 were graded manually with each multiple answer choice being equally weighted. On the other hand, the multiple answer questions for ME 3330 and ME 3311 were auto-graded in Canvas and each multiple answer choice was not equally weighted in calculating the student's grade. For example, let's consider hypothetically a multiple answer question with 4 false and 1 correct answer, thus a total of 5 choices. If a student selects the correct answer and 1 incorrect answer, Canvas will assign 0 points. However, a fair assessment would take into consideration that the student did not select the 3 other incorrect answers. This is what has been done in ME 4390 manually, where that same student would have received credit (3 out of 5) for not selecting the incorrect answers.

Table 2: Assessment Outcomes in Percentage for ME 3330 and ME 3311 (N=175).

	Does Not Meet (%)	Meets (%)	Exceeds (%)
KPI 4.1	1	19	80
KPI 4.2	25	0	75
KPI 4.3	84	13	3

Table 3: Assessment Outcomes in Percentage for ME 4390 (N=21).

	Does Not Meet (%)	Meets (%)	Exceeds (%)
KPI 4.2	5	33	62
KPI 4.3	9	43	48

Conclusions

In this paper, we carefully defined 3 KPIs for SO 4 and presented an effective and robust way to map student success for this outcome. We used this assessment approach with students in their second year, third year, and senior year. Given the large enrollments in the second- and third-year classes, the use of True/False questions and multiple answer quizzes have proven to be an effective and not too time consuming way to assess student performance for student outcome 4. We anticipate that as the program gains reputation and ABET accreditation, student enrollment will continue to rise. Thus, we expect student enrollment in the senior year to drastically increase in coming years.

Students struggle with applying the definitions of global, environmental, economic, and societal to case studies. Thus, we decided to introduce these concepts in the first-year course, Introduction to Digital Mechanical Engineering (ME 1201), starting in Fall 2025. These students will be enrolled in ME 3330 in their sophomore year and in ME 3311 in their junior year. We anticipate an improvement in students' ability to identify the impacts of engineering solutions. We will also spend more time in ME 3311 and ME 3330 developing students' understanding to differentiate between these impacts. We will also review the assessment tools to ensure that the correct answer is clear and that the distractors (false answers in the multiple answer questions) are reasonable. Further, we will modify, slightly, the way we phrase the questions. Rather than asking, “what are the environmental impacts,” we feel adding the word “likely” will help students generalize their thinking rather than locking in on the 1% or 2% possibility that each statement might have a meaningful impact. We would state, “what are the likely environmental impacts.”

Relative to the Canvas multiple-answer quiz for KPI 4.3, we determined that the grading rubric did not accurately measure students’ understanding. In particular, the grading rubric incorrectly weighed students’ ability to discern impact statements that did not apply to the case study. Future implementations of the multiple-answer quiz will be revised to more appropriately weigh student responses.

References

[1] ABET, “About ABET”, Accessed 1/7/2026. Online. Available: https://www.abet.org/about-abet/

[2] ABET, “Criteria for accrediting engineering programs, 2025-2026”, Accessed 9/23/2025. Online. Available: https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2025-2026/

[3] ABET, “History”, Accessed 1/7/2026. Online. Available: https://www.abet.org/about-abet/history/

[4] Framework for Defining and Mapping to Key Words in ABET Engineering Accreditation Commission Student Outcomes 1 – 7, A Pfluger, M Butkus, B Wallen, in *Proceedings of the 2022 Annual American Society of Engineering Education (ASEE) Conference and Exposition, Minneapolis, Minnesota, June 26-29, 2022.*

[5] New ABET Student Outcomes Assessment: Developing Performance Indicators and Instruments for Outcome 4, S. Kumpaty, K. Reichl, A. Vyas, *Proceedings of the ASME 2020 International Mechanical Engineering Congress and Exposition, Virtual, Online, November 16-19, 2020.*

[6] National Society of Professional Engineers, “Code of ethics,” Accessed 9/23/2025. Online. Available: https://www.nspe.org/sites/default/files/resources/pdfs/Ethics/CodeofEthics/NSPECodeofEthicsforEngineers.pdf.

[7] National Society of Professional Engineers, “Board of ethical review cases,” Accessed 9/23/2025. Online. Available: https://www.nspe.org/career-growth/ethics/board-ethical-review-cases.

[8] N. Washuta, A. Eggleton, J Righter, R Rabb, “Defining key terms in new ABET student outcomes,” in *Proceedings of the 2022 Annual American Society of Engineering Education (ASEE) Conference and Exposition, Minneapolis, Minnesota, June 26-29, 2022.*

[9] ABET, “Workshops”, Accessed 1/7/2026. Online. Available: https://www.abet.org/workshops/

[10] The University of North Carolina at Chapel Hill, “Generative AI in Academic Writing,” Accessed 1/7/2026. Online. Available: https://writingcenter.unc.edu/tips-and-tools/generative-ai-in-academic-writing/

[11] National Institute for Engineering Ethics, “Incident at Marales,” Accessed 10/3/2025. Online. Available: https://www.niee.org/incident-at-morales/