Electrical Engineering - Bachelor of Science - Mid-Cycle Review & SLOA Year

Current Compliance Year: 2022-2023
Mid-Cycle review

Recent Recommendations

Feedback will include recommendations from the last Expedited Review or from your most recent review by your school or college. You may not see any feedback or recommendations until you have completed your first full or mid-cycle review.

Response to Previous Recommendations (if any):

(1) Beginning Fall 2022, we have completely revised the EE program curriculum. The new curriculum requires 125 credits for graduation compared to 134 for the previous curriculum. This should reduce the time required for graduation.
(2) In the new curriculum, we removed the three major options (communications, power and control, and computer) of the previous curriculum. This will increase the number of students in upper division courses and further reduce the time for graduation by providing a well-defined path to graduation that is less likely to lead to delays caused by a fraction of students jumping from one option to other.
(3) Professor [redacted] of ECE is the director of Alaska Space Grant Program and the Alaska NASA EPSCoR program. Thus deep ties already exist between the EE program and the Alaska Space Grant and NASA. Many undergraduate and graduate EE students actively participate in the Alaska Space Grant Program. The department also has collaboration with Alaska Center for Energy and Power (ACEP) which provides another avenue for undergraduate research.
(4) In addition to in person group advising, the department is taking a proactive approach to advising by contacting sophomore and higher level students before the registration opens to set up an advising meeting.
(4) The teaching load is distributed amongst the department faculty in proportion to their assigned workload, which in turn depends on the nature (full, half-time, quarter-time) of the appointment with the department.

Student Learning Outcomes

The previous Student Learning Outcomes Assessment has been submitted as its own report. Going forward you will use the following prompts to discuss the success of your most recent SLOA plan and address your assessment activities since your last SLOA report (typically the past two years or since your last program review).

Learning outcomes feedback from last review:
Feedback will be provided once you have completed a full or mid-cycle review.

Discuss your SLOA findings, changes you are making and what you hope to see as a result:

During 2021-22, we collected data using three direct assessment mechanisms (course-based Faculty Performance Indicator Assessment Report (FPAR), senior capstone design project, FE exam), and one

indirect method (senior exit survey). The results of data evaluation, conclusions, and recommendations by faculty are summarized below.

(1) Assessments based on FPARs, the senior capstone design projects, and senior exit survey showed that in general student performance of all seven student outcomes (SO) was well above the respective benchmarks (>75% for FPAR, >3 on a scale of 1-5 for capstone design project and senior exit survey). (The low performance for SO6 in EE 333 resulted because three out of 10 students not complete the laboratory design project.)

(2) The results of Fundamentals of Engineering (FE exam) taken during 2021-22 period showed that over 90% of the 11 students who took the exam passed (national pass rate ~73% over the same period).

(3) Based on these assessment results, faculty concluded students are developing strong science, math, and engineering skills and communication. Starting Fall 2022, Faculty recommended assessing all student outcomes every year instead of a 2-year cycle used previously. This will provide better comparison from one year to the next.

(4) Professors [redacted], [redacted], and [redacted] assessed senior capstone design courses and other faculty assessed outcomes using FPARs in selected courses. The senior exit survey is spearheaded by the department chair. The entire faculty is involved in analyzing and evaluating the assessment data and providing conclusions and recommendations.

Discuss the curricular changes made based on assessing your SLO. If you haven't made any curricular changes, please explain why not and address what you did notice in the review, including strengths of your curriculum through the assessment of your outcomes:

With a small number of students, it is essential to exercise caution when drawing general conclusions, especially recommending curricular changes. Overall our program is strong, and no significant curricular changes resulted from the above conclusions. Given that all outcomes assessed by three independent methods were above the respective threshold for each method, the faculty decided to take no actions, other than keep a close eye on it during the next assessment cycle. Based on the feedback they received from students, individual faculty made improvements related to specific topics in their courses.

On the other hand, an entirely new curriculum has been developed over the last several years and offered beginning Fall 2022. The motivation for the new curriculum was, as discussed above, to streamline the program to reduce the graduation time and increase the enrollment in upper level course. The capstone design course, offered in the last semester of the program, is now offered as a 2-semester course sequence, giving students more time to work on their project.

Are communication outcomes embedded in the SLOA Plan?

As of 2017 all Baccalaureate programs were required to embed the communication outcomes within their SLOA Plans, this is optional for non-Baccalaureate programs.

Not Embedded

Student Success

To access the Student Success Dashboard please sign into a UA computer with VPN connection (if not on campus). You will need your UA credentials and it is best accessed with the most updated version of Chrome, Edge, Firefox or Safari browsers; Internet Explorer is not supported. You will need to filter the data to see your programs. If you need assistance in finding the data for your programs, please contact your data liaison or Julia Manfredini in the PAIR office.

Data Liaisons

Each school or college has a team of Data Liaisons to help you analyze the data provided in the portal and may be able to help you see your data in multiple contexts. You can find a list of data liaisons on the resources page for Program Review.

The college or school level committee will also have access to this data with the goal that by providing these visualizations data availability will be increased.

Data supplied within the dashboard linked below is intended for Academic Program Review and not for any other purpose.

Student Success Data Dashboard

Previous Feedback

Feedback will be provided once you have completed a full or mid-cycle review.

Student Success Data Trends:

Decline in majors,Increase in SCH,Decline in degrees awarded,Decline in persistence,Decrease in pass rates

If equity gaps were found in any of your disaggregated student success data, please explain how you plan to address those gaps. Please contact your data liaison or make an appointment with Julia Manfredini to learn more about analyzing your data.

NOTE: The gender and race data provided to us was not per degree, but per department. The following discussion is about the equity gaps in the department, not specifically for the BSEE program. We noticed a one year drop in some of the categories, and will be monitoring those categories carefully to see if the trends continue. However, the faculty did not see enough evidence to qualify any of those as equity gaps at this point. An apparent severity of some of these drops could be attributed to a small number of students in those categories. Here are the two potential concerns that will require further monitoring: - Pass rate per race: [redacted] pass rate went from 100% in 2021 to 62.5% in 2022. Other races remained flat. The percentage and the number of [redacted] students is low, which can explain the drastic drop. - Pass rate per gender: Pass rate for [redacted] students went from 100% in 2021 to 89.8% in 2022. For [redacted] students, it remained almost flat (93.3% to 92%).

Optional Data Explanation

Feel free to share more of your thoughts on the data provided.

The institutional research data provided can be improved. When small number of students are involved it is better to provide numbers rather than percentages. In some categories the data is provided for the department as a whole and not for the individual program. It is difficult to draw conclusions about a specific program bases on such data.

High Impact Practices

According to the AAC&U, High-Impact Educational Practices "have been widely tested and have been shown to be beneficial to college students from many backgrounds." UAF is particularly interested in Undergraduate Research and/or Scholarly Activity because it is one of our mission fulfillment indicators, but all of these researched High-Impact Educational Practices should be reflected in your program's student learning outcomes and curriculum.

Previous Feedback

Feedback will be provided once you have completed a full or mid-cycle review.

High-Impact Practices Used in this Program

Please use the following fields to discuss how your program is using the high-impact practices, successes and known issues and solutions, or ways you are considering incorporating them in the future. If you are not using any of the high-impact practices listed, please use the "Other or None of These," filed to share what your program is doing to help students be successful.

High Impact Practices that currently apply to your program:

Undergraduate Research,Writing-Intensive Courses,Capstone Courses and Projects,Collaborative Assignments and Projects

Other or None of these (explain)

Submission

Submitter & Collaborator Names

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Submitter Email

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College or School Review Committee

The college or school committees set the tone for helping each program feel seen during this process. We have provided you with strength-based feedback tags to attach to this program review. Please select as many as applicable.

Overall Recommendations

Increase graduates,Consider curricular revisions

Explanation of Recommendations

Revise curriculum to decrease time to graduation, increase the number of students in upper division EE courses, and distribute teaching workload more amongst the department faculty.
Develop deeper partnerships with the Alaska Space Grant program and other

Student Learning Outcomes Assessment Feedback (tags)

Strong alignment with SLOA plan,"Clear, concise presentation of findings"

Student Learning Outcomes Assessment Feedback (narrative)

Your report shows strong alignment between the plan, the results, and the analysis done by the program.
The committee appreciates you attached a new SLOA, which reflects significant changes to reduce graduation time and to increase enrollment.

Profile Feedback

Financial Feedback

Student Success & Equity Feedback

While it is important to discuss equity gaps in student success, there are other aspects of the success data that merit comment, such as overall enrollment or graduation rates and data can be disaggregated at the program level, which would add more specificity to your report.
*Please note that the Accreditation and Assessment Office will follow up to walk you through the filtering process by program.

High-Impact Practices Feedback

Your report describes well some high impact practices that foster students' engagement and success.

UNIVERSITY OF ALASKA FAIRBANKS
Student Learning Outcomes Assessment Plan
Bachelor of Science in Electrical Engineering

College of Engineering and Mines

07 May 2021

Expanded Statement of Institutional Purpose	Intended Objectives/Outcomes	Assessment Criteria and Procedures	Implementation (what, when, who)
MISSION STATEMENT: *The Mission of the UAF Electrical and Computer Engineering Department is to offer the highest quality, contemporary education at the undergraduate and graduate levels and to perform research appropriate to the technical needs of the state of Alaska, the nation, and the world.* ***GOAL STATEMENT:*** *Prepare students with the following program educational objectives:* ***1. Breadth.*** *Graduates will utilize their broad education emphasizing electrical engineering to serve as the foundation for productive careers in the public or private sectors, graduate education, and lifelong learning.* ***2. Depth.*** *Graduates will apply their understanding of the fundamental knowledge prerequisite for the practice of and/or advanced study in electrical engineering, including its scientific principles, rigorous analysis, and creative design. The BSEE*	(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	DIRECT: Faculty Performance Indicator Assessment Reports (FPARs) in EE 333, 406/443/461	Every third year by course instructors. 2019-2020, 2022-2023, 2025-2026
		INDIRECT: Senior Exit Survey	Every year
	(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.	DIRECT: Senior Capstone Design Project evaluated using standard rubric	Every third year by course instructors. 2020-21, 2023-24, 2026-27
		INDIRECT: Senior Exit Survey	Every year coordinated by the department chair.
	(3) An ability to communicate effectively with a range of audiences.	DIRECT: Senior Capstone Design Project evaluated using standard rubric	Every third year by course instructors. 2020-21, 2023-24, 2026-27
		INDIRECT: Senior Exit Survey	Every year coordinated by the department chair.
	(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.	DIRECT: Senior Capstone Design Project evaluated using standard rubric	Every third year by course instructors. 2020-21, 2023-24, 2026-27
		INDIRECT: Senior Exit Survey	Every year coordinated by the department chair.
	(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.	DIRECT: Senior Capstone Design Project evaluated using standard rubric	Every third year by course instructors. 2020-21, 2023-24, 2026-27
		DIRECT: Faculty Performance Indicator Assessment Report (FPAR) in EE 102	Every third year by course instructors. 2020-21, 2023-24, 2026-27
		INDIRECT: Senior Exit Survey	Every year coordinated by the department chair.

program offers depth concentration areas in communications, computer engineering, and power and control. ***3. Professional Skills.*** *Graduates will apply skills for clear communication, responsible teamwork, professional attitudes, and ethics to succeed in the complex modern work environment.*	(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	DIRECT: Faculty Performance Indicator Assessment Reports (FPARs) in EE 331, 333, 406/443/461	Every third year by course instructors. 2019-2020, 2022-2023, 2025-2026
		INDIRECT: Senior Exit Survey	Every year coordinated by the department chair.
	(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	DIRECT: Senior Capstone Design Project evaluated using standard rubric	Every third year by course instructors. 2020-21, 2023-24, 2026-27
		INDIRECT: Senior Exit Survey	Every year coordinated by the department chair.

Evaluation and Use of Assessment Results: The assessment results are annually analyzed and evaluated by the entire ECE faculty in a Student Outcomes Assessment Meeting held in the second week of May. The results of this evaluation are then used to recommend specific improvements in courses that reinforce the skills related to a particular outcome. This approach provides a continuous assessment and improvement of the entire BSEE program.

Revised 05/05/21 by Vikas Sonwalkar

Performance Rubrics for ABET a-k Student Outcomes

Performance Levels 1 - 5 (very weak, weak, average, strong, very strong)

Program Outcomes	1 = very weak	3 = average	5 = very strong
(a) an ability to apply knowledge of mathematics, science, and engineering	Does not appear to grasp the connection between theory and the problem; Calculations are not performed or performed incorrectly; Quantities are generally listed without units; Does not understand the connection between mathematical models and engineering systems.	Some gaps in understanding the application of theory to the problem and expects theory to predict reality; Minor errors in calculations; Most quantities are listed with units; Chooses a mathematical model or scientific principle that applies to an engineering problem, but has trouble in model development.	Translates academic theory into engineering applications and accepts limitations of mathematical models of physical reality; Executes calculations correctly; Expresses quantities using correct and preferred units; Combines mathematical and/or scientific principles to formulate models relevant to electrical engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	Does not follow experimental procedures; Cannot select the appropriate equipment and instrumentation for required investigations; Is unaware of measurement error; Makes no attempt to relate data to theory	Experimental procedures most often followed, but occasional oversight leads to loss of experimental efficiency and/or loss of data; Needs some guidance in selecting appropriate equipment and instrumentation; Is aware of measurement error but does not account for it statistically or does so at a minimal level; Applies appropriate theory to data when prompted to do so, but misinterprets physical significance of theory or variable involved and makes errors in unit conversions	Develops and implements logical experimental procedures; Can select appropriate equipment and instruments to perform investigations; Is aware of measurement error and is able to account for it; Analyzes and interprets data carefully using appropriate theory and translates theory into practice or applies to physical systems
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, societal, political, ethical, health and safety, manufacturability, and sustainability.	No design strategy, haphazard approach; Unable to relate prior knowledge to the design problem; Several important design criteria are missing; Ideas are not new or innovative.	Uses a design strategy with guidance; Can use prior knowledge to design individual pieces of equipment competently when guided to do so; Missing some essential and desirable design specifications/criteria; Generates solutions that are workable and practical, but generally are not that innovative.	Develops a design strategy, including a plan of attack, decomposition of work into subtasks, development of a timetable; Understand how areas interrelate and demonstrates ability to integrate prior knowledge into a new problem; Establishes a comprehensive list of essential and desirable design specifications/criteria; Generates alternative solutions that are unique, novel and workable.

(d) an ability to function on multi-disciplinary teams	Routinely fails to prepare for meetings; Does work on his/her own, does not value team work; Does not consider the ideas of others; Is openly critical of the performance of others; Is discourteous to other group members.	Prepares somewhat for meetings, but ideas are not clearly formulated; Occasionally works as a loner or interacts to a minor extent with extra-disciplinary team members; Persuades others to adopt only his/her ideas or grudgingly accepts the ideas of others; Sometimes criticizes ideas of other team members, blames others for errors; Is not always considerate or courteous towards team members.	Is prepared for meetings with clearly formulated ideas; Cooperates with others; Values alternative perspectives and encourages participation among all team members; Remains non-judgmental while disagreeing with others, seeks conflict resolution, does not "point fingers" or blame other when things go wrong; Is a courteous team member.
(e) an ability to identify, formulate, and solve engineering problems	Demonstrates solutions implementing simple applications of one formula or equation with close analogies to class/lecture problems; Does not realize when major components of the problem are missing; Does not appear to grasp the connection between theory and the problem; Has no coherent strategies for problem solving; No attempt at checking the obviously incorrect solution--no commentary.	Demonstrates solution with integration of diverse concepts or derivation of useful relationships involving ideas covered in course concepts, however, no alternative solutions are generated; Is missing some of the pieces of the whole problem; Some gaps in understanding the application of theory to the problem and expects theory to predict reality; Has some strategies for problem-solving, but does not apply them consistently; The solution is correct, but not checked in other ways.	Demonstrates creative synthesis of solutions and creates new alternatives by combining knowledge and information; Demonstrates understanding of how various pieces of the problem relate to each other and the whole; Translates academic theory into engineering applications and accepts limitation of mathematical models of physical reality; Formulates strategies for solving problems; The solution is correct and checked in other ways when it can be, the interpretation is appropriate and makes sense.
(f) an understanding of professional and ethical responsibility	Student is not aware of any codes for ethical behavior; Blames other for own issues and problems; Is frequently absent from class and is generally not collegial to fellow students, staff, and faculty; Student has been caught cheating or plagiarizing the work of others.	Student is aware of the existence of the IEEE Code of Conduct and other bases for ethical behavior; Doesn't recognize the need to take personal responsibility for his/her actions; Sometimes exhibits unprofessional behavior; is sometimes absent from class without reason; Does not model ethical behavior among peers and faculty.	Student understands IEEE Code of Conduct and other bases for ethical behavior; Takes person responsibility for his/her actions; Is punctual, professional, and collegial; attends classes regularly; Demonstrates ethical behavior among peers and faculty.

(g) an ability to communicate effectively	Talk is poorly organized, e.g. no clear introduction or summary of talk is presented; Extremely nervous delivery; Uses poor English; Multiple slides are unclear or incomprehensible, too much detail on text slides, tables are not legible; Text rambles, points made are only understood with repeated reading and key points are not organized; Little or no structure or organization, no subheadings or proper paragraph structure used; Graphs, tables or diagrams are used, but no reference is made to them. Not appropriate content for a range of audiences.	Presents key elements of an oral presentation adequately; Slight appearance of stage fright; Occasionally uses an inappropriate style of English--too conversational; One or two slides are unclear or incomprehensible, most text slides could be more succinct, could remove a table row/column here or there; Articulates ideas, but writing is somewhat disjointed, superfluous or difficult to follow; Materials are generally organized well, but paragraphs combine multiple thoughts or sections and sub-sections are not identified clearly; Uses graphs, tables and diagrams, but only in a few instances are they applied to support, explain or interpret information. Some pertinent material for range of audiences.	Well organized, Items discussed in a logical sequence that has been made clear to the audience; Excellent stage presence; Uses proper American English; Information on slides is always presented in a concise manner that can be quickly and easily digested; Articulates ideas clearly and concisely; Organizes written materials in a logical sequence to enhance the reader's comprehension (paragraphs, subheadings, etc.); Uses graphs, tables and diagrams to support points--to explain, interpret and assess information. Well covered for all ranges.
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	Is unaware of current trends in electrical engineering; Is unaware of historical effect of engineering solutions; Is not familiar with any technical periodicals; Isn't sure why he/she is studying engineering.	Is aware of current trends in electrical engineering; Is aware of historical aspects of engineering solutions, but is not influenced by them; Is aware of the existence of technical periodicals--would know where to look to find them; Is interested in engineering because of what the discipline offers him/her personally.	Is familiar with the current trends in electrical engineering; Respects the historical aspects of engineering solutions and their impacts; Reads and is familiar with the content of periodicals that are relevant to understanding the global and societal impact of engineering (e.g. IEEE Spectrum & IEEE Potentials); Has a personal perspective on the importance (or lack thereof) of engineering in today's world.
(i) a recognition of the need for, and an ability to engage in life-long learning	Requires detailed or step-by-step instructions to complete a task; Unable to recognize own shortcomings or deficiencies; Assumes that all learning takes place within the confines of the class; Shows little or no interest in outside learning resources; Does not show any interest in professional and/or technical societies.	Requires guidance as to expected outcome of task or project; Sometimes is able to avoid repeating the same mistakes; Does not always take responsibility for own learning; Seldom brings information from outside sources to assignments; Occasionally participates in the activities of local professional and technical societies.	Demonstrates ability to learn independently; Learns from mistakes and practices continuous improvement; Demonstrates responsibility for creating one's own learning opportunities; Participates and takes a leadership role in professional and technical societies available to the student body.

(j) a knowledge of contemporary issues	Has no clue about issues, techniques, trends and events in the engineering discipline and in society and in the world; Hopes that a job will fall into his/her lap; Unable to comment on political solutions or is unaware of world and local happenings.	Has some knowledge of current techniques, trends and events in the engineering discipline and of current events in society; Has a somewhat narrow perspective on the current job market; Able to comment on major political issues, but is not familiar enough with them to defend a position on them.	Has knowledge of current techniques, trends and events in the engineering discipline, and of current events in society; Has a good perspective on the current job market; Able to discuss in-depth major political issues at national, state and local levels.
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	Struggles with simple tasks in PC use and is unable to use current software packages; Does not know how to use mathematical software; Uses simulation/modeling software without knowledge of assumptions inherent in its development; Does not operate most instrumentation and other equipment, and/or does so incorrectly or requires frequent supervision.	Can perform simple tasks requiring PC use; Minor errors in applying mathematical software; Is aware of assumptions inherent in simulation/modeling software but is not clear on their impact on problem solution; Is tentative in operation of instrumentation and other equipment.	Maintains current, state-of-the-art abilities in PC use; Executes calculations correctly using mathematical software; Is aware of assumptions inherent in simulation/modeling software, and their impact on problem solution; Is able to comfortably operate instrumentation and other equipment.