

UNIVERSITY OF ALASKA FAIRBANKS  
Student Learning Outcomes Assessment Plan  
Bachelor of Science in Computer Engineering  
College of Engineering and Mines

| Expanded Statement of Institutional Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Intended Objectives/Outcomes                                                                                                                                                                                                                   | Assessment Criteria and Procedures                                                   | Implementation (what, when, who)                                               |
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| <p><b>MISSION STATEMENT:</b><br/>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.</p> <p><b>GOAL STATEMENT:</b><br/>Prepare students with the following program educational objectives:</p> <p><b>1. Breadth.</b> Graduates will utilize their broad education emphasizing computer engineering to serve as the foundation for productive careers in the public or private sectors, graduate education, and lifelong learning.</p> <p><b>2. Depth.</b> Graduates will apply their understanding of the fundamental knowledge prerequisite for the practice of and/or advanced study in computer engineering, including its scientific principles, rigorous analysis, and creative design.</p> <p><b>3. Professional Skills.</b> Graduates will apply skills for clear communication, responsible teamwork, professional attitudes, and ethics to succeed in the complex modern work environment.</p> | 1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.                                                                                                  | Faculty Performance Assessment Reports (FPARs) in EE 333 and EE 443                  | Assessed annually by course instructor starting in 22-23 (Last assessed 21-22) |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 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.                   | FPAR in Senior Capstone Design Course (EE 482). Until 2022 it was assessed in EE 444 | Assessed annually by course instructor. (Last assessed in 21-22)               |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3) An ability to communicate effectively with a range of audiences.                                                                                                                                                                            | FPAR in EE 482 (previously in EE 444)                                                | Yearly by course instructor. (Assessed 21-22)                                  |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 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. | FPAR in EE 482 (previously in EE 444)                                                | Yearly by course instructor. (Assessed 22-22)                                  |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 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.                                                 | FPAR in EE 102<br>FPAR in EE 482 (previously EE 444)                                 | Yearly by course instructor. (Assessed 21-22)                                  |
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|  | 7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies. | FPAR in EE 482 (previously EE 444)                                                                | Yearly by course instructor. (Assessed 21-22)                               |
|  |                                                                                                    | Senior Capstone Design Project                                                                    | Yearly by course instructor                                                 |
|  |                                                                                                    | Senior Exit Survey                                                                                | Every year, student survey                                                  |
|  | Acquire broad knowledge base expected in the field of Computer Engineering.                        | Nationally standardized FE (Fundamentals of Engineering) Exam, with subscores in many topic areas | Collect results from each Fall and Spring FE Exam, evaluated by ECE faculty |

**Evaluation and Use of Assessment Results:** The assessment results are annually analyzed and evaluated by the entire ECE faculty in a Student Outcomes Meeting held typically 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 BSCpE program.

Revised 11/16/22 by Dejan Raskovic

## Performance Rubrics for ABET 1-7 Student Outcomes

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

| Student Outcomes                                                                                                                                                                                                            | 1 = very weak                                                                                                                                                                                                                                                                                                                                                                                                 | 3 = average                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5 = very strong                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| 1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics                                                                                | 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. Does not grasp the interrelationship of wide-ranging or conflicting technical issues associated with the complex engineering problem. | 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. Grasps some of the wide-ranging or conflicting technical issues and their interrelationship associated with the complex engineering problem.                                                                                                | 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 computer engineering. Formulates a creative solution within bounds of wide-ranging or conflicting technical issues.                                                                                                                                         |
| 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 | 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. Does not consider or evaluate the impact of a design on public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.                                                         | 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. Sometimes considers the impact of a design on some of the following: public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. Sometimes can evaluate how that design impacts the above factors. | 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. Considers and evaluates the impact of a design on public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. |

| Student Outcomes                                                                                                                                                                                                                              | 1 = very weak                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3 = average                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5 = very strong                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| 3. An ability to communicate effectively with a range of audiences                                                                                                                                                                            | 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. Unable to distinguish the comprehension abilities of a wide range of audiences, and hence fail at communicating. | 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. Able to distinguish the comprehension abilities of a wide range of audiences, and able to communicate somewhat effectively with some range of audiences, but not all. | 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. Able to clearly communicate with a wide 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 | Student is not aware of any codes for ethical behavior; Blames other for own issues and problems. Often exhibits unprofessional behavior. Student does not understand the many professional and ethical responsibilities in all steps of the engineering design process. The student does not make informed engineering judgments considering the impact of engineering solutions in global, economic, environmental, and societal contexts.                                                                                                                                                                                           | Student is aware of the existence of the IEEE Code of Conduct and other bases for ethical behavior; Doesn't always recognize the need to take personal responsibility for his/her actions; Sometimes exhibits unprofessional behavior. Student understands some the many professional and ethical responsibilities in all steps of the engineering design process. The student does sometimes make informed engineering judgments considering the impact of engineering solutions in global, economic, environmental, and societal contexts.                                                                                                                                                                                                                                                                                                              | Student understands IEEE Code of Conduct and other bases for ethical behavior; Takes person responsibility for his/her actions. Student understands the many professional and ethical responsibilities in all steps of the engineering design process. The student makes excellent informed engineering judgments considering the impact of engineering solutions in global, economic, environmental, and societal contexts.                                                                                                                                                                   |

| <b>Student Outcomes</b>                                                                                                                                                                       | <b>1 = very weak</b>                                                                                                                                                                                                                                                                                                                                                                                                             | <b>3 = average</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>5 = very strong</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| 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 | Cannot lead others, is not prepared for meetings, does not bring any ideas forward. Does not cooperate with others or value alternative perspectives or encourage or create an inclusive environment. Does not understand or establish achievable goals. Cannot plan ahead to meet deadlines. Does not contribute appropriate work products to meet the objectives of the team project.                                          | Shows some leadership for their portion of team projects and is sometimes prepared for meetings with clearly formulated ideas. Sometimes cooperates with others and sometimes values alternative perspectives and participation among all team members. Sometimes may criticize others, jeopardizing the inclusive environment. Can sometimes collaborate with others to establish achievable goals, but not always. Sometimes articulates plans to ensure deadlines are met. Generally, but not always, contributes appropriate work products to meet the objectives of the team project. | Shows excellent leadership for their portion of team projects and is prepared for meetings with clearly formulated ideas. Cooperates with others; Values alternative perspectives and encourages participation among all team members in an inclusive environment. Collaboratively establishes achievable goals. Develops well-articulated plans to ensure deadlines are met. Contributes appropriate work products to meet the objectives of the team project. |
| 6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions                                                | 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. Does not apply good engineering judgment and draws mostly inappropriate conclusions.                                                                                                                               | 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. Applies some engineering judgment and draws some appropriate conclusions.                   | 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. Applies very good engineering judgment to draw appropriate conclusions.                                                   |
| 7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.                                                                                            | 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. Unable to find and access appropriate learning strategies to gain the required new knowledge. | 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. Finds and accesses some appropriate learning strategies to gain some of the required new knowledge.                                                                                                                                                   | 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. Finds and accesses appropriate learning strategies to gain the required new knowledge.                                                                       |