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)
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 computer 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 computer engineering, including its scientific principles, rigorous analysis, and creative design. **3. Professional Skills.** Graduates will apply skills for clear communication, responsible teamwork, professional attitudes, and ethics to succeed in the complex modern work environment.	a) An ability to apply knowledge of mathematics, science and engineering.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPARs – Faculty Performance Criteria Assessment Reports in EE 203, 311, 333, 353, and 354	Every third year by course instructors. ABET outcomes a-k are assessed on a rotating basis over a 3-year cycle. (Last assessed 2016-17)
		Senior Exit Survey	Every year
	b) An ability to design and conduct experiments, as well as to analyze and interpret data.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPARs in EE 333 and 343	Every third year by course instructors. (Assessed 16-17)
		Senior Exit Survey	Every year
	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.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPAR in EE 444	Every third year by course instructors. (Assessed 17-18)
		Senior Exit Survey	Every year
	d) An ability to function on multi-disciplinary teams.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPARs in ES 101, EE 102, ESM 450, and EE 444	Every third year by course instructors. (Assessed 17-18)
		Senior Exit Survey	Every year
	e) An ability to identify, formulate and solve engineering problems.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPAR in EE 443	Every third year by course instructor
		Senior Exit Survey	Every year
	f) An understanding of professional and ethical responsibility.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPAR in EE 444	Every third year by course instructors. (Assessed 17-18)
		Senior Exit Survey	Every year

	g) An ability to communicate effectively in oral and written form to audiences in the discipline as well as to translate the content to audiences outside the discipline, making it relevant to broader communities; integrate feedback from others.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPAR in EE 444	Every third year by course instructors. (Assessed 17-18)
		Senior Exit Survey	Every year
	h) The broad education necessary to understand the impact of engineering solutions in a global and societal context.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPAR in EE 444	Every third year by course instructors. (Assessed 17-18)
		Senior Exit Survey	Every year
	i) A recognition of the need for, and an ability to engage in life-long learning.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPAR in EE 444	Every third year by course instructors. (Assessed 17-18)
		Senior Exit Survey	Every year
	j) A knowledge of contemporary issues.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPAR in EE 444	Every third year by course instructors. (Assessed 17-18)
		Senior Exit Survey	Every year
	k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	Senior Capstone Design Project evaluated using standard rubric	Yearly by course instructor
		FPARs in EE 333, 343, 353 and 354	Every third year by course instructors. (Assessed 16-17)
		Senior Exit Survey	Every year
	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 April and October 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 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 5/8/18 by Dejan Raskovic

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.

Revised 5/8/18 by Dejan Raskovic