

Taxonomy Level:	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Bloom's Definition:	Remembering previously learned information	Grasping the meaning of information	Applying knowledge to actual situations	Breaking down objects or ideas into simpler parts and seeing how the parts relate and are organized	Rearranging component ideas into a new whole	Making judgments based on internal evidence or external criteria
Verbs:	Arrange, define, describe, duplicate, identify, label, list, match, memorize, name, order, outline, recognize, relate, recall, repeat, reproduce, select, state	Classify, convert, defend, describe, discuss, distinguish, estimate, explain, express, extend, generalized, give example(s), identify, indicate, infer, locate, paraphrase, predict, recognize, rewrite, report, restate, review, select, summarize, translate	Apply, change, choose, compute, demonstrate, discover, dramatize, employ, illustrate, interpret, manipulate, modify, operate, practice, predict, prepare, produce, relate, schedule, show, sketch, solve, use, write	Analyze, appraise, breakdown, calculate, categorize, compare, contrast, criticize, diagram, differentiate, discriminate, distinguish, examine, experiment, identify, illustrate, infer, model, outline, point out, question, relate, select, separate, subdivide, test	Arrange, assemble, categorize, collect, combine, comply, compose, construct, create, design, develop, devise, explain, formulate, generate, plan, prepare, propose, rearrange, reconstruct, relate, reorganize, revise, rewrite, set up, summarize, synthesize, tell, write	Appraise, argue, assess, attach, choose, compare, conclude, contrast, defend, describe, discriminate, estimate, evaluate, explain, judge, justify, interpret, relate, predict, rate, select, summarize, support, value
Outcome Element: Apply knowledge of mathematics	Recognizes functional relationships among independent and dependent variables. Describes physical significance of functions, derivatives of functions, and integrals of functions.	Explains the role of mathematics as a tool for modeling systems and processes.	Applies mathematical principles to obtain analytical or numerical solution to model equations. Chooses a mathematical model of a system or process appropriate for the required accuracy.	Identifies mathematical and physical assumptions that allow model to be developed and solved at the level of accuracy required. Apply concepts of integral and differential calculus and linear algebra to solve problems.	Combines mathematics principles to formulate models of chemical, physical, and/or biological processes and systems as relevant to area of concentration.	Evaluates validity and reliability of mathematical models by comparing model solutions to either known results for simplified cases (i.e. numerical solutions compared to asymptotic analytical solutions) or relevant empirical data. Interprets mathematical model results to estimate accuracy and reliability.

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Outcome Element: Apply knowledge of science and engineering fundamentals	Describes fundamental scientific and engineering principles in chemical, physical, and/or biological processes and systems as relevant to area of concentration.	Identifies which fundamental scientific and engineering principles govern the performance of a given process or system.	Applies engineering science principles as relevant to area of concentration, e.g.: - "conservation" principles of total mass, species mass, linear momentum, angular momentum, energy, or charge to model chemical, physical, and/or biological processes or systems. - rate and constitutive equations to model relevant chemical, physical, and/or biological processes or systems. - thermodynamic principles to predict bounds on the performance of processes or systems. - materials principles to characterize behavior of physical, chemical, and/or biological processes or systems.	Analyzes modeling results of systems or processes using fundamental scientific and engineering principles. Analyzes data sets using statistical concepts.	Combines scientific and engineering principles to formulate models of processes and systems.	Evaluates validity and reliability of model solutions by comparing model predictions to either known experimental results for specific processes or systems or simplified theoretical results. Interprets physical significance of model predictions. Defends use of selected engineering science principles to model a specific process or system.

Outcome B: An ability to design and conduct experiments, as well as to analyze and interpret data.

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Outcome Element: Designing Experiments	Can recognize applicable analytical models, possible simulators (e.g. physical, digital, continuous, other format), testing apparatus, databases, models, etc. Can identify applicable theory and recognize the past history Can describe different measurement techniques and alternatives based on cost, etc. Gives examples of possible disruptions that may occur while conducting experiment that could affect experimental data Can discuss laboratory/experimental protocols Understands the need for proper units	Can indicate how existing theory/history differs/complements current question Can select the variables in question (controllable, level of variation, impact with other variables) Identifies the constraints and assumptions for the experiment - cost, time, equipment Can construct an appropriate hypothesis or problem statement Can select appropriate equipment, test apparatus, model, etc. for measuring variables in question Aware of orderliness and integrity of data	Can use existing theory/history to design an experiment Chooses the measure(s) of effectiveness by which the outcome or the alternative will be evaluated – cost, quality, value, time to complete, Feasibility Formulates the control and evaluating alternatives of the experiment Develops contingency plans Apply constraints and assumptions into experimental design Determines the data that are appropriate to collect Specifies and justifies the assumptions given test conditions	Predicts experimental uncertainties	Seeks information for experiment from multiple sources	

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Outcome Element: Conduct Experiments		Aware of measurement errors in instrumentation, human, environment Anticipates and minimizes experimental disruptions via pilot study	Acknowledges possible disruptions to existing surroundings and operations Uses appropriate measurement techniques to collect data Facilitates use of modern data collection techniques (computer for data logging) Follows ethical protocols when collecting data Documents collection procedures such that experiment may be repeated Anticipates and minimizes data errors via pilot study			

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Outcome Element: Analyze Data		Can select and explain different methods of analysis (descriptive and inferential) and depth of the analysis needed Can identify different audiences and their analysis/summary needs Can identify artifacts/confounding elements that may result	Uses appropriate tools to analyze data Selects and uses appropriate, self-explanatory graph formats for data Prepares analysis such that results can be replicated	Can apply statistical procedures Investigates possible artifacts with a balance of costs associated with the analysis	Organizes information into meaningful categories	

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Interpret Data		Can recognize how results relate or differ from theory or previous results	Can verify and validate experimental results	Questions whether constraints hold in both experiment and real world Relates and makes a connection between the measured property and variables Examines data WRT measures of effectiveness Makes considerations for risk	Combine results of multiple experiments, history or data sources Clearly presents information usable in formats (graph, numerical, text, etc.)	Considers possible extensions of results to other areas Interprets what the results mean with respect to the assumptions and constraints Interprets results with regards to how results relate the theoretical state of nature or system Selects the most appropriate solutions based on solution criteria Assesses the accuracy and precision of the results Interprets results with respect to the original hypothesis

Outcome C: An ability to design a system, component, or process to meet desired needs

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Outcome Element: <u>Need Recognition</u> Identify stated and unstated wants and needs that motivate the design effort; convert them into a needs statement.)	Recite definitions; name established methods and list their steps	Describe differences between different methods; carry out steps in a hypothetical design situation when asked	Select and perform appropriate method at a proper stage of a design project	Analyze perceived wants and needs to isolate the most relevant needs	Produce a clear and unambiguous needs statement in a design project	Assess/verify consistency of needs statement with customer's and societal needs
Outcome Element: <u>Problem Definition</u> Determine design objectives and functional requirements based on needs statement, identify constraints on the design problem, and establish criteria for acceptability and desirability of solutions.	Recite definitions; name established methods and list their steps	Describe differences between different methods; carry out steps when asked	Select and utilize appropriate method for problem definition; successfully produce problem definition at an appropriate stage of a design project	Analyze a needs statement to isolate information pertaining to problem definition	Guide a design project by use of the produced problem definition	Evaluate adequacy and consistency of produced problem definition with needs statement, reality
Outcome Element: <u>Planning (Strategic)</u> Development of a design strategy, including an overall plan of attack, decomposition of design problem into subtasks, prioritization of subtasks, establishment of timetables and milestones by which progress may be evaluated.	Recite definitions; name and list steps in design process; list established management strategies and their elements	Describe differences between different design steps; carry out steps when asked	Select and perform appropriate design stage at an appropriate point in a design project	Analyze progress of design in order to revise plan as needed	Produce a design strategy and use it to guide a design project	Evaluate progress by comparing current design state to design plan
Outcome Element: <u>Control and Management (Tactical)</u> Guidance of course of action during design and in response to changing conditions.	Name project monitoring techniques; list their elements and applications; list methods to modify design plans	Describe differences between different techniques; modify a given design plan given a situation	Select and perform appropriate monitoring, modification method during a design project	Analyze progress of design in order to revise plan as needed; analyze errors to determine proper reaction	Maintain a design strategy during a design project	Judge quality of monitoring; judge quality of revisions to plan
Outcome Element: <u>Information Gathering</u> Gather information about the design problem, including the need for a solution, user needs and expectations, relevant engineering fundamentals and technology, and feedback from users.	Name and list steps in information gathering; list established methods and their elements	Use specified information gathering method to research a specified design issue	Recognize need for information during a design project; gather information using an appropriate method	Analyze information need to determine type of information to gather during a design project	Employ gathered information in design decisions	Judge quality of gathered information
Outcome Element: <u>Generate Ideas</u> Transform functional objectives/requirements into candidate solutions.	Name established idea generation methods and list their steps and attributes	Describe differences between methods; perform specified method in hypothetical design situation when asked	Select and perform appropriate idea generation methods in a design project	Analyze failed candidates to suggest new candidates	Integrate generated ideas into design plan; generate ideas creatively or ad hoc where established methods fail	Judge completeness, quality of generated candidates
Outcome Element: <u>Modeling</u> Employ models / representations / simulations of the physical world to provide information for design decisions.	Recite definitions; name and list modeling and simulation methods and representation techniques, their elements and applicability	Describe differences between methods; use a specified representation to investigate a specified design issue, carry out steps of a specified method when asked	Select and perform model or representation at an appropriate point in a design project	Analyze output of model or representation	Incorporate output of model into design project	Evaluate quality of model, simulation, or representation and its output
Outcome Element: <u>Feasibility</u> Evaluate feasibility of alternatives or proposed solutions by considering stated constraints as well as implied constraints such as manufacturability, cost, compatibility	Recite definition of feasibility; name and list steps in feasibility analysis methods	Can recognize feasible candidates among a selection of candidates (using a specified method)	Perform feasibility analysis at an appropriate point in a design project, selecting applicable method	Analyze performance results, modeling results, interfaces to determine source of failure	Use the result of feasibility analysis to choose a candidate; employ insights gained	Evaluate judgements of feasibility, particularly with respect to possible biases
Outcome Element: <u>Evaluation</u> Objectively determine relative value of feasible alternatives or proposed solutions by comparing expected or actual performance to evaluation criteria.	Name and list evaluation methods and their elements, applicability	Describe differences between different methods; carry out specified method when asked	Select and apply appropriate evaluation method at an appropriate point in a design project	Analyze results of evaluation to discern additional criteria	Rank or otherwise rate candidates based on evaluation results; report on expected performance of candidates	Judge quality and comprehensiveness of evaluation, particularly by recognizing possible biases
Outcome Element: <u>Selection / Decision</u>	Name established decision and selection methods and their steps and applicability; list	Describe differences between decision and selection methods; make a decision or	Select and perform appropriate decision and selection methods at an appropriate point in a	Analyze feasible alternatives to identify bases for decision, selection	Select a candidate and proceed with design	Evaluate quality of selection or decision, e.g. with respect to possible bias

Outcome C: An ability to design a syste...

Selection of most feasible and suitable concept among design alternatives.	common decision criteria	selection given a set of alternatives	design project			
<p>Outcome Element: <u>Implementation</u></p> <p>Creating an instance of physical products and processes for purpose of testing or production</p>	<p>List and outline manufacturing and prototyping methods; list applications, strengths, weaknesses</p>	<p>Describe differences between methods; select an appropriate method given a situation; build a prototype by a specified method</p>	<p>Select and implement fabrication, production in a design project</p>	<p>Analyze output to suggest alternate methods of fabrication or production</p>	<p>Build a prototype or manufacture the artifact; incorporate components into a final design</p>	<p>Judge quality of prototype or product</p>
<p>Outcome Element: <u>Communication</u></p> <p>Exchange of information with others, utilizing appropriate formats.</p>	<p>Name types of communication and their formats; name and list steps in communication methods; list difficulties, strengths, and applications</p>	<p>Describe differences between different forms of communication; carry out when asked; identify possible pitfalls in a hypothetical design situation</p>	<p>Select and perform appropriate form of communication at appropriate points in a design project</p>	<p>Analyze messages to identify implied information; recognize errors and means of remedy</p>	<p>Communicate successfully throughout a design project; direct received communications to proper recipient</p>	<p>Evaluate effectiveness of chosen format and message</p>
<p>Outcome Element: <u>Documentation</u></p> <p>Produce usable documents of record regarding the design process and design state, including decision history and criteria, project plan and progress, intermediate design states, finished product and use of product.</p>	<p>Name common forms and purposes of documentation; list common targets of documentation, elements of good documentation</p>	<p>Describe differences between forms of documentation; document a specific design action by a specific form when asked</p>	<p>Select and perform appropriate documentation at an appropriate point in a design project</p>	<p>Analyze design activity to locate targets of documentation;</p>	<p>Create comprehensive history of design process as design proceeds</p>	<p>Evaluate quality of produced documentation and choice of documentation format (e.g., given audience)</p>
<p>Outcome Element: <u>Iteration</u></p> <p>Utilize strategies to inform design decisions which may contribute to a change in a design state (e.g., the problem definition, problem solutions, or design process plan)</p>	<p>Recites definitions; identifies strategies or procedures that generate information which may contribute to design decisions.</p>	<p>Can describe iterative process models of design; modify, improve or elaborate a design state given a situation.</p>	<p>Select and perform strategies to generate information that may be used to modify, improve or elaborate a design state.</p>	<p>Examine and critique progress for opportunities to revise design state as needed; analyze violations, inconsistencies, or conflicts to determine proper response.</p>	<p>Incorporate and integrate feedback; Generate new knowledge about design problem; Develop new strategies or tools to monitor progress.</p>	<p>Critique quality of monitoring, strategies and tools; judge quality of revisions to design state.</p>

Collaboration/ Conflict Mgt.	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Team Development: <i>Basic principles of group development and interpersonal dynamics</i>	- Defines stages of team development and the sequence in which they occur	- Recognizes distinctions between stages in team development - Identifies specific behaviors and skills that support team effectiveness	- Determines a teams current state of development	- Distinguishes effective team process relative to ineffective team process	- Formulates plans for helping a team develop from one stage to the next	- Accurately evaluates a teams current state of development and prescribe plans for enhancing effectiveness
Interpersonal style: <i>Recognizing and capitalizing on differences in style and perspective</i>	- Recognizes differences in interpersonal style	- Describes how differences in interpersonal style impact team behavior and performance	- Modifies his/her own style to accommodate needs of others	- Can compare and contrast differences in team members interpersonal styles	- Capitalizes on individual differences in style and perspective to improve team performance	- Evaluates the pros and cons of different style types relative to team performance
Conflict Management: <i>Principles of problem-based Conflict mgt.</i>	- Defines principles of constructive conflict management (win-win; issues versus positions; objective criteria; interest based negotiation)	- Describes how to use principles of constructive conflict management	- Applies principles of constructive conflict management to interactions with others	- Identifies underlying issues associated with conflicting positions	- Effectively constructs solutions that integrate seemingly contrary positions	- Evaluates conflict outcomes against objective criteria
Participation: <i>Understanding of and willingness to be fully involved in team efforts</i>	- Can define what participation means in a team setting	- Describes what one must to participate fully in team projects	- Shares responsibilities with other team members - Demonstrates commitment to team goals - Supports other team members in their assigned roles - Is flexible and responsive to others needs		- Helps team create plans for ensuring/improving participation - Encourages involvement from others	

Team Communication	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Active Listening: <i>Conveying understanding and using listening skills to move a conversation forward</i>		- Describes active listening and its role in team effectiveness	- Restates what has been said to show understanding - Asks open-ended questions in order to encourage discussion - Summarizes main points of discussions before moving on to other topics - Asks questions to clarify misunderstandings - Conveys understanding of others perspectives	- Identifies relationships between active listening and team performance	- Uses active listening skills to enhance knowledge and develop better understanding (e.g. to clarify design requirements)	- Accurately assesses own/others ability to listen actively
Feedback: <i>Giving and receiving constructive criticism</i>		- Understands principles of constructive feedback	- Gives specific and constructive feedback to other team members - Appropriately balances negative comments with positive ones - Solicits feedback from others - Avoids judgmental language or cheap shots when giving feedback	- Identifies relationships between active listening and team performance	- Incorporates feedback from others into revisions/ improvements	- Accurately assesses own/others ability to give receive/ feedback

Team Communication	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Influencing others: <i>Persuading others through well reasoned use of facts and clear conveyance of ideas</i>		- Understands principles of how to influence others	- Articulates ideas clearly and concisely - Uses specific examples to make points and convey ideas - Persuades others to adopt his/her point of view		- Develops plans and presentations that influence others	- Accurately assesses own/others ability to influence others
Sharing Information: <i>Providing and reviewing information in a timely manner</i>		- Describes important ways of sharing information in a team setting	- Shares information with others on the team - Provides information on time	- Differentiates between useful and unnecessary information	- Combines different kinds/sources of information to create solutions or new ideas	

Team Decision-making	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Defining a Problem: <i>Identifying and articulating the problem to be solved</i>	- Defines specific steps in the decision-making process	- Describes steps in decision-making process and how they relate to one another	- Applies a systematic decision-making process to solving problems	- Collects data to pinpoint problems - Analyzes problems objectively - Tests assumptions underlying ideas,	- Recognizes interrelationships among problems and issues	

				positions or statements		
Innovation and idea generation: <i>Generating creative and viable solutions</i>	- Defines innovation and idea generation	- Describes how innovation and idea generation are distinct and how they are similar -Understands tools and techniques for generating ideas	- Uses brainstorming and other idea generation techniques - Participates in the development of ideas		- Builds upon others ideas - Integrates information and ideas from varied sources to create new solutions	- Cor - Is c - Enc - Sur - other

Team Decision-making	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	
Judgment / Using facts: <i>Reaching conclusions based upon clear analysis of facts and ideas</i>	Recognizes tools and techniques for making judgements	Accurately describes how to use techniques for making judgments (fishbone, narrowing, histograms)	- Makes decisions based upon facts rather than "gut-feel" or intuition -Discourages team members from rushing to conclusions - Presses team members for facts to support decisions	- Establishes objective criteria against which to evaluate alternatives -Accurately analyzes trends and patterns in order to reach conclusions	- Seeks solutions that satisfy multiple criteria	- Evaluates alternatives in relation to objective criteria	
Reaching Consensus: <i>Ensuring buy-in and commitment to decisions reached</i>	- Defines consensus-based decision-making	- Distinguishes consensus-based decision-making from other forms of decision-making	- Seeks buy-in from all team members before finalizing decisions -Polls team members for their opinions -Listens to the opinions and feelings of other team members - Does not pressure others into accepting decisions -Accurately determines when to use consensus decision-making and when not to	- Considers alternatives from several points of view	- Alters solutions so that all can support it	-Employs a devil's advocate to evaluate pros and cons of alternatives	- Is s and c agree

Self-Management	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	
Establishing directions and standards: <i>Helping create plans and structure for the team</i>		Describes how to use planning tools (e.g. goal setting, Gantt charts)	- Establishes task priorities - Clearly states expectations regarding performance - Keeps the team focused - Records milestones and accomplishments	- Helps clarify conflicts regarding roles and responsibilities - Reconciles conflicting priorities	- Formulates action plans and timetables - Creates strategies and plans of action	- Evaluates team performance (task) relative to objectives	- Cel - Is c - Issue
Managing meetings: <i>Using principles of effective team meetings</i>	- Defines a Working Agreement	- Describes the components of an effective team meeting	- Discourages side-conversations and or getting off track during discussions - Helps manage time during meetings - Assists in note taking / recording meeting minutes	- Helps monitor meeting progress and effectiveness	- Helps team develop a working agreement	- Evaluates team performance (process) relative to its working agreement	
Personal conduct: <i>Demonstrating personal responsibility to the team and respect for team members</i>		- Understands what one must do to be effective in a team setting	- Follows through on commitments - Is prompt for meetings and appointments - Does not criticize others behind their backs - Is flexible and adapts to demands of situations and constraints - Maintains an appropriate balance between listening and speaking	- Differentiates between team membership and team leadership	- Knows when to assume a leadership role and when to let others assume that role		- Sur team - Tres - Cor other under - Do other - Sha

ABET e—An Ability to Identify, Formulate, and Solve Engineering Problems

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(1) Challenges the way things are being done	Defines facts about current processes and procedures.	Identifies and understands all problems associated with current methods.	Uses knowledge to compute possible undesirable outcomes.	Identifies and analyzes key areas where improvements can be made.	Creates new alternatives by combining knowledge and information.	Evaluate current practices to determine their efficiency and/or value.
(2) Improves on what has been done before	Provides a list of possible alternatives.	Recognizes the positive and negative aspects of each of the alternatives.	Uses knowledge and information to change current processes and procedures.	Can compare and contrast previous practices versus proposed improvements.	Reconstructs current practices integrating improvements where needed.	Appraises each alternative with respect to the others, including the option not to make a change.
(3) Generates many potential solutions to a given problem	Identifies and lists new alternatives to solve engineering problems.	Describes and understands the engineering problem to be solved.	Demonstrates ability and uses knowledge, information, and skills, to produce many alternatives to solve an engineering problem.	Identifies and analyzes potential solutions to an engineering problem.	Can create and explain potential solutions to an engineering problem.	Uses judgement to evaluate the many alternatives to solve an engineering problem.
(4) Suggests new approaches to solving problems.	Can identify the value of the perspectives of other people in relation to solving an engineering problem.	Can describe new ideas in relation to how an engineering problem should be solved.	Uses knowledge to compute possible new approaches. Generates innovative methods to solve problems.	Examines new approaches to gain an understanding of which approach should be used to solve an engineering problem.	Set-up a relation between an engineering problem and the new approaches developed to solve it.	Can assess the effectiveness of each approach.
(5) Discourages others from rushing to conclusions without facts.	Lists the facts that the user can be certain of. Recognizes the importance of using facts to solve engineering problems.	Understands and describes why facts are key to solving engineering problems.	Uses facts to solve engineering problems and employs others to do the same.	Separate facts from assumptions.	Generates facts to support conclusions when solving engineering problems.	Evaluates why decisions are made for validity.
(6) Handles unknowns or open-ended questions effectively.	Defines what the user knows and does not know.	Indicates where information is needed.	Uses proper technique to answer questions that are unknown or open-ended.	Asks questions to gain knowledge in areas that are unknown.	Manages known information to formulate the answer to unknown and open-ended questions.	Uses appropriate skills and techniques to estimate the answer to unknown and open-ended questions.
(7) Demonstrates openness to new ideas.	Can identify the value of the perspectives of other people's ideas in relation to solving an engineering problem.	Recognizes the importance of receiving new ideas to solve engineering problems.	Uses knowledge to demonstrate an openness to apply new ideas to solve engineering problems.	Can compare and contrast new ideas versus existing ideas.	Collects new idea information from multiple sources.	Can assess the effectiveness of each new idea. Can judge new concepts fairly.

(8) Demonstrates the ability to apply theoretical concepts to practical problem solving.	Can identify applicable theory and recognize past history when solving practical engineering problems.	Can indicate how theory can be applied in practice.	Can use theoretical concepts to develop solutions to solve practical engineering problems.	Can breakdown theory concepts and analyze their relationship to solving practical engineering problems.	Relates theoretical concepts to practical problem solving.	Can interpret results using theoretical concepts as supporting evidence.
(9) Uses appropriate resources to locate pertinent information.	Can recall appropriate resources to utilize to obtain information.	Understands what resources to use to locate information for problem solving.	Uses resources adequately to obtain information. Demonstrates knowledge of appropriate resources to use.	Identifies and selects appropriate resources needed to gather information.	Collects a list of resources to gather information necessary to solve the problem at hand.	Appraises information resources needed to gather information.
(10) Estimates Outcomes.	Can list and describe various outcomes for solving engineering problems.	Can describe and defend alternatives to estimate outcomes.	Applies knowledge of information and data with respect to alternatives to predict outcomes.	Analyzes, and calculates outcomes to engineering problems.	Collects possible outcomes to a given engineering problem.	Can interpret the given information and predict possible outcomes.
(11) Compares calculations to estimates to check for errors.	Can recognize errors when comparing the estimate to the final calculation.	Identifies calculation errors when comparing the estimate to the final calculation.	Uses mathematical skills to discover errors associated with the estimate and the final calculation.	Can compare results to estimates to identify errors.	Relates calculation results to estimations to verify data.	Can evaluate calculations to see if the solutions adhere to expected values/units.
(12) Develops criteria for the evaluation of proposed solutions.	Can define and list key components that a proposed solution should consider.	Can create and classify criteria used to evaluate proposed solutions.	Demonstrates knowledge of engineering principles necessary for developing criteria.	Can categorize information into criteria for the evaluation of proposed solutions.	Construct a list of criteria that addresses the problem and for the solutions to adhere to.	Can generate criteria necessary to make judgements about proposed solutions.
(13) Constructs a problem statement.	Can define and outline problem variables and information given, to construct a problem statement.	Uses the principles and theories of engineering to clearly define a problem statement.	Uses information and knowledge to construct a problem statement effective for problem solving.	Can analyze the problem variables to develop a problem statement.	Combine and relate problem variables into a problem statement.	Selects information useful in constructing a problem statement.
(14) Generates ideas for possible solutions.	Recalls on past experience as a foundation for identifying new ideas.	Can create and describe new ideas to be used for solving engineering problems.	Uses knowledge and information to produce many ideas for possible solutions to solve engineering problems.	Can analyze and identify ideas that can be used to solve engineering problems.	Generate a list of ideas that can contribute to possible problem solutions.	Evaluate solutions on their ability to solve a given problem.
(15) Selects most appropriate solutions based on solution criteria.	Can list all possible solutions and solution criteria.	Can explain and select the "best" solution using a set of criteria.	Uses knowledge, information and skills to select the "best" solution based on a set of criteria.	Has the ability to compare and to contrast solutions to select the "best" based on a set of criteria.	Assemble a collection of solutions that adhere to the given solution criteria.	Chooses the "best" solution based on the solution criteria by using all of the evidence for support.
(16) Selects and documents the solution to be recommended.	Selects most appropriate solution based on criteria.	Can explain and describe in writing the engineering problem solution.	Demonstrates knowledge of the engineering problem to be solved. Can choose and write problem solution description.	Can compare and contrast solutions to select the "best" solution. Can illustrate in writing the solution to be recommended.	Prepare and write documentation that recommends and explains a solution.	Uses facts when selecting solution to engineering problem. Provides detailed documentation of the recommended solution.
(17) Collects feedback for continuous improvement.	Ability to identify suitable sources of useful feedback.	Recognizes the importance obtaining feedback from others for continuous improvement.	Obtains and documents feedback of others for continuous improvement.	Can analyze feedback to select the appropriate feedback that can be used for continuous improvement.	Compose a list of positive feedback that can lead to future improvement.	Evaluate feedback to determine if useful for future improvements.

(18) Uses a basic knowledge of social sciences in the formulation of problem solutions.	Relates social science knowledge when formulating an engineering problem solution.	Has basic knowledge and understanding of the social sciences with respect to forming engineering problem solutions.	Can apply social science knowledge when forming engineering problem solutions.	Can relate the basic knowledge of social sciences to formulate engineering problem solutions.	Relates social science knowledge to formulate engineering problem solutions.	Justify problem solutions with knowledge of social sciences.
(19) Applies basic knowledge of management to problem solving.	Describes the responsibilities of management, and relates it to problem solving.	Has basic knowledge of management techniques and applications.	Can apply basic management knowledge towards solving engineering problems.	Can relate the basic knowledge of management to solve engineering problems.	Relates management knowledge to engineering problem solving.	Appraise solutions from a managerial point of view.
(20) Uses appropriate resources to locate pertinent information.	Can define and describe resources needed to locate information. Can list where to find the resources and how they are used.	Understands what resources to use to locate information for problem solving.	Uses information and knowledge to construct a problem statement effective for problem solving.	Identifies and selects appropriate resources needed to gather information.	Collects a list of resources to gather information necessary to solve the problem at hand.	Appraise information resources needed to gather information.
(21) Estimates outcomes.	Can list and describe various outcomes for solving engineering problems.	Can describe and defend alternatives to estimate outcomes.	Applies knowledge of information and data with respect to alternatives to predict outcomes.	Analyzes, and calculates outcomes to engineering problems.	Collects possible outcomes to a given engineering problem.	Interpret the given information and predict possible outcomes.
(22) Compares calculations to estimates to check for errors.	Can recognize errors when comparing the estimate to the final calculation.	Identifies calculation errors when comparing the estimate to the final calculation.	Uses mathematical skills to discover errors associated with the estimate and the final calculation.	Can compare results to estimates to identify errors.	Relates calculation results to estimations to verify data.	Uses mathematical skills to discover errors associated with the estimate and the final calculation.
(23) Develops criteria for the evaluation of proposed solutions.	Can define and list key components that a proposed solution should consider.	Can create and classify criteria used to evaluate proposed solutions.	Demonstrates knowledge of engineering principles necessary for developing criteria.	Can categorize information into criteria for the evaluation of proposed solutions.	Construct a list of criteria that addresses the problem and for the solutions to adhere to.	Can generate criteria necessary to make judgements about proposed solutions.
(24) Constructs models of physical systems, which incorporate those effects necessary to achieve the required accuracy by correctly estimating appropriate magnitudes for parameters and inputs.	Can define methods of information gathering to acquire an accurate estimate.	Can classify and identify useful methods of information gathering for the physical system model.	Uses knowledge to construct models of physical systems.	Analyze and examine individual components of the physical system and determine the appropriate accuracy needed.	Generate a model of a physical system within an acceptable order of magnitude.	Appraise the accuracy of the model against an actual physical system that it is simulating.
(25) Applies the appropriate "conservation" principles of total mass, linear momentum, angular momentum, energy, and charge to model physical systems.	Can relate principles of physics to engineering problem solving.	Can predict the behavior of a system in terms of the physical properties of particles and energy.	Uses knowledge of the principles of total mass, linear momentum, angular momentum, energy, and charge to model physical systems.	Break down the physical system in terms of mass, linear momentum, angular momentum, energy and change.	Explain the physical model as a whole, adhering to the basic principles of physics and conservation.	Evaluate calculations to insure the laws of conservation are held.
(26) Applies the principles of the 2 nd law of thermodynamics to predict upper bounds on the performance of thermodynamic cycles.	Can relate the principles of the 2 nd law of thermodynamics to engineering problem solving.	Can estimate a physical system's performance and efficiency with the second law of thermodynamics.	Demonstrates and applies knowledge of the principles of the 2 nd law of thermodynamics to predict upper bounds on the performance of thermodynamic cycles.	Determine those components of the physical model that can be analyzed with the second law of thermodynamics.	Explain the physical model as a whole to determine the upper bounds on performance of thermodynamic cycles, adhering to the second law of thermodynamics.	Evaluate calculations to insure the second law of thermodynamics is held.
(27) Judges, interprets, and explains the results of modeling by relating the results to the fundamental laws of physics.	Can relate the results of the physical model to the fundamental laws of physics.	Can summarize the results of a physical model and it's relation to the fundamental laws of physics.	Interpret the results of modeling in terms of the fundamental laws of physics.	Identify the results of modeling that relate to the fundamental laws of physics.	Summarize the results of physical modeling and the applicable principles of physics.	Judges, interprets, and explains the results of modeling by relating the results to the fundamental laws of physics.
(28) Applies the appropriate principles of chemistry to model engineering systems.	Can relate the principles of chemistry to model engineering systems.	Can explain the chemical properties of the engineering system model.	Illustrate an engineering system using the principles of chemistry.	Distinguish the applicable properties of chemistry to analyze the engineering system.	Uses the principles of chemistry where appropriate to model engineering systems.	Interpret the data from an engineering system and how it relates and adheres to the principles of chemistry.
(29) Makes appropriate and necessary chemical-	Can identify which assumptions can be made safely without damaging the integrity	Can estimate the necessary chemical-related parameters and inputs for engineering	Uses knowledge of chemistry to make accurate assumptions.	Analyze each parameter and input to the engineering system to determine the needed	Formulate a list of chemical-related assumptions to feed into the engineering system.	Appraise each chemical-related assumption to yield the desired result.

related assumptions for parameters and inputs to enable models to provide the required accuracy.	of the data.	system models.		accuracy.		
(30) Applies the principles of chemistry to account for species mass in engineering systems.	Relates the principles of chemistry to account for species mass in engineering systems.	Can describe and explain species mass in engineering systems with chemical principles.	Uses knowledge of chemistry to compute mass in engineering systems.	Analyze species mass using the principles of chemistry in engineering systems.	Combine the necessary principles of chemistry to analyze species mass in engineering systems.	Describe species mass in an engineering system with the fundamental principles of chemistry.
(31) Interprets and explains the results of modeling based on the fundamental laws of chemistry.	Can relate the results of the physical model to the fundamental laws of chemistry.	Can explain and report the details of the results of modeling based on the fundamental laws of chemistry.	Applies knowledge of the fundamental laws of chemistry to analyze the results of the physical model.	Contrast individual results from modeling to the fundamental laws of chemistry.	Uses the fundamental laws of chemistry to support the evaluation of the results of modeling.	Evaluate results of an engineering model and compares them to the fundamental laws of chemistry.
(32) Demonstrates knowledge of the role of mathematics as a tool in modeling systems.	Can relate the results of the physical model to mathematics.	Can describe the relation between the physical model and the underlying mathematical principles.	Uses mathematics knowledge as a tool when modeling systems.	Relate the role of mathematics in modeling physical and engineering systems.	Relate the role of mathematics in modeling engineering systems.	Interpret an engineering model with mathematical theory and principles.
(33) Demonstrates understanding of functional relationships.	Can relate different mathematical functions to each other.	Estimate the outcomes of functions based on the behavior of other functions.	Can manipulate functions to solve for other relative functions.	Examine the properties of functional relationships.	Generates a series of relevant functions to an engineering model and relates them to one another.	Interpret the meaning of the relationships between functions.
(34) Distinguishes between change, rate of change, and integrals of functions.	Can recall basic knowledge of calculus.	Can classify change, rate of change and integrals of functions. Can describe the differences and similarities between each.	Can compute and solve basic calculus problems.	Distinguish the individual qualities and properties of change, rate of change and integrals.	Formulate elementary principles of calculus in modeling engineering systems.	Contrast the concepts of change, rate of change and integration from calculus.
(35) Constructs and solves a mathematical model that is appropriate for the accuracy required.	Can state appropriate hypothesis and theorems to create mathematical models.	Can explain the relevance of the hypothesis and theory to the mathematical model.	Produce results from a mathematical model that has the needed accuracy.	Can break down components of a mathematical model, and analyze each section independently.	Can assemble and synthesize individual components to solve a mathematical model with accuracy.	Appraise and evaluate the level of accuracy of: mathematical model.
(36) Makes appropriate and necessary mathematics-related assumptions to enable models to provide the required accuracy.	Can recall basic mathematical and statistical knowledge to support assumptions made to achieve accuracy.	Understands the mathematics-related assumptions to enable models to provide the required accuracy.	Use mathematical knowledge to make assumptions about an engineering model.	Distinguish the needed levels of accuracy in the various areas of an engineering model.	Construct and propose mathematical assumptions to generate the required accuracy.	Assess and judge assumptions to see if they support the needed accuracy.
(37) Judges, interprets and explains the results of engineering systems that are due to the mathematics employed.	Can define and describe the results of engineering systems by recalling mathematical knowledge.	Can employ the mathematical knowledge needed and express how it relates to the engineering system.	Interpret mathematical aspects of an engineering system's results.	Examine each of the results from an engineering system in terms of its mathematical properties.	Summarize the results of engineering systems and the applicable principles of mathematics.	Judges, interprets, and explains the results of modeling by relating the results to the principles of mathematics.

ABET f—An Understanding of Professional and Ethical Responsibility

Definitions	knowledge	comprehension	Application	analysis	synthesis	evaluation
Bloom's Definition:	Remembering previously learned information	Grasping the meaning of information	Applying knowledge to actual situations	Breaking down objects or ideas into simpler parts and seeing how the parts relate and are organized	Rearranging component ideas into a new whole	Making judgments based on internal evidence or external criteria
Verbs	Arrange, define, describe, duplicate, identify, label, list, match, memorize, name, order, outline, recognize, relate, recall, repeat, reproduce, select, state	Classify, convert, defend, describe, discuss, distinguish, estimate, explain, express, extend, generalize, give example(s), identify, indicate, infer, locate, paraphrase, predict, recognize, rewrite, report, restate, review, select, summarize, translate	Apply, change, choose, compute, demonstrate, discover, dramatize, employ, illustrate, interpret, manipulate, modify, operate, practice, predict, prepare, produce, relate, schedule, show, sketch, solve, use, write	Analyze, appraise, break down, calculate, categorize, compare, contrast, criticize, diagram, differentiate, discriminate, distinguish, examine, experiment, identify, illustrate, infer, model, outline, point out, question, relate, select, separate, subdivide, test	Arrange, assemble, categorize, collect, combine, comply, compose, construct, create, design, develop, devise, explain, formulate, generate, plan, prepare, propose, rearrange, reconstruct, relate, reorganize, revise, rewrite, set up, summarize, synthesize, tell, write	Appraise, argue, assess, attach, choose, compare, conclude, contrast, defend, describe, discriminate, estimate, evaluate, explain, judge, justify, interpret, relate, predict, rate, select, summarize, support, value
(1) Demonstrates an ability to make informed ethical choices		User can identify concrete facts from intangible assumptions in a given situation.	When making an informed ethical decision the user can: Use knowledge to identify specific information to consider; use knowledge to identify the impacts (short-term and long-term); use the perspectives of other people; use knowledge to gain information.	User can separate facts from assumptions in order to distinguish where more information is needed.	The newly acquired facts are then collected and combined with the information surrounding the ethical decision being made.	Defend the newly acquired information in terms of their validity to support the ethical decision being made.

(2) Demonstrates knowledge of a professional code of ethics	User can identify the codes of conduct that a professional engineer should behave by.	User can describe their professional code of ethics; identify and characterize one different from their own; has a general knowledge of the impacts.	Shows knowledge of a professional code of ethics when considering possible alternatives during decision-making.	Can identify and analyze components of a decision independently of each other in terms of ethical guidelines.	Relates components of an ethical decision together in order to abide by their professional code of ethics.	Evaluate and judge a situation and possible further actions in terms of their professional code of ethics.
(3) Evaluates the ethical dimensions of professional engineering and scientific practice	Can identify and define ethical issues concerning a decision, which can impact the individual, the company and the public.	Can describe ethical issues and how they effect the individual, the company and the public.	Can apply ethics when practicing engineering or science in a professional environment.	Can identify cost, schedule and risk components in terms of ethics when evaluating professional engineering and scientific practice.	Can combine cost, schedule and risk components together to make an informed ethical decision.	User can evaluate the value and credibility of information and their sources to make sound judgements.
(4) Demonstrates ethical practice	Uses information to identify knowledge gaps. User can recognize the cost, schedule and risk components in terms of ethical issues.	User can integrate and describe ethical components used in practice (cost, schedule and risk) along with their professional code of ethics.	Uses knowledge, information, and the perspectives of other people to evaluate all of the impacts (short-term and long-term) when performing the task of making an ethical decision. Practices team concepts.	Can identify where knowledge is needed for competency, communication of information in a responsible manner, and the awareness of public safety concerns.	Can combine ethical components in terms of behavior (competence, responsibility, and public safety) of an ethical decision together to make an informed ethical choice.	Evaluate and judge a situation in practice, using facts and a professional code of ethics.

Learning Outcomes/Attributes
Learning Outcomes/Attributes

ABET 3g—An ability to communicate effectively

Definitions	knowledge	comprehension	application	analysis	synthesis	evaluation	vs
Bloom's Definition:	Remembering previously learned information	Grasping the meaning of information	Applying knowledge to actual situations	Breaking down objects or ideas into simpler parts and seeing how the parts relate and are organized	Rearranging component ideas into a new whole	Making judgments based on internal evidence or external criteria	Sensitive to receive w/o assessment; willing to judge; respond; commit; satisfaction (acceptance); preference (when v)
Verbs	Arrange, define, describe, duplicate, identify, label, list, match, memorize, name, order, outline, recognize, relate, recall, repeat, reproduce, select, state	Classify, convert, defend, describe, discuss, distinguish, estimate, explain, express, extend, generalize, give example(s), identify, indicate, infer, locate, paraphrase, predict, recognize, rewrite, report, restate, review, select, summarize, translate	Apply, change, choose, compute, demonstrate, discover, dramatize, employ, illustrate, interpret, manipulate, modify, operate, practice, predict, prepare, produce, relate, schedule, show, sketch, solve, use, write	Analyze, appraise, break down, calculate, categorize, compare, contrast, criticize, diagram, differentiate, discriminate, distinguish, examine, experiment, identify, illustrate, infer, model, outline, point out, question, relate, select, separate, subdivide, test	Arrange, assemble, categorize, collect, combine, comply, compose, construct, create, design, develop, devise, explain, formulate, generate, plan, prepare, propose, rearrange, reconstruct, relate, reorganize, revise, rewrite, set up, summarize, synthesize, tell, write	Appraise, argue, assess, attach, choose, compare, conclude, contrast, defend, describe, discriminate, estimate, evaluate, explain, judge, justify, interpret, relate, predict, rate, select, summarize, support, value	Accept, defend, question, enjoy
(1) Communicates information, concepts, and ideas effectively in writing	identifies and repeats standard formats; recalls and reproduces standard grammar and mechanics; recognizes elements of the writing process	summarizes and paraphrases accurately; classifies various audiences and purposes	employs the writing process; produces a variety of documents using appropriate formats, grammar, and mechanics; uses discipline-specific conventions	analyzes and criticizes arguments effectively; selects and uses appropriate style and content for various audiences and purposes	constructs a logical argument using evidence for support; designs, writes and revises documents appropriate for various audiences and purposes	argues effectively using evidence; evaluates one's own and others' logic and organization; selects appropriate format, content, organization, and tone for various audiences and purposes	has confidence using a communication tool; a role plays in academic professional writing; learns to think

(2) Orally communicates information, concepts, and ideas effectively	recalls and repeats information in oral presentations, often from memory; has difficulty responding to questions	paraphrases or summarizes information in oral presentations; restates and/or gives examples when questioned	uses appropriate presentation techniques (e.g. maintains eye contact, modulates voice, does not use distracting gestures, etc.); uses process strategies to prepare presentations	outlines and selects appropriate material to include in oral presentation depending on analysis of audience and purpose; analyzes and appraises when questioned	plans, prepares and delivers a well-organized, logical oral presentation; reconstructs, explains when questioned	listens carefully and responds to questions appropriately; is able to explain and interpret results for various audiences and purposes	has confidence in using presentation as a communication tool; appropriate role play in academic professional care
(3) Graphically communicates information, concepts, and ideas	recognizes and duplicates graphics conventions	selects and restates graphics conventions	uses professional graphics in written and oral presentations; uses appropriate graphics conventions (e.g. formats, captions, titles, axes, legends, etc.)	analyzes data using graphical techniques; illustrates concepts using graphics; identifies appropriate uses of graphics in written and oral presentations	creates effective professional graphics for a variety of audiences and purposes; explains complex concepts through graphics	argues effectively using graphics; uses graphics to explain, interpret, and assess information; evaluates graphical arguments based on logic, evidence, and presentation	has confidence in using graphics communication tool; appropriate role play in academic professional care

(4) Can acquire and use information from a variety of sources, including electronic retrieval systems	identifies various information sources	summarizes and reports information accurately	gathers information from a variety of sources; uses information to produce technical reports and solve problems	analyzes information; tests the credibility of information sources; selects state-of-the-art information in his/her discipline	concisely and precisely summarizes and synthesizes information	reads critically and evaluates the credibility of information sources including the effectiveness of claims and supporting evidence; discriminates between various audiences and purposes and designs communications appropriate for them	values ability to retrieve information; has ability to retrieve and information
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Attributes for Outcome H - The broad education necessary to understand the impact of engineering solutions in a global and societal context.

Definitions	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Bloom's Definition:	Remembering previously learned information	Grasping the meaning of information	Applying knowledge to actual situations	Breaking down objects or ideas into simpler parts and seeing how the parts relate and are organized	Rearranging component ideas into a new whole	Making judgments based on internal evidence or external criteria
Verbs:	Arrange, define, describe, duplicate, identify, label, list, match, memorize, name, order, outline, recognize, relate, recall, repeat, reproduce, select, state	Classify, convert, defend, describe, discuss, distinguish, estimate, explain, express, extend, generalized, give example(s), identify, indicate, infer, locate, paraphrase, predict, recognize, rewrite, report, restate, review, select, summarize, translate	Apply, change, choose, compute, demonstrate, discover, dramatize, employ, illustrate, interpret, manipulate, modify, operate, practice, predict, prepare, produce, relate schedule, show, sketch, solve, use, write	Analyze, appraise, breakdown, calculate, categorize, compare, contrast, criticize, diagram, differentiate, discriminate, distinguish, examine, experiment, identify, illustrate, infer, model, outline, point out, question, relate, select, separate, subdivide, test	Arrange, assemble, categorize, collect, combine, comply, compose, construct, create, design, develop, devise, explain, formulate, generate, plan, prepare, propose, rearrange, reconstruct, relate, reorganize, revise, rewrite, set up, summarize, synthesize, tell, write	Appraise, argue, assess, attach, choose, compare, conclude, contrast, defend, describe, discriminate, estimate, evaluate, explain, judge, justify, interpret, relat, predict, rate, select, summarize, support, value
Outcome Element Understand the impact of engineering solutions in a <i>global</i> context Global - meaning to cross cultures and societies, example areas of impact include, but not limited to, environmental, political, and economic.	Can define key terms associated with understanding global issues. Lists the steps in a method for identifying impacts of an engineering solution that crosses cultures or societies. Can name sources of global impact knowledge. Describes how nations and peoples around the globe are related. Can recall the impacts of several engineering solutions, recent and historical, and their anticipated and unanticipated impacts Student can identify a variety of types of impacts for a engineering solution (i.e. environmental, political, economical). Can identify criteria to be considered when an engineering solution has a global presence (e.g., language issues, different safety standards, etc.)	Can describe situations where society has become more global. Can explain an illustration of how modern technologies have had a global impact (e.g. chemicals in environment, telecommunications). Can classify types of impacts an engineering solution in a global context. Can recognize examples where solving one engineering problem led to the development of other engineering-related problems (ex. development of nuclear energy to reduce depletion of oil results in increased nuclear waste; development of antibiotics to help reduce bacterial infections results in an evolution of more resistant strains of bacteria)	Can identify potential impacts, both short and long term, of an engineering solution currently being proposed. Uses knowledge about the interrelationships of peoples and environments around globe to identify impacts of engineering solutions. Identifies the relevant groups of people and environmental systems that need to be considered when evaluating an engineering solution.	Appraises the actual impacts of an engineering solution into the appropriate impacts	Summarizes the interrelated aspects of engineering solutions Incorporates gained knowledge of potential and actual impacts into the design process of an engineer.	Can assess conflicting / competing tradeoffs in order to make informed decisions about engineering solutions. Judges the acceptability of the impacts of an engineering solution

Definitions	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Bloom's Definition:	Remembering previously learned information	Grasping the meaning of information	Applying knowledge to actual situations	Breaking down objects or ideas into simpler parts and seeing how the parts relate and are organized	Rearranging component ideas into a new whole	Making judgments based on internal evidence or external criteria
Verbs:	Arrange, define, describe, duplicate, identify, label, list, match, memorize, name, order, outline, recognize, relate, recall, repeat, reproduce, select, state	Classify, convert, defend, describe, discuss, distinguish, estimate, explain, express, extend, generalized, give example(s), identify, indicate, infer, locate, paraphrase, predict, recognize, rewrite, report, restate, review, select, summarize, translate	Apply, change, choose, compute, demonstrate, discover, dramatize, employ, illustrate, interpret, manipulate, modify, operate, practice, predict, prepare, produce, relate schedule, show, sketch, solve, use, write	Analyze, appraise, breakdown, calculate, categorize, compare, contrast, criticize, diagram, differentiate, discriminate, distinguish, examine, experiment, identify, illustrate, infer, model, outline, point out, question, relate, select, separate, subdivide, test	Arrange, assemble, categorize, collect, combine, comply, compose, construct, create, design, develop, devise, explain, formulate, generate, plan, prepare, propose, rearrange, reconstruct, relate, reorganize, revise, rewrite, set up, summarize, synthesize, tell, write	Appraise, argue, assess, attach, choose, compare, conclude, contrast, defend, describe, discriminate, estimate, evaluate, explain, judge, justify, interpret, relat, predict, rate, select, summarize, support, value
Outcome Element: Understand the impact of engineering solutions in a <i>societal</i> context Societal – meaning issues associated with the groups of people and their beliefs, practices and needs	Can describe the key features characterizing an individual perspective Can identify a variety of practices, methods that others use Can define key terms associated with understanding societal context Can identify milestones in the evolution of current society, global society. Can state differences in needs that result from diversity in society Can state ways in which modern society is diverse. Can identify different facets by which an engineered solution impacts modern society (e.g. aesthetics, religion, economics) Can name sources of societal impact knowledge.	Can identify and characterize different perspectives (beliefs, practices, etc.). Can compare various practices/perspectives to identify similarities and differences. Can describe the role that science, technology and engineering has played in the development of modern society. Can describe how ideas and customs from other cultures have contributed to the engineering discipline and/or modern society.	Can explain engineering conflicts in terms of differences of perspectives. Can identify alternative mechanisms for solving a given problem. Can use knowledge to identify impacts of an engineering solution Can use knowledge of the ways in which ideas and customs from other cultures have contributed to modern life in order to support the identification of the impact of engineering solutions. Can identify the key attributes of perspective different from their own.	Appraises the failure of an engineering solution and investigate the role that unanticipated impacts played in the failure of the solution. Can appraise alternative mechanisms for solving a conflict of a society's perspective.	Can critically evaluate the strengths and weaknesses of their own perspectives Can assess conflicting / competing tradeoffs in order to make informed decisions about engineering solutions. Judges the acceptability of the impacts of an engineering solution	

Outcome I. A recognition of the need for, and an ability to engage in life-long learning (**Updated 6/9/99**)

Taxonomy Level:	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Bloom's Definition:	Remembering previously learned information	Grasping the meaning of information	Applying knowledge to actual situations	Breaking down objects or ideas into simpler parts and seeing how the parts relate and are organized	Rearranging component ideas into a new whole	Making judgments based on internal evidence or external criteria
Verbs:	Arrange, define, describe, duplicate, identify, label, list, match, memorize, name, order, outline, recognize, relate, recall, repeat, reproduce, select, state	Classify, convert, defend, describe, discuss, distinguish, estimate, explain, express, extend, generalize, give example(s), identify, indicate, infer, locate, paraphrase, predict, recognize, rewrite, report, restate, review, select, summarize, translate	Apply, change, choose, compute, demonstrate, discover, dramatize, employ, illustrate, interpret, manipulate, modify, operate, practice, predict, prepare, produce, relate, schedule, show, sketch, solve, use, write	Analyze, appraise, breakdown, calculate, categorize, compare, contrast, criticize, diagram, differentiate, discriminate, distinguish, examine, experiment, identify, illustrate, infer, model, outline, point out, question, relate, select, separate, subdivide, test	Arrange, assemble, categorize, collect, combine, comply, compose, construct, create, design, develop, devise, explain, formulate, generate, plan, prepare, propose, rearrange, reconstruct, relate, reorganize, revise, rewrite, set up, summarize, synthesize, tell, write	Appraise, argue, assess, attach, choose, compare, conclude, contrast, defend, describe, discriminate, estimate, evaluate, explain, judge, justify, interpret, relate, predict, rate, select, summarize, support, value
Outcome element: Demonstrates reading, writing, listening and speaking skills	Ability to list the skills necessary for reading, writing, listening, and speaking.	Ability to give examples of where the skills for effective reading, writing, listening, and speaking lead to success in life.	Ability to apply the skills necessary for reading, writing, listening, and speaking to each situation (i.e. school, job, everyday life).	Ability to analyze how the skills facilitate the communication process.	Ability to develop and organize the skills necessary for reading, writing, listening, and speaking in order to take in information and express it to others in a comprehensive manner.	Ability to evaluate the effectiveness of the skills necessary for reading, writing, listening, and speaking as it relates to the communication process.
Demonstrate an awareness of what they need to learn	identify the tools needed in order to conduct research and develop independent learning skills	explain how awareness of what has been learned will enhance research and independent learning skills	apply what has been learned to an actual project	examine what has been learned and point out how learning relates to project outcome	integrate learning outcomes	assess the impact awareness has on the amount and quality of learning
Following a learning plan	define the elements that go into developing a learning plan	select elements of the learning plan and describe them	apply the learning plan to an actual research project or independent learning opportunity	analyze the learning plan for effectiveness	develop a learning plan	evaluate alternative learning plans for future projects
Identifying, retrieving, and organizing information	recall previously learned information	discuss the meaning of the information	use the information learned in actual situations	identify how the information is interrelated	organize the information categorically	judge the information based on various criteria
Understand and remember new information	memorize new information	convert the new information into own personal mode of understanding	apply the new information to an actual situation	compare and contrast new information with previously learned information	integrate new information with previously existing information	summarize and evaluate integrated information
Demonstrate critical thinking skills	memorize facts, formulas, theories, etc	explain facts, formulas, theories, etc. in own words	apply the facts, formulas, theories, etc. to everyday situations	question the meaning behind the facts, formulas, theories, etc.	synthesize all of the facts, formulas, theories, etc. into a comprehensive way of understanding	assess extent of understanding of skills and ability to use them
Demonstrate ability to reflect on own understanding	recall own understanding of information learned	identify the ways in which information is learned	illustrate how information is applied in various situations	analyze how well material is being learned and understood	modify mental strategies for better understanding	evaluate thinking skills

Cotton, K. (1998). Lifelong learning skills for the preschool/kindergarten child: Tips for parents. Portland, OR: Northwest Regional Laboratory.

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Knapper, C. K., & Cropley, A. J. (1980). Lifelong learning and higher education: Implications for teaching. University of Waterloo, Waterloo, Ontario, Canada.

Taxonomy Level:	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
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Outcome Element: Ability to address the major socio-economic issues facing US and world	List and describe the major socio-economic issues; e.g., global warming; over population; depletion of natural resources; energy and water supplies; nuclear waste and proliferation; environmental pollution; disease; trade; human rights, etc. Have study abroad experience	Able to discuss, in-depth, several of these issues; summarize cogent aspects; recognize consequences; take and defend a position.	Able to examine a specific area, country or scenario relative to one or more of these issues; able to discuss implications.	Ability to analyze an issue from a "systems" perspective; develop a model or abstraction of the situation; make and defend simplifying assumptions; exercise model to draw inferences to assist in decision making.	Ability to design a system or strategy that addresses a particular issue in a given scenario or location. Ability to propose out-of-the-box alternatives; formulate alternative solutions.	Able to evaluate alternative solutions, or scenarios using a series of different measures – e.g., economic, quality of life; number of individuals affected; global ramifications; etc.
Definitions	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Outcome Element: Ability to address political issues at nation, state and local levels.	Can list and describe major political issues at national, state and local levels. Can list major candidates – senators, representatives, governors, mayors and describe their positions on important issues..	Able to discuss in-depth major political issues at national, state and local levels. Can summarize essence of several issues; take and defend a position on them.	Able to examine the ramifications of one or more of these issues on a specific population or cohort.	Ability to analyze a political issue from a "systems" perspective; develop a model or abstraction of the situation; make and defend simplifying assumptions; exercise model to draw inferences to assist in decision making.	Ability to design a system or strategy that addresses a particular political issue relative to a given scenario or location.	Able to evaluate alternative political solutions, or scenarios using a series of different measures –e.g., economic, quality of life; number of individuals affected, political ramifications; etc.

Outcome K: Graduates have an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (Updated 6/12/99)

Taxonomy Level:	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
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Outcome Element: Use modern engineering techniques, skills, and tools such as computer software, simulation packages, and diagnostic equipment.	Lists available techniques, skills, and tools available to a specific engineering discipline.	Classifies the role of each technique, skill, and tool in solving engineering problems, studying the performance of existing processes or systems, and/or developing designs.	Uses engineering techniques, skills, and tools including computers to solve engineering problems. Uses engineering techniques, skills, and tools including computers to monitor performance of engineering systems and/or create engineering designs. Uses engineering techniques, skills, and tools to acquire information needed for decision-making.	Compares results from computer software or simulators with system performance or results from alternative calculation methods including heuristics. Selects appropriate techniques and tools for a specific engineering task.	Combines the use of two or more tools and techniques to solve an engineering problem or develop an engineering design. Combines use of engineering tools plus system operating information to find optimal operating conditions. Combines results from heuristic calculations, graphical analysis, and computer simulation to support decision-making.	Evaluates which techniques or tools are most appropriate to complete a specific engineering task. Compares results from several engineering tools to determine which best explains "reality."