



Course Portfolio Assignment

Introduction:

Program outcomes are statements that describe what the students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviours that students acquire in their matriculation through the program. The ME (AE) Program at KAU has defined 11 outcomes, which are identical to the ABET a to k outcomes, as follows:

- a. An ability to apply knowledge of mathematics, science, and engineering
- b. An ability to design and conduct experiments, as well as to analyze and interpret data
- c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d. An ability to function on multi-disciplinary teams
- e. An ability to identify, formulate, and solve engineering problems
- f. An understanding of professional and ethical responsibility
- g. An ability to communicate effectively
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i. A recognition of the need for, and an ability to engage in life-long learning
- j. A knowledge of contemporary issues
- k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Critical Outcomes:

Although the present course is assumed to address several outcomes, it was designated as a *key course* to address only 2 of them; namely outcomes (**X and Y**)^{*}. These 2 outcomes are considered as the *critical outcomes* of this course. Several learning activities in this course are expected to address these 2 outcomes. Also some assessment tools are designed to give you the chance to demonstrate that you have mastered the same outcomes. You are advised to refer to the course articulation matrix to define the course learning objectives, topic, and assessment tools related to these outcomes.

Your Task:

You are asked to prepare a *course portfolio* as a showcase to display convincing evidences that you mastered these 2 outcomes. Those convincing evidences, known as *artifacts*, are nothing but carefully selected examples of the work you developed throughout this course. This could be one of the following if it is directly related to the considered outcome:

1. Homework assignments
2. Reports
3. Written exams or exam items
4. Written project reports
5. Written critiques of documents or oral presentations
6. Oral presentations (live or on videotape)
7. Research proposals, student-formulated problems
8. Abstracts, executive summaries or term papers

Rules for Submitting Your Portfolio:

The portfolio is considered as an assignment to which 10% of the course grade is allocated. It is to be submitted *one week* before the final exam and should be arranged according to the *Contents of the portfolio* described hereafter. A student who fails to submit the portfolio on time will not be allowed to sit for his final exam. The best portfolio will receive 5% of the course grade as bonus and will be selected for inclusion in the Aeronautical Engineering Program Binder for the present semester.

You need to select at least 2 artifacts per outcome to include in your portfolio. The artifacts should represent convincing evidences to any reader of your portfolio that you mastered the corresponding outcome. This will be insured using the corresponding Outcome Assessment Rubric. If you consider that one artifact represents convincing evidences of achievement of several critical outcomes, you need to make copies of this artifact to be inserted in the respective outcome divider.

The portfolio itself will be evaluated using the Portfolio Assessment Rubric. Consult the *Assessment Rubrics Appendices* of the present document which is included to help you to identify what is required.

Contents of the Portfolio:

A course portfolio should be prepared by the students taking the course and should contain the following items:

- Cover page
- Portfolio Assessment Rubric
- Table of contents
- Introduction
- One divider per outcome that contains:
 - At least one introductory page
 - At least 2 artifacts each preceded by the Outcome Assessment Rubric and a reflective statement
- Summative reflective conclusions

The Course Portfolio Introduction is to include at least:

1. Course information
2. Course goals
3. Course learning objectives
4. Course-addressed program outcomes
5. Position of the course in the curriculum
6. How the portfolio is organized

The introductory pages to each outcome should:

1. Summarize what the outcome attributes mean to the student
2. Outline the importance of the outcome to the course and to the student
3. Explain the student's learning experience of the outcome
4. Evaluate the student's achievement level of the outcome attributes

The reflective statement preceding each artifact should answer the following questions:

1. What is the artifact, how was it created, and for what purpose?
2. Why have the student chosen this artifact for inclusion in his portfolio?
 - a. How does it reflect the student's personal learning objectives?
 - b. What meaning does it have in relation to the student's professional growth?
3. Based on the above, what new goals can the student set forward?

Note that reflection is an integral part of your learning process. It is also an important attribute of a life-long learner

The Course Portfolio Summative Conclusions will contain:

1. Course evaluation Survey
2. Course learning objectives survey
3. Course-addressed program outcomes survey
4. Negative and positive points of the course
5. Proposals to improve course offering
6. Advice to other students who plan to take the course.

Assessment Rubrics Appendices:

Rubrics describe to the student and the assessor how the standards set in performance criteria can be met, at varying levels of quality. Rubrics normally include a scale of points to be awarded across all performance levels, such as:

- 'Excellent,' 'Good,' 'Fair,' 'Poor,' and 'Unacceptable',
- '4,' '3,' '2,' and '1,' or simply
- 'Pass', 'Fail'.

Rubrics should focus on identifying the presence or absence of observable items, avoiding vague terms that are difficult to demonstrate (e.g. appreciate, understand) or that could be interpreted in different ways by different assessors (e.g. appropriate, adequate).

This part contains rubrics to be used in your portfolio as follows:

- Portfolio Assessment Rubric to evaluate the whole portfolio. This should be included as the first page of the portfolio just after the title page.
- Assessment Rubrics for outcomes (**X and Y**)*. You need to make several photocopies and attach one copy of the corresponding rubric to each artifact used to address that outcome.

Best wishes.

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- **X and Y** should be replaced by the critical outcomes of the course



Assessment Rubric for Course Portfolio - Part I (To be accompanied by the rubrics for the outcomes to be assessed)*

Assessed Items		4	3	2	1	NA	Points Earned
1	Portfolio Structure	Creative and captures readers attention. Presented with title, table of contents and introduction that contains course information, goals, learning objectives, course-addressed program outcomes, position of the course in the curriculum, and how the portfolio is organized. Professionally written with adequate formatting and are free from linguistic errors.	Presented with title, table of contents and introduction that contains course information, goals, learning objectives, course-addressed program outcomes, position of the course in the curriculum, and how the portfolio is organized. Professionally written with adequate formatting and are free from linguistic errors.	Presented with title, table of contents and introduction that contains course information, goals, learning objectives, course-addressed program outcomes, position of the course in the curriculum, and how the portfolio is organized. Unprofessionally written with inadequate formatting and/or linguistic errors.	Presented with some missing items.		1 X ----- ---
2	Introductory Pages to Each Outcome	Presenting for each required outcome the meaning of the outcome attributes to the student, their importance to the course, the student's learning experience, and his achievement level. Pages are professionally written with adequate formatting and are free from linguistic errors.	Presenting for each required outcome the meaning of the outcome attributes to the student, their importance to the course, the student's learning experience, and his achievement level. Nevertheless introductory pages are written with inadequate formatting and/or linguistic errors.	Either the meaning of the outcome attributes to the student, their importance to the course, the student's learning experience, or his achievement level, is not presented for one or more of the required outcomes.	Introductory pages are missing for one or more of the required outcomes.		2 X ----- ---
3	Reflective Statement Associated with Each Artifact	All reflections address the artifact and explain why and how it was created, why it was chosen for inclusion in the portfolio and indicate which new goals the student can set forward. Reflections are professionally written with adequate formatting and are free from linguistic errors.	All reflections address the artifact and explain why and how it was created, why it was chosen for inclusion in the portfolio and indicate what are the new goals the student can set forward, but they are written with inadequate formatting and/or linguistic errors.	Reflections for some artifacts either do not address the artifact, do not explain why and how it was created, do not indicate why it was chosen for inclusion in the portfolio or do not deal with the new goals the student can set forward.	Reflective statements are missing for one or more of the included artifacts.		3 X ----- ---
4	Summative Reflective Conclusion	Includes thoroughly filled course evaluation survey, course learning objectives survey, and course-addressed program outcomes survey. Negative and positive points of the course are addressed together with proposals to improve course offering, and advices to other students who plan to take the course. Conclusion is professionally written with adequate formatting and is free from linguistic errors.	Includes the 3 thoroughly filled surveys, negative and positive points of the course, proposals to improve course offering, and advices to other students who plan to take the course, but it is written with inadequate formatting and/or linguistic errors.	Includes the 3 thoroughly filled surveys, but some of the other items (negative and positive points of the course, proposals to improve course offering, and advices to other students who plan to take the course) are missing.	Some surveys are missing or not thoroughly filled.		1 X ----- ---

28-26 = A+, 25-23 = A, 22-20 = B+, 19-17 = B, 16-15 = C+, 14-12 = C, 11-10 = D+, 9-7 = D, 6 or less =F



Assessment Rubrics for Program Outcomes

Outcome (a): The artifact demonstrates the student's ability to apply knowledge of mathematics, science, and engineering fundamentals.

Attributes		4	3	2	1	NA
1	Formulates appropriate solution strategies	Can easily convert word problems to equations. Sees what must be done	Forms workable strategies, but may not be optimal. Occasional reliance on brute force	Has difficulty in planning an approach. Tends to leave some problems unsolved	Has difficulty getting beyond the given unless directly instructed	
2	Systematically executes the solution strategy	Consistently implements strategy. Gets correct answers	Implements well. Occasional minor errors may occur	Has some difficulty in solving the problem when data are assembled. Frequent errors.	Often is unable to solve a problem, even when all data are given	
3	Applies engineering judgment to evaluate answers	Has no unrecognized implausible answers	Has no more than one if any unrecognized implausible answers. If any it is minor and obscure	Attempts to evaluate answers but has difficulty. Recognizes that numbers have meaning but cannot fully relate.	Makes little if any effort to interpret results. Numbers appear to have little meaning	



Assessment Rubrics for Program Outcomes

Outcome (b): The artifact demonstrates the student's ability to design and conduct experiments, as well as to analyze and interpret data.

Attributes		4	3	2	1	NA
1	Defines problem	The problem to be solved is clearly stated. Objectives are complete, specific, concise, and measurable. They are written using correct technical terminology and are free from linguistic errors.	The problem to be solved is described but there are minor omissions or vague details. Objectives are conceptually correct and measurable but may be incomplete in scope or have linguistic errors	An attempt is made to identify the problem to be solved but it is described in a confusing manner, objectives are not relevant, contain technical/ conceptual errors or objectives are not measurable.	No mention is made of the problem to be solved.	
2	Identifies variables to be measured	Dependent and independent variables are identified as well as the range for both and the appropriate increments for measurements.	Dependent and independent variables are identified as well as the range for both of them	Dependent and independent variables are identified as well as the range of some of them	Dependent and independent variables are not correctly identified	
3	Identifies appropriate available sensors, instrumentation and/or software tools to measure physical quantities	A complete list of appropriate tools and instrumentation is present with complete justification. All details about how tools and instruments will be used are provided and clear (range and number of data points are optimized to capture full response within equipment limitations).	A complete list of appropriate tools and instrumentation is present with incomplete justification or with vague or incomplete details about how they will be used (range and appropriate number of data points to capture the phenomenon).	The list of appropriate tools and instrumentation is incomplete, the selection is not justified, or no details are given about how they will be used (range and appropriate number of data points to capture the phenomenon)	Failure to identify appropriate tools and instrumentation or some of the chosen measurements cannot be made with the available equipment.	
4	Design a reliable experiment that solves the problem	The experiment solves the problem and has a high likelihood of producing data that will lead to a reliable solution.	The experiment attempts to solve the problem but due to the nature of the design there is a moderate chance the data will not lead to a reliable solution.	The experiment attempts to solve the problem but due to the nature of the design the data will not lead to a reliable solution.	The experiment does not solve the problem.	
5	Deals responsibly with safety and environmental issues related to experimentation.	Measures to deal responsibly with both safety issues and environmental hazards are presented	Measures to deal responsibly either with safety issues or with environmental hazards are presented	Measures to deal with safety and environmental hazards are vague, incomplete, or insufficient	No mention is made to safety or environmental issues related to designed experiment	
6	Identifies, evaluates and minimizes sources of experimental uncertainty	All experimental uncertainties are correctly identified, evaluated, and effective steps are taken to minimize them.	Most experimental uncertainties are correctly identified, evaluated, and effective steps are taken to minimize them.	An attempt is made to identify experimental uncertainties, but most are missing, described vaguely, incorrectly evaluated, or ineffectively minimized.	No attempt is made to identify, evaluate or minimize experimental uncertainties.	
7	Records and represents data in a meaningful way	All important data are present, organized, and recorded clearly.	All important data are present, but recorded in a way that requires some effort to comprehend.	Some important data are absent or incomprehensible.	Data are either absent or incomprehensible.	
8	Analyzes data appropriately	The analysis is appropriate, complete, and correct.	The analysis is appropriate but it contains minor errors or omissions.	An attempt is made to analyze data, but it is either seriously flawed or inappropriate.	No attempt is made to analyze the data.	
9	Makes a reasonable judgment about the results of the experiment	An acceptable judgment is made about the result, with clear reasoning. The effects of assumptions and experimental uncertainties are considered.	An acceptable judgment is made about the result, but the reasoning is flawed or incomplete.	A judgment is made about the results, but it is not reasonable or coherent.	No discussion is presented about the results of the experiment	



Assessment Rubrics for Program Outcomes

Outcome (c): The artifact demonstrates the student's ability to design a system, component, or process to meet desired needs within realistic constraints.

Attributes		4	3	2	1	NA
1	Defines problem	The problem to be solved is clearly stated. Objectives are complete, specific, and concise. Customer needs are correctly identified and transformed into design requirements.	The problem to be solved is described but there are minor omissions or vague details. Objectives are conceptually correct but may be incomplete or badly transformed into design requirements.	An attempt is made to identify the problem to be solved but it is described in a confusing manner, objectives are not relevant or contain technical/ conceptual errors and design requirements are vague, not measurable, or absent.	No mention is made of the problem to be solved.	
2	Plans an effective design strategy	A workable Design strategy is developed, including a plan of attack, decomposition of work into subtasks, development of a timetable	An attempt is made to develop a workable design strategy but it is either incomplete or unclear	Fails to develop a design strategy but is able to follow a design strategy with some guidance	No design strategy; haphazard approach	
3	Develops and compares alternative solutions and selects a baseline design	Develops several potential solutions and compares them to find the best baseline	Develops and compares multiple solutions, but neglects one or two key aspects	Develops and compares multiple solutions to a problem, but neglects several key aspects	Only focuses on one solution to a problem.	
4	Considers realistic constraints	Developed solutions include economic, safety, environmental and other realistic constraints	Developed solutions include only minor or cursory consideration of economic, safety, and environmental constraints	No consideration of economics, safety, and environment	Developed solutions obviously violate some realistic constraints	
5	Integrates prior knowledge	Successfully integrates prior knowledge of mathematics, science and engineering principles to the design problem.	An attempt is made to use prior knowledge but it is either incomplete or contains conceptual errors	Can use prior knowledge to design individual pieces of equipment competently only when guided to do so	Unable to relate prior knowledge to the design problem	
6	Uses Engineering tools	Uses computer tools and engineering resources effectively	Uses computer tools and engineering resources with minor errors	Minimal or incorrect use of computer tools and engineering resources	No use of computer tools or engineering resources	
7	Optimizes the baseline design	Practical measures of effectiveness are defined. Economic and other constraints are used to correctly optimize the baseline design	Practical measures of effectiveness are defined but the optimization process contains minor errors or omissions	Measures of effectiveness are impractical or the optimization process is erroneous	No optimization of the baseline is carried out	
8	Evaluates the solution	Performance of the final design compares favourably to customer demands and existing products if any.	Performance of the final design fails to satisfy customer requirements but deviations are analysed and improvements are proposed.	Performance of the final design fails to satisfy customer requirements. Deviations are analysed but no improvements are proposed.	Final design is not evaluated	
9	Documents the design procedure	Supports design procedure with documentation and references	Design documentations are insufficient or unclear.	Design is done, but procedures and equations are not documented or referenced	Design is done incompletely without the proper equations and without references	



Assessment Rubrics for Program Outcomes

Outcome (d): The artifact demonstrates the student's ability to function on multi-disciplinary teams

Attributes		4	3	2	1	NA
1	Achieves goal while functioning on a multidisciplinary and/or diverse team	Product is of very high quality and faculty were not required to resolve issues in team management	Product is of high quality and minimal if any faculty actions were taken in team management	Product is of marginal quality and some faculty corrective actions were taken in team management	Product is inadequate or team management issues were extreme	
2	Effectively utilizes and integrates different skills and abilities of team members	The contributions of all members are clear and self-reporting of contributions and teamwork are balanced	The contributions of all members are reasonably clear and self-reporting of contributions are generally balanced	Some members' contributions are less clear. Self-reports indicated that one or more members did the vast majority of work.	One or more members did the entire project while one or more members did little or nothing	
3	Performance inside the team is regularly reported, evaluated, and improved	Regular and well written team meeting minutes are used to document team performance. Peer to peer assessment is used to regularly and frankly evaluate and improve team performance	Regular team meeting minutes and peer-to-peer assessment are used to document team performance, but no action is taken to improve this performance	Team meetings are irregular, meeting minutes are badly written, or peer-to-peer assessment does not reflect members' contributions	Meeting minutes or peer-to-peer assessment forms are not present	



Assessment Rubrics for Program Outcomes

Outcome (e): The artifact demonstrates the student's ability to identify, formulate, and solve engineering problems

Attributes		4	3	2	1	NA
1	Essential information is captured and distinguished from extraneous data	Consistently uses relevant information with little or no extraneous data.	Ultimately identifies relevant information but may start with extraneous data.	Identifies some principles but seems to have difficulty in distinguishing what is needed.	Cannot identify and assemble relevant information.	
2	The problem is approached and modelled in a logical and technically correct fashion	Student consistently and efficiently applies engineering principles. No conceptual errors and few if any procedural errors exist. Student appears to be sound in all areas	Student can apply principles. Only rare and minor conceptual errors occur. Few procedural errors. Student displays a working knowledge in all areas	Student can apply principles but may need improvement in one or more areas. Some conceptual and procedural error may be evident	Student has significant technical problems in several of the listed areas.	
3	The absence of necessary information is recognized and reasonable approximations are made	Consistently identifies and estimates missing information using sound principles. Always recognizes the limitations of the estimation	Generally makes approximations of missing data. Recognizes that some error is introduced by approximating	Will approximate, but may lack reasonable basis for approximating. May fail to appreciate limits imposed by approximations	Becomes frustrated and gives up when data are missing	
4	Clear Solution Procedure	Presents easy-to-follow steps which are logical and adequately detailed.	Most of the steps are understandable. Some steps lack detail, or are confusing.	Some of the steps are understandable; most are confusing and lack detail.	Solution procedure is not sequential. Most steps are missing or are confusing.	
5	The problem solution is usually correct and always reasonable	Has no unrecognized implausible answers	Has no more than one if any unrecognized implausible answers. If any, it is minor and obscure	Attempts to evaluate answers but has difficulty. Recognizes that numbers have meaning but cannot fully relate to problem.	Makes little, if any, effort to interpret results. Numbers appear to have little meaning	



Assessment Rubrics for Program Outcomes

Outcome (f): The artifact demonstrates the student's understanding of professional and ethical responsibilities

Attributes		4	3	2	1	NA
1	Demonstrates an understanding of ethical issues	Student can identify and explain the impact of a decision on multiple constituencies	Student can express opposing views clearly and succinctly	Student seems to recognize that ethical issues are important but cannot see opposing views	Student does not recognize ethical dilemmas	
2	Demonstrates a knowledge of engineering ethics codes	Student identifies engineering ethics codes and acts in accordance with them	Student is aware that codes exist and behaviour is consistent with them	Student behaves ethically but does not recognize the existence of codes	Student is unaware of codes or ignores their principles	
3	Applies a decision making process to identify appropriate ethical choices	Identifies alternatives by seeking multiple viewpoints and alternatives	Identifies several alternative plans based on experience	Seeks alternatives only if primary plan is opposed	Fails to seek alternatives	
4	Makes informed ethical choices	Uses ethics codes, input from constituencies and common sense to evaluate choices. Accepts responsibility for decisions	Uses heuristics or personal experience to make choices that are consistent with codes. Accepts responsibility	Makes decisions based on personal feelings. May avoid taking responsibility for actions	Behaves unethically and blames others for failures	



Assessment Rubrics for Program Outcomes

Outcome (g): The artifact demonstrates the student's ability to communicate effectively in writing

Attributes		4	3	2	1	NA
1	Presents correct technical information written at the appropriate level for the intended reader	Information is accurate, thorough and clearly appropriate for audience	Information is accurate, reasonably thorough and some consideration is given to audience	Information is somewhat incomplete or inaccurate. Excessive jargon is used or writing is too non-technical.	Audience is ignored and technical level is inappropriate. Information is false or missing	
2	Formatted correctly and contains few, if any, typographical or grammatical errors.	The document meets specifications perfectly and is free of errors	The document generally follows specifications and has few errors	The documents deviates from specifications and/or contains several errors	The document completely ignores specifications and is filled with errors	
3	Contains an introduction that interests and orients a reader, a body that is relevant and covers important points and conclusions with summary and recommendations, when appropriate	The document provides a thorough and organized analysis that leads the reader through all technical issues clearly and succinctly.	The document is reasonably well organized and there are some connections between sections	The document has some organizational problems. Sections are essentially correct, but there is little transition or connection between them	The document rambles with little organization. It is difficult to determine the key points.	
4	References are used to credit work from other sources	The document contains a standard, well formatted, and ethically prepared reference list.	The document is reasonably referenced with some minor omissions or formatting errors.	References are omitted, deviate from standard specifications, and/or contain several errors.	The document is not ethical. Work from other sources is intentionally copied as if it is an authentic material	

Outcome (g): The artifact demonstrates the student's ability to communicate effectively in oral

Attributes		4	3	2	1	NA
1	Maintains audience interest	Audience is actively involved during the presentation	Audience remains alert and asks appropriate questions	Audience gets key points. Few, if any, questions are asked	Audience loses interest	
2	Makes effective use of visual aids	Visual aids are clear, easy to read and informative. They enhance understanding rather than distract the audience	Visual aids are useful, but could have been improved	Visual aids are not used	Visual aids are illegible, too small, distracting, sloppy or otherwise hinder the speaker	
3	Contains an introduction that interests and orients the audience, a body that is relevant and covers important points and conclusions with recommendations, when appropriate	The document provides a thorough and organized analysis that leads the reader through all technical issues clearly and succinctly.	The document is reasonably well organized and there are some connections between sections	The document has some organizational problems. Sections are essentially correct, but there is little transition or connection between them	The document rambles with little organization. It is difficult to determine the key points.	
4	Uses allotted time appropriately	Finishes in appropriate time range without using filler material or cutting key points	Finishes in appropriate time range and covers necessary material	Slightly exceeds allotted time or adds excessive filler or cuts important points	Exceeds allotted time and either cuts vital material or rambles	
5	Answer to questions	Self confident in answering questions. Answers are clear and complete	The student is not self confident in answering questions although answers are correct	Answers are vague or contain errors.	Unable to answer questions	



Assessment Rubrics for Program Outcomes

Outcome (h): The artifact demonstrates the student's understanding of the impact of engineering solutions in a global, economic, environmental, and societal context.

Attributes		4	3	2	1	NA
1	Awareness of global effects of a project, product, practice, or event.	Deep understanding of the immediate and long-term issues involved on users and non-users locally and globally.	Good understanding of the widespread effects involved but with somewhat limited perspective about long-term factors	Some awareness of the more extended effects.	Seems to have considered only effects on immediate users, if any	
2	Understanding of economic factors	Deep understanding of applied economic factors of related products and the impact they may have on the economy at large as well as long term trends	Good understanding of applied economic factors and how they affect other related products	Some understanding of applied economic factors.	Little or no understanding of economic factors involved.	
3	Awareness of implications to society at large	Deep understanding of the immediate and long-term implications to society in the creation and/or use of a product or project, and the overall potential benefits and risks to society	Good understanding of the implications to society in the creation and/or use of the product or project, as well as its relation to general societal issues;	Moderate understanding of the implications to society in the creation and/or use of the product or project.	Little or no understanding of (or interest in?) implications to society involved in the creation and/or use of the product or project	
4	Awareness of environmental impact	Deep understanding of applied environmental factors of related products and their long-term impact. Ability to propose efficient solutions to minimize or fully disclose all negative environmental impacts.	Good understanding of applied environmental factors of related products and their impact. Awareness of possible solutions to minimize or fully disclose all negative environmental impacts.	Some understanding of applied environmental factors of related products and their impact	Environmental issues are disregarded.	



Assessment Rubrics for Program Outcomes

Outcome (i): a recognition of the need for, and an ability to engage in life-long learning (Partially Revised)

Attributes		4	3	2	1	NA
1	Recognizes the need for learning	Usually goes beyond what is required in completing an assignment, brings information from outside sources into assignments.	Goes sometimes beyond what is required in completing an assignment and brings information from outside sources into assignments	Completes only what is required.	Has trouble completing even the minimum required tasks	
2	Accesses information effectively and efficiently	Accesses information from a variety of sources and critically assess their quality, validity and accuracy.	Accesses information from a variety of sources and assess their quality, validity and accuracy to a limited extend.	Accesses information from a variety of sources without any attempt to assess their quality, validity and accuracy.	Unable to access information unless clearly guided to pending sources.	
3	Demonstrates ability to learn independently	Analyzes new content by breaking it down, comparing, contrasting, recognizing patterns, and/or interpreting information.	Has some difficulties in analyzing new contents.	Requires guidance as to expected outcome of task or project	Requires detailed or step-by-step instructions to complete a task	
4	Positively reflects on his own learning	Regularly reflects on his learning process, evaluates personal performance and progress, and takes required actions and improvements.	Reflects on his learning process, evaluates personal performance and progress, but fails to take required actions.	Occasionally reflects on his learning process if asked to do.	Unable to recognize his own shortcomings or deficiencies	



Assessment Rubrics for Program Outcomes

Outcome (j): The artifact demonstrates the student's knowledge of contemporary issues.

Attributes		4	3	2	1	NA
1	Correctly locates, selects, and critically describes literature results and compares them to his own work	Literature sources are used effectively to frame process and compare results. Relevant comparisons are found for all results	Primary results are compared to literature sources. Literature results are current and from reliable sources	Some literature comparisons are provided, but may be incomplete or outdated	Literature comparisons are omitted or incorrect.	
2	Reference lists reflect adequate coverage of sources containing contemporary issues	Bibliography is complete, current, and represents a wide variety of sources	Bibliography contains multiple sources and is adequate for the assignment	Bibliography is minimally acceptable, but limited. Does not represent a thorough search	Bibliography consists of professor-provided references and unverified internet data only	
3	Design project selection and work show an understanding of current needs and contemporary issues in Engineering	Project utilizes (or at least considers) novel materials and/or approaches. Knowledge of safety and environment are clearly shown and impact the design	Project utilizes (or at least considers) at least one novel approach. Safety and environmental issues are addressed	Project uses only classical processes. Little evidence of novel approaches or "Green" engineering is evident	Project uses outdated, unsafe, or environmentally unacceptable methods.	



Assessment Rubrics for Program Outcomes

Outcome (k): The artifact demonstrates the student's ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

	Attributes	4	3	2	1	NA
1	Utilizes engineering principles to formulate problems	Student consistently and efficiently applies engineering principles. No conceptual errors and few if any procedural errors exist. Student appears to be sound in all areas	Student can apply principles. Only rare and minor conceptual errors occur. Few procedural errors. Student displays a working knowledge in all areas	Student can apply principles but may need improvement in one or more areas. Some conceptual and procedural error may be evident	Student has significant technical problems in several of the listed areas.	
2	Uses sufficient mathematical skills to solve engineering problems	Readily applies calculus, differential equations and algebra to solve problems. Displays clear understanding of advanced math techniques	Applies calculus, differential equations and algebra effectively. May have minor errors or be challenged by higher mathematics	Has difficulty in formulating appropriate differential equations and identifying boundary conditions. Has adequate mechanics in mathematics	Is often limited by inability to solve calculus problems or differential equations	
3	Efficiently uses computer software to solve problems and present results	Capable of using discipline related commercial packages. Work documents are word processed, clear, and contain well integrated computer-made graphs, figures, and illustrations that enhance comprehension.	The student is aware of the presence and capabilities of discipline related commercial packages. Word processors are used efficiently with adequate graphics and illustrations.	Only word processors and graphics software are used. Illustrations are adequate but could be more plentiful or informative	Reports are handwritten, typed on a typewriter, or produced using plain text.	
4	Efficiently uses modern measuring instruments	Capable of using discipline related modern non-conventional measuring instruments efficiently.	The student has a working knowledge of discipline related modern and non-conventional measuring instruments.	The student is aware of the presence and capabilities of discipline related modern and non-conventional measuring instruments.	Student's experimental capabilities are limited to conventional equipment, if any	
5	Uses the internet to gather and disseminate information	Student devises and maintains detailed, user-friendly web pages with helpful graphics and frequent updates.	Student uses the internet to efficiently search and gather information, or to make and maintain simple web pages.	Student can search the internet and communicate through e-mails.	No web use is evident	