# COLLEGE OF ENGINEERING

## PERFORMANCE CRITERIA FOR ABET OUTCOMES

## FOR

## ENGINEERING PROGRAMS

## INCLUDING

## RUBRIC TABLES

**PREPARED BY**
**THE ASSESSMENT COMMITTEE**

**MARCH 2008**

# Performance Criteria for ABET Program Outcomes for Engineering, Technology and Computer Science Programs

The College of Engineering Assessment Committee has developed the performance criteria for all of the ABET outcomes for Engineering, Technology, and Computer Science Programs in the College of Engineering**.**

**The Performance Criteria**
The performance criteria were developed using the ABET outcomes for the three ABET Accreditation Commissions (EAC, TAC, and CAC). The committee first grouped similar outcomes from the three ABET Accreditation Commissions and labeled the groups as Outcome 1 through Outcome 11. There is one page of performance criteria for each outcome group in this document.

**What you need to assess and how to assess them**
**Performance Criteria Needing Assessment:** Performance criteria with Arabic numbers (such as 1, 2, 2.1, etc.) need to be assessed individually. Statistical class averages, and percent of students with averages at or above the departmental expected average have to be reported for each of these performance criteria.

**Outcomes:** The class average for all performance criteria listed under an outcome should be computed and used as the measure for the outcome. The percentage of students with average at or above the departmental expected average has to be reported for each outcome.

**Basis for Assessing Performance Criteria**: All items with Roman numbers (such as i, ii, iii, etc.) can be considered as guides or basis to be used to assess the performance criteria. These details were provided to assist faculty in knowing the types of possible assignments that can be given and used to assess the performance outcome. Statistical class averages do not have to be reported for these.

**Coding Performance Criteria for Outcomes in Course Matrix**
Previously we had only one performance number for each outcome, and thus we coded the outcomes in the course matrix as a, b, c, etc. With the breakdown of each outcome into performance criteria, the coding should be changed to reflect the performance criteria number. Thus use coding such as a.1, b.3, b.1.2, etc where the first letter indicates the outcome, and the numbers indicate the performance criteria numbers as provided. **For consistency throughout the college, DO NOT make any modifications to the numbering of the outcomes as contained in this document. Any request for numbering changes should be made to the Assessment Committee.**

**Guidelines for Using the Performance Criteria**
Each outcome has anywhere from one to five performance criteria that may have to be assessed.
Working on the premise that we do not have to assess every course every semester, and that we do not have to assess every outcome in a course in a semester, an opportunity to reduce the amount of work needed for assessing the outcomes exists..

Each department is, therefore, being requested to meet as early as possible to develop a plan that limits the total number of outcomes to be assessed by a faculty member per semester to a limit set by the department, say 4.

Each department needs to meet to select and FIX (i.e. individual faculty cannot change the selected performance criteria ) the specific performance criteria that will have to be assessed for each outcome in each course.

Each department should also have a statement that states the **EXPECTED AVERAGE** and the **PERCENTAGE OF PASSING STUDENTS THAT HAVE TO MEET OR EXCEED THE EXPECTED AVERAGE** for the outcome and a performance criteria to have been successfully met by the department. For example: " The acceptable average for outcomes in the Mechanical Engineering Department is 75%, and 70% of the passing students in a class is expected to meet or exceed this expected average for the performance criteria and an outcome to have been met".

# COLLEGE OUTCOME 1

***EAC a,** "ability to apply the knowledge of mathematics, science, and engineering."

*Assignments that test competency in this area will include problems that test a students ability to (1) solve algebraic, integral, and differential equations (that are encountered in the subject area) analytically or numerically, and (2) apply appropriate conservation principles to solve problems in the subject area.*

*EAC a Engineering Accreditation Commission outcome a

1. **Knowledge and application of Basic mathematics**
   - (i) Able to apply basic mathematics involving algebra
   - (ii) Able to apply basic mathematics involving geometry
   - (iii) Able to apply basic mathematics involving trigonometry

2. **Knowledge and application of Intermediate Mathematics**
   - (i) Able to apply and solve problems involving Differential Calculus
   - (ii) Able to apply and solve problems involving Integral calculus
   - (iii) Able to apply and solve problems involving Probability and Statistics

3. **Knowledge and application of Advanced Mathematics**
   - (i) Able to apply and solve problems involving advanced mathematics (e.g. complex analysis, numerical analysis, Fourier series, LaPlace transforms)
   - (ii) Able to apply and solve problems involving Linear Algebra in engineering

4. **Knowledge and Application of Science**
   - 4.1 Demonstrate knowledge and ability to apply Chemistry in engineering
   - 4.2 Demonstrate knowledge and ability to apply Physics in engineering

5. **Knowledge and Application of named prerequisite engineering courses**
   - 5.1 Knowledgeable and able to apply Engineering Prerequisite Subject/Course 1 (state name)
   - 5.2 Knowledgeable and able to apply Engineering Prerequisite Subject /Course 2 (state name)

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## COLLEGE OUTCOME 1

### a. Ability to apply the knowledge of mathematics, science, and engineering.

*Assignments that test competency in this area will include problems that test a students ability to (1) solve algebraic, integral, and differential equations (that are encountered in the subject area) analytically or numerically, and (2) apply appropriate conservation principles to solve problems in the subject area.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| **Description of Performance Criteria Being Assessed** | | | | | |
|---|---|---|---|---|---|
| 1. **Knowledge and application of Basic mathematics**<br>(i) Able to apply basic mathematics involving algebra<br>(ii) Able to apply basic mathematics involving geometry<br>(iii) Able to apply basic mathematics involving trigonometry | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **2. Knowledge and application of Intermediate Mathematics**<br>(i) Able to apply and solve problems involving Differential Calculus<br>(ii) Able to apply and solve problems involving Integral calculus<br>(iii) Able to apply and solve problems involving Probability and Statistics | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **3. Knowledge and application of Advanced Mathematics**<br>(i) Able to apply and solve problems involving Advanced mathematics (e.g. complex analysis, numerical analysis, Fourier series, LaPlace transforms)<br>(ii) Able to apply and solve problems involving Linear Algebra in engineering | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **4. Knowledge and Application of Science (Chemistry)**<br>4.1 Demonstrate knowledge and ability to apply Chemistry in engineering | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **4. Knowledge and Application of Science (Physics)**<br>4.2 Demonstrate knowledge and ability to apply Physics in engineering | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **5. Knowledge and Application of named prerequisite engineering courses**<br>5.1 Knowledgeable and able to apply Engineering Prerequisite<br>Subject/Course 1 (state name) | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **5. Knowledge and Application of named prerequisite engineering courses**<br>5.2 Knowledgeable and able to apply Engineering Prerequisite<br>Subject /Course 2 (state name) | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

# COLLEGE OUTCOME 2

**EAC b**, "Ability to design and conduct experiments, as well as to analyze and interpret data"

*Assignments that test competency in this area will be derived from the laboratory component of the course. Assessment will be based on the use of proper procedure for conducting the experiment, data collection and analysis, presentation of derived results (tabular and graphical), and the interpretation of both the raw and derived results. For ability to design experiments, there will be assignment(s) in which students will be required to design an experiment to measure a given phenomena using instrumentation available in the department.*

**1. Ability to design experiments**

Given a phenomenon to be experimentally investigated, the students are able to:

**1.1 Plan and Understand the phenomenon**

Students are able to

(i) Identify the measurable parameters of the phenomenon
(ii) Identify the relationship between the phenomenon and the measured parameters
(iii) Identify different methods and the specific devices for measuring the parameters.

**1.2 Select instruments/Design/Assemble Set-up and provide instructions for its use**

Students are able to

(i) Identify and select or design appropriate equipment or components for measuring the parameters and,
(ii) Provide steps for setting up and conducting the designed experiment.

**2. Ability to conduct experiments**

Students are able to:

(i) Demonstrate general lab safety.
(ii) Follow experimental procedures for the experiment, while maintaining all safety precautions.
(iii) Demonstrate knowledge of how equipment functions and their limitations.
(iv) Complete Pre-Lab before coming to the lab when required.
(v) Collect and record data using appropriate units of measurement and identify the dependent and independent variables in the experiment.

**3. Ability to analyze and Interpret experimental data**

Students are able to:

(i) Analyze the data to generate the required parameters using appropriate units and significant figures.
(ii) Use statistical analysis as needed.
(iii) Present the data (raw /derived) in tabular or graphical form to meet the objectives and to aid in interpretation.
(iv) Discuss the raw and derived data/graphs and assess the validity of the results.
(v) Demonstrate the ability to relate how experimental result can be used to improve a process.
(vi) Draw appropriate or reasonable conclusions.

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## COLLEGE OUTCOME 2

### a. Ability to design and conduct experiments, as well as to analyze and interpret data.

*Assignments that test competency in this area will be derived from the laboratory component of the course. Assessment will be based on the use of proper procedure for conducting the experiment, data collection and analysis, presentation of derived results (tabular and graphical), and the interpretation of both the raw and derived results. For ability to design experiments, there will be assignment(s) in which students will be required to design an experiment to measure a given phenomena using instrumentation available in the department*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| **Description of Performance Criteria Being Assessed** | | | | | |
|---|---|---|---|---|---|
| **1. Ability to design experiments**<br>Given an phenomenon to be experimentally investigated, the students are able to:<br>**1.1** Plan and Understand the phenomenon.<br>Students are able to:<br>(i) Identify the measurable parameters of the phenomenon.<br>(ii) Identify the relationship between the phenomenon and the measured parameters.<br>(iii) Identify different methods and the specific devices for measuring the parameters. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **1. Ability to design experiments**<br>Given an phenomenon to be experimentally investigated, the students are able to:<br>**1.2** Select instruments/Design/Assemble Set-up and provide instructions for its use<br>Students are able to:<br>(i) Identify and select or design appropriate equipment or components for measuring the parameters and,<br>(ii) Provide steps for setting up and conducting the designed experiment. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **2. Ability to conduct experiments**<br>Students are able to:<br>(i) Demonstrate general lab safety.<br>(ii) Follow experimental procedures for the experiment, while maintaining all safety precautions.<br>(iii) Demonstrate knowledge of how equipment functions and their limitations.<br>(iv) Complete Pre-Lab before coming to the lab when required.<br>(v) Collect and record data using appropriate units of measurement and identify the dependent and independent variables in the experiment. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **3. Ability to analyze and Interpret experimental data**<br>Students are able to:<br>(i) Analyze the data to generate the required parameters using appropriate units and significant figures.<br>(ii) Use statistical analysis as needed.<br>(iii) Present the data (raw /derived) in tabular or graphical form to meet the objectives and to aid in interpretation.<br>(iv) Discuss the raw and derived data/graphs and assess the validity of the results.<br>(v) Demonstrate the ability to relate how experimental result can be used to improve a process.<br>(vi) Draw appropriate or reasonable conclusions. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

## COLLEGE OUTCOME 3

**EAC 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."

*Assignments that test competency in this area will be derived from courses with design component and will be based on understanding of the design process, identification of a need, problem definition, project planning, project management, information gathering, idea generation and creativity, feasibility studies and evaluation of ideas to select the most feasible and suitable concept, appropriate mathematical modeling of problem, implementation through prototype development, and communication to disseminate the results.*

**1. Ability to Define/Understand the Problem and then Plan the Project**

Students are able to:

(i) Identify the customer and the needs.
(ii) Identify and list the design objectives.
(iii) Identify the design constraints.
(iv) Define the design strategy and methodology.
(v) Identify and break down work into tasks and subtasks and identify the personnel and deliverables for each.
(vi) Develop a Gantt chart and critical path analysis for managing the project.
(vii) Establish major milestones for tracking progress and define performance metrics to measure success.

**2. Ability to Conduct a Review of the Literature, Generate Ideas and Apply Creativity**

Students are able to:

(i) Identify the types of information needed for a complete understanding of all aspects of the project (Based on task described in the project planning).
(ii) Gather information on relevant fundamentals, theory / concept (demonstrate technical competence) and relate them to the design.
(iii) Provide the sources in a list of references properly cited in the literature review section and relevant sections of the report.
(iv) Define functional requirements for design (Specific required actions needed to be performed for the design to be achieved).
(v) Transform functional requirements into candidate solutions / mathematical modeling.
(vi) Evaluate candidate solutions to arrive at feasible designs.

**3. Ability to Perform Preliminary and Detailed Design**

Students are able to:

(i) Identify applicable codes and standards for the design
(ii) Perform relevant detailed analysis (engineering, mathematical, economic) in accord with applicable codes and standards.
(iii) Develop final design specifications
(iv) Do the design within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(v) Select materials/components/software/test equipment.
(vi) Fabricate a prototype or a model (physical, software, hardware) of the design.
(vii) Test or simulate the design and make necessary changes to obtain optimum design.

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## COLLEGE OUTCOME 3

**b. 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.**

*Assignments that test competency in this area will be derived from courses with design component and will be based on understanding of the design process, identification of a need, problem definition, project planning, project management, information gathering, idea generation and creativity, feasibility studies and evaluation of ideas to select the most feasible and suitable concept, appropriate mathematical modeling of problem, implementation through prototype development, and communication to disseminate the results.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| **Description of Performance Criteria Being Assessed** | | | | | |
|---|---|---|---|---|---|
| **1. Ability to Define/Understand the Problem and then Plan the Project**<br>Students are able to:<br>(i) Identify the customer and the needs.<br>(ii) Identify and list the design objectives.<br>(iii) Identify the design constraints.<br>(iv) Define the design strategy and methodology.<br>(v) Identify and break down work into tasks and subtasks and identify the personnel and deliverables for each.<br>(vi) Develop a Gantt chart and critical path analysis for managing the project.<br>(vii) Establish major milestones for tracking progress and define performance metrics to measure success. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **2. Ability to Conduct a Review of the Literature, Generate Ideas and Apply Creativity**<br>Students are able to:<br>(i) Identify the types of information needed for a complete understanding of all aspects of the project (Based on task described in the project planning).<br>(ii) Gather information on relevant fundamentals, theory / concept (demonstrate technical competence) and relate them to the design.<br>(iii) Provide the sources in a list of references properly cited in the literature review section and relevant sections of the report.<br>(iv) Define functional requirements for design (Specific required actions needed to be performed for the design to be achieved).<br>(v) Transform functional requirements into candidate solutions / mathematical modeling.<br>(vi) Evaluate candidate solutions to arrive at feasible designs. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **3. Ability to Perform Preliminary and Detailed Design**<br>Students are able to:<br>(i) Identify applicable codes and standards for the design<br>(ii) Perform relevant detailed analysis (engineering, mathematical, economic) in accord with applicable codes and standards.<br>(iii) Develop final design specifications<br>(iv) Do the design within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability<br>(v) Select materials/components/software/test equipment.<br>(vi) Fabricate a prototype or a model (physical, software, hardware) of the design.<br>(vii) Test or simulate the design and make necessary changes to obtain optimum design. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

# COLLEGE OUTCOME 4

**EAC d**, "an ability to function on multi-disciplinary teams."

*Assignments that test competency in this area will include problems that test a students ability to (1) accommodate the needs of others, (3) apply principles of constructive conflict management to interactions with others, (4) share responsibilities, (4) commit to team goals, (5) support members, (6) communicate with team members.*

Students are able to

**1. Manage themselves as a team by following good team management practices and resolve conflicts**

(i) Plan group meetings and time management, assign team roles (leader, recorder, etc) assign and keep good record of team meetings and activities.

(ii) Distribute project tasks evenly to team members, and evaluate performance of team members on a regular basis.

(iii) Resolve conflicts professionally within the group (*Example will be an assignment to identify potential problems and indicate how they will resolve them*).

**2. Track and meet project schedule**

(i) Track progress of team members to ensure project is on schedule (through submission of progress reports).

(ii) Share ideas, complete assigned task on time, help others, and be professional to each other (through peer evaluation of team members on these characteristics).

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## COLLEGE OUTCOME 4

### b. An Ability to function on multi-disciplinary teams.

*Assignments that test competency in this area will include problems that test a students ability to (1) accommodate the needs of others, (3) apply principles of constructive conflict management to interactions with others, (4) share responsibilities, (4) commit to team goals, (5) support members, (6) communicate with team members.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| **Description of Performance Criteria Being Assessed** | | | | | |
|---|---|---|---|---|---|
| **1. Manage themselves as a team by following good team management practices and resolve conflicts**<br>(i) Plan group meetings and time management, assign team roles (leader, recorder, etc) assign and keep good record of team meetings and activities.<br>(ii) Distribute project tasks evenly to team members, and evaluate performance of team members on a regular basis.<br>(iii) Resolve conflicts professionally within the group (*Example will be an assignment to identify potential problems and indicate how they will resolve them*). | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor(0-54): Unacceptable Performance |
| **2. Track and meet project schedule**<br>(i) Track progress of team members to ensure project is on schedule (Through submission of progress reports).<br>(ii) Share ideas, complete assigned task on time, help others, and be professional to each other (through peer evaluation of team members on these characteristics). | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

# COLLEGE OUTCOME 5

EAC e, "an ability to identify, formulate, and solve engineering problems."

*Assignments that test competency in this area will include problems that test a students ability to (1) apply systematic problem solving methodology that includes identifying all known variables, unknown variables, construction of reasonable schematic for realistic visual representation of the problem, listing appropriate assumptions, determining appropriate property values, and using appropriate conservation principles, laws, and mathematic to solve the problem, and evaluating the reasonableness of the computed results.*

**Students are able to**

**1. Identify engineering/technical/computing problems**

Given a problem, the student is able to:

(i) Understand the given problem and identify the subject area and concept involved.

(ii) Convert the problem into a well labeled sketch (such as free body diagram, flow chart, functional block diagram, schematic diagram).

(iii) Identify the system of units applicable to the problem.

**2. Formulate/analyze engineering/technical/computing problems**

Given a problem, the student is able to:

(i) Define the known and the unknown variables in the problem.

(ii) State relevant laws and equations needed for the problem.

(iii) List and apply assumptions to the relevant laws and equations to obtain the specific equations appropriate to the problem.

**3. Solve engineering/technical/computing problems**

Given a problem, the student is able to:

(i) Implement strategy to solve the problem.

(ii) Solve the problem (showing consistent units throughout).

(iii) Evaluate and interpret the result.

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**COLLEGE OUTCOME 5**

## c. An ability to identify, formulate, and solve engineering problems.

*Assignments that test competency in this area will include problems that test a students ability to (1) apply systematic problem solving methodology that includes identifying all known variables, unknown variables, construction of reasonable schematic for realistic visual representation of the problem, listing appropriate assumptions, determining appropriate property values, and using appropriate conservation principles, laws, and mathematic to solve the problem, and evaluating the reasonableness of the computed results.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| **Description of Performance Criteria Being Assessed** | | | | | |
|---|---|---|---|---|---|
| **1. Identify engineering/technical/computing problems**<br>Given a problem, the student is able to<br>(i) Understand the given problem and identify the subject area and concept involved<br>(ii) Convert the problem into a well labeled sketch (such as free body diagram, flow chart, functional block diagram, schematic diagram)<br>(iii) Identify the system of units applicable to the problem | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **2. Formulate/analyze engineering/technical/computing problems**<br>Given a problem, the student is able to<br>(i) Define the known and the unknown variables in the problem<br>(ii) State relevant laws and equations needed for the problem<br>(iii) List and apply assumptions to the relevant laws and equations to obtain the specific equations appropriate to the problem. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **3. Solve engineering/technical/computing problems**<br>Given a problem, the student is able to<br>(i) Implement strategy to solve the problem<br>(ii) Solve the problem (showing consistent units throughout)<br>(iii) Evaluate and interpret the result | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

## COLLEGE OUTCOME 6

**EAC f**, "an understanding of professional and ethical responsibility."

*Assignments that test competency in this area will include problems that test a students knowledge in the Professional Code of Ethics, ability to apply relevant aspects of the professional code of ethics when considering alternative decisions or solutions, ability to ethically evaluate the short and long term impact of engineering solutions on community and environment.*

**1. Students understand and demonstrate ethical responsibilities**

(i) Students are able to demonstrate the knowledge of professional code of ethics (*Review code of ethics from your specific professional society and from your State board of professional Engineers. Students may be tested on these*).
(ii) Students are able to evaluate case studies and make ethical decisions (*Instructor may present a case study and request students to identify and provide professional and ethical considerations for addressing the problem posed in the case study*).
(iii) Students acknowledge the work of others they use through proper permission and citation.
(iv) Students apply ethics in the academic environment and desist from cheating, plagiarism, and report such unethical practices to proper authorities.

**2. Students understand and demonstrate professional responsibilities**

(i) Apply professional standards (use of handbooks, codes, standards) in obtaining, reporting, analyzing data or in design.
(ii) Attend classes on regular basis and informs professor when excused absence situation occurs (use attendance policy and the professionalism of students in informing and getting excuse for being absent).
(iii) Students demonstrate high academic standards, personal responsibilities (continually looks for own mistakes and opportunities/methods for improvement), and exercises good judgment and discretion (make decisions based upon a defined body of acquired knowledge).

3**. Students understand and demonstrate social responsibilities (for computer science and technology only)**

(i) Students consider and evaluate short and long term impact of a solution on society and environment in arriving at a final solution ( Students may be required to evaluate the impact of their solutions on the local, national, or global society).
(ii) Students are cognizant of the importance of proper engineering knowledge in ensuring the public safety in all engineering designs and decisions they make (the need to use standards, and to design and build as safe as possible).

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## COLLEGE OUTCOME 6

**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.**

*Assignments that test competency in this area will include problems that test a students ability to (1) solve algebraic, integral, and differential equations (that are encountered in the subject area) analytically or numerically, and (2) apply appropriate conservation principles to solve problems in the subject area.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| Description of Performance Criteria Being Assessed | | | | | |
|---|---|---|---|---|---|
| **1. Ability to Define/Understand the Problem and then Plan the Project**<br>Students are able to:<br>(i) Identify the customer and the needs.<br>(ii) Identify and list the design objectives.<br>(iii) Identify the design constraints.<br>(iv) Define the design strategy and methodology.<br>(v) Identify and break down work into tasks and subtasks and identify the personnel and deliverables for each.<br>(vi) Develop a Gantt chart and critical path analysis for managing the project.<br>(vii) Establish major milestones for tracking progress and define performance metrics to measure success. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **2. Ability to Conduct a Review of the Literature, Generate Ideas and Apply Creativity**<br>Students are able to:<br>(i) Identify the types of information needed for a complete understanding of all aspects of the project (Based on task described in the project planning).<br>(ii) Gather information on relevant fundamentals, theory / concept (demonstrate technical competence) and relate them to the design.<br>(iii) Provide the sources in a list of references properly cited in the literature review section and relevant sections of the report.<br>(iv) Define functional requirements for design (Specific required actions needed to be performed for the design to be achieved).<br>(v) Transform functional requirements into candidate solutions / mathematical modeling.<br>(vi) Evaluate candidate solutions to arrive at feasible designs. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **3. Ability to Perform Preliminary and Detailed Design**<br>Students are able to:<br>(i) Identify applicable codes and standards for the design<br>(ii) Perform relevant detailed analysis (engineering, mathematical, economic) in accord with applicable codes and standards.<br>(iii) Develop final design specifications<br>(iv) Do the design within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability<br>(v) Select materials/components/software/test equipment.<br>(vi) Fabricate a prototype or a model (physical, software, hardware) of the design.<br>(vii) Test or simulate the design and make necessary changes to obtain optimum design. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

# COLLEGE OUTCOME 7

**EAC g**, "an ability to communicate effectively."

*Assignments that test competency in written and communication will include problems that test the students ability to logically arrange information, use correct grammar, use appropriate report format, use discipline specific conventions including citations, use appropriate visual aids and presentation techniques to engage audience, modulate voice and speak clearly without distractions, use acceptable graphical conventions.*

## Oral Communication

1. **Ability to Organize, Plan, Design/Prepare and Use Appropriate Visual Aids for communication/Presentation**
   (i) Students are able to organize presentation in well structured logical sequence making it easy for audience to follow the content with clear understanding.
   (ii) Students are able to prepare effective slides (*adequate and relevant technical content and viewgraphs that are legible, completely labeled/annotated/dimensioned to illustrate important features of the work being presented*)
   (iii) Students are able to use modern presentation techniques (*may include visually enhanced transitions, animations, video, and sound clips*).
   (iv) Students are able to stay within time limits

2. **Ability to Articulate Subject Knowledge (Technical Content)**
   (i) Students demonstrate knowledge and understanding of the subject. (*This may be demonstrated by presenting literature review, originality, creativity, required standards, constraints, and other appropriate considerations such as economics, environmental, and societal impact*)
   (ii) Students are able to prepare and display prototypes or models when they are necessary to support the presentation.
   (iii) Students respond clearly to questions in a professional manner after restating questions to audience

3. **Appearance and Ability to Provide Good Oral Delivery**
   Students are able to:
   (i) Use correct grammatical English and technical terms appropriate to technical area and audience; speak with clarity and confidence;
   (ii) Maintain good posture and eye contact with the audience ( should not read from prepared notes) and elicit the attention of the audience
   (iii) Dress appropriately for the occasion.

*Instructor may record the presentation for assessment display purpose, and must ensure to get consent for witness protection from the students.*

**COLLEGE OF ENGINEERING**
**DEPARTMENT OF MECHANICAL ENGINEERING**
**SPRING 2008 SEMESTER**

## COLLEGE OUTCOME 7

**g. An ability to communicate effectively (Oral).**

*Assignments that test competency in written and communication will include problems that test the students ability to logically arrange information, use correct grammar, use appropriate report format, use discipline specific conventions including citations, use appropriate visual aids and presentation techniques to engage audience, modulate voice and speak clearly without distractions, use acceptable graphical conventions.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| **Description of Performance Criteria Being Assessed** | | | | | |
|---|---|---|---|---|---|
| **1. Ability to Organize, Plan, Design/Prepare and Use Appropriate Visual Aids for communication/Presentation**<br>(i) Students are able to organize presentation in well structured logical sequence making it easy for audience to follow the content with clear understanding.<br>(ii) Students are able to prepare effective slides (*adequate and relevant technical content and viewgraphs that are legible, completely labeled/annotated/dimensioned to illustrate important features of the work being presented*)<br>(iii) Students are able to use modern presentation techniques (*may include visually enhanced transitions, animations, video, and sound clips*).<br>(iv) Students are able to stay within time limits | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **2. Ability to Articulate Subject Knowledge (Technical Content)**<br>(i) Students demonstrate knowledge and understanding of the subject. (*This may be demonstrated by presenting literature review, originality, creativity, required standards, constraints, and other appropriate considerations such as economics, environmental, and societal impact*)<br>(ii) Students are able to prepare and display prototypes or models when they are necessary to support the presentation.<br>(iii) Students respond clearly to questions in a professional manner after restating questions to audience<br>(vii) Evaluate candidate solutions to arrive at feasible designs. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **3. Appearance and Ability to Provide Good Oral Delivery**<br>Students are able to:<br>(i) Use correct grammatical English and technical terms appropriate to technical area and audience; speak with clarity and confidence;<br>(ii) Maintain good posture and eye contact with the audience ( should not read from prepared notes) and elicit the attention of the audience<br>(iii) Dress appropriately for the occasion. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

# COLLEGE OF ENGINEERING
# DEPARTMENT OF MECHANICAL ENGINEERING
# SPRING 2008 SEMESTER

## Oral Presentation

| |
|---|
| Title of Presentation: |
| Name of Presenters: |
| Date of Presentation: |
| Name of Examiner/Appraiser: |

| **Performance Criteria** | Not Acceptable (0-59.9%) | Below Expectations (60-69.9%) | Average meets minimal expectations 70-79.9 | Very Good Meets Expectations (80-89.9%) | Excellent Exceeds Expectations (90-100%) |
|---|---|---|---|---|---|
| **1. Ability to Organize, Plan, Design/Prepare and Use Appropriate Visual Aids for communication/Presentation** | 20 40 59 | 60 65 69 | 70 75 79 | 80 85 89 | 90 95 99 |
| Presentation is organized in well structured logical sequence making it easy for audience to follow the content with clear understanding. | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ |
| Slides are well prepared and are effective in helping audience to understand. (*adequate and relevant technical content and viewgraphs that are legible, completely labeled, annotated, dimensioned to illustrate important features of the work being presented*) | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ |
| Modern presentation techniques are used (*may include visually enhanced transitions, animations, video, and sound clips*). | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ |
| **Average for this Performance Criteria** | | | | | |
| **2. Ability to Articulate Subject Knowledge (Technical Content)** | | | | | |
| Demonstration of knowledge and understanding of the technical subject. (*This may be demonstrated by presenting literature review, originality, creativity, required standards, constraints, and other appropriate considerations such as economics, environmental, and societal impac*t) | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ |
| Prototypes or models are prepared and displayed when they are necessary to support the presentation. | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ |
| Questions are responded to in a clear professional manner after restating questions to audience | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ |
| **Average for this Performance Criteria** | | | | | |
| **3. Appearance and Ability to Provide Good Oral Delivery** | | | | | |
| Correct grammatical English and technical terms appropriate to technical area and audience are used; and presenters speak with clarity and confidence | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ |
| Good posture and eye contact with the audience are maintained *( should not read from prepared notes*) and elicits the attention of the audience | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ |
| Presenters dress appropriately for the occasion. | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ |
| **Average for this Performance Criteria** | | | | | |
| **GRAND AVERAGE FOR OUTCOME** | | | | | |

## Written Communication

### 1. Ability to organize, plan and properly format a written technical report

(i) Students are able to organize report by categorizing ideas for the report into well and logically organized chapters, major sections, subsections and paragraphs blended within the larger units.
(ii) Students provide Title Page, Abstract, and Table of Contents, list of Figures, and List of Tables properly formatted.
(iii) Students provide figure number and title for each figure in the report, reference each figure, and completely discuss each figure in the report in accord with standards in the project manual.
(iv) Students provide table number and title for each table in the report in accord with standards in the project manual, reference each table, and completely discuss each table in the report.
(v) Students properly cite references in the report and provide well formatted reference list at the end.
(vi) Students prepare the written report in accord with standard report formatting provided in the Senior Projects Report Manual.

### 2. Ability to compose original texts and properly apply the conventions of written language.

Students are able to
(i) properly apply capitalization, punctuation, and penmanship, to communicate clearly
(ii) Spell proficiently
(iii) Apply standard grammar and usage to communicate clearly and effectively in writing including
- **using complete sentences**, varying the types such as compound and complex to match meanings and purposes
- properly employing standard English usage in writing for audiences, including subject-verb agreement, pronoun referents, and parts of speech
- properly using adjectives (comparative and superlative forms) and adverbs appropriately to make writing vivid or precise
- properly using prepositional phrases to elaborate written ideas
- properly using conjunctions to connect ideas meaningfully

**(iv)** Use available technology to support aspects of creating, revising, editing, spell checking, and publishing the report.

### 3. Ability to provide appropriate discussion, conclusions and recommendations

Students are able to clearly
(i) Summarize the goals, objectives, and indicate whether they were met.
(ii) Summarize the results.
(iii) Summarize constraints and codes and indicate whether they were met.
(iv) Provide logical conclusions and recommendations (including strengths and weaknesses).

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## COLLEGE OUTCOME 7

**g. An ability to communicate effectively (Written Communication).**

*Assignments that test competency in written and communication will include problems that test the students ability to logically arrange information, use correct grammar, use appropriate report format, use discipline specific conventions including citations, use appropriate visual aids and presentation techniques to engage audience, modulate voice and speak clearly without distractions, use acceptable graphical conventions.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| Description of Performance Criteria Being Assessed | | | | | |
|---|---|---|---|---|---|
| **1. Ability to organize, plan and properly format a written technical report**<br>(i) Students are able to organize report by categorizing ideas for the report into well and logically organized chapters, major sections, subsections and paragraphs blended within the larger units.<br>(ii) Students provide Title Page, Abstract, and Table of Contents, list of Figures, and List of Tables properly formatted.<br>(iii) Students provide figure number and title for each figure in the report, reference each figure, and completely discuss each figure in the report in accord with standards in the project manual.<br>(iv) Students provide table number and title for each table in the report in accord with standards in the project manual, reference each table, and completely discuss each table in the report.<br>(v) Students properly cite references in the report and provide well formatted reference list at the end.<br>(vi) Students prepare the written report in accord with standard report formatting provided in the Senior Projects Report Manual. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **2. Ability to compose original texts and properly apply the conventions of written language.**<br>Students are able to<br>(i) Properly apply capitalization, punctuation, and penmanship, to communicate clearly<br>(ii) Spell proficiently<br>(iii) Apply standard grammar and usage to communicate clearly and effectively in writing including<br>• **using complete sentences**, varying the types such as compound and complex to match meanings and purposes<br>• properly employing standard English usage in writing for audiences, including subject-verb agreement, pronoun referents, and parts of speech<br>• properly using adjectives (comparative and superlative forms) and adverbs appropriately to make writing vivid or precise<br>• properly using prepositional phrases to elaborate written ideas<br>• properly using conjunctions to connect ideas meaningfully<br>(i) Use available technology to support aspects of creating, revising, editing, spell checking, and publishing the report. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **3. Ability to provide appropriate discussion, conclusions and recommendations**<br>Students are able to clearly<br>(i) Summarize the goals, objectives, and indicate whether they were met.<br>(ii) Summarize the results.<br>(iii) Summarize constraints and codes and indicate whether they were met.<br>(iv) Provide logical conclusions and recommendations (including strengths and weaknesses). | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

## COLLEGE OUTCOME 8

**EAC h**, "the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context."

*Assignments that test competency in this area will include problems that test a student's ability to discuss/predict potential short and long term impacts of proposed engineering solution on society and the environment, employ prospective of others (group or culture) to identify the impact of engineering solutions.*

1. Students are able to investigate a given engineering problem and are able to analyze the short and long term impact (political, economic, environmental, health, safety, cultural) of proposed solutions on society (local, regional or global context).

    - *Instructor poses a problem (case study), and asks students to propose solution and indicate how proposed solution will impact society*
    - *Instructor poses a problem, provides solutions, and asks students to analyze solutions and determine their impact on society.*
    - *Students working on projects are required to analyze and determine the effects of their proposed solution on society*

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## COLLEGE OUTCOME 8

### h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

*Assignments that test competency in this area will include problems that test a student's ability to discuss/predict potential short and long term impacts of proposed engineering solution on society and the environment, employ prospective of others (group or culture) to identify the impact of engineering solutions.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| **Description of Performance Criteria Being Assessed** | | | | | |
|---|---|---|---|---|---|
| 1. Students are able to investigate a given engineering problem and are able to analyze the short and long term impact (political, economic, environmental, health, safety, cultural) of proposed solutions on society (local, regional or global context).<br>• *Instructor poses a problem (case study), and asks students to propose solution and indicate how proposed solution will impact society*<br>• *Instructor poses a problem, provides solutions, and asks students to analyze solutions and determine their impact on society.*<br>• *Students working on projects are required to analyze and determine the effects of their proposed solution on society* | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

## COLLEGE OUTCOME 9

**EAC i**, "recognition of the need for, and the ability to engage in life-long learning."

*Assignments that test competency in this area will include problems that test a students ability to (1) identify, retrieve, and organize information needed for a particular new task even if the task is outside of his/her area of expertise, (2) apply facts, formulas, theories, to everyday life, and (3) develop a study plan and follow the plan.*

**1. Students are aware of the need for lifelong learning**

(i) Given an open ended problem, students are aware of the need and are able to independently acquire additional knowledge and data needed for solving the problem. *(Instructor may give an assignment that requires students to learn additional information not covered in class for successful completion of the assignment).*

*(ii)* Students join and participate in activities of local student chapters of professional or other organizations and are aware of or make use of programs provided by the professional organizations in the areas of training and continuing education.

**2. Students engage in life-long learning activities**

(i) Students are able to effectively use library and online resources for research and are abreast with current developments in their discipline. (*Instructor can give an assignment requiring students to use other resources to study on their own and use the information studied to solve the problem, or give a library assignment*)

(ii) Students are able to identify and take advantage of learning opportunities available on internet and elsewhere such as seminars, webinars, conferences, workshops and tutorials. *(The instructor should direct the students to identify some of these activities and require them to show documentation of their involvement).*

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## COLLEGE OUTCOME 9

### i. Recognition of the need for, and the ability to engage in life-long learning.

*Assignments that test competency in this area will include problems that test a students ability to (1) identify, retrieve, and organize information needed for a particular new task even if the task is outside of his/her area of expertise, (2) apply facts, formulas, theories, to everyday life, and (3) develop a study plan and follow the plan.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| **Description of Performance Criteria Being Assessed** | | | | | |
|---|---|---|---|---|---|
| **1. Students are aware of the need for lifelong learning**<br>(i) Given an open ended problem, students are aware of the need and are able to independently acquire additional knowledge and data needed for solving the problem. *(Instructor may give an assignment that requires students to learn additional information not covered in class for successful completion of the assignment).*<br>(ii) Students join and participate in activities of local student chapters of professional or other organizations and are aware of or make use of programs provided by the professional organizations in the areas of training and continuing education. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **2. Students engage in life-long learning activities**<br>(i) Students are able to effectively use library and online resources for research and are abreast with current developments in their discipline. (*Instructor can give an assignment requiring students to use other resources to study on their own and use the information studied to solve the problem, or give a library assignment*)<br>(ii) Students are able to identify and take advantage of learning opportunities available on internet and elsewhere such as seminars, webinars, conferences, workshops and tutorials. *(The instructor should direct the students to identify some of these activities and require them to show documentation of their involvement).* | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

# COLLEGE OUTCOME 10

**EAC j**, "Knowledge of Contemporary Issues."

*Assignments that test competency in this area will include problems that test a students knowledge in some of the socio-economic issues associated with the subject area e.g. global warming, overpopulation, depletion of natural resources, etc.*

*Assignments that test competency in this area will include problems that test a student's ability to discuss/predict potential short and long term impacts of proposed engineering solution on society and the environment, employ prospective of others (group or culture) to identify the impact of engineering solutions.*

**1. Students display knowledge in a variety of contemporary issues or topics**

*(i)* Students are able to identify current issues (socio-economic, political, environmental, cultural, health and safety) in engineering and technology. *Some examples are global warming, population, depletion of natural resources, alternative energy; outsourcing, security, ecology, engineering/technology workforce development, human rights and environmental pollution.*

(ii) Students are aware of contemporary issues in industry such as corporate culture, industry-academia-government collaboration, industrial competition, etc.

*Instructor may require the student to identify and discuss several of the contemporary issues; recognize consequences; take and defend a position and/or write a report.*

*Instructor may assign topics or issues and require the students to discuss these issues; recognize consequences; take and defend a position and/or write a report.*

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## COLLEGE OUTCOME 10

### j. Knowledge of Contemporary Issues

*Assignments that test competency in this area will include problems that test a students knowledge in some of the socio-economic issues associated with the subject area e.g. global warming, overpopulation, depletion of natural resources, etc.*
*Assignments that test competency in this area will include problems that test a student's ability to discuss/predict potential short and long term impacts of proposed engineering solution on society and the environment, employ prospective of others (group or culture) to identify the impact of engineering solutions.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| **Description of Performance Criteria Being Assessed** | | | | | |
|---|---|---|---|---|---|
| **1. Ability to Define/Understand the Problem and then Plan the Project**<br>Students are able to:<br>(i) Identify the customer and the needs.<br>(ii) Identify and list the design objectives.<br>(iii) Identify the design constraints.<br>(iv) Define the design strategy and methodology.<br>(v) Identify and break down work into tasks and subtasks and identify the personnel and deliverables for each.<br>(vi) Develop a Gantt chart and critical path analysis for managing the project.<br>(vii) Establish major milestones for tracking progress and define performance metrics to measure success. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **2. Ability to Conduct a Review of the Literature, Generate Ideas and Apply Creativity**<br>Students are able to:<br>(i) Identify the types of information needed for a complete understanding of all aspects of the project (Based on task described in the project planning).<br>(ii) Gather information on relevant fundamentals, theory / concept (demonstrate technical competence) and relate them to the design.<br>(iii) Provide the sources in a list of references properly cited in the literature review section and relevant sections of the report.<br>(iv) Define functional requirements for design (Specific required actions needed to be performed for the design to be achieved).<br>(v) Transform functional requirements into candidate solutions / mathematical modeling.<br>(vi) Evaluate candidate solutions to arrive at feasible designs. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **3. Ability to Perform Preliminary and Detailed Design**<br>Students are able to:<br>(i) Identify applicable codes and standards for the design<br>(ii) Perform relevant detailed analysis (engineering, mathematical, economic) in accord with applicable codes and standards.<br>(iii) Develop final design specifications<br>(iv) Do the design within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability<br>(v) Select materials/components/software/test equipment.<br>(vi) Fabricate a prototype or a model (physical, software, hardware) of the design.<br>(vii) Test or simulate the design and make necessary changes to obtain optimum design. | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |

## COLLEGE OUTCOME 11

**EAC k**, "an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice."

*Assignments that test competency in this area will include problems that test a student's ability to use acquired engineering techniques, skills, and tools to solve engineering problems. Tools may include computers, modern instruments, and specialized software.*

**1. Students are able to use techniques and skills acquired in their studies necessary for engineering practice.**

(i) Students are able to utilize the latest problem solving and design techniques/methods in their discipline (such as unified modeling language (UML), numerical techniques, process simulators, and the design process)

**2. Students are able to use modern engineering tools necessary for engineering practice**

(i) Students are able to solve problems using current software used in the discipline (such as Matlab, AutoCAD, EES, Ansys, Multisim, Pspice, .NET, C++ compiler, etc)

(ii) Students are able to utilize the latest available hardware/equipment used in the discipline (such as NC machine, signal generators, oscilloscope, strength testing machine, computer hardware)

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**COLLEGE OUTCOME 11**

## k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

*Assignments that test competency in this area will include problems that test a student's ability to use acquired engineering techniques, skills, and tools to solve engineering problems. Tools may include computers, modern instruments, and specialized software.*

Course: _____ Semester _____Instructor_____

Assignment Description: _____Due Date _____

| **Description of Performance Criteria Being Assessed** | | | | | |
|---|---|---|---|---|---|
| **1. Students are able to use techniques and skills acquired in their studies necessary for engineering practice.**<br>(i) Students are able to utilize the latest problem solving and design techniques/methods in their discipline (such as unified modeling language (UML), numerical techniques, process simulators, the design process) | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| **2. Students are able to use modern engineering tools necessary for engineering practice**<br>(i) Students are able to solve problems using current software used in the discipline (such as Matlab, AutoCAD, EES, Ansys, Multisim, Pspice, .NET, C++ compiler, etc)<br><br>(ii) Students are able to utilize the latest available hardware/equipment used in the discipline (such as NC machine, signal generators, oscilloscope, strength testing machine, computer hardware) | Excellent (90-100): Performance Exceeds Expectations | Very Good (80-89): Performance meets Expectations | Average (70-79): Performance Meets Minimum Expectations | Below Average (55-69): Performance does not Meet Expectations | Poor (0-54): Unacceptable Performance |
| TOTAL | | | | | |