Outcome E. Graduates will have an ability to identify, formulate and solve engineering problems.

Course	Performance indicators
MAE 243, 320, 321, 342, 454, 456, 460	Capability to identify an engineering problem from a layman's need.
MAE 243, 320, 321, 342, 454, 456, 460	Formulate and problem with engineering principles of mechanics.
MAE 243, 320, 321, 342, 454, 456, 460	Solve a problem using engineering methods, tools and instruments.
MAE 243, 320, 321, 342, 454, 456, 460	Grade distribution.

Tools used:	Course assessment by faculty, Alumni survey, Employer survey.
Data Collection:	The data are collected every semester based on the course offerings.
Frequency of data collection:	The data are collected every time courses are taught.
Data Analysis:	The data obtained are analyzed every year.

Closing the loop: This outcome is subject to review every year based on performance criteria and metrics and specific action items are developed, if necessary, to revise the content of the courses. The analyzed data are presented separately to the following groups in meetings.

a) Feedback to students on all assignments

b) Feedback to faculty, particular from majors.

Outcome and Performance Indictor		**Performance Indicator Rubric**				
Assessment Outcome E. "Graduates will have an ability to identify, formulate and solve engineering problems."		**Poor**	**Fair**	**Good**	**Very Good**	**Excellent**
PI1	Capability to identify an engineering problem from a layman's need	No effort in identifying an eng. problem	Slight ref. to the eng. nature of a problem	Clear indication of the prob. nature	Eng. Concepts used to define prob.	Eng. Concepts used to define prob. and explained
PI2	Formulate and problem with engineering principles of mechanics	Formulation absent	Form. poorly presented	From. Mentioned but not developed	Form. used with equations	Form. used with equations and explanations
PI3	Solve a problem using engineering methods, tools and instruments	Solution unexplained	Attempt to use a sol. method	Some sol. method applied	Sol method correctly applied	Sol. method correct and explained
PI4	Grade distribution	1 (F)	2 (D)	3 (C)	4 (B)	5 (A)

Explanations:

Performance Indicator 1. (PI1). "Capability to identify an engineering problem from a layman's need." Engineering problems are often posed to solve specific needs. In the search of an engineering solution it is often necessary to identify the nature of the problem to be addressed and the nature of the system to deal with in order to establish operational, constraint and performance parameters. The following rubrics are used to assess this indicator:

- **Poor.** This rubric is used when there is no evidence of an effort made to establish or describe the nature of a particular problem or system or approach to follow.
- **Fair**. This rubric is used when there is some description of the nature and characteristics of a problem, a system or an engineering approach to apply.

- **Good**. This rubric is used when there is a clear description of the nature and characteristics of a problem, a system or an engineering approach in such a way that a clear path to a formulation and solution may result as a consequence.
- **Very Good**. This rubric is used when there is a clear description of the nature and characteristics of a problem, a system or an engineering approach in such a way that a clear path to a formulation and solution is produced.
- **Excellent.** This rubric is used when in addition to the previous rubric there is an explanation or arguments that illustrate how the nature of the problem, system or approach was arrived at.

Performance Indicator 2. (PI2). "Formulate a problem with engineering principles of mechanics." Engineering problems can be solved only after a mathematical formulation based on principles of mechanics has been developed for the problem at hand: The following rubrics are used to assess this indicator:

- **Poor.** This rubric is used when there is no evidence of an effort made to establish a formulation, producing a weak connection between the problem being addressed and the steps leading to a possible solution.
- **Fair**. This rubric is used when there is an attempt to establish a formulation which somehow connects the problem being addressed and provides a path towards a possible solution.
- **Good**. This rubric is used when there is a clear approach for establishing a formulation based on principles of mechanics which leads to a solution approach for the engineering problem being addressed.
- **Very Good**. This rubric is used when there is a clear approach for establishing a formulation based on principles of mechanics and a procedure described to reach a solution anticipating possible scenarios.
- **Excellent.** This rubric is used when in addition to the previous rubric there is an explanation or arguments that illustrate how the formulation was arrived at or developed.

Performance Indicator 3. (PI3). "Solve a problem using engineering methods, tools and instruments." Engineering problems ultimately call for solutions which can be obtained by applying engineering and mathematical procedures, tools, instruments and techniques aimed at producing results, which in turn represent a solution to the problem at hand. The following rubrics are used to assess this indicator:

- **Poor.** This rubric is used when a solution is not attained or appears to be flawed, or when the solution offered does not actually reflect the nature of the problem at hand.
- **Fair**. This rubric is used when only a partial solution is attained leaving important aspects or constraints of the problem unaddressed, underestimated or mistreated.
- **Good**. This rubric is used when a solution is attained which satisfies the basic performance requirements, without violating any of the constraints.
- **Very Good**. This rubric is used when a solution is attained which satisfies the basic performance requirements, without violating any of the constraints and provides evidence that it is the best possible solution.
- **Excellent.** This rubric is used when in addition to the previous rubric there is a clear description of how the solution was arrived at, and the rationale behind it.

Performance Indicator 4. (PI4). Grade distribution from class on applicable assignments or exercises. A, B, C, D ,F