Outcome A. Graduates will have an ability to apply knowledge of mathematics, science and engineering.

Course	Performance indicators
MAE 241, 242, 316, 331, 343	Use of concepts of physics or chemistry in the formulation of engineering problems.
MAE 241, 242, 316, 331, 343	Application of mathematics methods in solving engineering problem.
MAE 241, 242, 316, 331, 343	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 A. **"Graduates will have an ability to apply knowledge of mathematics, science and engineering"**		**Poor**	**Fair**	**Good**	**Very Good**	**Excellent**
PI1	Use of concepts of physics or chemistry in the formulation of engineering problems	Concepts absent	Concepts barely noticeable	Concepts mentioned	Concepts applied	Concepts applied and explained
PI2	Application of mathematics methods in solving engineering problem	Methods absent	Methods barely noticeable	Methods used	Methods used correctly	Methods applied explained
PI3	Grade distribution	1 (F)	2 (D)	3 (C)	4 (B)	5 (A)

Explanations:

Performance Indicator 1. (PI1). "Use of concepts of physics or chemistry in the formulation of engineering problems." Engineering problems in mechanical engineering often require the use of concepts of physics or chemistry in their formulation, as opposed to use of formulas, graphs or tables as "black boxes." Engineering exercises thus require students to use and apply science concepts when they formulate problems. The following rubrics are used to assess this indicator:

- **Poor.** This rubric is used when a problem formulation lacks a reference to any concept of science, and resources to the use of formulas, tables or other means without clear rationale of the fundamentals principles being used.
- **Fair.** This rubric is used when **s**ome marginal reference of a concept of science is made but in such a way that the connection between the concept and the problem is marginal or weak.
- **Good.** This rubric is used when the concepts of science used in a particular engineering problem formulation are stated in a way that the connection between the concept invoked and the problem is clear and relevant.
- **Very Good.** This rubric is used when the formulation of an engineering problem is clearly related to a concept of science, which is relevant to the problem and the solution, and the application of the science concept is clear and correctly posed.
- **Excellent.** This rubric is used when a problem formulation uses clear and proper concepts of science, which are relevant and in addition the application of these concepts is well documented, explained and presented in a logic progression.

Performance Indicator 2. (PI2). "Application of mathematics methods in solving engineering problem." Problems in mechanical engineering often require the use of mathematical methods, procedures and models. Students develop skills to apply mathematical procedures to model mechanical systems and to find meaningful solutions to engineering problems. The following rubrics are used to assess this indicator:

- **Poor.** This rubric is used when a problem formulation lacks a reference to any math concept, and resources to the use of formulas, tables or other means without clear rationale of the fundamentals principles being used.
- **Fair.** This rubric is used when **s**ome marginal reference of a math concept is made but in such a way that the connection between the concept and the problem is marginal or weak.
- **Good.** This rubric is used when the math concepts used in a particular engineering problem formulation are stated in a way that the connection between the concept invoked and the problem is clear and relevant.
- **Very Good.** This rubric is used when the formulation of an engineering problem is clearly related to a math concept, which is relevant to the problem and the solution, and the application of the math concept is clear and correctly posed.
- **Excellent.** This rubric is used when a problem formulation uses clear and proper math concepts, which are relevant and in addition the application of these concepts is well documented, explained and presented in a logic progression.

Performance Indicator 3. (PI3). Grade distribution from class on applicable assignments or exercises. A, B, C, D ,F