Outcome I. Graduates will have a recognition of the need for, and an ability to engage in, life-long learning.

Course	Performance indicators
MAE 343, 454	Awareness and understanding of long life learning implications.
MAE 343, 454	Development of self-taught skills.
MAE 343, 454	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				
Outcome I "Graduates will have a recognition of the need for, and an ability to engage in, life-long learning".		**Poor**	**Fair**	**Good**	**Very Good**	**Excellent**
PI1	Awareness and understanding of long life learning implications	No notion of life-long-learning (LLL)	LLL barely Mentioned	LLL Addressed in context	LLL Addressed in context and illustrated	LLL Addressed, illustrated & discussed
PI2	Development of self-taught skills	No notion self-taught skills	self-taught skills mentioned	self-taught skills used	self-taught skills used and illustrated	self-taught skills used, illustrated & explained
PI3	Grade distribution	1 (F)	2 (D)	3 (C)	4 (B)	5 (A)

Performance Indicator 1. (PI1). "Awareness and understanding of long life learning implications." Engineering is a profession which requires continuous self-education and lifelong learning to stay current. The following rubrics are used to assess this indicator:

- **Poor.** This rubric is used when an assignment offers no evidence addressing the issue of self-learning or creative use of resources.
- **Fair**. This rubric is used when an assignment offers some evidence of self-learning and some creative use of resources.
- **Good**. This rubric is used when an assignment offers clear evidence of self-learning and creative use of resources.
- **Very Good**. This rubric is used when an assignment offers clear evidence of self-learning and creative use of resources that leads to solutions.
- **Excellent**. This rubric is used when in addition to the previous rubric, the self-learned material is illustrated and resources used are listed and documented.

Performance Indicator 2. (PI2). "Development of self-taught skills." Engineering is a profession which often requires self-taught skills to formulate and solve engineering problems. The following rubrics are used to assess this indicator:

- **Poor.** This rubric is used when an assignment offers no evidence of self-taught skills used in the formulation and/or solution of engineering problems.
- **Fair**. This rubric is used when an assignment offers some evidence self-taught skills which are referenced in the formulation of engineering problems or in their solution.
- **Good**. This rubric is used when an assignment offers evidence of self-taught skills which are then used in the formulation of engineering problems and applied in their solution.
- **Very Good**. This rubric is used when an assignment offers clear evidence of self-taught skills which are used in the formulation of engineering problems, applied in their solution and are illustrated.

- **Excellent**. This rubric is used when in addition to the previous rubric; the self-taught skills are illustrated, explained and documented.

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

Assessment Tool:

Course Assessment Rubric by Faculty

Mechanical Engineering Program Course-Outcome Matrix

(October 2014)

ABET Outcome		***a***	***b***	***c***	***d***	***e***	***f***	***g***	***h***	***i***	***j***	***k***	
Required Course **K** = Key Course r = related Course	Credit Hours	Apply Math, Science, and Engr	Design Experiments and Analyze and	Design System, Component, or Process	Multi-disciplinary Teams	Identify, Formulate and Solve Engr Problems	Professional and Ethical Responsibility	Communicate Effectively	Broad Education - Global and Societal	Life-long Learning	Contemporary Issues	Techniques, Skills, and Modern Engr Tools	Number of Outcomes per course
ENGR 101 *Engr. Problem Solving 1*	3						F	G					2
MAE 211 *Mechatronics*	3			C	D								2
MAE 241 *Statics*	3	A											1
MAE 242 *Dynamics*	3	A											1
MAE 243 *Mech. of Materials*	3					E							1
MAE 244 *Dynam. & Strength Lab*	1		B		~~D~~							K	**2**
MAE 316 *Analy. of Engr. Sys.*	3	A										K	2
MAE 320 *Thermodynamics*	3					E			H		J		3
MAE 321 *Applied Thermodynamics*	3					E					J		2
MAE 322 *Thermal and Fluids Lab.*	3		B					G					2
MAE 331 *Fluid Mechanics*	3	A									J		2
MAE 342 *Dynamics of Machines*	3					E	F						2
MAE 343 *Intermed. Mech. Matls.*	3	A								I			2
MAE 411 *Advanced Mechatronics*	3		B									K	2
MAE 423 *Heat Transfer*	3			C					H		J		3
MAE 454 *Machine Design and Mfg.*	3			C		E				I			3
MAE 456 *CAD & Finite Elem. Ana.*	3			C		E						K	3
MAE 460 *Automatic Controls*	3					E						K	2
MAE 471 *Prin. of Engr. Design*	3			C	D		**F**	G					**4**
No. of courses/outcome	55	5	3	5	**2**	7	**3**	3	2	2	4	5	
MATH 155 *Calculus 1*	4	r											
CHEM 115 *Fund. of Chemistry*	4	r	r				r						
ENGR 199 *Orientation to Engr.*	1	r		r		r	r	r		r	r		
ENGL 101 *Composition and Rhetoric*	3							r					
MATH 156 *Calculus 2*	4	r								r			
ENGR 102 *Engr. Problem Solving 2*	3	r		r		r							
PHYS 111 *General Physics*	4	r	r			r		r					
PHYS 112 *General Physics*	4	r	r			r		r		r			
ENGL 102 *Composition & Rhetoric*	3							r		r			
MATH 251 *Multivariable Calculus*	4	r								r			
MATH 261 *Elem. Diff. Equations*	4	r								r			
IENG 302 *Manufacturing Processes*	2	r		r	r								
IENG 303 *Manufact. Processes Lab*	1	r	r	r	r								
EE 221 *Intro. to Electrical Engr.*	3	r		r		r							
EE 222 *Intro. to Electrical Engr. Lab*	1	r	r	r									
GEC (21 hours)	21							r	r		r		
Technical Electives (6 hours)	6								r	r	r	r	

Outcome	ABET Assessment Team members To conduct Assessment of Year 2014	
a	Ismail Celik, Yu Gu, Mario Perhinschi and Pat Browning	**Outcome a** "Graduates will have an ability to apply knowledge of mathematics, science and engineering."
b	Marvin Cheng, Alfred Lynam and Marcello Napolitano	**Outcome b** "Graduates will have an ability to design and conduct experiments, as well as to analyze data."
c	Ken Means, Terry Musho and Greg Thompson	**Outcome c** "Graduates will have an ability to design a system, component or process to meet desired needs."
d	Kostas Sierros, Jim Smith and Scott Wayne	**Outcome d** "Graduates will have an ability to function on multidisciplinary teams."
e	Ever Barbero, John Kuhlman, Andrew Nix and Jason Gross	**Outcome e** "Graduates will have an ability to identify, formulate and solve engineering problems."
f	Wade Huebsch and David Mebane	**Outcome f** "Graduates will have an understanding of professional and ethical responsibility."
g	Salva Akkerman, Cosmin Dumitrescu and Nithi Sivaneri	**Outcome g** "Graduates will have an ability to communicate effectively."
h	Victor Mucino and John Christian	**Outcome h** "Graduates will have the broad education necessary to understand the impact of engineering solutions in a global and societal context".
i	Xingbo Liu, Ed Sabolsky and Samir Shoukry	**Outcome i** "Graduates will have a recognition of the need for, and an ability to engage in, life-long learning".
j	Bruce Kang, Sam Mukdadi and Nick Wu	**Outcome j** "Graduates will have knowledge of contemporary issues."
k	Larry Banta, Hailin Li and Xueyan Song	**Outcome k** "Graduates will have an ability to use the techniques, skills and modern engineering tools necessary for engineering practice."

MECHANICAL ENGINEERING	I	Outcome I-2014

Outcome I "Graduates will have a recognition of the need for, and an ability to engage in, life-long learning".	**Assessment Team:** Xingbo Liu, Ed Sabolsky and Saminr Shoukry

Performance Indicators: PI1. Awareness and understanding of long life learning implications PI2. Development of a self-taught skills PI3. Grade average for the entire class.	Rubrics for Performance Indicators:					
		Poor (1)	Fair (2)	Good (3)	Very good (4)	Excellent (5)
Performance: P = (PI1 + PI2 + GA) / 3 **P= Performance** **PI1 = Performance Indicator 1** **PI2 = Performance Indicator 2** **GA= Average grade of class in assignment*** **(if GA is based on 100 pt scale, divide by 20; if GA is based on 4 pt scale, multiply by 1.25)**	PI1	No notion of life-long-learning (LLL)	LLL barely Mentioned, some creative use of resources	LLL Addressed in context with some creative use of resources	LLL Addressed in context and illustrated, creative use of resources	LLL Addressed, illustrated and discussed. creative use of resources
	PI2	No evidence of self-taught skills	Some evidence of self-taught skills	Self-taught skills used in problem solving	Self-taught skills used and illustrated	Self-taught skills used and clearly illustrated and documented

Course/Term	**PI1**	**PI2**	**Grade Average***	**Performance**	**Observations (Score explanation)**
MAE 343					
MAE 454					
Other ??					
Overall Performance 2014					
Average 2013					

Follow-up or Corrective Actions:	**Responsible Person/Team/Cmte.**
	To: AE CC
	To: Instructor (by Course)
	To: Instructor (by Course)
	To: Instructor (by Course)

MECHANICAL ENGINEERING	MAE 343	Outcome I-2014

Outcome I

"Graduates will have a recognition of the need for, and an ability to engage in, life-long learning".

Assessment Team:

Xingbo Liu, Ed Sabolsky and Saminr Shoukry

Performance Indicators:

PI1. Awareness and understanding of long life learning (LLL) implications
PI2. Development of a self-taught skills
PI3. Grade average for the entire class.

Performance: P = (PI1 + PI2 + GA) / 3

P= Performance
PI1 = Performance Indicator 1
PI2 = Performance Indicator 2
GA= Average grade of class in assignment*
(if GA is based on 100 pt scale, divide by 20; if GA is based on 4 pt. scale, multiply by 1.25)

Rubrics for Performance Indicators:

	Poor (1)	Fair (2)	Good (3)	Very good (4)	Excellent (5)
PI1	No notion of life-long-learning (LLL)	LLL barely Mentioned, some creative use of resources	LLL Addressed in context with some creative use of resources	LLL Addressed in context and illustrated, creative use of resources	LLL Addressed, illustrated and discussed. creative use of resources
PI2	No evidence of self-taught skills	Some evidence of self-taught skills	Self-taught skills used in problem solving	Self-taught skills used and illustrated	Self-taught skills used and clearly illustrated and documented

Course MAE 343	PI1	PI2	Class Grade Ave.	Average	Observations (Score explanation)
Key Asg. 1 (HW)					
Key Asg. 2 (HW)					
Key Asg. 3 (HW)					
Test 1 (Problem)					
Test 2 (Problem)					
Other (Project)					
Total Average					
Overall Performance 2014					
Overall Performance 2013					

Follow-up or Corrective Actions:	**Responsible Person/Team/Cmte.**
	To: AE CC
	To: Instructor (by Course)

MECHANICAL ENGINEERING	MAE 454	Outcome I-2014

Outcome I "Graduates will have a recognition of the need for, and an ability to engage in, life-long learning".	**Assessment Team:** Xingbo Liu, Ed Sabolsky and Saminr Shoukry
Performance Indicators: PI1. Awareness and understanding of long life learning (LLL) implications PI2. Development of a self-taught skills PI3. Grade average for the entire class.	Rubrics for Performance Indicators:

	Poor (1)	Fair (2)	Good (3)	Very good (4)	Excellent (5)
PI1	No notion of life-long-learning (LLL)	LLL barely Mentioned, some creative use of resources	LLL Addressed in context with some creative use of resources	LLL Addressed in context and illustrated, creative use of resources	LLL Addressed, illustrated and discussed. creative use of resources
PI2	No evidence of self-taught skills	Some evidence of self-taught skills	Self-taught skills used in problem solving	Self-taught skills used and illustrated	Self-taught skills used and clearly illustrated and documented

Performance: P = (PI1 + PI2 + GA) / 3

P= Performance
PI1 = Performance Indicator 1
PI2 = Performance Indicator 2
GA= Average grade of class in assignment*
(if GA is based on 100 pt scale, divide by 20; if GA is based on 4 pt. scale, multiply by 1.25)

Course MAE 454	**PI1**	**PI2**	**Class Grade Ave.**	**Average**	**Observations (Score explanation)**
Key Asg. 1 (HW)					
Key Asg. 2 (HW)					
Key Asg. 3 (HW)					
Test 1 (Problem)					
Test 2 (Problem)					
Other (Project)					
Total Average					
Overall Performance 2014					
Overall Performance 2013					

Follow-up or Corrective Actions:	**Responsible Person/Team/Cmte.**
	To: AE CC

	To: Instructor (by Course)

Assessment Tool:

Alumni Survey

MAE Alumni Survey of Educational Success

Dear Alum, in an effort to improve the quality of our Educational Programs in Mechanical and Aerospace Engineering, we would like to request few minutes of your time to help us assess the level of attainment of our Educational Objectives and Learning Outcomes that our graduates exhibit in the development of their professional activity. This survey will serve as a tool for the assessment of our Program and is not intended to be used to evaluate you individually.

Please tell us your year of graduation and the degree that you earned.

This is a required question

In my work, I am able to apply knowledge of math, science and engineering effectively.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I am able to design and conduct experiments, and analyze data.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I am able to design a system, component or process to meet desired needs and constraints.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I am able to function productively on multidisciplinary teams.

- Strongly Agree
- Agree
- Neutral

- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I am able to identify, formulate and solve engineering problems.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I have a good understanding of professional and ethical responsibility.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I am able to communicate effectively, both verbally and in writing.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I understand the impact of engineering solutions in a global and societal context.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I recognize the need for, and engage in, life-long learning.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I am aware of and appreciate contemporary engineering issues.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I am proficient in the use of techniques, skills and modern tools necessary for engineering practice.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

In my work, I am prepared to meet the varying demands of the workforce in the technological arena.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

Please add comments below to clarify or add to any of your answers above, or to provide general comments about the level of satisfaction you have with the way your education in the MAE department has prepared you for your career.

This is a required question

In general, How would you rate yourself in the following categories

	Poor	Fair	Good	Very Good	Excellent
Your proficiency in your field					
Your drive to learn on your own.					
Your preparedness to meet the demands of the job-market					

Please enter one response per row

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Assessment Tool:

Employer Survey

Employer Survey of MAE Graduates

Dear Employer, in an effort to improve the quality of our Educational Programs in Mechanical and Aerospace Engineering, we would like to request few minutes of your time to help us assess the level of attainment of our Educational Objectives and Learning Outcomes that our graduates exhibit in the development of their professional activity in your company. This survey will serve as a tool for the assessment of our Program and is not intended to be used to evaluate the graduate's work for you or in your company.

Please tell us how many WVU MAE graduates you employ, and for how long.

This is a required question

WVU MAE graduates in my employ are able to apply knowledge of math, science and engineering effectively.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ are able to design and conduct experiments, and analyze data.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ are able to design a system, component or process to meet desired needs and constraints.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ are able to function productively on multidisciplinary teams.

- Strongly Agree
- Agree

- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ are able to identify, formulate and solve engineering problems.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ have a good understanding of professional and ethical responsibility.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ are able to communicate effectively, both verbally and in writing.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ understand the impact of engineering solutions in a global and societal context.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ recognize the need for, and engage in, life-long learning.

- Strongly Agree
- Agree
- Neutral

- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ are aware of and appreciate contemporary engineering issues.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ are proficient in the use of techniques, skills and modern tools necessary for engineering practice.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

WVU MAE graduates in my employ are prepared to meet the varying demands of the workforce in the technological arena.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- Not Applicable

This is a required question

Please add comments below to clarify or add to any of your answers above, or to provide general comments about the level of satisfaction you have with graduates of the MAE department at WVU.

This is a required question

In general, How would you rate WVU MAE graduates in the following categories

	Poor	Fair	Good	Very Good	Excellent
Proficiency in his/her field					
Drive to learn on his/her own					
Preparedness to meet the demands of the job market					

Please enter one response per row

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