

**Outcome G.** Graduates will have an ability to communicate effectively.

Course	Performance indicators
ENGR 101, MAE 322, 471	Effectiveness of written-graphical communication.
ENGR 101, MAE 322, 471	Effectiveness of oral-graphical communication
ENGR 101, MAE 322, 471	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 Indicator		Performance Indicator Rubric				
<b>Outcome G</b> “Graduates will have an ability to communicate effectively.”		<b>Poor</b>	<b>Fair</b>	<b>Good</b>	<b>Very Good</b>	<b>Excellent</b>
PI1	Effectiveness of written-graphical communication	No write up organization poor expression	Poor write up organization and barely acceptable expression	Some organization acceptable expression	Clear organization and acceptable expression	Clear organization and clear objective expression
PI2	Effectiveness of oral-graphical communication	Unprepared oral presentation	Unorganized oral presentation	Somewhat organized but marginal delivery of presentation	Organized and clear delivery of presentation	Organized and clear presentation and clear graphics.
PI3	Grade distribution	1 (F)	2 (D)	3 (C)	4 (B)	5 (A)
<p><b>Performance Indicator 1. (PI1).</b> “<u>Effectiveness of written communication.</u>” Engineering professional practice requires effective written and graphical descriptions for reports of projects, designs, and results of testing and processes. The following rubrics are used to assess this indicator:</p> <ul style="list-style-type: none"> <li>- <b>Poor.</b> This rubric is used when reports or documents related to specific engineering assignments are unorganized and/or poorly written with poor expression of graphical descriptions.</li> <li>- <b>Fair.</b> This rubric is used when reports or documents related to specific engineering assignments are barely acceptable but lack quality in organization and expression.</li> <li>- <b>Good.</b> This rubric is used when reports or documents related to specific engineering assignments are acceptable in organization and expression.</li> <li>- <b>Very Good.</b> This rubric is used when reports or documents related to specific engineering assignments are well written, well organized and provide descriptions with clear expression.</li> <li>- <b>Excellent.</b> This rubric is used when reports or documents are very well written, organized, provide descriptions with clear expression and professionally presented.</li> </ul> <p><b>Performance Indicator 2. (PI2).</b> “<u>Effectiveness of oral-graphical communication.</u>” Engineering professional practice often requires effective oral and graphical communication to present projects, designs, and results of testing and processes. The following rubrics are used to assess this indicator:</p> <ul style="list-style-type: none"> <li>- <b>Poor.</b> This rubric is used when reports or documents related to specific engineering assignments do not provide evidence of an oral or graphical presentation.</li> <li>- <b>Fair.</b> This rubric is used when reports or documents related to specific engineering assignments provide evidence of an oral or graphical presentation without details on its organization and few visual elements.</li> </ul>						

- **Good.** This rubric is used when reports or documents provide evidence of an oral or graphical presentation with appropriate organization and quality visuals.
- **Very Good.** This rubric is used when reports or documents provide evidence of well-organized oral and graphical presentation with appropriate quality visuals elements.
- **Excellent.** This rubric is used when in addition to the previous rubric; there is evidence of presentation clarity and effectiveness.

**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)

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

Outcome	<b>ABET Assessment Team members To conduct Assessment of Year 2014</b>	
a	Ismail Celik, Yu Gu, Mario Perhinschi and Pat Browning	<b>Outcome a</b> “Graduates will have an ability to apply knowledge of mathematics, science and engineering.”
b	Marvin Cheng, Alfred Lynam and Marcello Napolitano	<b>Outcome b</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	<b>Outcome c</b> “Graduates will have an ability to design a system, component or process to meet desired needs.”
d	Kostas Sierros, Jim Smith and Scott Wayne	<b>Outcome d</b> “Graduates will have an ability to function on multidisciplinary teams.”
e	Ever Barbero, John Kuhlman, Andrew Nix and Jason Gross	<b>Outcome e</b> “Graduates will have an ability to identify, formulate and solve engineering problems.”
f	Wade Huebsch and David Mebane	<b>Outcome f</b> “Graduates will have an understanding of professional and ethical responsibility.”
g	Salva Akkerman, Cosmin Dumitrescu and Nithi Sivaneri	<b>Outcome g</b> “Graduates will have an ability to communicate effectively.”
h	Victor Mucino and John Christian	<b>Outcome h</b> “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	<b>Outcome i</b> “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	<b>Outcome j</b> “Graduates will have knowledge of contemporary issues.”
k	Larry Banta, Hailin Li and Xueyan Song	<b>Outcome k</b> “Graduates will have an ability to use the techniques, skills and modern engineering tools necessary for engineering practice.”

MECHANICAL ENGINEERING				G	Outcome G-2014				
<b>Outcome G</b> “Graduates will have an ability to communicate effectively.”				<b>Assessment Team:</b> Salva Akkerman, Cosmin Dumitrescu and Nithi Sivaneri					
<b>Performance Indicators:</b> PI1. Effectiveness of written-graphical communication PI2. Effectiveness of oral-graphical communication PI3. Grade average for the entire class.				Rubrics for Performance Indicators:					
					Poor (1)	Fair (2)	Good (3)	Very good (4)	Excellent (5)
<b>Performance: <math>P = (PI1 + PI2 + GA) / 3</math></b> <b>P= Performance</b> <b>PI1 = Performance Indicator 1</b> <b>PI2 = Performance Indicator 2</b> <b>GA= Average grade of class in assignment*</b> (if GA is based on 100 pt scale, divide by 20; if GA is based on 4 pt scale, multiply by 1.25)				PI1	Not organized and ideas not expressed	Poorly organized and ideas expressed poorly	Well organized or ideas expressed clearly	Well organized and ideas expressed clearly	Very well organized and ideas expressed very clearly
				PI2	Not organized and ideas not expressed	Poorly organized and ideas expressed poorly	Well organized or ideas expressed clearly	Well organized and ideas expressed clearly	Very well organized and ideas expressed very clearly
Course/Term	PI1	PI2	Grade Average*	Performance	Observations (Score explanation)				
ENGR 101									
MAE 322									
MAE 471									
<b>Overall Performance 2014</b>									
<b>Average 2013</b>									
<b>Follow-up or Corrective Actions:</b>					<b>Responsible Person/Team/Cmte.</b>				
					To: AE CC				
					To: Instructor (by Course)				
					To: Instructor (by Course)				
					To: Instructor (by Course)				

MECHANICAL ENGINEERING		ENRG 101		Outcome G-2014	
<b>Outcome G</b> “Graduates will have an ability to communicate effectively.”				<b>Assessment Team:</b> Salva Akkerman, Cosmin Dumitrescu and Nithi Sivaneri	
<b>Performance Indicators:</b> PI1. Effectiveness of written-graphical communication PI2. Effectiveness of oral-graphical communication PI3. Grade average for the entire class.				Rubrics for Performance Indicators:	
<b>Performance: <math>P = (PI1 + PI2 + GA) / 3</math></b> <b>P= Performance</b> <b>PI1 = Performance Indicator 1</b> <b>PI2 = Performance Indicator 2</b> <b>GA= Average grade of class in assignment*</b> (if GA is based on 100 pt scale, divide by 20; if GA is based on 4 pt. scale, multiply by 1.25)					
	Poor (1)	Fair (2)	Good (3)	Very good (4)	Excellent (5)
PI1	Not organized and ideas not expressed	Poorly organized and ideas expressed poorly	Well organized or ideas expressed clearly	Well organized and ideas expressed clearly	Very well organized and ideas expressed very clearly
PI2	Not organized and ideas not expressed	Poorly organized and ideas expressed poorly	Well organized or ideas expressed clearly	Well organized and ideas expressed clearly	Very well organized and ideas expressed very clearly
<b>Course</b> <b>ENGR 101</b>	<b>PI1</b>	<b>PI2</b>	<b>Class Grade Ave.</b>	<b>Average</b>	<b>Observations (Score explanation)</b>
Key Asg. 1 (HW)					
Key Asg. 2 (HW)					
Key Asg. 3 (HW)					
Test 1 (Problem)					
Test 2 (Problem)					
Other (Project)					
Total Average					
<b>Overall Performance 2014</b>					
<b>Overall Performance 2013</b>					
<b>Follow-up or Corrective Actions:</b>					<b>Responsible Person/Team/Cmte.</b>
					To: AE CC
					To: Instructor (by Course)



MECHANICAL ENGINEERING			MAE 322		Outcome G-2014				
<b>Outcome G</b> “Graduates will have an ability to communicate effectively.”				<b>Assessment Team:</b> Salva Akkerman, Cosmin Dumitrescu and Nithi Sivaneri					
<b>Performance Indicators:</b> PI1. Effectiveness of written-graphical communication PI2. Effectiveness of oral-graphical communication PI3. Grade average for the entire class.				Rubrics for Performance Indicators:					
					Poor (1)	Fair (2)	Good (3)	Very good (4)	Excellent (5)
<b>Performance: <math>P = (PI1 + PI2 + GA) / 3</math></b> <b>P= Performance</b> <b>PI1 = Performance Indicator 1</b> <b>PI2 = Performance Indicator 2</b> <b>GA= Average grade of class in assignment*</b> (if GA is based on 100 pt scale, divide by 20; if GA is based on 4 pt. scale, multiply by 1.25)				PI1	Not organized and ideas not expressed	Poorly organized and ideas expressed poorly	Well organized or ideas expressed clearly	Well organized and ideas expressed clearly	Very well organized and ideas expressed very clearly
				PI2	Not organized and ideas not expressed	Poorly organized and ideas expressed poorly	Well organized or ideas expressed clearly	Well organized and ideas expressed clearly	Very well organized and ideas expressed very clearly
Course MAE 322	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									
<b>Overall Performance 2014</b>									
<b>Overall Performance 2013</b>									
<b>Follow-up or Corrective Actions:</b>					<b>Responsible Person/Team/Cmte.</b>				
					To: AE CC				

	To: Instructor (by Course)
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MECHANICAL ENGINEERING			MAE 471		Outcome G-2014				
<b>Outcome G</b> “Graduates will have an ability to communicate effectively.”				<b>Assessment Team:</b> Salva Akkerman, Cosmin Dumitrescu and Nithi Sivaneri					
<b>Performance Indicators:</b> PI1. Effectiveness of written-graphical communication PI2. Effectiveness of oral-graphical communication PI3. Grade average for the entire class.				Rubrics for Performance Indicators:					
					Poor (1)	Fair (2)	Good (3)	Very good (4)	Excellent (5)
<b>Performance: <math>P = (PI1 + PI2 + GA) / 3</math></b> <b>P= Performance</b> <b>PI1 = Performance Indicator 1</b> <b>PI2 = Performance Indicator 2</b> <b>GA= Average grade of class in assignment*</b> (if GA is based on 100 pt scale, divide by 20; if GA is based on 4 pt. scale, multiply by 1.25)				PI1	Not organized and ideas not expressed	Poorly organized and ideas expressed poorly	Well organized or ideas expressed clearly	Well organized and ideas expressed clearly	Very well organized and ideas expressed very clearly
				PI2	Not organized and ideas not expressed	Poorly organized and ideas expressed poorly	Well organized or ideas expressed clearly	Well organized and ideas expressed clearly	Very well organized and ideas expressed very clearly
Course MAE 471	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									
<b>Overall Performance 2014</b>									
<b>Overall Performance 2013</b>									
<b>Follow-up or Corrective Actions:</b>					<b>Responsible Person/Team/Cmte.</b>				
					To: AE CC				

	To: Instructor (by Course)
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**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	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your drive to learn on your own.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your preparedness to meet the demands of the job-market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**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	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Drive to learn on his/her own	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preparedness to meet the demands of the job market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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