



## Engineering Technology | 2015-2016 Assessment Report

1. Please give a brief overview of the assessment data you collected this year.

**ENGR 213**, Engineering mechanics was the course in which **ABET learning outcome j** was assessed. Outcome j states that a student will demonstrate:

A knowledge of the impact of engineering technology solutions in a societal and global context.

The following assignment was used to assess outcome j and the assessment rubric is provided below with the percent and (number) of students who achieved unsatisfactory, developing, satisfactory, or exemplary for each item in the rubric.

Paper: Chose a modern engineering innovation and write an 8-10 page paper (double spaced, font size 11 or 12) answering the following:

1. Describe the problem that the innovation was seeking to solve.
2. Investigate and describe what constituencies (people, the environment, companies, etc) benefitted from the innovation and how they benefitted. Consider this on a global scale.
3. Investigate and describe what constituencies were negatively impacted by the innovation and how they were impacted.
4. Describe relationships and potential outcomes between affected constituencies
5. Based on the above, assess the solution on a global scale

**Assessment was performed using the rubric below. In each category the percentage and (number) of students achieving each criteria is reported.**

n = 8 students	Unsatisfactory	Developing	Satisfactory	Exemplary
Describes the project and its purpose	Fails to define problem or describe its purpose <b>0, (0)</b>	Gives little information about project and purpose <b>0, (0)</b>	Adequately describes project and purpose from one perspective <b>37.5%, (3)</b>	Thoroughly describes project and purpose from more than one perspective <b>62.5% (5)</b>

Investigates and discusses what entities will benefit and how	Fails to describe what entities will benefit or how they will benefit	Identifies one benefit and which entity benefits	Identifies/discusses two to three benefits; local recipient entities; and the nature of the benefits	Thoroughly assesses multiple benefits and recipients and the nature of the benefit both locally and globally
	<b>0, (0)</b>	<b>0, (0)</b>	<b>87.5%, (7)</b>	<b>12.5%, (1)</b>
Investigates and discusses what entities will suffer and how	Fails to describe what entities will suffer or how they will suffer	Identifies one negative outcome and the recipient entity	Identifies/discusses two to three negative outcomes, local recipient entities; and the nature of the negative outcome	Thoroughly assess multiple negative outcomes and recipients and the nature of the outcome locally and globally
	<b>12.5%, (1)</b>	<b>25%, (2)</b>	<b>50%, (4)</b>	<b>12.5%, (1)</b>
Describes realistic potential outcomes between affected parties	Fails to describe relationships or outcomes between affected groups	Hypothesizes some outcomes, but fails to consider if they are realistic	Identifies at least one potential realistic outcome in the context of relationships between entities	Thoroughly discusses from more than one perspective realistic outcomes in the context of relationships between affected groups
	<b>37.5%, (3)</b>	<b>12.5%, (1)</b>	<b>50%, (4)</b>	
Assess and discuss global precedents	Makes no assessment	Makes some assessment but fails to consider global precedents	Assesses based on one perspective and considers global precedents from this perspective	Gives thorough assessment based on multiple perspectives and discusses global precedents from multiple perspectives
		<b>50%, (4)</b>	<b>50%, (4)</b>	
Paper is well organized with correct spelling and grammar	Little organization and multiple grammar/spelling errors per page	Paper has some inconsistent organization and 2 to 3 spelling/grammar errors per page	Paper is organized with no more than 1 spelling/grammar error per page	Paper is well organized and only 5 or fewer spelling/grammar errors in entire paper
		<b>75%, (6)</b>	<b>25%, (2)</b>	

ET 330, Hydrology, was the course in which **ABET learning outcomes b, e, and j** were assessed.

**Outcome b** states that a student will demonstrate: An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies).

This was met with the following end of term assignment:

### Hydrology project

A village in Pakistan wants to build a 200 acre reservoir to hold rainfall excess from the annual monsoon to be used during the dry summer for irrigation. The annual monsoon lasts about 4 weeks in April. You will use the 100 year monsoon as the design basis for the reservoir. They have hired you to size the reservoir and estimate how much water from the reservoir will be available for irrigation in August. They also wish to have you derive the hydrograph for the river that flows by the edge of the village based on a previous hydrograph.

You are given the following data:

Total depth of precipitation (over the 4 week monsoon) for the past 20 years of monsoons:

<u>Year</u>	<u>depth P (in)</u>	<u>Year</u>	<u>depth P (in)</u>
2010	24	2000	30
2009	23	1999	25
2008	28	1998	23
2007	26	1997	27
2006	29	1996	29
2005	25	1995	25
2004	27	1994	31
2003	26	1993	28
2002	23	1992	32
2001	31	1990	28

The village is 15,000 acres, 13,000 of which is agricultural lands. Assume negligible infiltration over the 2000 acres that comprise the village due to excessive soil compaction and impervious surfaces. To estimate infiltration over the agricultural lands, field data was taken during a previous monsoon to be fitted to a Horton infiltration model. The rate of infiltration was measured initially, after 2 hours and after 4 days (96 hours) and is as follows;

time (hrs)	f (in/hr)
0	2.3
2	0.8
96	0.02

It can be assumed that 10% of precipitation goes to fill initial abstraction or is intercepted. In addition, a smaller village will draw 50 ft<sup>3</sup>/sec from the river during the monsoon period to support its own irrigation reservoir.

Based upon this, determine how deep a 200 acre storage reservoir must be to hold the rainfall excess.

Second, determine the volume of water available for irrigation at the beginning of August. The average water temperature for the summer months is 80°F and the average air temperature and humidity are 90°F and 60%, respectively, and the coefficient C is assumed to be 16 and the wind speed is 12 mph.

Last, given the following total hydrograph data for the river during a 2 week monsoon, estimate the monsoon hydrograph for the 100 year event of duration 4 weeks. Find the value of the rational coefficient from the water mass balance above. When applying the depth of R to deriving the unit hydrograph and the new monsoon hydrograph, round depth of rainfall excess to the next highest integer value.

<u>Time (weeks)</u>	<u>Q (cfs)</u>
0	400
1	700
2	1000
3	1300
4	1600
5	1200
6	800
7	400

Your final report should include all calculations written neatly in an organized fashion, the rational coefficient C for the watershed, the depth of the reservoir, the volume of rainfall excess in the reservoir at the end of the April monsoon and at the beginning of August, and the hydrograph for the 100 year monsoon event of duration 4 weeks.

Each group or individual will turn in one report. Each group or individual may ask three free questions of the project manager (me). Consulting with any other student or faculty member constitutes cheating and will result in a failing grade for the course. This includes any discourse during work on project in class days.

**Assessment was performed using the rubric below. In each category the percentage and (number) of students achieving each criteria is reported.**

n= 28 students	Unsatisfactory	Developing	Satisfactory	Exemplary
Write correct water mass balance from written problem description	Fails to write water mass balance	Identifies at least 70% of mass balance terms from written problem statement	Identifies all but one mass balance term from written problem description	Identifies all mass balance terms relevant to written problem description
	7.1%, (2)	7.1%, (2)	7.1%, (2)	78.6%, (22)

Apply appropriate mathematical models to estimate each term in mass balance	Fails to identify appropriate models for mass balance terms  7.1%, (2)	Applies correct models for at least 70% of mass balance terms  7.1%, (2)	Makes only one error in determining values of mass balance terms  10.8%, (3)	Applies appropriate math models for each term to correctly determine its numerical value  75%, (21)
Apply statistics to determine design storm	Fails to apply statistics  3.6%, (1)	Applies some statistics, but fails to consider all factors  3.6%, (1)	Applies statistics correctly, but makes math error  7.1%, (2)	Applies correct statistical models to determine design storm depth  89.3%. (24)
Convert each term in mass balance to volume of water	Fails to convert mass balance terms to volumes  7.1%, (2)	Correctly converts at least 65% of mass balance terms to volumes  3.6%, (1)	Makes only one error in converting mass balance terms to volumes  10.8%, (3)	Applies correct methodology to convert mass balance term to volumes  78.6%, (22)
Determine correct storm storage volume/depth	Fails to use mass balance or design storm to determine correct volume/depth  7.1%, (2)	Makes more than one error in determining storage volume/depth  3.6%, (1)	Makes only one error in determining storage volume/depth  10.8%, (3)	Correctly determines storage volume/depth  78.6%, (22)
Convert given hydrograph into design storm hydrograph	Fails to model design storm hydrograph  10.8%, (3)	Makes more than one error in modeling design storm hydrograph  3.6%, (1)	Makes only one error in modeling design storm hydrograph  17.9%, (5)	Correctly models design storm hydrograph  67.9%, (19)

**Outcome e** states that a student will demonstrate an ability to function effectively as a member or leader on a technical team.

This was met with the following assignment:

**1. Stream flow measurement (group of 4 to 5 people)**

Using criteria discussed in class, form a group of 4-5 students and measure stream flow in the arboretum. The following materials will be needed. Each group will turn in one estimate of stream flow with calculations and each group member will evaluate all other group members' participation according to the rubric below.

Materials needed:

Measuring tape

Ruler

Orange or other similar sized floating object

Stop watch

Two group member with wading boots or shoes that can get wet

Pencil and paper

Assessment was performed using the rubric below. In each category the percentage and (number) of students achieving each criteria is reported.

n = 28 students	Unsatisfactory	Developing	Satisfactory	Exemplary
Brings assigned tools and shares in team work	Brings no tools and does not perform assigned duties	Brings some tools and/or reluctantly performs some duties	Brings necessary tools and performs assigned duties  7.1%, (2)	Brings necessary tools, performs assigned duties, and assists others willingly  92.9%, (26)
Listens to other team members	Never allows anyone else to speak	Usually does most of the talking	Listens most of the time and responds professionally  3.6%, (1)	Listens and appropriately and professionally responds  96.4%, (27)
Contributes to final calculation using collected data	Does not contribute to final calculation	Contributes minimally to calculation  3.6%, (1)	Contributes to entire calculation  10.8%, (3)	Contributes and explains concepts to group members as needed  85.7%, (24)
Has a positive attitude toward team members	Demonstrates a poor attitude toward the work and does not respect group members	Is a reluctant team member  3.6%, (1)	Is a willing participant and is respectful of group members  3.6%, (1)	Demonstrates a positive attitude and is respectful towards group members  92.9%, (26)

**Outcome f** states that the student will have An ability to identify, analyze, and solve broadly defined engineering technology problems.

This was met with the following assignment:

The attached article describes a dam on the Nile River that Ethiopia is building. You are to write an 8-10 page (double spaced with font size 11 or 12) paper that

1. Describes the project and its purpose
2. Investigates and discusses thoroughly what entities (peoples, the environment, etc) will benefit from the dam and how (socially, economically, politically, environmentally) they will benefit
3. Investigates and discusses thoroughly what entities (peoples, the environment) will suffer negatively from the dam and how (socially, economically, politically, environmentally) they will suffer
4. Describes realistic potential outcomes between affected parties
5. Makes a realistic assessment and discuss any potential global precedents.

Consider not just the immediate affected parties, but the impact on a global scale. Does this dam project set any precedents for future development?

The paper will be graded on two criteria:

1. How well is the above assessment criteria is met?
2. How well is the paper written in terms of grammar and organization?

**Assessment for the first criteria was performed using the rubric below. In each category the percentage and (number) of students achieving each criteria is reported.**

n = 28 students	Unsatisfactory	Developing	Satisfactory	Exemplary
Describes the project and its purpose	Fails to define problem or describe its purpose	Gives little information about project and purpose  10.7%, (3)	Adequately describes project and purpose from one perspective  28.6%, (8)	Thoroughly describes project and purpose from more than one perspective  60.7%, (17)

Investigates and discusses what entities will benefit and how	Fails to describe what entities will benefit or how they will benefit	Identifies one benefit and which entity benefits  10.7%, (3)	Identifies/discusses two to three benefits; local recipient entities; and the nature of the benefits  53.6%, (15)	Thoroughly assesses multiple benefits and recipients and the nature of the benefit both locally and globally  35.7%, (10)
Investigates and discusses what entities will suffer and how	Fails to describe what entities will suffer or how they will suffer	Identifies one negative outcome and the recipient entity  10.7%, (3)	Identifies/discusses two to three negative outcomes, local recipient entities; and the nature of the negative outcome  53.6%, (15)	Thoroughly assess multiple negative outcomes and recipients and the nature of the outcome locally and globally  35.7%, (3)
Describes realistic potential outcomes between affected parties	Fails to describe relationships or outcomes between affected groups  3.6%, (1)	Hypothesizes some outcomes, but fails to consider if they are realistic  3.6%, (1)	Identifies at least one potential realistic outcome in the context of relationships between entities  57.1%, (16)	Thoroughly discusses from more than one perspective realistic outcomes in the context of relationships between affected groups  35.7%, (10)
Assess and discuss global precedents	Makes no assessment	Makes some assessment but fails to consider global precedents  32.1%, (9)	Assesses based on one perspective and considers global precedents from this perspective  57.1%, (16)	Gives thorough assessment based on multiple perspectives and discusses global precedents from multiple perspectives  10.7%, (3)



Assessment for the second criteria was performed using the rubric below. In each category the percentage and (number) of students achieving each criteria is reported.

n = 28 students	Unsatisfactory	Developing	Satisfactory	Exemplary
Topic is thoroughly researched and properly cited	Topic is not researched much beyond given information  7.1%, (2)	One or two appropriate references are used and cited	Three or four appropriate references are used and cited  25%, (7)	Topic is thoroughly researched from multiple (5 or more) sources and is well cited  67.9%, (19)
Paper is well organized	Paper is not organized at all	Paper has some organization, but inconsistent  10.7%, (3)	Paper is organized according to the questions asked, but not well organized overall  3.6%, (1)	Paper is organized according to topics and overall into an easy to follow flow of information  85.7%, (24)
Correct grammar and spelling are used throughout	Grammar and spelling are poor – many errors per page  39.3%, (11)	Grammar and spelling are marginally acceptable – 2 to 3 errors per page  28.6%, (8)	Grammar and spelling are good – no more than one error per page  25%, (7)	Grammar and spelling are near perfect – no more than 3 errors in entire paper  7.1%, (2)
Tables and figures illustrate concepts	No tables or figures are provided  14.3%, (4)	One figure or table is given – a map of area  25%, (7)	Tables and figures illustrate some concepts  14.3%, (4)	Tables and figures completely support the text  46.4%, (13)

2. How will you use what you've learned from the data that was collected?

**ENGR 213: Outcome j**

Engineering students often have difficulty with basic grammar and spelling as is evidenced by the summary assessment. Next fall, I will either have proof that someone proofread the paper for them or I will require a first draft so that I can help with grammar and spelling. We will also spend more time in class discussing the specifics of each criteria and examples will be provided to help students determine relationships and outcomes and future precedents.

**ET 330: Outcome b**

No significant changes will need to be made.

**ET 330: Outcome e**

Clearly, having the students evaluate each other was an assessment failure as they mostly just gave each other the highest rating with little or no thought even though they were assured these evaluations were anonymous. A different evaluation scheme is required and the professor must find a way to observe each group.

**ET 330: outcome f**

Additional class time should be given to discussing the assignment and describing what is meant by potential outcomes and global precedents.

**ET 330: Writing emphasis**

While papers were well researched and organized, grammar and spelling remain an issue. Students will either be required to verify use of an outside proofreader or the professor will have to require a first draft so facilitate corrections.