





ET 344 Human machine Interface											
ET 346 Electric Power Systems											
ET 348 Electromag. Fields & Apps.											
ET 350 Data Comm. & Protocols											
ET 360 Project Management									x		
ET 390 Mechatronics Y	x				x						
ET 400 Internship T ET 410 Capstone			x				x	x			x

**Environmental Engineering Technology ABET Assessment Grid**

<b>Outcomes</b>	A	B	C	D	E	F	G	H	I	J	K
<b>Courses</b>		(1)	(3)	(2)	(6)		(4)		(5)		
ET 101 Intro. to ET M								x	x		x
ET 103 Surveying H		x			x						
ET 105 Drawing H	x										
ET 118 Fluids 1 H			x			x					

ET 201 Intro. to Air T							x				
ET 202 Intro. to Solid Waste K										x	
ET 203 Intro. to Water and Waste Water H				x							
ET 330 Hydrology T		x			x					x	
ET 360 Project Management H									x		
ET 391 GIS ??											
ET 464 Atm. Poll. T ET 334 Solid Waste K ET 331 W & WW H	x			x		x					
ET 400 Capstone ET 410 Internship T			x				x	x			x

**Mechanical Engineering Technology ABET Assessment Grid**

<b>Outcomes</b>	A	B	C	D	E	F	G	H	I	J	K
<b>Courses</b>		(1)	(3)	(2)	(6)		(4)		(5)		
ET 101 Intro. to ET M								x	x		x
ET 105 Drawing H	x										
ET 106 Parametric Model 1							x				



ET 322 Design Problems				x							
ET 360 Project Management H									x		
ET 390 Mechatronics Y	x				x						
ET 400 Internship T ET 410 Capstone			x				x	x			x

2. Which technique will you use to assess this outcome?

A number of techniques will be used to assess each outcome. For example, learning outcome j (A knowledge of the impact of engineering technology solutions in a societal and global context) will be assessed in the **ENGR 213, Engineering Mechanics** course. The assignment and grading rubric by which this has been assessed are given below:

Paper: Chose a modern engineering innovation and write a 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

The paper will be due Tuesday, November 17<sup>th</sup>. A hard copy must be brought to class. You may choose your own topic or select from the list below:

- Hybrid or electric vehicles
- Wind Turbines
- Hydraulic fracturing
- Deep water and arctic drilling technology
- Nuclear fission

**Assessment will follow the rubric below:**

	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	Adequately describes project and purpose from one perspective	Thoroughly describes project and purpose from more than one perspective
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
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
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
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
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

### **The hydrology class will be used to assess learning outcomes**

b (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),

e (An ability to function effectively as a member or leader on a technical team), and

j (A knowledge of the impact of engineering technology solutions in a societal and global context)

The course also meets the UWGB general education requirement for writing emphasis and this will also be assessed.

**Outcomes j and writing emphasis were assessed by the following assignment and assessment rubrics:**

#### **Writing Assignment 2 (ABET learning outcome J and Writing Emphasis)**

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 addressed. (ABET j)
2. How well is the paper written in terms of grammar and organization.

Grading rubrics for the two criteria are given.



Assessment Rubric for Criteria 1 (ABET j):

	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	Adequately describes project and purpose from one perspective	Thoroughly describes project and purpose from more than one perspective
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
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
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
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

**Assessment Rubric for Criteria 2 (Writing Emphasis):**

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

**ABET learning outcome E was assessed by the following assignments and rubric:**

You will be given two small group assignments,

1. Estimate the volumetric flow of water (ft<sup>3</sup>/min and liters/sec) in the campus stream
2. Collect field data and estimate the terms in the Horton infiltration model for infiltration

The technique and specific expectations for both of these will be discussed in class. You may form your own groups, but may not use the same group for both assignments. Your grade will be based on how realistic

the final answer is and how well you work within your group. The latter will be assessed by your group members (confidentially) according to the rubric on the following page.

The following tools will be needed for each:

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

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

**2. Infiltration estimation (group of 4 people)**

Ruler

A lot of water (about 15 liters)

Stop watch

Pencil and paper

Ring infiltrometer (I will supply)

**Grading rubric for working effectively in teams in field exercises**

	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	Brings necessary tools, performs assigned duties, and assists others willingly
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	Listens and appropriately and professionally responds
Contributes to final calculation using collected data	Does not contribute to final calculation	Contributes minimally to calculation	Contributes to entire calculation	Contributes and explains concepts to group members as needed
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	Is a willing participant and is respectful of group members	Demonstrates a positive attitude and is respectful towards group members

Team member name	Brings tools/ shares work	Listens	Contributes to calculation	Has positive attitude
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**ABET learning outcome b was assessed by the following end of semester project and assessment rubric:**

In place of a final exam, students will complete a final project. Its scope will be defined at an appropriate time in the semester. It will be assessed by the following rubric.

### 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.

**Project assessment rubric:**

	Unsatisfactory	Developing	Satisfactory	Exemplary
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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
Apply appropriate mathematical models to estimate each term in mass balance	Fails to identify appropriate models for mass balance terms	Applies correct models for at least 70% of mass balance terms	Makes only one error in determining values of mass balance terms	Applies appropriate math models for each term to correctly determine its numerical value
Apply statistics to determine design storm	Fails to apply statistics	Applies some statistics, but fails to consider all factors	Applies statistics correctly, but makes math error	Applies correct statistical models to determine design storm depth
Convert each term in mass balance to volume of water	Fails to convert mass balance terms to volumes	Correctly converts at least 65% of mass balance terms to volumes	Makes only one error in converting mass balance terms to volumes	Applies correct methodology to convert mass balance term to volumes
Determine correct storm storage volume/depth	Fails to use mass balance or design storm to determine correct volume/depth	Makes more than one error in determining storage volume/depth	Makes only one error in determining storage volume/depth	Correctly determines storage volume/depth
Convert given hydrograph into design storm hydrograph	Fails to model design storm hydrograph	Makes more than one error in modeling design storm hydrograph	Makes only one error in modeling design storm hydrograph	Correctly models design storm hydrograph

3. Which course or group of students will you assess on the outcome chosen above and when?

I give two course examples in the previous question. All students are assessed for each assignment and corresponding learning outcome. For courses that are only engineering or engineering technology, only these students work is compiled for ABET purposes.