Annual Assessment Report
2012-2013 Academic Year

BACHELOR OF SCIENCE IN CIVIL ENGINEERING DEGREE PROGRAM

administered by the

Civil Engineering Department
Oregon Institute of Technology

1. INTRODUCTION
The Civil Engineering Department at Oregon Institute of Technology administers a Bachelor of Science in Civil Engineering (BSCE) degree. This degree is accredited by the Engineering Accreditation Commission of ABET, Inc. The program has maintained an average enrollment of 110 students with an average one-year retention of 85%. Approximately 23 BSCE degrees are awarded each year.

2. MISSION, OBJECTIVES, AND OUTCOMES
The mission, objectives, and student learning outcomes for the BSCE program are reviewed annually by the department at the fall retreat during convocation. Based upon feedback received from ABET evaluators during 2010 visit, minor changes were made to the objectives and outcomes. A revised set of objectives and outcomes were discussed at a department retreat in 2011 and then discussed with the department's Industrial Advisory Council (IAC) during the fall of 2011. The department and IAC approved the revised outcomes and objectives below. No changes have been made to the mission of the department.

2.1 Program Mission
The mission of the Bachelor of Science in Civil Engineering (BSCE) program at Oregon Institute of Technology is to prepare students for professional practice. To be prepared to practice as professionals, engineers must be able to act responsibly and ethically, understand their limits and the limits of the tools they use, communicate effectively, work well in teams, and, amid the changing landscape of the field of civil engineering, be able to pursue graduate level education.

2.2 Program Objectives
The following objectives are what the faculty expects graduates from the program to be able to accomplish a few years after the commencement of their careers and stem directly from the program mission. The alumni from the BSCE program at Oregon Tech should:

1. practice in civil engineering or a related field
2. pursue advanced education in civil engineering or a related field
3. act as responsible, effective, and ethical citizens
4. communicate effectively
5. collaborate effectively

2.3 Program Outcomes

From these objectives stem a number of specific and measurable outcomes. In addition to being more specific, the outcomes state what students should be able to demonstrate while in the program and provide evidence that the objectives are also being met. Upon graduating from the BSCE program at Oregon Tech, students should possess:

(a). an ability to apply knowledge of mathematics, science, and engineering
(b). an ability to design and conduct experiments, as well as to analyze and interpret data
(c). an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d). an ability to function on multi-disciplinary teams
(e). an ability to identify, formulate, and solve engineering problems
(f). an understanding of professional and ethical responsibility as well as the importance of professional licensure
(g). an ability to communicate effectively
(h). the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i). a recognition of the need for, and an ability to engage in life-long learning
(j). a knowledge of contemporary issues
(k). an ability to use the techniques, skill, and modern engineering tools necessary for engineering practice
(l). an ability to explain basic concepts in management, business, public policy, and leadership
(m). an ability to evaluate concepts and ideas from alternative perspectives

3 ASSESSMENT CYCLE

The Civil Engineering Department follows a three-year assessment cycle during which the faculty members conduct numerous assessments to ensure the quality of the program. The 2012-2013 academic year is the second year in the current cycle.

During the 2011 fall retreat, the civil engineering department developed a plan for targeted assessments. This plan called for a cycle in which each outcome is directly assessed at least twice in specific, targeted courses in the curriculum—courses where the outcome is normally taught, reinforced, or otherwise addressed.

This cycle is a work in progress and is constantly evolving. The department faculty meets at the beginning of each term to discuss outcomes that are scheduled to be assessed during that term. Performance criteria for each outcome are developed, or reviewed if they had been used previously. After deciding on appropriate performance criteria, the faculty members discuss whether the targeted course is still an appropriate course in which to conduct the assessment or decide upon a new setting. Sometimes the newly-targeted course is during the same term and sometimes it is in a different term and so the outcome is moved to a new time in the cycle. As such, the assessment cycle may be slightly changed from year to year. Table 1 summarizes the most up-to-date cycle as well as the courses that have been targeted for assessments.

Table 1 Assessment Cycle with Targeted Courses

Outcome	Winter 12	Spring 12	Fall 12	Winter 13	Spring 13	Fall 13	Winter 14	Spring 14
a. fundamentals	CIV 328	ENGR 212						
b. experimentation			ENGR 231	ENGR 213				
c. design			CIV 416	CIV 402				
d. teamwork						ENGR 318	CIV 402	
e. problem solving	CIV 361	CIV 344						
f. professionalism						CE 351/Bridge design		
g. communication	*CIV 402							
h. broad education			CIV 315		CIV 202			
i. life-long learning			ENGR 101	CIV 402				
j. contemporary issues						Bridge Ratin	CE 354	
k. tools							CIV 402	CIV 374
l. leadership								
m. alternative perspectives						CIV 358		CIV 202

*Multiple assessments will be done for this outcome in this course during this term

4. 2011-2012 TARGETED ASSESSMENT ACTIVITIES

Each of the program outcomes are taught or reinforced in several classes. The tables in Appendix A illustrate the relationships between the program outcomes and each course in the curriculum. Courses with a predetermined relationship to a particular outcome were possible targets for direct assessments. As shown in Table 1, four outcomes were scheduled to be assessed in eight different targeted courses during the 2021-2013 academic year. Each of these assessments is detailed below.

4.1 Outcome (b): *an ability to design and conduct experiments, as well as to analyze and interpret data*

This outcome was assessed twice during the 2012-2013 academic year: the first time in a fluid mechanics course and the second time in a solid mechanics course.

4.1.1 First Assessment

Twenty-four students enrolled in ENGR 231-Fluid Mechanics in the fall term of 2012. The experimentation skills of these students were assessed during a laboratory exercise using performance criteria and a rubric developed by the civil engineering faculty. The results of this assessment are summarized in Table 2.

Students exceeded the minimum acceptable performance levels for all criteria, indicating that students have the abilities to design and conduct experiments, as well as to analyze and interpret data.

Table 2 Summary of First Assessment of Outcome (b): Experimentation

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Correctly identified all applicable variables	Observation of laboratory exercise and evaluation of associated hydraulic report by course instructor	1 - 4 according to form criteria	90% scoring ≥ 3.0	100.0% ≥ 3.0 100.0% = 4.0
Identified appropriate test standards / methodologies				100.0% ≥ 3.0 100.0% = 4.0
Chose / assembled appropriate test equipment / apparatus				100.0% ≥ 3.0 100.0% = 4.0
Chose appropriate test sample				100.0% ≥ 3.0 100.0% = 4.0
Followed appropriate standards / methodologies				100.0% ≥ 3.0 83.3% = 4.0
Accurately assessed and responded to preliminary results				100.0% ≥ 3.0 100.0% = 4.0
Performed appropriate analysis and interpretation of data				100.0% ≥ 3.0 83.3% = 4.0
Arrived at reasonable and defendable result				100.0% ≥ 3.0 50.0% = 4.0

4.1.2 Second Assessment

The students' experimentation abilities were assessed again in the winter term offering of ENGR 213-Strengths of Materials by observing students conducting a laboratory exercise and evaluating lab reports submitted by students. Sixteen students were evaluated by the instructing civil engineering professor using the same criteria and scale. Lab reports were submitted by students in groups of two or three. Groups existing solely of mechanical engineering students were excluded from this analysis.

The results presented in Table 3 suggest that students do have the ability to identify, formulate, and solve engineering problems as well as document their solutions.

Table 3 Summary of Second Assessment of Outcome (b): Experimentation

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Correctly identified all applicable variables	Observation of laboratory exercise and evaluation of associated individual worksheet responses and group laboratory reports by course instructor	1 - 4 according to form criteria	85% scoring ≥ 3.0	100.0% ≥ 3.0 100.0% = 4.0
Identified appropriate test standards / methodologies				100.0% ≥ 3.0 57.1% = 4.0
Chose / assembled appropriate test equipment / apparatus				100.0% ≥ 3.0 100.0% = 4.0
Chose appropriate test sample				100.0% ≥ 3.0 57.1% = 4.0
Followed appropriate standards / methodologies				100.0% ≥ 3.0 100.0% = 4.0
Accurately assessed and responded to preliminary results				100.0% ≥ 3.0 100.0% = 4.0
Performed appropriate analysis and interpretation of data				100.0% ≥ 3.0 85.7% = 4.0
Arrived at reasonable and defendable result				85.7% ≥ 3.0 85.7% = 4.0

4.2 Outcome (c): *an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability*

4.2.1 First Assessment

Outcome (c) was initially assessed in CIV 416-Structural Design for Lateral Loads in the fall of 2012. Fifteen students divided into four groups were asked to design a multi-story structural steel building to resist seismic loads. Each group submitted a packet of calculations which was assessed using the department's design rubric. The results of this assessment are summarized in Table 4.

The data reveal that students did not meet the minimum acceptable performance standards in three of the eight criteria. It was clear from the submittals that students did not take the project very seriously, nor did they take advantage of the instructor's willingness to perform a preliminary review. In a future offering of a similar course in the fall of 2013, students will be strongly encouraged to emphasis safety, needs, and assumptions. The instructor will also *require* a preliminary submittal so that significant errors or omissions can be addressed prior to project completion. This outcome will then be assessed again at the end of that course.

Table 4 Summary of First Assessment of Outcome (c): Design

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Design is cost effective	Caculations Package for Seismic Structural Design Project	1-4 According to attached criteria	75% of student teams scoring ≥ 3	75% ≥ 3
Design is safe				25% ≥ 3
Realistic design materials				100% ≥ 3
Design completed using practical techniques and tools				100% ≥ 3
Design completed on time				100% ≥ 3
Design fulfills intended need				50% ≥ 3
Designed according to realistic assumptions				50% ≥ 3
Design is constructable				100% ≥ 3

4.2.2 Second Assessment

The design outcome was assessed again in CIV 402-Design Project in the winter of 2013. Twenty-eight students were divided into five groups to complete five different capstone design projects over the course of two terms. The groups submitted comprehension design binders and drawing sets at the end of the project that were assessed by four department faculty members using the department's design rubric. Table 5 summarizes the results of these assessments.

The students' designs were generally satisfactory with 100% of groups scoring 3 or better in six of nine categories including those representing the, arguably, most important criteria of safety, cost effectiveness and timely completion. The sole area of concern in this assessment is that only 77% of the groups completed designs that were judged to be constuctable. Constructable design is always a challenge for student designers with little or no construction experience. Indeed, this issue of constructability remains a challenge for graduate engineers in their first several years of practice as Engineers in Training. The instruction team for the 2013-14 version of this course will evaluate these results and will adjust both course content and the minimum acceptable performance levels in this area.

Table 5 Summary of Second Assessment of Outcome (c): Design

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Design is cost effective	Design binder & drawing set	1-4 According to attached criteria	80% of student teams scoring >= 3	100% ≥ 3
Design is safe				100% ≥ 3
Realistic design materials				92% ≥ 3
Design completed using practical techniques and tools				100% ≥ 3
Design completed on time				100% ≥ 3
Design fulfills intended need				86% ≥ 3
Designed according to realistic assumptions				100% ≥ 3
Design is constructable				77% ≥ 3
Design process and results are properly documented.				100% ≥ 3

4.3 Outcome (h):*the broad education necessary to understand the impact of engineering solutions in a global and societal context*

This outcome was supposed to be assessed twice during the 2012-2013 academic year, once in junior-level a environmental engineering course and again in a sophomore sustainability course.

4.3.1 First Assessment

This outcome was first assessed in CIV 315-Principles of Environmental Engineering in the fall of 2012. The assessment was conducted using student poster presentations and written papers. The 15 students enrolled in the course each worked individually. Table 6 summarizes the results of this assessment as well as the criteria that were used.

Table 6 Summary of First Assessment of Outcome (h): Broad Education

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Assess effect on human population	Poster session (including discussion) & written paper	1 - 4 according to form criteria	90% scoring ≥ 3.0	100.0% ≥ 3.0 (96.7% = 4.0)
Assess effect on natural environment				100.0% ≥ 3.0 (83.3% = 4.0)
Assess effect on economy				86.7% ≥ 3.0 (56.7% = 4.0)

The results of the assessment indicate that students are aware of and generally able to assess effects of engineering solutions on the human populace, the natural environment, and the economy. As with preceding assessments for this outcome, the data continue to suggest that students are more able to articulate these concepts and effects in personal discussion than in a written memo. In other words, during the poster presentation portion of the assessment, 100% of the students scored a 3 or higher and 80% of the students scored a 4.

The results of this assessment were discussed in a department meeting. The faculty members felt that the civil engineering economy course continued to show positive effect on students' understanding of engineering solutions effect on economy. That, combined with the positive results from the poster presentations, led the faculty to conclude that no further action was required at this time.

4.3.2 Second Assessment

The second assessment of Outcome (h) did not happen during the 2012-2013 academic year. The sophomore sustainability course evolved in an unforeseen way during the year and the term in which the assessment had been planned was unexpectedly overscheduled with field trips and guest lectures, leaving neither time nor context for the outcome to be assessed. The second direct assessment of this outcome will take place in during the 2013-2014 academic year.

4.4 Outcome (i): *a recognition of the need for, and an ability to engage in life-long learning*

This outcome was assessed twice in 2013 using a survey assigned to a cohort of freshmen and seniors.

4.4.1 First Assessment

Twenty-nine freshmen students enrolled in ENGR 102-Introduction to Engineering during winter term completed the life-long learning assignment individually outside of class. Their responses, as well as the criteria used to assess them, are summarized in Table 7.

Table 7 Summary of First Assessment of Outcome (i): Life-Long Learning

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Students are aware of continuing education requirements for licensure	survey question	either aware of requirements or not aware	80% of students responding that they are aware that most states require continuing education	62% of students said that they were aware
Students have a positive outlook towards continuing education	survey question	students either responded that they saw continuing education as a way to grow professionally or as another hoop to jump through	80% of students responding that continuing education is a way to grow professionally	83% of students responded correctly
Students know where to go to continue their education or to find information on continuing education	survey question	students listed three sources, coordinator judged responses as valid sources of information	80% of students listing at least two valid sources	96.6% of students listed at least 2 valid sources of information on continuing education
Students identify at least one method of continuing education	survey question	students response to open-ended question was evaluated by coordinator	80% of students listing at least one way to continue their education	86.2% of students listed at least one way to continue their education
Students identify methods least likely to count towards continuing education credits	survey questions	students were given four multiple choice questions and asked on each to identify which choice was least like to count towards continuing education credits	80% of students correctly identifying at least two correct answers	72.4% of students correctly answered at least two questions

Students met the performance standards for three of the five criteria, falling short in an awareness of state requirements for continuing education and on identifying unacceptable methods of continuing education. These results were discussed in a department meeting and it was determined that the performance levels were satisfactory, and that it was unreasonable to

assume that freshmen who are newly embarking on their college experience would be aware of, or even thinking about, what type of education would be necessary beyond their college education. Viewed in the light of the results from a similar assessment of senior students, which is summarized in the following section, it is heartening to see the degree to which students attitudes and awareness change over time. It was determined then that students did obtain a recognition of the need for an ability to engage in life-long learning over the course of their university experience and the department agreed that no further action on this outcome was necessary.

4.4.2 Second Assessment

Twenty seniors enrolled in CIV 402-Senior Design Project in the winter term completed the same assignment individually outside of class. Their responses are summarized in Table 8. The minimal levels of performance were met for each of the criteria. Seniors performed significantly better on this assignment than freshmen suggesting that this is something that they are taught, either directly or indirectly, during their time at school.

Table 8 Summary of Second Assessment of Outcome (i): Life-Long Learning

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Students are aware of continuing education requirements for licensure	survey question	either aware of requirements or not aware	80% of students responding that they are aware that most states require continuing education	95% of students said that they were aware
Students have a positive outlook towards continuing education	survey question	students either responded that they saw continuing education as a way to grow professionally or as another hoop to jump through	80% of students responding that continuing education is a way to grow professionally	85% of students responded correctly
Students know where to go to continue their education or to find information on continuing education	survey question	students listed three sources, coordinator judged responses as valid sources of information	80% of students listing at least two valid sources	95% of students listed at least 2 valid sources of information on continuing education
Students identify at least one method of continuing education	survey question	students response to open-ended question was evaluated by coordinator	80% of students listing at least one way to continue their education	95% of students listed at least one way to continue their education
Students identify methods least likely to count towards continuing education credits	survey questions	students were given four multiple choice questions and asked on each to identify which choice was least like to count towards continuing education credits	80% of students correctly identifying at least two correct answers	95% of students correctly answered at least two questions

5 OTHER ASSESSMENT ACTIVITIES

The department participated in the university-wide assessments of the Institutional Student Learning Outcomes, specifically assisting in the Ethics and Professionalism assessments. Information on these activities can be obtained from the university's Director of Assessment.

6 DATA STORAGE AND MANAGEMENT

All of the paperwork associated with the assessments described herein is kept with the department's assessment coordinator, Sean St.Clair. This paperwork includes assessment reports, summary sheets, raw data, student work, and assessment/evaluation instruments.

7 OPEN ISSUES

There were a few items left open from the 2011-2012 academic year. It was anticipated at the time that these issues would be addressed in the 2012-2013 year, but the department was heavily involved in curriculum revisions and new program design and so these issues were left open. They will be discussed at the 2013 department retreat prior to 2013-2014 academic year.

7.1 Outcome (a): *an ability to apply knowledge of mathematics, science, and engineering*

Students did not meet the performance criterion of dynamics of pulley systems, a common shortcoming in the instructor's experience even though students indicate they understand this material in class discussion and based on homework results. The department will meet to discuss the one substandard result to determine what, if any, action needs to be taken on this outcome.

7.2 Outcome (e): *an ability to identify, formulate, and solve engineering problems*

The results of the first assessment, conducted in CIV 361, indicated that students have the abilities to identify, formulate, and solve engineering problems. The results also suggested that students do not consistently and completely document the problem before commencing the solution process. These issues will be discussed to determine what action needs to be taken in the future. The course instructor plans to place additional emphasis on problem documentation in future offerings of both the assessed course and other courses in the same technical area.

7.3 Outcome (g): *an ability to communicate effectively*

As mentioned in the 2011-2012, the civil engineering faculty had planned to meet with faculty members from the communication department to discuss issues with the technical writing course. This meeting took place in the fall of 2012 and it was agreed that the course did need updated. This outcome will be reassessed after the implementation of the redesigned course.

8 CONCLUSION

The 2012-2013 academic year was the second year in a three-year assessment cycle. This year, four outcomes were assessed in seven different targeted courses. Shortcomings were revealed in the area of design. The civil engineering faculty has already discussed a course of action to correct the issue with the design outcome and this outcome will be assessed again in the fall of 2013. Also, one planned assessment was not completed and the department will meet to reschedule this assessment for completion during the next academic year.

Appendix A
Mapping of Program Outcomes to Courses

		BSCE Program Outcomes												
Math and Science Courses		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
CHE 201/202/204/205	General Chemistry	I	I											
PHY 221/222/223	General Physics with Calculus	I	I											
Math 221	Introduction to Computational Software	R				I						I		
Math 251	Differential Calculus	I												
Math 252	Integral Calculus	R												
Math 254N	Vector Calculus I	R												
Math 321	Applied Differential Equations I	R												
Math 361	Statistical Methods	R												
	Math/Science Elective	R												

I: Introduced, R: Reinforced

		BSCE Program Outcomes												
General Education Courses		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
SPE 111	Fundamentals of Speech				I			I						
WRI 121/122	English Composition						I	I						
WRI 227	Technical Report Writing						I	R						
COM 401/402	Civil Engineering Project				R			R	R	I				
PHIL 331	Ethics in the Professions				R		I	R	I					
*ANTH 335	The Built Environment						I		I		I			
*HIST 335	The Engineering Profession						I		I		I			
	Social Science Electives								I					
	Humanities Electives								I					

I: Introduced, R: Reinforced

*Students must take *either* ANTH 335 or HIST 335

		BSCE Program Outcomes												
Introductory and Core Engineering Courses		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
ENGR 101/102	Introduction to Engineering			I	I		I	I		I				
CIV 112	Engineering Graphics							I				I		
CIV 201/202	Sustainable Civil Engineering													
CIV 223	Elementary Properties of Materials	I	R			I								
GME 161	Plane Surveying I	I				I								
ENGR 211	Statics	R				I								
ENGR 212	Dynamics	R				I								
ENGR 213	Strength of Materials	R	R			R		I						I
ENGR 231	Fluid Mechanics	R	R		I	R								
*ENGR 236	Fundamentals of Electrical Circuits	R				I								
*ENGR 355	Thermodynamics	R				I								
CIV 317	Economics for Civil Engineers	R				I	R					I	I	I

I: Introduced, R: Reinforced

*Students take *either* ENGR 236 *or* ENGR 355

		BSCE Program Outcomes												
	Civil Engineering Core Courses	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
CIV 315	Principles of Environmental Engineering	R				R			I		I			
CIV 321	Soil Mechanics and Foundations	R	R			R						R		
CIV 328	Structural Analysis	R				R						R		
CIV 331	Reinforced Concrete Design	R	R	I		R						R		
CIV 344	Structural Steel Design	R		I		R				R	R	R		I
CIV 358	Project Management				R		I	R	R		I		R	
CIV 361	Closed Conduit Design	R		I		R						R		I
CIV 362	Hydrology and Surface Water Management	R	I		I	R						R		I
CIV 364	Introduction to Water and Wastewater Treatment Systems													
CIV 371	Introduction to Transportation Engineering	R	R			R					I	R		I
CIV 375	Highway Engineering	R		R		R						R		I
CIV 401/402	Civil Engineering Project	R		R		R	R		R	R	R	R	R	R
CIV 415	Civil Design Software Applications	R				R		R				R		I

I: Introduced, R: Reinforced

		BSCE Program Outcomes												
	Senior Elective Courses	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
CIV 410	Basic Dynamics of Structures	R				R						R		
CIV 416	Structural Design for Lateral Loads	R		R		R				R	R	R		
CIV 418	Structural Matrix Analysis	R				R						R		
CIV 435	Timber Design	R		R		R						R		
CIV 445	Design of Reinforced Masonry Structures	R		R		R						R		
CIV 464	Water and Wastewater Treatment Plant Design	R		R		R						R		R
CIV 466	Solid and Hazardous Waste Management				R	R					R	R		
CIV 467	Groundwater	R				R						R		
CIV 468	Environmental River Mecanics													
CIV 469	Treatment of Wetlands													
CIV 475	Traffic Engineering	R	R	R		R					R	R		R
CIV 476	Environmental Remediation Technologies					R						R		
CIV 531	Open-Channel Hydraulics													
CIV 551	Bridge Design													
CIV 573	Transportation and Land Development													
CIV 574	Advanced Pavement Design													

I: Introduced, R: Reinforced