Proposal to: Extend an Existing Degree Program to a New Site

Program Title:

Degree (level): Bachelor of Science

In (major or field): Civil and Environmental Engineering

Site(s) at which currently offered: Washington State University (WSU) Pullman

CIP Code (consult registrar): 140801
(**C**lassification of **I**nstructional **P**rograms)

Department(s): Civil and Environmental Engineering

College(s): Engineering & Architecture

Contact Person:

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Title: Professor

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Site of Origin (campus where this program will be delivered on-site or primary campus from which distance courses will be delivered)**: WSU Tri-Cities**

Starting Date: Fall 2012

Method of course delivery: (check all that apply)

- ☒ Classroom
  - ❍ Pullman
  - ❍ Vancouver
  - ● Tri-Cities
  - ❍ Spokane
  - ❍ Other site(s): _____
- ☐ AMS or Video-conferencing System
- ☐ On-line
- ☐ Other _____

Mission Statement

Washington State University is a public research university committed to its land-grant heritage and tradition of service to society. Our mission is threefold:

- To **advance** knowledge through creative research and scholarship across a wide range of academic disciplines.
- To **extend** knowledge through innovative educational programs in which emerging scholars are mentored to realize their highest potential and assume roles of leadership, responsibility, and service to society.
- To **apply** knowledge through local and global engagement that will improve quality of life and enhance the economy of the state, nation, and world.

Mission statement of the Campus and the Department

WSU Tri-Cities mission is to provide personalized undergraduate and graduate education with faculty, staff, and students engaged in research, outreach, and community service commensurate with University's land-grant mission.

The mission of the undergraduate program of the Department of Civil and Environmental Engineering (CEE) at WSU is to provide a comprehensive education that prepares our students to be successful in engineering practice and advanced studies.

How this proposed program will complement or reflect these missions.

The proposed CEE program at Tri-Cities will fulfill the university's mission by enhancing the intellectual, creative, and practical abilities of the individuals who choose to come to WSU Tri-Cities. It will fulfill the department's mission by providing a comprehensive education that prepares our students to be successful in engineering practice and advanced studies. It will fulfill the College of Engineering and Architecture's (CEA) mission by providing a comprehensive education to a diverse community in engineering through extended education programs.

Extending the program to WSU Tri-Cities will fulfill the campus's mission by extending knowledge through CEE program in which emerging scholars will be mentored to realize their highest potential and assume roles of leadership, responsibility, and service to society.

Program Description

The nature and focus of the CEE program at Tri-Cities will be identical to the program at Pullman. It will offer a general civil engineering program at the beginning. Options in structural, environmental, and water resources engineering may be added based on enrollment and demand.

Need and Student Demand for the Program

The CEE department has extensive experience in offering graduate level environmental engineering program at WSU Tri-Cities for more than 16 years. The environmental engineering program at WSU Tri-Cities is very successful and has granted in the neighborhood of 70 Master of Science (MS) degrees. The students who have earned MS degrees from the program are successfully employed in their profession. The faculty of CEE has always been supportive of the graduate program at Tri-Cities and, very recently, they have voted unanimously to extend the undergraduate program to WSU Tri-Cities.

The CEE program at Pullman has imposed an enrollment cap. There is, however, still demand for civil and environmental engineers and there are also place bound students who want to attend CEE program at Tri-Cities. As the only public four-year institution in south central Washington, WSU Tri-Cities is uniquely positioned to support the region's economic development and higher education needs. WSU Tri-Cities has the distinction of being one of the few university campuses in the United States immediately adjacent to a national laboratory and some of the world's largest engineering firms and globally-competitive private businesses. WSU Tri-Cities is a destination campus for the greater Mid-Columbia region, with service to minority and first-generation college students, as well as those who choose to attend college while living close to home. WSU Tri-Cities wants to be known nationally and internationally for signature programs supported in the engineering, sciences and technology disciplines. The Tri-Cities community is fully supportive of the campus's expansion to a full four-year civil and environmental engineering program.

The Higher Education Coordinating Board (HECB) and the Legislature have determined that broader access, across the state, to "high demand" – e.g., engineering – programs is critical for the economy of the state (*http://www.hecb.wa.gov/news/documents/Skilled-EducatedWorkforce2009.pdf*).

The only outstanding issue is sustained funding for the program. Currently, there is one tenured full professor at WSU Tri-Cities and another full-time clinical assistant professor. We are in the process of hiring another full-time faculty member with generous gifts of $940,000.00 from Washington River Protection Solutions (WRPS) and CH2M Hill. These gifts will enable WSU Tri-Cities to support two faculty members for the next 4 years. Enrollment demand will sustain the program and the Tri-Cities campus is committed to sustained funding for the faculty positions. We believe that the community support is in place to assist WSU Tri-Cities in its request for funding from the state legislature when there is opportunity to do so.

WSU Tri-Cities will be the only institutions to provide a four-year civil and environmental engineering degree program in south central Washington. Columbia Basin College (CBC), located in Pasco, offers pre-requisite course work for students transferring to four-year programs.

About 30 students enquired about the civil and environmental engineering program at WSU Tri-Cities over the last three years. We were permitted by the department to offer courses through the junior year. Our inability to offer the senior year courses dissuaded the students from the program and encouraged them to go to mechanical engineering, or to Pullman, or elsewhere. Our interaction with the transfer students and incoming freshman students lead us to the conclusion that there is a significant demand for civil engineering program at WSU Tri-Cities.

It is also to be noted that our program at Pullman has imposed an enrollment cap and, consequently, not all the interested students are able to gain access to the program. The program at WSU Tri-Cities will enable us to serve the region, the state, and the nation by training more civil and environmental engineers.
A survey conducted by Cindy Rios and Janae Loeber in 2007 titled “Current and Projected Professional Employment Needs Market Research Survey” indicates that there is a significant number of civil and environmental engineers currently employed in the general vicinity of the Tri-Cities. The survey also indicates that there will be growing need in future.

We anticipate that there will be 15-20 students in the lower division classes and about 15-20 students in the upper division classes to start with.

Most of our graduates from Pullman have multiple job offers from industry or have been admitted to graduate school with assistantship. Recession appears to have an adverse impact on the job market. However, we do expect that the job market in this field will rebound to a similar level by the time students in this program graduate with a Bachelor of Science (BS) degree.

The HECB reports that "the latest long-range forecasts from the Washington Employment Security Department predict that science, technology, engineering, mathematics, and health occupations will grow at a much higher rate than employment overall, even during the recession years (2008-2013)" (http://www.hecb.wa.gov/research/documents/ResearchBriefonJobGrowth-RevisedFinal.pdf, p. 5). The HECB further notes that, "The largest of the public-sector occupations are in civil engineering, public transportation (three different occupations), environmental sciences, maintenance and repair, and urban and regional planning" (http://www.hecb.wa.gov/research/documents/10258_Green_Jobs_Report_for_Web_2009.pdf, p. 31). It is also reported that, "In Washington, the greatest number of anticipated openings will be in civil engineering, aerospace engineering, and mechanical engineering. Overall, 1,905 openings in engineering are anticipated in each year between 2011 and 2016. In the 2006-2007 academic year, 1,494 bachelor's and graduate degrees were awarded in engineering in Washington with an overall gap of more than 400 annual openings." (http://www.hecb.wa.gov/news/documents/Skilled-EducatedWorkforce2009.pdf, p. 19). Civil and mechanical engineering are the disciplines within engineering that is currently most in demand by students.

The US Bureau of Labor Statistics reports that there were 278,400 civil engineers employed in 2008. The projected need in 2018 is reported to be 345,900, an increase of 24%, much faster than average for all occupations (http://www.bls.gov/oco/ocos027.htm#projections_data).

Characteristics of Students Currently in the Department's Program and the Students at the New site

Students at Pullman live on or near campus. Students at Tri-Cities are generally expected to be placebound by ties of family and/or work. Some of them are likely to be slightly older. Veterans and Latinos are also expected in the Tri-Cities CEE program in larger number than in Pullman. A few may attend the program part-time. Some may have related work experience that will enrich the program. In all other respects, including academic preparation, we expect the students to be similar.

Recruitment Plan

The program will be well advertised to the appropriate students through the pre-engineering programs at the local community colleges. The most helpful people initially will be faculty at the pre-engineering programs at CBC and other neighboring community colleges. Others who will help are pre-engineering students who will spread the information via word-of-mouth. In addition, the word will be spread through contact at high schools, engineering companies and engineering societies in each community.

WSU Tri-Cities have solid contacts with local high schools, neighboring community colleges and local engineering industry through their engineering advisory boards.

Goals, Objectives, and Student Learning Outcomes

A) Goals and Objectives

The CEE program at WSU Tri-Cities is an extension of the program at Pullman. Its goals and objectives will be the same as those of the program at Pullman. The following are the stated objectives of the program.

1. Our graduates will be ready for the technical challenges of careers related to civil engineering.
   Our program will prepare graduates to meet the needs of industry or to pursue graduate studies in the field of civil engineering through a curriculum based on principles of mathematics, science, and fundamentals of engineering design and analysis.
2. Our graduates will be ready to pursue their careers with professionalism and grow into positions of leadership, thriving in an increasingly diverse and globalized society.
   Our program will prepare graduates for professional careers with a foundation of ethics and a breadth of experiences, in and out of the classroom, that allows them to operate in a global, diversified society and workplace.
3. Our graduates will be able to grow and adapt to changes in technology and society.
   Our program will prepare graduates to keep up with state-of-the-art technologies and tools to address issues that are relevant to ever changing societal and economic needs.
4. Our graduates will be ready to interact in a professional manner with others in a variety of settings.
   Our program will prepare graduates for effective written, oral, and graphical communication with managers, subordinates, project teams, clients, and the public.

B) Student Learning Outcomes

Graduates of the program will achieve the following student learning outcomes which are exactly the same as stipulated by our CEE program at Pullman.

Outcome 1: A firm foundation and knowledge of mathematics, science and engineering principles and the ability to apply the knowledge (adapted from ABET outcome "a").

Outcome 2: An ability to design and conduct experiments and the ability to analyze the data, interpret results and draw conclusions (adapted from ABET outcome "b").

Outcome 3: The ability to design a component, system or process to meet desired needs and imposed constraints (adapted from ABET outcome "c").

Outcome 4: The ability to think logically, critically and creatively (outcome added by constituents).

Outcome 5: The ability to work in multidisciplinary teams (adapted from ABET outcome "d").

Outcome 6: The ability to identify, formulate and solve civil engineering problems (adapted from ABET outcome "e").

Outcome 7: The ability to use appropriate modern techniques, skills and tools, including computer applications, necessary for engineering practice (adapted from ABET outcome "k").

Outcome 8: An understanding of professional ethics and integrity and an engineer's responsibilities to the profession and society (adapted from ABET outcome "f").

Outcome 9: The ability to communicate effectively in written, oral and graphical forms (adapted from ABET outcome "g").

Outcome 10: Broad educational experiences that provide an awareness and understanding of the impact of engineering on global and societal issues (adapted from ABET outcome "h").

Outcome 11: A knowledge of contemporary issues (ABET outcome "j").

Outcome 12: Recognition of the importance of life-long learning and the benefits of being active in professional societies, such as ASCE (adapted from ABET outcome "i").

Current assessment methods are summarized in Table 1 of Appendix A. Appendix A contains the "Memorandum for the Record" for CEE program assessment. Current Assessment Plan will apply to all CEE programs, wherever and however delivered.

Curriculum

The curriculum to be offered is identical to the one offered in Pullman and is given below. WSU Tri-Cities has been offering freshman and sophomore level courses for the last 2-3 years for its engineering programs. These courses are offered once a year. No new freshman and sophomore level courses need to be added for the proposed civil engineering program.

Junior and senior level courses will be offered yearly in the sequence listed below with the exception of CE 302 and CE 414. CE 302 and CE 414 will be taught in a compressed schedule in summer at Pullman.

Cst M 254 is taught by the School of Architecture and Construction Management. We have been granted permission to teach this course here at Tri-Cities by Dr. Srinivas Allena, a resident civil engineering faculty. The approval letter can be found in Appendix B.

First Year

First Semester

Course	Credit Hours
Chem 105	4
Engl 101	3
GenEd 110	3
Math 171	4
Engr 120	2

Second semester

Course	Credit Hours
Biol 102	4
GenEd 111	3
Math 172	4
Math 220	2
EconS 101	3

Second Year

First Semester

Course	Credit Hours
Intercultural Studies	3
CE 211	3
ComSt 102	3
EE 221	2
Math 273	2
Phys 201	4

Second semester

Course	Credit Hours
ME 212	3
CE 215	3
Tier II Arts	3
Math 360 or 370	3
ME 220	1
Phys 202/Geol 102/Chem 106	4

Third Year

First Semester

Course	Credit Hours
CstM 254	2
CE 302	2
CE 315	3
CE 317	3
CE 330	3
CE 341	3

Second Semester

Course	Credit Hours
CE 322	3
CE 351	3
CE 303	2
Math 315	3
Engl 402	3
EE 304 (or ME 301)	2 (3)

Fourth Year

First Semester

Course	Credit Hours
CE 463	3
CE 480	1
CE 414	3
CE 430	3
CE 435	3
CE 475	3

Second Semester

Course	Credit Hours
CE 465	3
CE 466	1
Tier III Hum/Soc	3
CE 433	3
CE 442	3
CE 451 or CE 460	3

Additionally, CE 418 and CE 419 will be available as undergraduate-level counterparts of CE 518 and CE 519, respectively. These two courses are offered every year. Additional elective courses will be offered when there is a need.

Uses of Technology

Computers and overhead projectors will be used in most courses. Classrooms with videoconference delivery capability will be used for some courses. Students of CEE, irrespective of their locations, are expected to learn modern technologies of computer aided design, programming, and electronic communications.

Delivery Methods

The CEE program at Tri-Cities will be almost entirely site-based and face-to-face. For the near future, Surveying (CE 302) and CE 414 (Structural Engineering Laboratory) will be taught at Pullman. Students will be asked to go to Pullman in summer to attend these courses in a compressed schedule.

Students

Enrollment. Currently, we have a graduate program in environmental engineering. We have also been offering freshman, sophomore, and junior level courses for interested civil engineering students with the approval of the department. Our current FTE count stands at 13.2. We expect it to grow significantly when we are able to extend the four-year program to Tri-Cities. Expected headcount and enrollment numbers are presented below in Table 1. The ratio of headcount to FTE was taken from the mechanical engineering program at Tri-Cities. It is anticipated that mechanical engineering and civil engineering programs will have similar headcount to FTE ratio.

Table 1: Size of the Program

Number of Students	2012	2013	2014	2015*
Headcount	28	34	39	45
FTE	25	30	35	40

*We anticipate the program will reach full enrollment in 2015.

Admission Requirements. Students who have completed or will complete at least 45 semester hours of course work (including CE 211, Math 171, 172, and Phys 201 or equivalents) are eligible to apply for certification. The number of students certified into the department depends upon the available resources and facilities. An undergraduate may apply for certification as a major within the department after completion of 40 semester hours, and must apply after 60 semester hours. The best qualified students, based on cumulative GPA and grades in the prerequisite courses listed above will be certified until the carrying capacity is reached. Applications will be reviewed at the end of each semester.

Associate Science Transfer degree (AS-T) is the best fit degree for transfer from community colleges to this program. Alternatively, WSU Tri-Cities has established a mechanism, the Bridges Program, with CBC for advising students for a smooth transfer to a variety of bachelor's degree programs, including engineering.

Expected time for Program Completion. Most of the students will be full time. It is expected that they will complete all the requirements for the four-year civil engineering degree in four years.

Advising. Course planning will be done by local staff with occasional assistance from the undergraduate coordinator on the Pullman campus. Advising will be provided by the Tri-Cities Advising Center and on-site CEE faculty members.

Diversity. The CEA has increased its number of underrepresented minority certified majors by 93% over the last five years. This recruiting and retention effort will continue at Tri-Cities, too. WSU Tri-Cities has federal funding called "TRiO" , which is likely to continue until 2015, to support low-income first-generation students. WSU Tri-Cities has also significant number of scholarships for qualified freshman and transfer students. Further, WSU Tri-Cities wants to be known as a campus rich in its cultural diversity, as the only four-year public institution in Washington with Federal designation as a Hispanic Serving Institution (HSI). This will enhance our efforts to attract underrepresented students. Our writing and tutoring centers can also provide the much needed support to enrolled students.

Faculty and Administrative Support

Faculty Support. Currently, WSU Tri-Cities has a tenured full professor and a clinical assistant professor in civil engineering. The clinical position is being supported by a private gift that will continue for 4 years starting fall of 2011. A third faculty will be supported by another gift of $500,000 for 4 years beginning in fall of 2012. We have also a number of well qualified adjunct faculty. The list of the resident faculty and selected adjunct faculty is given below in Table 2.

Table 2: Program Faculty

FACULTY	Rank	Status (part, full, regular, adjunct)	% Effort in Program
Akram Hossain	Professor	Full	100
Srinivas Allena	Assistant Professor	Clinical	100
New	Assistant Professor	Regular	100
Dr. Jahangir Morshed	Adjunct Faculty	Adjunct	33.33[1]
Dr. Chris Wend	Adjunct Faculty	Adjunct	33.33
Dr. Jim Duncan	Adjunct Faculty	Adjunct	33.33
Dr. Alex Tartakovsky	Adjunct Faculty	Adjunct	16.67[2]
Dr. Raz Khaleel	Adjunct Faculty	Adjunct	33.33
Mr. Rick Cameron	Lecturer	Part-time	50.00[3]
Total FTE Faculty in Program			**5.0**

[1] *Teaches 2 courses in an academic year.*
[2] *Teaches 1 course in an academic year*
[3] *Teaches 3 courses in an academic year.*

Administrative Support. WSU Tri-Cities has adequately staffed advising and support services for engineering and computer science. No new resources are needed for extending the CEE program. The list of the most appropriate administrative personnel is given below in Table 3.

Table 3: Administrative Support

ADMINISTRATIVE SUPPORT	Title	Responsibilities	% Effort in Program
Kristen Wilson	Curriculum Advisor	Academic Advising	10%
TBN[1]	Curriculum Advisor	Academic Advising	25%
Bonnie Bates	Academic Coordinator	Administrative Support	25%
Steve Jordan	Laboratory Technician	Laboratory support	15%
Total Staff FTE in Program			0.75

[1] *To be named*

Library Capacity

Library capacity is not a concern. WSU Tri-Cities has adequate library resources to support the new CEE program. In fact, we have been offering freshman, sophomore, and junior level courses for the last 2-3 years and we have fully accredited Mechanical and Electrical Engineering programs for more than a decade.

Facilities

Laboratory classes for this program are ME 220, CE 302, CE 317, and senior year laboratory. WSU Tri-Cities has a well equipped laboratory for ME 220. A laboratory for CE 317 has already been established with state of the art equipment. For the time being, CE 302 will be taught at Pullman in summer on a compressed schedule and the students will be asked to go to Pullman for this course. The senior year laboratory course, CE 414, will also be taught at Pullman in summer in a compressed schedule.

Finances

Summary of Program Cost. WSU Tri-Cities, as mentioned earlier, has a successful MS program in Environmental Engineering and has been offering freshman through junior level courses for civil engineering for the last 2-3 years. Therefore, there is no need to reallocate funds to support this program. Further, WSU Tri-Cities has received two gifts totaling $940,000 to support two faculty positions for 4 years. It is to be noted that an adjunct faculty is paid $3,300 - $3,600 for teaching a course. Table 4 summarizes the approximate program cost.

Even if the state funding situation does not improve, it is expected that program will be sustained indefinitely with the existing funding and tuition revenue that will be generated at full enrollment.

Table 4: Summary of Program Cost

Civil and Environmental Engineering	Date	Existing Funds	New State Funds	Other Sources	Year 1 Total	Year 4 Total
Administrative Salaries, including benefits		27,000	-	-	27,000	27,000
Faculty Salaries, including benefits		163,216		182,000	345,216	345,216
TA/RA Salaries including benefits		-	-	-	-	-

Clerical Salaries, including benefits		6,600	-	-	6,600	6,600
Other Salaries including benefits		-	-	-	-	-
Contract Services		-	-	-	-	-
Goods and Services		5,000	-	-	5,000	10,000
Travel		2,600	-	-	2,600	3,900
Equipment		-	-	-	-	-
Other costs		-	-	-	-	-
Library		-	-	-	-	-
Direct Cost		**204,416**	**-**	**182,000**	**386,416**	**392,716**
Indirect Cost		**120,054**	**-**	**106,889**	**226,943**	**230,643**
Total Cost		**324,470**	**-**	**288,889**	**613,359**	**623,359**
FTE Students					25	40
Cost Per FTE					**24,534**	**15,584**

Salary Cost Detail. Table 5A presents salary cost detail for year 1. Table 5B presents salary cost detail for year 4 (2015) at which full enrollment is expected. In Tables 5A and 5B, salary for the adjunct faculty has not been included. An adjunct faculty is paid $3300 - $3600 for teaching a 3 credit hours course. Normally, 6 courses are taught by the adjunct faculty and the associated cost has been included in Table 4. Further, no salary increase has been considered for the next 4 years.

Table 5A: Salary Cost Detail for Year 1

Salary Cost Detail - Year 1					
Name	**Monthly salary**	**# of months**	**Annual Salary**	**Buyout Pgm %**	**Annual Pgm salary**
Administration:					
Kristen Wilson	2,855	12	34,260	10	3,426
TBN	2,855	12	34,260	25	8,565
Steve Jordan	4,770	12	57,240	15	8,586
Subtotal Administration	10,480		125,760		20,577
Faculty:					
Akram Hossain	9,476	9	85,280	100	85,280
Srinivas Allena	7,000	9	63,000	100	63,000
New	8,000	9	72,000	100	72,000
Subtotal Faculty	24,476		220,280		220,280

TA/RA's:					
Subtotal TA/RA	0		0		0
Clerical staff:					
Bonnie Bates	3,085	12	37,020	10	3,702
Subtotal Clerical	3,085		37,020		3,702
Total	38,041		383,060		244,559

Table 5B: Salary Cost Detail for Year 4 (2015)

Salary Cost Detail - Year 4 - Full Enrollment

Name	Monthly salary	# of months	Annual Salary	Buyout Pgm %	Annual Pgm salary
Administration:					
Kristen Wilson	2,855	12	34,260	10	3,426
TBN	2,855	12	34,260	25	8,565
Steve Jordan	4,770	12	57,240	15	8,586
Subtotal Administration	10,480		125,760		20,577
Faculty:					
Akram Hossain	9,476	9	85,280	100	85,280
Srinivas Allena	7,000	9	63,000	100	63,000
New	8,000	9	72,000	100	72,000
Subtotal Faculty	24,476		220,280		220,280
TA/RA's:					
Subtotal TA/RA	0		0		0
Clerical staff:					
Bonnie Bates	3,085	12	37,020	10	3,702

Subtotal Clerical	3,085	37,020	3,702
Total	38,041	383,060	244,559

Appendix A
Memorandum for the Record: CEE Program Assessment

MEMORANDUM FOR THE RECORD

Subject: CEE Program Assessment, Academic Year 2010/2011
Author: William F. Cofer
Date: August, 2011

BACKGROUND AND PURPOSE

In February 1999, the CEE faculty formally adopted the objectives, desired outcomes and the process for assessing our CEE program. The Curriculum/Assessment Committee developed this procedure over a period of one year with input and feedback from the faculty and stakeholders. In May 1999 CEE's advisory board provided a final review and concurred with the entire process, including objectives, outcomes, and assessment methods. Following the accreditation review in 2007, the educational objectives were revised, having been reviewed by the faculty, the students, and the advisory board. Assessment results, as well as the assessment process, are reviewed with the advisory board each spring. In Appendix A, an outline of the ABET Outcomes is presented. The CEE Educational Objectives are presented in Appendix B.

We are now completing the twelfth year of the CEE assessment process. This process requires the CEE chair (or chair's designee) to undertake a yearly review of how well we are meeting our objectives and desired outcomes using the assessment methods that have been established. The chair's report concludes with recommendations for improvement. Eleven assessment reports (1999/2000, 2000/2001, 2001/2002, 2002/2003, 2003/2004, 2004/2005, 2005/2006, 2006/2007, 2007/2008, 2008/2009, and 2009/2010) have been completed and are maintained in the CEE department for reference. This year's report for the 2010/2011 academic year includes the status of actions and recommendations adopted from previous reports, in addition to a thorough review of new assessment data obtained for the current year. The chair's report is sent to the Undergraduate Program Committee for review and comment. The committee's duties include prioritizing the recommendations, modifying the recommendations, and determining how to best implement the recommendations. The final set of recommendations is brought before the entire faculty for discussion and comment followed by a faculty vote. Once accepted, the recommendations are implemented according to the agreed plan.

This program assessment report is divided into two major parts. Part 1 is devoted to assessment of outcomes, which provides the greatest level of detail on evaluating and improving our program. Part 2 is devoted to assessment of objectives, which pertain to the accomplishments of our graduates.

PART 1 – OUTCOME ASSESSMENT

ASSESSMENT METHODS AND OVERVIEW

CEE's desired outcomes and assessment methods are summarized in the matrix in Table 1. The assessment methods are identified by the column headings, and the "X" indicates which desired outcomes are addressed by the particular assessment method. The outcome-assessment report begins by summarizing the major findings from each assessment method with supporting material attached as appendices. The outcome-assessment report concludes with a numerical scoring evaluation of how well we are achieving each desired outcome along with recommendations for improvement. CEE's numerical scoring is now standardized on a scale of 1 to 10 (highest) with a score of 5 meaning that the outcome is being achieved in a minimal, but satisfactory manner.

Table 1. Matrix of Desired Outcomes and Assessment Methods

Outcome	CE 480	CE 465	Lab. Electives	FE Exam	Curric. Debrief	Internship Supervisor feedback	All CEE courses
1 knowledge of mathematics, science and engineering principles		X	X	X			X

2 design and conduct experiments, analyze data, interpret results and draw conclusions			X				X
3 design a component, system or process		X					X
4 think logically, critically and creatively		X	X				X
5 work in multidisciplinary teams		X					X
6 identify, formulate and solve civil engineering problems		X	X	X			X
7 use appropriate modern techniques, skills and tools		X	X	X		X	X
8 understanding of professional ethics and integrity	X	X		X	X	X	X
9 communicate effectively	X	X	X		X	X	X
10 awareness and understanding of the impact of engineering on global and societal issues	X	X			X	X	X
11 knowledge of contemporary issues	X	X			X	X	X
12 importance of life-long learning	X	X			X	X	X

REVIEW AND FEEDBACK OF 2010/2011 ASSESSMENT DATA

CE 480. The ethics course is used to assess the desired outcomes associated with ethics, societal issues, communication and life-long learning (Outcomes #s 8, 9, 10, 11, 12). Tom Jobson and David Yonge, the course instructors, have completed the assessment report for academic year 2010/2011. Their reports are contained in Appendix C along with a description of the course. The main points are summarized below for each outcome along with the instructors' numerical evaluations using our standard numerical scoring system on a 1 to 10 scale with a score of 5 meaning our expectation is met satisfactorily.

Ethics (Outcome # 8). By having the students take primary responsibility for leading classroom discussions through case study presentations for ~75% of the semester and by having the students write five essays during the semester, we believe we are promoting real understanding of the issues discussed. Both the written and oral presentation assignments must reference specific NSPE Code violations. Students become more familiar with the Code and its provisions and how those provisions can guide an engineer in making ethical and professional decisions. Rating: 9

Communication (Outcome #9). CE 480 students participate in both written and oral communications. Assignments from this class are eligible for inclusion in the WSU required Writing Portfolio. Since there are several written papers, the students get sufficient feedback to improve their writing skills, including critiquing other students' essays. Rating: 8.5

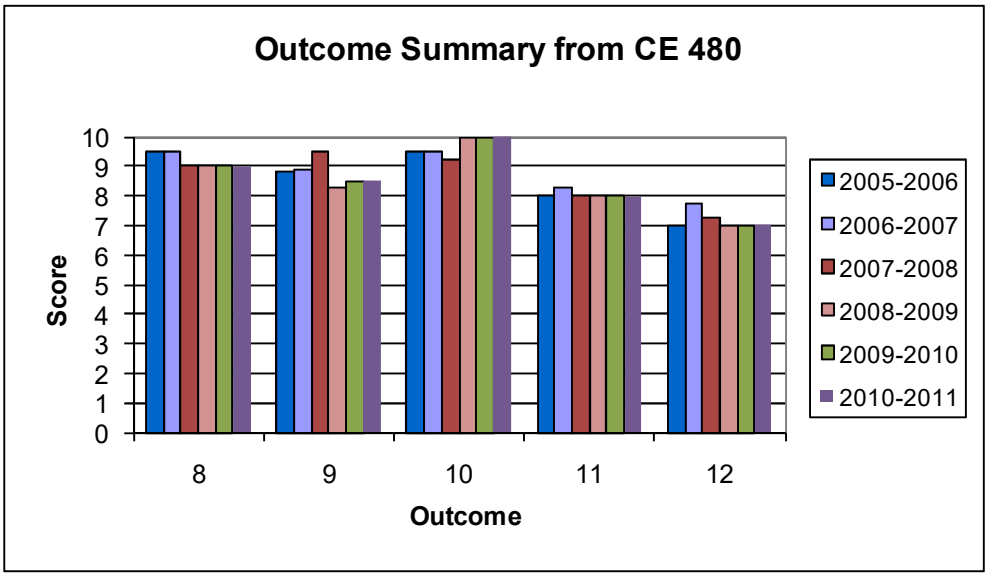
Impact on global and societal issues (Outcome # 10). This course emphasizes what it means to be a professional engineer. The responsibilities of the engineer are emphasized throughout the course. Students leave the class with an appreciation of the trust the public has invested in them, as well as the ramifications of breaches of that trust. Rating: 10

Knowledge of contemporary issues (Outcome # 11). We discuss up to date cases, as well as older cases. We discuss ethical problems that are not specifically in the NSPE Code – e.g. sexual harassment in the work place which has become a more contemporary issue. Rating: 8

Life-long learning (Outcome # 12). In CE 480 cases involving continuing education are discussed. The role of the professional society is also examined. Rating: 7

Table 2. CE-480 Outcome Assessment Summary from two instructors over six consecutive years.

Outcome Number	**#8**	**#9**	**#10**	**#11**	**#12**
Assessment Score 2004/2005 George Mount	9.5	8.3	9.5	8.0	6.5
Assessment Score 2005/2006 George Mount	9.5	8.8	9.5	8.0	7.0
Assessment Score 2006/2007 George Mount and Cara Poor	9.5	8.9	9.5	8.25	7.75
Assessment Score 2007/2008 Shane Brown and Kimberly Rentz	9	9.5	9.25	8	7.25
Assessment Score 2008/2009 David Yonge	9	8.3	10	8	7
Assessment Score 2009/2010 Tom Jobson and David Yonge	9	8.5	10	8	7
Assessment Score 2010/2011 Tom Jobson and David Yonge	**9**	**8.5**	**10**	**8**	**7**



All outcomes were judged to be exceeding expectations, with scores at or above 7.0. Compared to scores from previous years, all categories have remained steady.

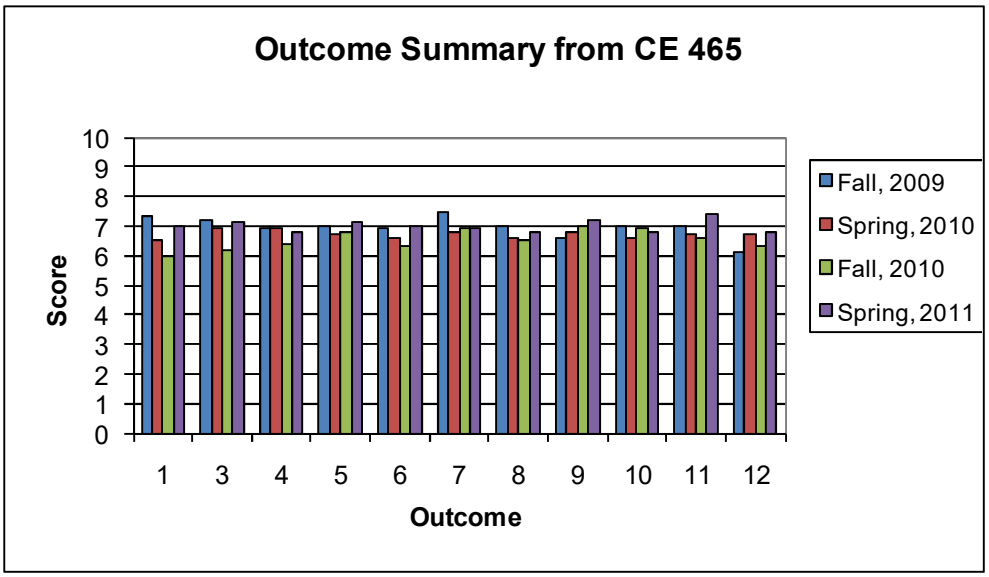
CE 465. Integrated CEE Design, our senior capstone design course, is used to assess almost all the desired outcomes to some degree. The only outcome it does not address is outcome # 2 (conducting experiments). In order to use CE 465 as a meaningful assessment tool, CEE's advisory board is playing an active role in evaluating the senior design projects and project teams at the end

of each semester. The process includes 30-minute presentations in a poster-session format from each project team to their assigned advisory board panel, a follow-up interview meeting between each advisory board panel and project team, a formal written evaluation of each project team on how well they demonstrated the desired outcomes, and finally a feedback session between key faculty and the advisory board on their findings and recommendations.

Advisory board evaluations have been completed for fall 2010 and spring 2011 and all evaluations, comments and memoranda are included in Appendix D. Standardized assessment forms were completed by the advisory board for each student project, which includes an assessment for each outcome. Shown in Table 3 are the scoring averages for the current academic year 2010/2011. Scores from the previous academic year are also provided for reference and to observe trends. Note that the assessment forms were revised for spring 2009 to facilitate greater consistency in the ratings. The rating values were recalibrated such that a score of 5 represents "satisfactory performance that meets expectations". Students of this caliber are those that they would hire.

Table 3. Summary of advisory board's evaluations of meeting desired outcomes, scale 1 to 10

Outcome	#1	#3	#4	#5	#6	#7	#8	#9	# 10	#11	#12
Fall, 2009	7.3	7.2	6.9	7.0	6.9	7.5	7.0	6.5	7.0	7.0	6.1
Spring, 2010	6.5	6.9	6.9	6.7	6.6	6.8	6.6	6.8	6.6	6.7	6.7
Fall, 2010	**6.0**	**6.2**	**6.4**	**6.8**	**6.3**	**6.9**	**6.5**	**7.0**	**6.9**	**6.6**	**6.3**
Spring, 2011	**7.0**	**7.1**	**6.8**	**7.1**	**7.0**	**6.9**	**6.8**	**7.2**	**6.8**	**7.4**	**6.8**



All outcomes were judged by the advisory board to be exceeding expectations. It is interesting to note that student performance in the spring semester generally exceeded that of the fall semester. This was particularly true for outcomes 1 (knowledge of mathematics, science, and engineering principles), 3 (design a component, system, or process), and 11 (knowledge of contemporary issues). Also, an increasing trend for outcome 9 (communicate effectively) is noted. Other observations and comments from the advisory board on the performance of the student teams are contained in the appendix. Specific recommendations:

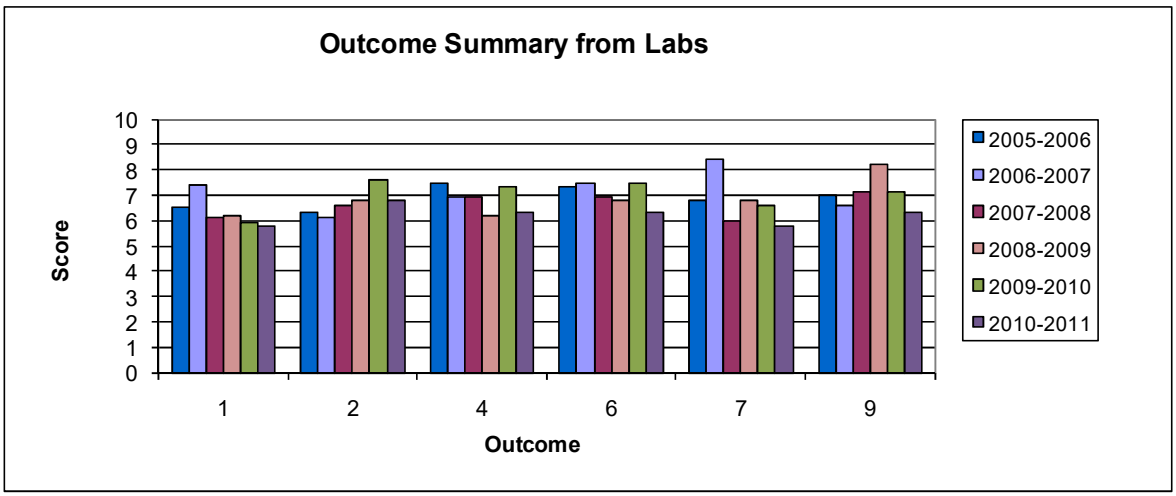
- Retaining wall and footing design should be included somewhere in the curriculum.
- For CE 465:
  - Make the projects more open-ended
  - Assign teams to ensure a better distribution of abilities and interests

Lab Electives. The four senior lab electives, CE 400, 414, 415, and 416 are primarily used to evaluate outcome # 2, the ability to design, conduct, and evaluate experiments. Also, the senior labs are used to help evaluate outcome #s 1, 4, 6, 7, and 9. Each laboratory course is offered once a year either in the fall or spring semester, and all students are required to take at least one senior laboratory course.

Standardized assessment forms were completed by the laboratory instructor at the completion of each class and are contained in Appendix E. The standardized assessment includes a quantitative scoring scheme for each outcome ranging from a score of 1 (needs significant improvement) to a score of 10 (outstanding). A score of 5 is just meeting expectations. Dave Yonge assessed CE 415 and Cara Poor assessed CE 416. Assessments for CE 400 and CE 414 were not received in a timely manner and, thus, their data is not included. An overall summary of the quantitative scoring is given in Table 4. Also shown are the average scores from previous years for a reference comparison.

Table 4. Quantitative summary of achieving desired outcomes from lab courses, scale 1 to 10

Lab Course	Outcome #1	Outcome #2	Outcome #4	Outcome #6	Outcome #7	Outcome #9
CE-400 Highway Mat.						
CE-414 Structures						
CE-415 Environmental	8	8	9	7	8	7
CE-416 Hydraulics	3.5	5.5	3.5	5.5	3.5	5.5
Average 2010/2011	**5.8**	**6.8**	**6.3**	**6.3**	**5.8**	**6.3**
History						
Average 2009/2010	5.9	7.6	7.3	7.5	6.6	7.1
Average 2008/2009	6.2	6.8	6.2	6.8	6.8	8.2
Average 2007/2008	6.1	6.6	6.9	6.9	6.0	7.1
Average 2006/2007	7.4	6.1	6.9	7.5	8.4	6.6
Average 2005/2006	6.5	6.3	7.5	7.3	6.8	7.0
Average 2004/2005	5.5	5.5	6.8	6.8	7.2	6.2



Average scores for all outcomes were in the range of exceeding expectations. However, there was a significant disparity in the individual scores for Outcomes 1, 4, and 7. From the written comments, contained in the appendix, it is apparent that the low scores for CE 416 were prompted by the inconsistent performance between the groups in the class. This indicates that a number of students in this particular class were weak. This reflects a similar comment from the review of CE 465, where it was noted that assignment of groups should be guided to ensure that some are not overly populated with weak students. Other observations and comments from them on the performance of the students are contained in the appendix.

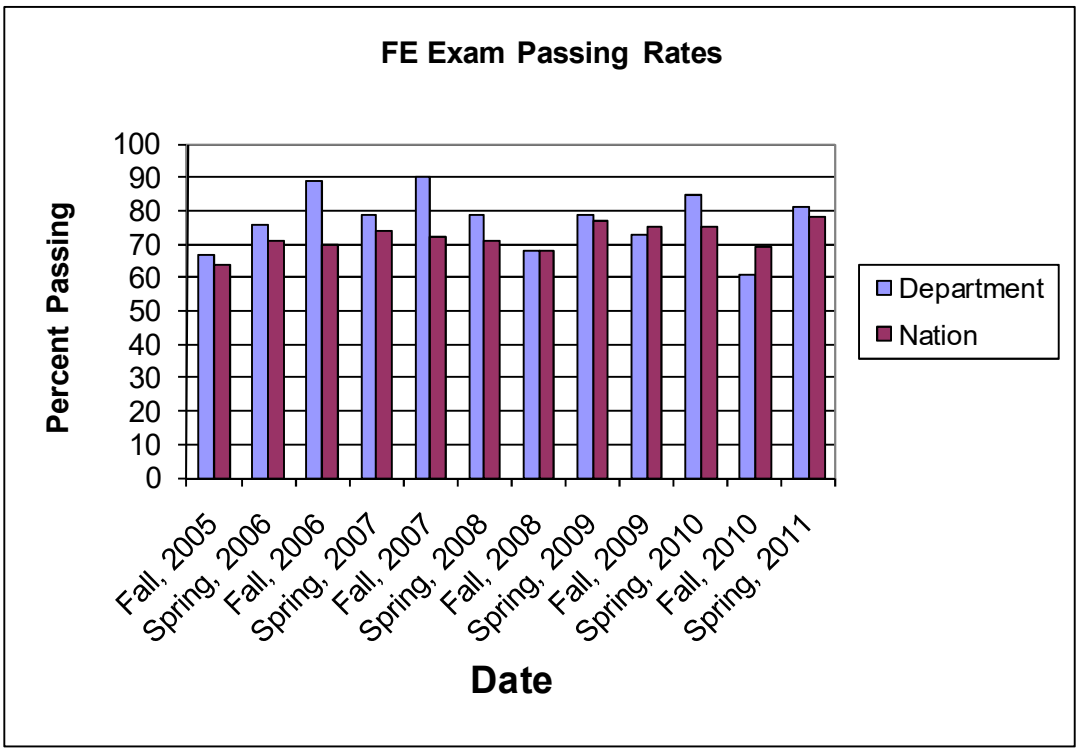
FE Exam. The Fundamentals of Engineering (FE) exam is a national exam that is used to help assess Outcomes # 1, #6, #7, and #8. Relevant results include pass rates, as well as statistics on the performance of our students in the various subjects, compared with national averages. As of spring 2000, all CEE students must take the FE exam as a requirement to graduate (it is mandatory to take the exam, not mandatory to pass). One department goal is for WSU students to achieve at least an 80% pass rate and to exceed the national average. Another use of the exam is to identify students' strengths and weaknesses in various disciplines and subject areas.

The FE exam is administered twice a year, once in April and once in October. The exam is given in two parts; (1) the morning part that focuses on engineering basics, and (2) the afternoon part that is more advanced and may be discipline specific. For the afternoon part, the students have an option of choosing the "General" exam, the "Environmental" exam, the "Structural" exam, or the "Civil" exam. Students are strongly encouraged to choose the "Civil" option, and the great majority do so.

This assessment report considers the new data from October 2010 and April 2011. For reference, the FE exam results reported in assessment reports for the past five years are repeated Table 5 in order to illustrate trends over time. Table 5 shows the total number of WSU students taking the test and the percent passing along with the comparison numbers for the nation as a whole. Note that the test results are only shown for students who are currently enrolled in school when they took the test. Complete results for the FE exam are given in Appendix F.

Table 5. Historical Record: Number of students taking FE exam and percent passing

FE Exam Date	**Enrolled in College (seniors) – Report 5**				**Not Enrolled (graduated) – Report 6**			
	Civil/Env–Option		**General-Option**		**Civil/Env-Option**		**General-Option**	
	WSU	**Nation**	**WSU**	**Nation**	**WSU**	**Nation**	**WSU**	**Nation**
October 2004	20 (90%)	1809 (75%)	3 (0%)	1014 (73%)	25 (72%)	2784 (61%)	7 (14%)	2407 (54%)
April 2005	27 (81%)	3045 (81%)	1 (100%)	1708 (76%)	31 (74%)	4005 (74%)	8 (63%)	3093 (62%)
October 2005	23 (70%)	2204 (67%)	1 (0%)	943 (57%)	9 (22%)	1171 (29%)	1 (0%)	1136 (26%)
April 2006	36 (75%)	3580 (72%)	2 (100%)	1365 (68%)	7 (43%)	1289 (41%)	5 (20%)	1218 (37%)
October 2006	35 (88%)	2702 (71%)	1 (100%)	814 (64%)	6 (17%)	1395 (37%)	7 (29%)	1094 (37%)
April 2007	28 (79%)	4001 (76%)	1 (100%)	1210 (69%)	5 (80%)	1335 (43%)	5 (60%)	1193 (37%)
October, 2007	20 (90%)	2920 (72%)	0		2 (50%)	1482 (37%)	2 (50%	1338 (35%)
April 2008	52 (79%)	4650 (71%)	1 (100%)	1175 (70%)	5 (60%)	1619 (32%)	4 (25%)	1207 (36%)
October, 2008	41 (66%)	3098 (68%)	3 (100%)	827 (65%)	5 (60%)	1647 (38%)	7 (71%)	1328 (37%)
April, 2009	58 (84%)	4844 (79%)	13 (62%)	1502 (68%)	13 (62%)	1769 (47%)	3 (33%)	1446 (35%)
October, 2009	66 (73%)	2993 (75%)	0		14 (36%)	1465 (41%)	2 (50%)	1372 (36%)
April, 2010	47 (85%)	5426 (75%)	0		13 (54%)	1710 (44%)	7 (29%)	1249 (36%)
October, 2010	**44 (61%)**	**3714 (69%)**	**0**		**11 (55%)**	**1561 (37%)**	**1 (0%)**	**639 (34%)**
April, 2011	**58 (81%)**	**6409 (78%)**	**0**		**9 (22%)**	**1340 (45%)**	**0**	



Observations

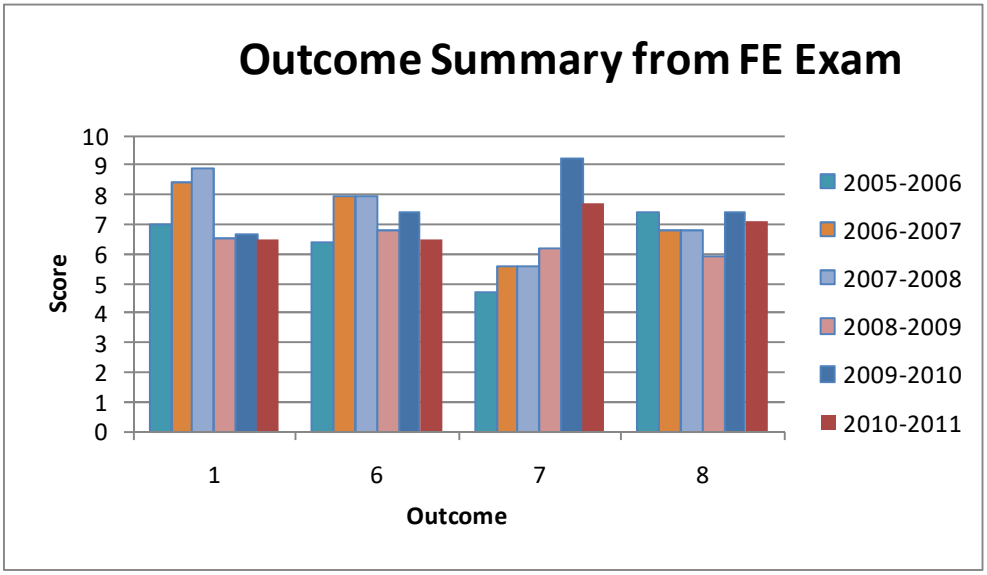
- The total passing rate for the 2010-2011 academic year was 73% for WSU CEE students and 75% for CE students, nationally. The goal of 80% passing was not achieved, and there was a large disparity between the pass rate in the spring versus that for the fall. Indeed, the performance of the students taking the exam in the fall was the worst in recent memory, both in terms of the percentage passing and in comparison with national results. It is interesting to note that, since 2008, the pass rates from the October exam are significantly lower than those for the April exam. This may indicate that more students are taking the exam earlier than their final semester, when they are less well prepared.
- With regard to the outcome summary from FE exam results, it is interesting to note that, beginning in fall, 2008, there was a sharp reduction in the scores for Outcome 1 (knowledge of mathematics, science, and engineering principles) compared to those of the prior two years. For Outcome 6 (identify, formulate, and solve civil engineering problems), the score this year is lower than those of the prior four years, although not dramatically so. Outcome 7, which deals exclusively with knowledge of computers, generally continues an upward trend. Outcome 8 (understanding of professional ethics and integrity) has held steady.
- This was the second year for the FE exam review course, CE 466. Again, it has generally seemed to have had little effect, especially for the October exam. The April pass rates are slightly elevated compared to the prior two years, however.
- With regard to individual subjects, WSU scores at or below 95% of national scores and/or downward trends are items of concern. Those subjects include the following:
    - Dynamics
    - Electricity and Magnetism
    - Construction Management
    - Materials
    - Water and Wastewater (for the Environmental PM exam)

  Regarding Dynamics, there have been issues with teaching quality that are being addressed. The electric circuits course and construction management courses are electives that many of our students do not take. The Materials topic includes concrete and asphalt mixes, which subjects are taught mainly in elective courses. Finally, because a small, but significant, minority of the students choose to take the Environmental Engineering PM exam, composite scores for environmental and hydraulics/water were developed. It is interesting that, among the students who chose the environmental PM exam, the scores for water and wastewater treatment were relatively low. This may be caused by a reduced emphasis on that subject area for those concentrating in environmental engineering.
- Other observations on individual subjects:

- An upward trend in Chemistry and Statics since the watershed year of 2008-2009 is noted.
- Student performance in Dynamics since 2008-2009 has held steady at a relatively low level.
- Student performance in Engineering Economics is quite strong.
- Student performance in Fluid Mechanics is acceptable, but weaker in 2009-2010 and 2010-2011 than before.
- Student performance in Strength of Materials is strong.
- Student performance in Surveying is strong.
- Student performance in Probability and Statistics is acceptable, but it has been relatively low for two years.
- Student performance in Construction Management has trended downward since 2007-2008.
- Student performance in Environmental Engineering has held steady, but it has been below the national level since 2004-2005. This may be the result of a reduced emphasis on wastewater treatment.
- Student performance in Structural Analysis and Soil Mechanics and Foundations has been inconsistent.
- With few exceptions, student performance in Structural Design has been quite strong. This may indicate student interest in that subject.
- Student performance in Transportation has occasionally been relatively low.
- Student performance in Materials has been steady, but below the national average since 2005-2006.

Table 6. FE-exam results interpreted in terms of outcome assessment scores

Outcome Number	#1	#6	#7	#8
Assessment Score 2004/2005	6.4	7.1	7.6	5.8
Assessment Score 2005/2006	7.0	6.4	4.7	7.4
Assessment Score 2006/2007	8.4	8.0	5.6	6.8
Assessment Score 2007/2008	8.9	8.0	5.6	6.8
Assessment Score 2008/2009	6.6	6.8	6.2	5.9
Assessment Score 2009/2010	6.6	7.4	9.2	7.4
Assessment Score 2010-2011	**6.5**	**6.5**	**7.7**	**7.1**



While the FE exam results indicate that relevant outcomes are being met successfully, occasional reductions in the pass rate and scores for certain subjects since spring, 2008 are noted. This is certainly influenced by natural variations in the makeup, interests, and quality of the cohorts progressing through the program. Other factors that may be contributing to this trend include the

increase in class sizes that has accompanied the rapid expansion of the program and the economic recession that has led to fewer internship and employment opportunities. However, regarding the curriculum, an evaluation of the FE exam review course, CE 466, is recommended to determine if and how its effectiveness can be enhanced. In addition, it is recommended that students be strongly advised to wait until their final semester to take the exam.

Curricular Debrief. The curricular debrief group consists of CEE seniors selected to be a representative cross-section of our student population. The students were presented with a real-world engineering scenario involving problems faced in the field that have not yet been resolved, adapted from current news stories. They were asked to act as a team of engineers working together on the ill-structured problem described in the real-world scenario. They were not asked to solve the problem(s), but rather to determine what was most important to address and come to consensus on approaches to resolution. The purpose is to get an objective measure of how well their education at WSU has provided them with the ability to: understand professional ethics (outcome # 8, ABET 3f), communicate effectively (outcome #9, ABET 3g), be aware of societal issues (outcome #10, ABET 3h), know contemporary issues (outcome #11, ABET 3j), and appreciate the importance of life-long learning and professionalism (outcome #12, ABET 3i).

The WSU Office of Assessment and Innovation (OAI) facilitated the debrief exercise in spring, 2011 with a randomly selected set of six Civil Engineering seniors. Students discussed a current issue in the field related to global water shortages. The exercise was conducted in a controlled setting in which the students were in a common room, but communicated via online discussion. The scenario that was given and the transcript of their discussion are given in Appendix G.

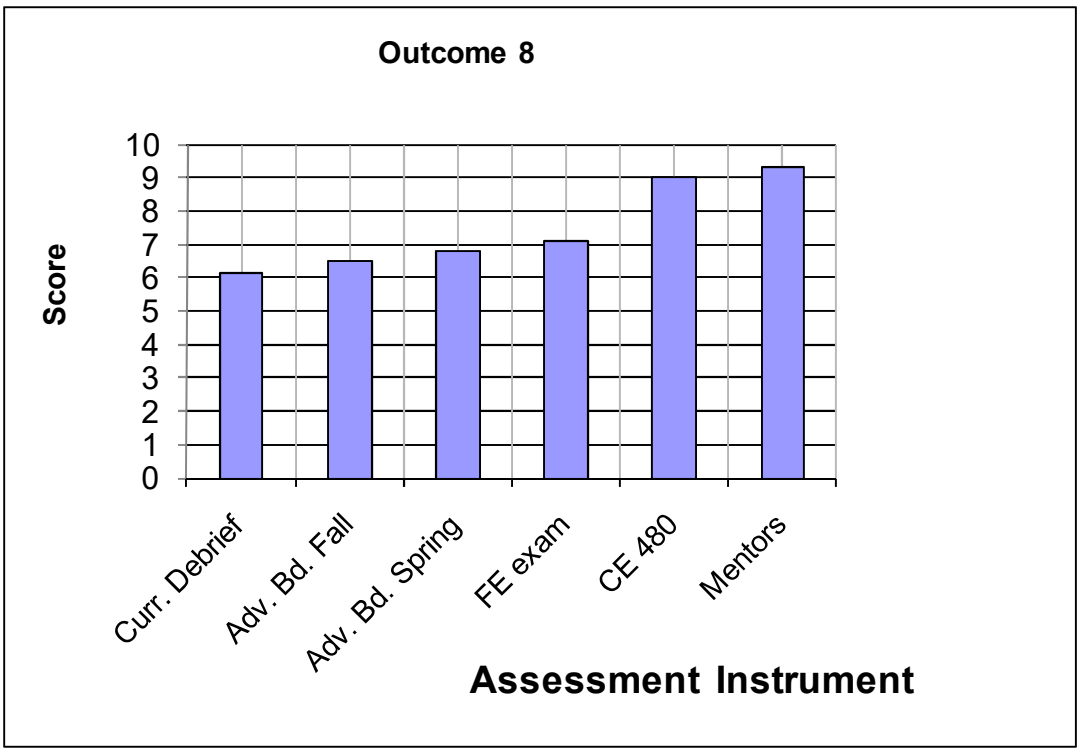
Four faculty (two of which have participated from the outset of the project, and two since 2009) then rated the quality of the 2011 curricular debrief discussion. The rubric that was used is given in Appendix G. The scores are listed below.

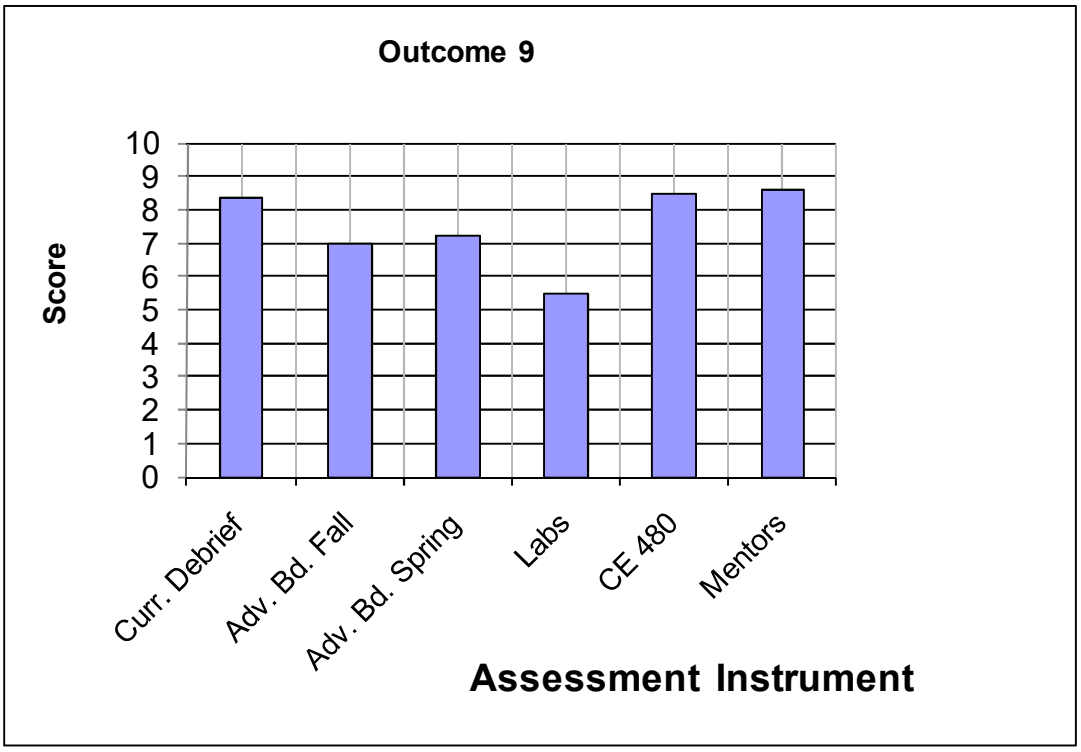
- **Understanding of professional and ethical responsibility (related to outcome # 8).** The average score was 3.7/6.
- **Ability to communicate effectively (related to outcomes # 9).** The average score was 5.0/6.
- **Understanding of the impact of engineering solutions in a global, economic, environmental, and societal context (related to outcome # 10).** The average score was 3.9/6.
- **Ability to engage in life-long learning (related to outcome # 12).** The average score was 2.8/6.
- **Knowledge of contemporary issues (related to outcome # 11).** The average score was 4.0/6.

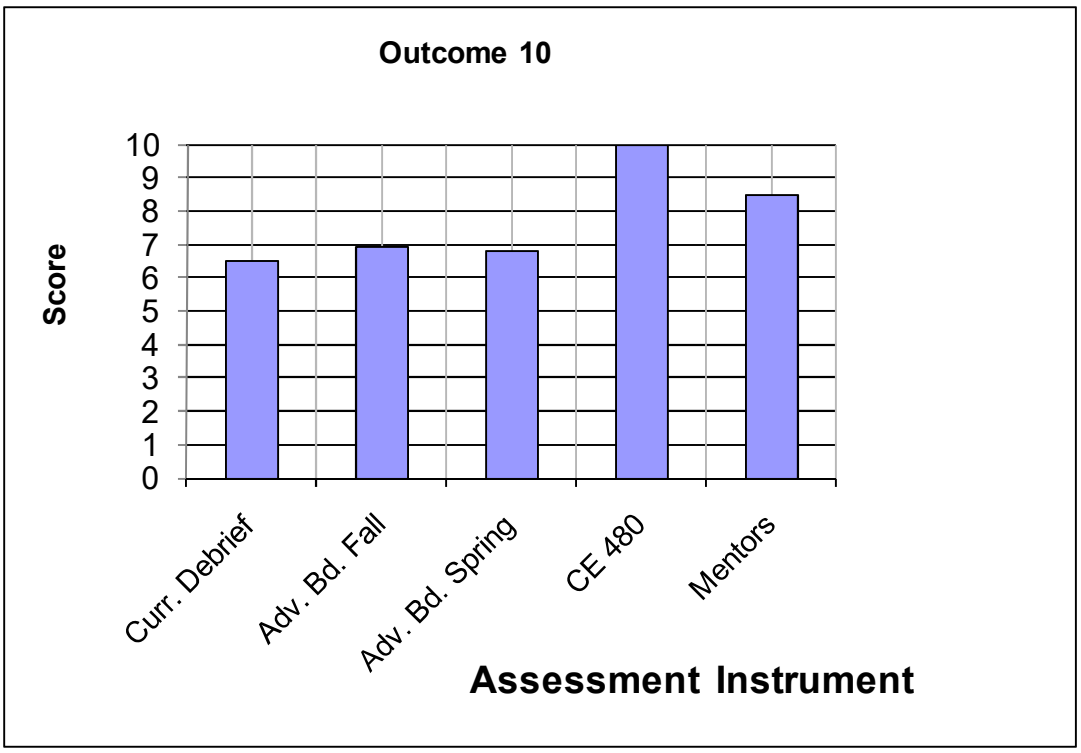
Table 7. Curricular Debrief Assessment Summary

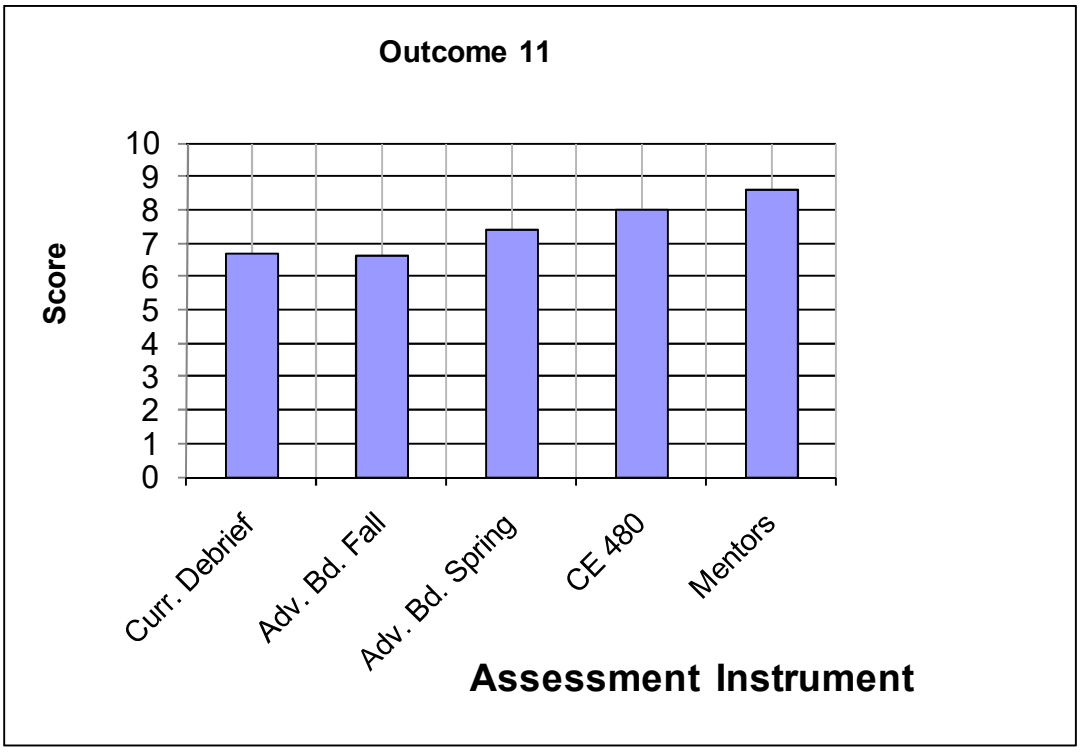
Outcome Number	8	9	10	11	12
Assessment Score 2010/2011	6.2	8.3	6.5	6.7	4.7

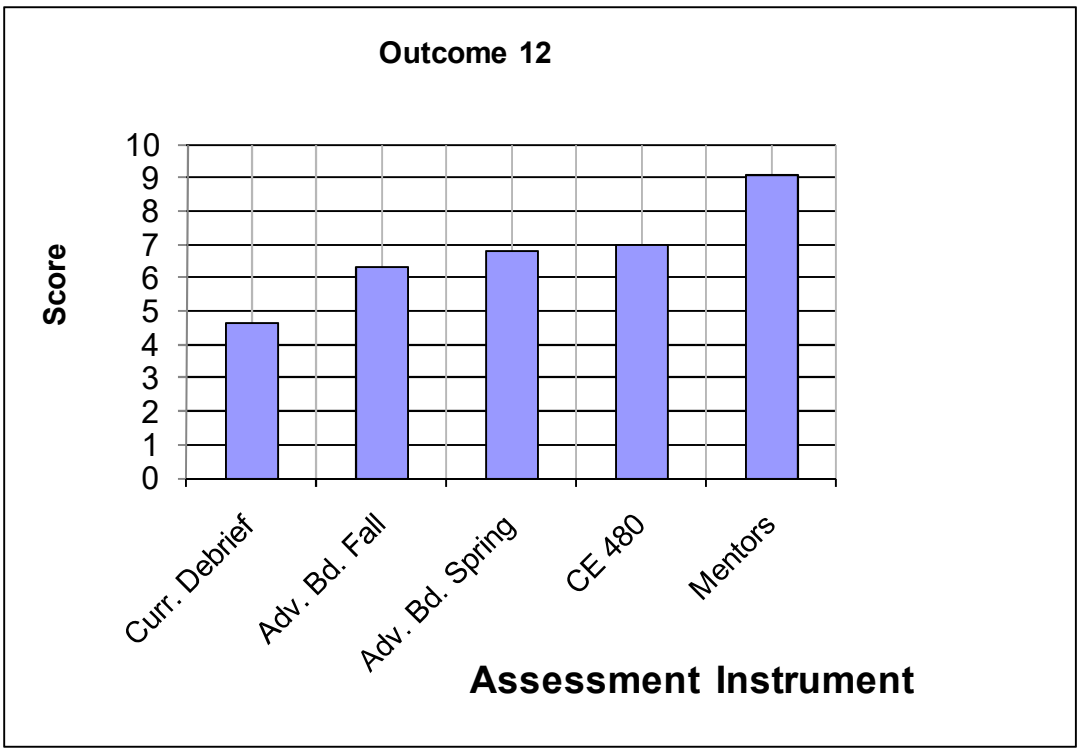
Because the sample of students for the Curricular Debrief was small (6 students), its ratings are compared to those from the other measures used for assessment. The other instruments include the Advisory Board evaluations of the CE 465 groups (direct measure), the evaluations by the senior lab class instructors (indirect measure), the FE exam (direct measure), the evaluations by the CE 480 instructors (indirect measure), and the evaluations by internship mentors (indirect measure). For the comparison, ratings are put on a scale of 1 – 10, with a score of 5 being satisfactory.


Outcome 8
Score
10
9
8
7
6
5
4
3
2
1
0
Curr. Debrief
Adv. Bd. Fall
Adv. Bd. Spring
FE exam
CE 480
Mentors
Assessment Instrument


Outcome 9
Score
10
9
8
7
6
5
4
3
2
1
0
Curr. Debrief
Adv. Bd. Fall
Adv. Bd. Spring
Labs
CE 480
Mentors
Assessment Instrument


Outcome 10
Score
10
9
8
7
6
5
4
3
2
1
0
Curr. Debrief
Adv. Bd. Fall
Adv. Bd. Spring
CE 480
Mentors
Assessment Instrument


Outcome 11
Score
10
9
8
7
6
5
4
3
2
1
0
Curr. Debrief
Adv. Bd. Fall
Adv. Bd. Spring
CE 480
Mentors
Assessment Instrument



From the charts, it is apparent that there were occasionally large differences between the scores from the various instruments.

- The score from CE 480 was significantly higher than the others for Outcomes 10 (awareness and understanding of the impact of engineering on global and societal issues) and 12 (importance of life-long learning). This may be a result of the context of the class through which the evaluations were made.
- The score from the Curricular Debrief was significantly lower than the others for Outcome 12. This was inferred from the performance of a limited number of students in a very controlled situation.
- Differences in the scores for Outcome 12 from the different instruments may be at least partially caused by differences in the rubrics used.

Because of the variation between the top and bottom scores and the differences in the groups evaluated and the instruments used, we will consider average values.

- For Outcome 8, the average score is 7.5.
- For Outcome 9, the average score is 7.5.
- For Outcome 10, the average score is 7.7.
- For Outcome 11, the average score is 7.5.
- For Outcome 12, the average score is 6.8.

All of the average scores are well above the acceptable range. The following recommendations are made for the Curricular Debrief:

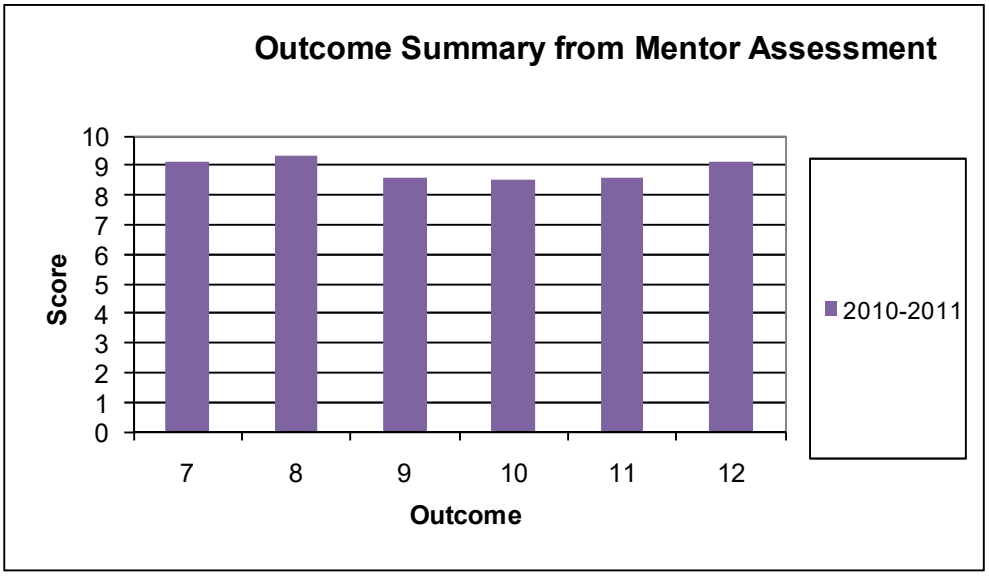
- Choose more students and have the exercise be part of a class so that they have an incentive to perform at their highest level.
- Make it a live exercise with face to face communication.
- Meet with the students prior to beginning the exercise to ensure that they understand what they are to do.

Internship Supervisor Feedback. With the introduction of the experiential requirement, a survey is now sent to all of the students' mentors for the purpose if evaluating them in the areas encompassed by Outcomes 7 – 12. Of particular interest are the reviews from the mentors of the students who pursue outside internships. An example survey form is given in Appendix H.

Completed surveys were received for 18 students in 2010/2011. The results have been compiled, and they are shown in Table 8, below.

Table 8. Internship Mentor Assessment Summary

Outcome Number	7	8	9	10	11	12
Assessment Score 2010/2011	9.1	9.3	8.6	8.5	8.6	9.1



The reviews of nearly all of the students pursuing internships were quite positive, as indicated by the scores all being significantly greater than the minimally acceptable value of 5.

Exit Interview. The department conducts exit interviews to collect data on the background of graduating seniors and their future plans/employment. In addition, they are asked for their opinion on a number of issues pertaining to their undergraduate experience. See Appendix I. From the exit interviews:

- Students averaged about 5.0 years to degree.
- 67 percent of those interviewed had transferred to WSU.
- 71 percent of those interviewed had had internship experience.
- 5 percent of those interviewed had had international experience.
- 10 percent of those interviewed graduated from the Honors College.
- The average salary offer was $50,500.
- 29 percent of those interviewed were going to graduate school.

All CEE Courses. Each CEE course is required to have a syllabus that defines which outcomes the course will impact. Individually, each faculty member continually evaluates the desired outcomes with observed outcomes and redirects the course accordingly. A collection of course syllabi is contained in the ABET self-study report.

This assessment method is not routinely under the direct review of the curriculum/assessment committee or the chair, but rather is implemented by the individual faculty member who is teaching the course. However, when the other primary assessment methods indicate that there is a problem with a particular desired outcome, the curriculum committee will utilize the CEE course assessment tool to help ascertain what improvements may be needed in a particular course to improve certain outcomes.

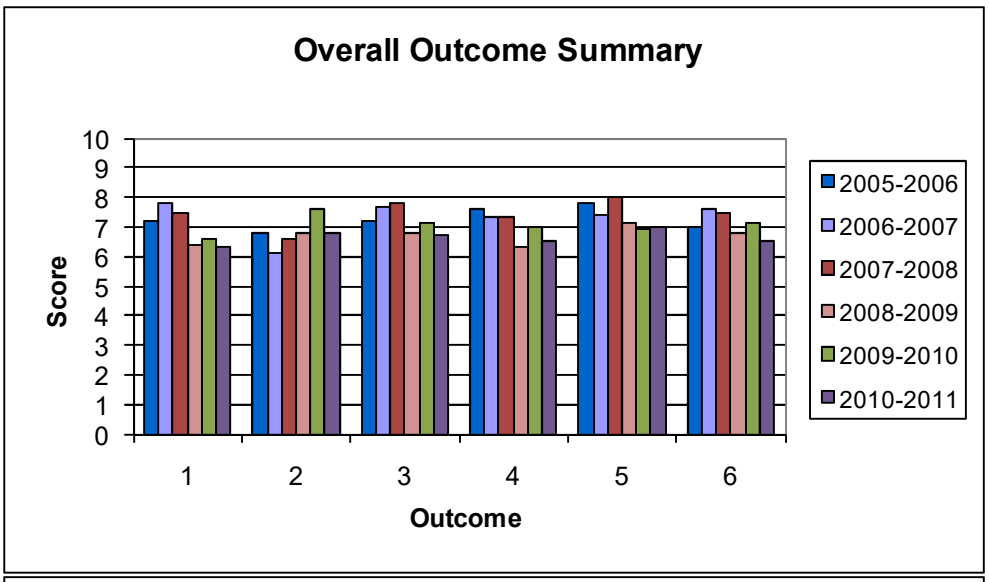
SUMMARY OF OUTCOME ASSESSMENT

Table 9 provides a numerical summary of all assessment tools as they apply to each outcome. Recall that the numerical score assigned to each outcome is on a scale of 1 to 10 (highest) where a score of 5 implies that we are meeting expectations the expectations of that outcome in a satisfactory manner. For easy reference, the interpretation of the numerical scores is repeated below.

Definition of CEE's standardized scores for assessing outcomes	1 - 2 Significant improvement needed	3 - 4 Slight improvement needed	5 - 6 Satisfactory - meets expectation	7 - 8 Moderately exceeds expectation	9 - 10 Outstanding

Table 9. Summary of Assessment Results

Outcome	Ethics CE-480	CE-465 Fall	CE-465 Spring	Lab Elective	FE Exam	Curric. Debrief	Mentor	Net Average Assessment
1. Knowledge of mathematics, science and engineering principles		6.0	7.0	5.8	6.5			**6.3**
2. Design and conduct experiments, analyze data, interpret results and draw conclusions				6.8				**6.8**
3. Design a component, system or process		6.2	7.1					**6.7**
4. Think logically, critically and creatively		6.4	6.8	6.3				**6.5**
5. Work in multidisciplinary teams		6.8	7.1					**7.0**
6. Identify, formulate and solve civil engineering problems		6.3	7.0	6.3	6.5			**6.5**
7. Use appropriate modern techniques, skills and tools		6.9	6.9	5.8	7.7		9.1	**7.3**
8. Understanding of professional ethics and integrity	9	6.5	6.8		7.1	6.2	9.3	**7.5**
9. Communicate effectively	8.5	7.0	7.2	6.3		8.3	8.6	**7.7**
10. Awareness and understanding of impacts on global and societal issues	10	6.9	6.8			6.5	8.5	**7.7**
11. Knowledge of contemporary issues	8	6.6	7.4			6.7	8.6	**7.5**
12. Importance of life-long learning and professionalism	7	6.3	6.8			4.7	9.1	**6.8**



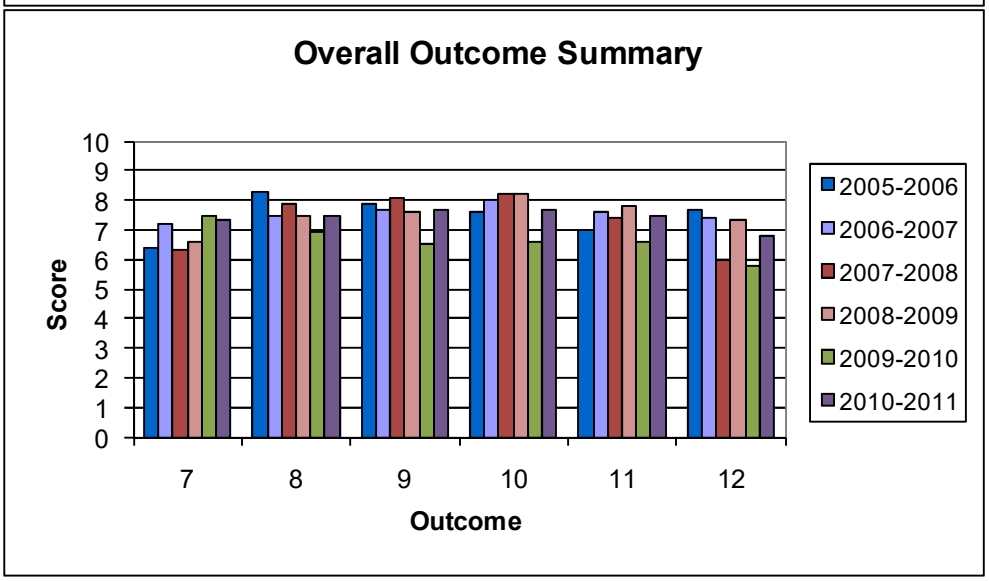


Table 10 lists each outcome showing the net average assessment score for the last five years. More importantly, a summary of the observations is made as well as the result of our past efforts in improving the outcomes. Even though all outcomes are being met in a satisfactory or better manner, there are several opportunities for improvement. Recommendations for improvement are given in Table 10 in ***italics*** with the intent of making a good program even stronger.

Table 10. Overall Outcome Assessment and Recommendations

Outcome #1 **A firm foundation and knowledge of mathematics, science and engineering principles and ability to apply knowledge**.

2005/06 score: 7.2
2006/07 score: 7.8
2007/08 score: 7.5
2008/09 score: 6.4
2009/2010 score: 6.6
2010/2011 score: 6.3

Comment: This score is driven by evaluations from the Advisory Board, lab instructors, and FE exam results. While still quite acceptable, the scores for the 2008/2009, 2009/2010, and 2010/2011 cohorts are reduced compared to those from the three prior years. It was interesting to see that the performance of the spring cohort was significantly better than that of the fall cohort, both with the advisory board evaluations and the FE exam pass rate.
Past Actions*:* The various measures used to assess this outcome indicate that our students continue to be strong in this area.
On-going Actions: No special actions.
Recommendations: ***None.***

Outcome #2 **An ability to design and conduct experiments and the ability to analyze the data, interpret results and draw conclusions**.

2005/06 score: 6.8
2006/07 score: 6.1
2007/08 score: 6.6
2008/09 score: 6.8
2009/2010 score: 7.6
2010/2011 score: 6.8

Comment: This score is purely based on evaluations from the lab instructors. It has remained steady, compared with previous years.
Past Actions: Probability and Statistics (Math 360/370) was made a co-requisite for senior lab classes.
On-going Actions: Efforts are being made to ensure that the assessment from the lab classes is meaningful and consistent.
Recommendations: ***None.***

Outcome #3 **The ability to design a component, system or process to meet desired needs and imposed constraints**.

2005/06 score: 7.2
2006/07 score: 7.7
2007/08 score: 7.8
2008/09 score: 6.8
2009/2010 score: 7.1
2010/2011 score: 6.7

Comment: This score is driven completely by the evaluation of the Advisory Board. It has held steady over the years at a high value. The apparent slight dip in the scores after 2007/2008 is likely a revision of the rubric used to evaluate the CE 465 teams.
Past Actions*:* Traditionally, this has been an area of strength. There were no special actions from last year.
On-going Actions: None
Recommendations: ***None.***

Outcome #4 **The ability to think logically, critically and creatively**.

2005/06 score: 7.6
2006/07 score: 7.3
2007/08 score: 7.3
2008/09 score: 6.3
2009/2010 score: 7.0
2010/2011 score: 6.5

Comment: This score is driven by evaluations from the Advisory Board and from lab instructors. It remains at a strong level.
Past Actions*:* Because this outcome appears to remain solid, no specific actions have been initiated based on observations related to this outcome.
On-going Actions: None.
Recommendations: ***None.***

Outcome #5 **The ability to work in multidisciplinary teams**.

2005/06 score: 7.8
2006/07 score: 7.4
2007/08 score: 8.0
2008/09 score: 7.1
2009/2010 score: 6.9
2010/2011 score: 7.0

Comment: This score is driven completely by evaluations from the Advisory Board. It remains at a strong level.
Past Actions: The multidisciplinary nature of the senior projects in CE-465 has been successful by incorporating several areas of civil engineering (structures, environmental, geotechnical, transportation, and hydraulics) into each project. However in order to enlarge the multidisciplinary scope, we have pursued inter-departmental interactions with a college-level capstone course. A college sponsored, two semester capstone sequence is now available, which draws students from many disciplines, including business. Also, in accordance with feedback from past assessments, the oral communication requirement was expanded from just Public Speaking to also allow courses in group communication.
On-going Actions. None.
Recommendations: ***None***

Outcome #6 **The ability to identify, formulate and solve civil engineering problems**.

2005/06 score: 7.0
2006/07 score: 7.6
2007/08 score: 7.5
2008/09 score: 6.8
2009/2010 score: 7.1
2010/2011 score: 6.5

Comment: This score is driven by evaluations from the Advisory Board and lab instructors, as well as FE exam results. It remains consistently strong. However, the Advisory Board suggested that there is a need to include retaining wall design and footing design in the curriculum. Also, the FE exam scores in the area of Environmental Engineering have been consistently below the national average.
Past Actions*:* An action that has been undertaken based on the observation of the advisory board and the alumni survey was to provide the CE-465 students with improved cost estimation skills. To this end we have requested that CE-465 devote at least one lecture period to cost estimation using faculty from Construction Management Program. Also we formally opened our list of senior-elective course to include Cost Estimating (Cst M 470) or Construction Scheduling (Cst M 455) to replace our defunct course in Construction Management (CE 464). Also, on the basis of past assessments, emphasis was placed on earthwork calculations within CE 301, using the Civil3D software. And, there is increasing use of mentors from practice for the various CE 465 teams.
On-going Actions: Discussion was initiated within the environmental engineering faculty on the relative emphasis given to wastewater treatment versus air pollution control, especially within CE 341, and within the structures/geotech faculty on the teaching of footing and retaining wall design.
Recommendations: ***No new recommendations.***

Outcome #7 **The ability to use appropriate modern techniques, skills and tools, including computer applications, necessary for engineering practice**.

2005/06 score: 6.4
2006/07 score: 7.2
2007/08 score: 6.3
2008/09 score: 6.6
2009/2010 score: 7.5
2010/2011 score: 7.3

Comments: This score is driven by evaluations from the Advisory Board, lab instructors, and internship mentors, as well as FE exam results. It is at its highest level in recent years.
Past Actions*:* In conjunction with the Electrical Engineering Department, the programming experience for the undergraduates was switched from the C language to MATLAB. This has resulted in a more relevant and positive experience for the students. In addition, it has allowed for computational methods to become a more significant part of senior-level electives. This change became an official part of the curriculum in Fall, 2007. In addition, since Fall, 2007, students have been required to own laptop computers. The effects of these changes became apparent this year. Finally, beginning with the cohort being certified in 2010, the new course, CE 303 (Civil Engineering Computer Applications), is required.
On-going Actions: All faculty will continue to increase the use of computer applications in their courses.
Recommendations: None.

Outcome #8 **An understanding of professional ethics and integrity and an engineer's responsibilities to the profession and society**.

2005/06 score: 8.3
2006/07 score: 7.5
2007/08 score: 7.9
2008/09 score: 7.5
2009/2010 score: 6.9
2010/2011 score: 7.5

Comments: This score is driven by evaluations from the Advisory Board, lab and CE 480 instructors, and internship mentors, as well as FE exam results and the Curricular Debrief. This score remains high, largely due to the CE 480 course.
Past Actions*:* On the basis of suggestions from the Advisory Board, we have asked advisors to emphasize the benefits of joining the student chapter of the ASCE. Also, we have encouraged the chapter to seek more opportunities to promote professionalism.
On-going Actions: None.
Recommendations: ***None.***

Outcome #9 **The ability to communicate effectively in written, oral and graphical forms**.

2005/06 score: 7.9
2006/07 score: 7.7
2007/08 score: 8.1
2008/09 score: 7.6
2009/2010 score: 6.5
2010/2011 score: 7.7

Comments: This score is driven by evaluations from the Advisory Board, lab and CE 480 instructors, and internship mentors, as well as the Curricular Debrief. This score is at a high value this year. The Advisory Board is generally pleased with the drawings and presentations of our students. The students' writing skills are not as strong as the others, however.
***Past Actions*:** We have instituted the formal requirement that students complete Engl 402 prior to taking the senior laboratory elective course so that they are better trained to write their lab reports. In addition, the committee looked into method(s) to fully utilize GenEd 302 to improve writing skills in the key writing courses; CE 317, CE 465 and Laboratory Elective Courses. As mentioned for Outcome 5, we expanded the oral communication requirement from just Public Speaking to include options for courses in group communication. In response to concerns about student writing skills, a departmental website has been established as a resource for writing in student projects.
On-going Actions: Continue to standardize writing requirements and standards within department courses.
Recommendations: ***None.***

Outcome #10 **Broad educational experiences that provide an awareness and understanding of the impact of engineering on global and societal issues**.

2005/06 score: 7.6
2006/07 score: 8.0
2007/08 score: 8.2
2008/09 score: 8.2
2009/2010 score: 6.6
2010/2011 score: 7.7

Comments: This score is driven by evaluations from the Advisory Board, CE 480 instructors, and internship mentors, as well as the Curricular Debrief. This score is back to a high level this year.
Past Actions*:* Faculty have been encouraged to include discussions of global and societal issues in their classes. Also, CE 465 has been working with Engineers Without Borders with the goal of providing at least one project per year in a developing country. Also, on the basis of past assessments, an experiential requirement was added to the curriculum, beginning with the cohort being certified in fall, 2008. Finally, an elective area for Sustainability was added with three new courses, including a capstone sequence for sustainable design.
On-going Actions: At every opportunity possible, faculty will continue to give students examples of engineering impacts on society. Also, advisors are encouraging students to consider opportunities to study abroad.
Recommendations: ***None.***

Outcome #11 **A knowledge of contemporary issues**.

2005/06 score: 7.0
2006/07 score: 7.6
2007/08 score: 7.4
2008/09 score: 7.8
2009/2010 score: 6.6
2010/2011 score: 7.5

Comments: The discussion for this outcome is similar to that for Outcome 10.
Past Actions: In the past, this outcome was our lowest scoring outcome, but it has improved. The difficulty was partly because we had not developed a clear definition of what the outcome implies, and partly because the associated assessment tools (CE 480, CE 465, Focus Group and surveys) were subject to a wide range of interpretations. The curriculum/assessment committee and the advisory board have worked to develop consistent criteria and assessment tools for this outcome, in addition to the Curricular Debrief. Also, the new experiential requirement and encouragement to study abroad apply to this outcome, as well as to Outcome 10.
On-going Actions: Implementation of the above.
Recommendations: None.

Outcome #12 **Recognition of the importance of life-long learning and the benefits of being active in professional societies such as ASCE**.

2005/06 score: 7.7
2006/07 score: 7.4
2007/08 score: 6.0
2008/09 score: 7.3
2009/2010 score: 5.8
2010/2011 score: 6.8

Comment: This score is driven by evaluations from the Advisory Board, CE 480 instructors, and internship mentors, as well as the Curricular Debrief. Although there has been significant fluctuation for this outcome, the score this year is high. The Advisory Board puts a heavy emphasis on students being active in the student chapter of the ASCE and their aspirations to obtain their PE license. They also noted that fewer students than before have participated in internships, which has hampered their performance in CE 465. The experiential requirement was intended to encourage participation in internships, but the economic recession has limited the opportunities.
Past Actions: In order to promote professionalism, we changed our curriculum to make it a mandatory requirement for our students to take the FE exam prior to graduating. Preparation for the exam has been formalized with the addition of a required, 1-credit course, CE 466. Also, the advising system has been revamped to allow and encourage discussions with faculty about professional and life-long learning issues. The advising evaluation form was revised to include categories on internships and career planning to encourage discussion. The addition of the experiential requirement should have an effect on this outcome.
On-going Actions: All faculty will encourage students to join the ASCE student chapter.
Recommendations: ***Encourage CE 480 instructors to consider the rubric from the Curricular Debrief for item 3i and apply those attributes to some of their assignments.***

As a final remark for Part 1 of this report, it should be noted that all scores are in the satisfactory range or higher, with scores above 6.5 in all categories but one.

Appendix B
Approval for Teaching Cst M 254

WASHINGTON STATE UNIVERSITY

School of Architecture and Construction Management

September 16, 2011

Dr. Akram Hossain
Civil & Environmental Engineering
Washington State University Tri-Cities
Richland, Washington 99354

Dear Dr. Hossain,

This letter is pertaining to our recent conversations regarding the CstM 254 - Construction Graphics course and the need for it to be offered at the Tri-Cities campus. As discussed, this is a core course requirement for the Civil Engineering but is currently offered only at the Pullman campus. Also, it was indicated that a faculty member, Dr. Srinivas Allena, would be capable of and/or willing to teaching this course to the students located at the Tri-Cities campus.

I have discussed the issue with Jason Peschel who is currently teaching the course here in Pullman and we have agreed to allow the course to be taught by the faculty on the Tri-Cities campus. To summarize, the course is currently taught with two key components in mind. The first is the development of basic plan reading, visualization and hand drawing skills which comprises the lecture portion of the course. The second is the development of student competencies using AutoCAD which comprises the lab portion of the course. As such, Professor Peschel will be forwarding the course syllabus to Dr. Allena via e-mail in an effort to facilitate necessary course prep so that the course can be offered at the Tri-Cities campus during the spring 2012 semester.

However, this is a conditional exception that will be recognized until such time that we have the resources and capabilities to offer this course as an on-line or DDP option. At that time, students in the Tri-Cities and elsewhere will be required to take the course as offered through the Construction Management program.

I apologize for the delay and apologize for any inconvenience that it may have caused. If you have any further questions or comments please feel free to contact me at 509.335.2648 or via e-mail at mkirk@wsu.edu.

Sincerely,

Dr. Max Kirk
Associate Professor
Assistant Director, School of Architecture & Construction Management

cc: Jason Peschel, Construction Management
file

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M E M O R A N D U M

TO: Ken Struckmeyer, Executive Secretary
Faculty Senate

FROM: Becky Bitter, Registrar's Office

FOR: Academic Affairs Committee

DATE: 17 January 2012

SUBJECT: Proposal to Extend the Bachelor of Science in Civil Engineering to WSU Tri-Cities

At its meeting on November 16, 2011, AAC reviewed and approved the attached proposal to extend the Bachelor of Science in Civil Engineering to WSU Tri-Cities.

AAC discussed the proposal with Akram Hossain, Professor of Civil Engineering at Tri-Cities.

At this time, Faculty Senate review and approval is recommended, to be effective fall 2012.