Proposed Sustainable Engineering Concentration

within the BSE Degree in Civil Engineering

Summary

The Civil and Environmental Engineering faculty propose the creation of an undergraduate concentration in Sustainable Engineering within the Bachelor's of Science in Engineering (BSE) in Civil Engineering.

Demand for the Concentration

With limited world resources, especially in urban areas, there is large demand for new sustainable engineering approaches and technologies in order to maintain and improve the quality of life for future generations. The new concentration will help apply the sustainable practices in all areas of urban infrastructure that currently exist within our degree. Both academia and industry are currently moving towards the trend of incorporating sustainable practices in civil engineering. We need to establish this new concentration in order to remain competitive and current with this trend. The new concentration will require developing and updating several courses to emphasize the sustainability approach.

Many jobs are currently available that are applicable to the proposed Sustainable Engineering concentration. We have been contacted by several employers asking for graduates with sustainable engineering emphasis. Also, we received informal requests from our students about courses in the sustainable engineering area. Attached is a snap shot of the jobs available in this area.

Although there will be Sustainability minor available for all ASU students, the Sustainable Engineering concentration is different for the following reasons:

1. The sustainable engineering concentration deals with engineering applications.
2. The sustainable engineering concentration meets the ABET requirements.
3. The sustainable engineering concentration fits within the 120-hr curriculum, but the sustainability minor requires additional courses. Also, students in the sustainable engineering concentration will have the option to enroll in the sustainability minor if they want in order to obtain more knowledge on sustainability in fields other than engineering.

Description of the Requirements

The BSE degree in Civil Engineering without concentration requires a total of 120 credit hours, including required and elective hours. The proposed BSE Civil Engineering degree with Sustainable Engineering Concentration will include a specified/required 3-hour course that will satisfy humanities. It will also replace 15 hours of the technical and design elective hours with

15 hours of required courses. The following courses will be required for the concentration; all courses are three credit hours each:

- CEE 181: Technological, Social & Sustainable (has been offered as omnibus FSE194)
- Two of the following existing courses:
  - CEE 440: Engineering Hydrology
  - CEE 462: Unit Operations in Environmental Engineering
  - CEE 466: San System Design
  - CEE 474: Transportation Systems Planning
- CEE 485: Sustainable CE Systems Engineering (has been offered as omnibus course) OR CON 448: Sustainable Construction (has been offered as omnibus course)
- SOS 300: Advanced Concepts and Integrated Approaches in Sustainability (A new course that will be developed by the School of Sustainability as a part of the sustainability minor in the School of Sustainability program)
- CEE 416/SOS 434: Sustainable Energy and Material Use (existing SOS course, CEE crosslisting to be added)

Primary Faculty Participants

With the exception of one course (SOS 300), all courses required for the concentration are topics that are currently offered. Therefore, current instructors will continue offering the same courses. SOS 300 will be offered by current faculty from the School of Sustainability.

Minimum Residency Requirements

There will be no specific residency requirement for the Sustainable Engineering concentration other than the regular ASU residency requirement.

Letters of Support

The School of Sustainable Engineering and the Built Environment has the resources to support this concentration as presented in the proposal, without impacting core course resources. A letter of support from the Director of the School of Sustainable Engineering and the Built Environment is attached.

A letter of support from the School of Sustainability is provided to show documentation that they agree and understand that SOS 300 and CEE 416/SOS 434 will be part of our required concentration curriculum. We will be going through the ACRES process to establish permanent course numbers for CEE 181: Technology, Society & Sustainability; CEE 485: Sustainable CE Systems Engineering; and CON 448: Sustainable Construction. In addition, documentations will be submitted to the General Studies Council to add the HU and H designations to CEE 181.

Ira A. Fulton
Schools of Engineering
ARIZONA STATE UNIVERSITY

To: James Collofello, Associate Dean, Ira A. Fulton School of Engineering

From: Paul Westerhoff,
Director, School of Sustainable Engineering and the Built Environment

Date: March 1, 2010

RE: Proposal for a Sustainable Engineering Concentration in the Bachelor of Science in Engineering degree in Civil, Environmental, and Sustainable Engineering

The faculty of the School of Sustainable Engineering and the Built Environment support the proposal for a new concentration of Sustainable Engineering in the Bachelor of Science in Engineering degree in Civil, Environmental, and Sustainable Engineering. This new concentration will enable us to attract engineering students interested in complex systems, and help keep the civil engineering field at the front of leading technological change for society. The proposed concentration incorporates many of the ideas and classes in the new university wide sustainability minor. I served on the ad-hoc Provost committee to develop the sustainability minor with Chris Boone. The sustainable engineering concentration will allow students to take classes in the area of sustainability while also meeting ABET requirements. Overall, we anticipate the sustainable engineering concentration to increase enrollment in our program and provide a rigorous and focused series of courses designed to address a critical need for the future of the US economy.

School of Sustainable Engineering and the Built Environment
Civil, Environmental and Sustainable Engineering
Del E. Webb School of Construction
PO Box 875306 Tempe, AZ 85287-5306
(480) 965-3589 FAX (480) 965-0557

School of Sustainability
ARIZONA STATE UNIVERSITY

March 9, 2010

Curriculum Committee
Ira A. Fulton Schools of Engineering
Arizona State University

Dear FSE Curriculum Committee,

I am writing in support for the new concentration in Sustainability Engineering in the BSE in Civil Engineering in the School of Sustainable Engineering and the Built Environment at ASU. The program is designed to provide students with exposure to material from several disciplines that are useful to inform their thinking about the fields included in their major. Additionally, the program includes an opportunities for faculty members associated with the School of Sustainability to teach and interact with these students. We understand that there will be one or possibly more courses from the School of Sustainability required in the concentration and we are prepared to provide these courses as the resources these courses demand are provided. We support this proposal and believe that it will be an positive addition to the programs available to undergraduates in the Fulton Schools of Engineering at Arizona State University.

Sincerely,

Charles L. Redman

Director, School of Sustainability
Virginia M. Ullman Professor of Natural History and the Environment

School of Sustainability
Box 875502, Tempe, Arizona 85287-5502
Phone: (480) 965-8654 Fax: (480)965-8087
charles.redman@asu.edu

ASU ARIZONA STATE UNIVERSITY

Major Map: Civil Engineering – (Sustainable Engineering) Bachelor of Science in Engineering (B.S.E.)

Ira A. Fulton School of Engineering \ Catalog Year: 2010-2011

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			Completed ATP: ☐ *Yes* ☐ *No*		*Completed AGEC:* ☐ *Yes* ☐ *No*
Course Subject and Title *(courses in bold/shading are critical)*	Hrs.	Upper Division	Transfer Course/Grade	Minimum Grade if Required	Additional Critical Requirement Notes
TERM ONE: 0-15 CREDIT HOURS					
ASU 101-FSE: The ASU Experience	1	☐			• ASU 101-FSE should be completed first semester. • An SAT, ACT, Accuplacer, or TOEFL score determines placement into first-year composition courses • ASU Math Placement Exam score determines placement in Mathematics course *CHM 113 is a prerequisite and does not apply toward degree credit. **If ENG 105 a 3 hr applicable elective must also be taken prior to graduation. See Advisor. • **Maintain minimum ASU cumulative GPA Of 2.0**
CEE 100: Intro to Civil and Environmental Engineering OR ECN 211/212 (SB): Macroeconomic Principles/ Microeconomic Principles or ECN 201: Economic Issues & Analysis (SB)	2 or 3	☐		Grade of C in CEE 100	
CHM 114: General Chemistry for Engineers (SQ) OR CHM 116: General Chemistry II* (SQ)	4	☐			
CEE 181 Technological, Social & Sustainable Systems (HU, H)	3	☐			
MAT 265: Calculus for Engineers I	3	☐		Grade of C	
ENG 101 or 102: First-Year Composition OR ENG 105: Advanced First-Year Composition** OR ENG 107 or 108: English for Foreign Students	3	☐		Grade of C	
TERM TWO: 16-30 CREDIT HOURS					
CEE 100: Intro to Civil and Environmental Engineering OR ECN 211/212 (SB): Macroeconomic Principles/ Microeconomic Principles or ECN 201: Economic Issues & Analysis (SB)	2 or 3	☐		Grade of C in CEE 100	• **Maintain minimum ASU cumulative GPA Of 2.0**
MAT 242: Elementary Linear Algebra	2	☐		Grade of C	
MAT 266: Calculus for Engineers II	3	☐		Grade of C	
PHY 121/122: University Physics I/ Laboratory I (SQ)	3/1	☐		Grade of C	
ENG 101 or 102: First-Year Composition OR ENG 105: Advanced First-Year Composition** OR ENG 107 or 108: English for Foreign Students	3	☐		Grade of C	
TERM THREE: 31-45 CREDIT HOURS					
CEE 210: Engineering Mechanics: Statics	3	☐		Grade of C	• **Complete 12 critical courses by end of term 3.** • **Maintain minimum ASU cumulative GPA Of 2.0**Complete First-Year Composition requirement: ENG 101 & 102 or ENG 107 & 108 or ENG 105
MAT 267: Calculus for Engineers III	3	☐		Grade of C	
MAT 275: Modern Differential Equations (MA)	3	☐		Grade of C	
PHY 131/132: University Physics II: Electricity and Magnetism/ Laboratory II (SQ)	3/1	☐		Grade of C	
TERM FOUR: 46-60 CREDIT HOURS					
CEE 212: Engineering Mechanics: Dynamics	3	☐		Grade of C	
CEE 213: Introduction to Deformable Solids	3	☐		Grade of C	
EEE 202: Circuits I OR MAE 240: Thermofluids I	4	☐			
Basic Science Elective:	3	☐			
TERM FIVE: 61-75 CREDIT HOURS					
#CEE 384: Numerical Methods for Engineers (CS)	3	☒		Grade of C	# Designates Major Course: A minimum cumulative GPA of 2.30 required in all CEE 3XX courses, a minimum cumulative GPA of 2.30 required in all CEE 4XX courses. NOTE: A maximum of two "D" grades are allowed in all 3XX and 4XX courses combined.
Select 3 # CEE 300: Engineering Business Practice (L) (3 hrs) # CEE 321: Structural Analysis and Design (4 hrs) # CEE 341: Fluid Mechanics for Civil Engineers (4 hrs) # CEE 351: Geotechnical Engineering (4 hrs) # CEE 353: Civil Engineering Materials (3 hrs) # CEE 361: Introduction to Environmental Engineering (4 hrs) # CEE 372: Transportation Engineering (4 hrs)	10-12	☒		Grade of C in each	
IEE 380: Probability and Statistics for Engineering Problem Solving	3	☒			
TERM SIX: 76-90 CREDIT HOURS					
Select remaining 4 # CEE 300: Engineering Business Practice(L) (3 hrs) # CEE 321: Structural Analysis and Design (4 hrs) # CEE 341: Fluid Mechanics for Civil Engineers (4 hrs) # CEE 351: Geotechnical Engineering (4 hrs) # CEE 353: Civil Engineering Materials (3 hrs) # CEE 361: Introduction to Environmental Engineering (4 hrs) # CEE 372: Transportation Engineering (4 hrs)	14 - 16	☒		Grade of C in each	# Designates Major Course: A minimum cumulative GPA of 2.30 required in all CEE 3XX courses, a minimum cumulative GPA of 2.30 required in all CEE 4XX courses. NOTE: A maximum of two "D" grades are allowed in all 3XX and 4XX courses combined.
TERM SEVEN: 91-105 CREDIT HOURS					
#CEE 400 Earth Systems Engineering and Management (HU, H) OR Social & Behavioral Science (SB) AND Cultural Diversity in the US (C) or Global Awareness (G)	3	☐		Grade of C in CEE 400	• Technical Elective and Design Elective requirements: Complete a total of 2 design electives and 4 technical electives during Term 7 and Term 8. See Advisor for guidance in selection. # Designates Major Course: A minimum cumulative GPA of 2.30 required in all CEE 3XX courses, a minimum cumulative GPA of 2.30 required in all CEE 4XX courses. NOTE: A maximum of two "D" grades are allowed in all 3XX and 4XX courses combined.
Select 1course from #CEE 440:Engineering Hydrology (3) #CEE 462:Unit Operations in Environmental Engineering (3) #CEE 466: San System Design (3) #CEE 474: Transportation Systems Planning	3	☒		Grade of C	
#CEE 485: Sustainable CE Systems Engineering (3), OR #CON 494 Sustainable Construction (3)	3	☒		Grade of C	
#SOS 300: AdvConcepts and Integr Approaches in Sustainability (3)	3	☒		Grade of C	
#CEE416: Sustainable Energy and Material Use (3)	3	☒		Grade of C	

ASU ARIZONA STATE UNIVERSITY

Major Map: Civil Engineering – (Sustainable Engineering)
Bachelor of Science in Engineering (B.S.E.)
Ira A. Fulton School of Engineering \ Catalog Year: 2010-2011

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Course Subject and Title *(courses in bold/shading are critical)*	Hrs.	Upper Division	Transfer Course/Grade	Minimum Grade if Required	Additional Critical Requirement Notes
TERM EIGHT: 106-120 CREDIT HOURS					
# CEE 400: Earth Systems Engineering and Management (HU, H) OR Social & Behavioral Science (SB) AND Cultural Diversity in the US (C) or Global Awareness (G) if CEE 400 completed	3	☐		Grade of C in CEE 400	• Technical Elective and Design Elective requirements: Complete a total of 2 design electives and 4 technical electives during Term 7 and Term 8. See Advisor for guidance in selection. # Designates Major Course: A minimum cumulative GPA of 2.30 required in all CEE 3XX courses, a minimum cumulative GPA of 2.30 required in all CEE 4XX courses. NOTE: A maximum of two "D" grades are allowed in all 3XX and 4XX courses combined.
# CEE 486: Integrated Civil Engineering Design (L)	4	☒		Grade of C	
# Technical Elective or # Design Elective	3	☒		Grade of C	
Select an additional course from #CEE 440: Engineering Hydrology (3) #CEE 462: Unit Operations in Environmental Engineering (3) #CEE 466: San System Design (3) #CEE 474: Transportation Systems Planning	3	☒		Grade of C	
Humanities, Fine Arts & Design (HU) AND Cultural Diversity in the US (C) or Global Awareness (G)	3	☐			

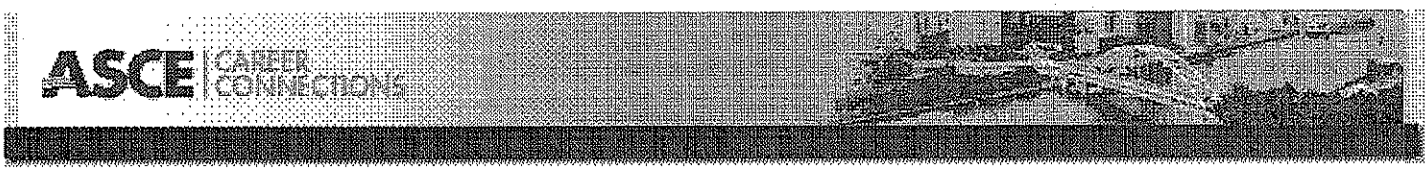
Graduation Requirements Summary:

Total Hours Regular Curriculum (120)	Total UD Hrs (45 min)	Total Hrs at ASU (30 min)	Cumulative GPA (2.00 minimum)	Major GPA (2.30 Min. CUM GPA in CEE 3XX, 2.30 min CUM GPA in CEE 4XX))	Hrs Resident Credit for Academic Recognition (56 min)	Total Comm. College Hrs. (64 Max)

General University Requirements: Legend

- General Studies Core Requirements:
  - Literacy and Critical Inquiry (L)
  - Mathematical Studies (MA)
  - Computer/Statistics/Quantitative applications (CS)
  - Humanities, Fine Arts, and Design (HU)
  - Social and Behavioral Sciences (SB)
  - Natural Science-Quantitative (SQ)
  - Natural Science-General (SG)
- General Studies Awareness Requirements
  - Cultural Diversity in the US (C)
  - Global Awareness (G)
  - Historical Awareness (H)
- First-Year Composition

Additional Notes:



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Feb. 16, 2010	Structural Engineer	Selas Fluid Processing Corp.	US - Blue Bell, PA 19422 (Philadelphia suburb)	
Feb. 16, 2010	Senior Geotechnical / Materials Engineer	AMEC Earth & Environmental	CAN - ON - Windsor	
Feb. 15, 2010	Civil Engineering I	RS&H	US - Charlotte	
Feb. 15, 2010	Assistant Professor	Notre Dame University	LBN - Nationwide	
Feb. 12, 2010	Roadway Engineer	Gresham, Smith & Partners	US - Jackson, MS	
Feb. 12, 2010	Senior Bridge Engineer IV	RS&H	US - Charlotte, Raleigh, or Atlanta	
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Feb. 12, 2010	Geo Technical Engineer	Siefert Associates, LLC	US - Central Connecticut	
Feb. 12, 2010	Aviation Engineer III	RS&H	US - Spokane, WA	
Feb. 12, 2010	Office Leader/ Senior Airfield Civil Engineer	RS&H	US - Austin	
Feb. 12, 2010	Senior Electrical Engineer	RS&H	US - Chicago	
Feb. 11, 2010	Senior Airfield Civil Engineer	RS&H	US - Ft. Lauderdale	
Feb. 11, 2010	Senior Airfield Civil Engineer	RS&H	US - Los Angeles	
Feb. 11, 2010	Professional Land Surveyor	LCS	US - Baton Rouge Metropolitan Area	

Feb. 11, 2010	Senior Roadway Engineer	RS&H	US - Charlotte or Raleigh
Feb. 11, 2010	Office Leader/ Senior Airfield Civil Engineer	RS&H	US - Washington D.C.
Feb. 11, 2010	Civil Engineer (Hydrologic)	U.S. Government, DOE, Southwestern	US - OK - Tulsa
Feb. 09, 2010	Faculty Tenure Track Energy Position	Villanova University	US - PA - Villanova
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Environmental Specialist First Environment, Inc.	Sacramento, CA; Chicago, IL; Boonton, NJ; Washington, DC;	Full Time	Senior Level	Feb 8, 2010
Environmental Engineering Assistant Princeton Plasma Physics Laboratory	Princeton, NJ;	Full Time	Mid Level	Feb 2, 2010
Sustainability Analyst GreenShape, LLC	Washington, DC;	Full Time	Mid Level	Feb 1, 2010
Sustainable Building Monitoring Analyst Ecological LLC	New York, NY;	Full Time	Senior Level	Jan 25, 2010
MEP Engineer/ Commissioning Specialist U.S. Green Building Council	Washington, DC;	Full Time	Mid Level	Jan 13, 2010