THE OHIO STATE UNIVERSITY

College of Engineering

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Columbus, OH 43210-1278

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Date: 23 June 2010

To: Randy Smith
Vice Provost, Office of Academic Affairs

From: Ed McCaul
Secretary College of Engineering Committee on Academy Affairs (CCAA)

Subject: Semester Conversion Proposals for BS in Civil Engineering, BS in Environmental Engineering, and Environmental Engineering Minor

Attached is a letter from Carolyn Merry, Department Chair of Civil and Environmental Engineering and Geodetic Science, as well as semester conversion proposals for the BS in Civil Engineering Degree, BS in Environmental Engineering Degree, and the Environmental Engineering Minor.

These proposals were reviewed by a subcommittee of CCAA. After reviewing the proposals and having some changes made to them the subcommittee recommended to the full committee that they be approved. After a discussion, CCAA unanimously approved the proposals along with the withdrawal of the Civil Engineering (Advanced Professional) Degree and the BS in Geomatics Engineering Degree on the 23rd of June 2010 and requested that I forward the proposals to you for consideration by CAA. If you have any questions concerning these proposals please let me know.

THE OHIO STATE UNIVERSITY

Department of Civil and Environmental Engineering and Geodetic Science

470 Hitchcock Hall
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Phone (614) 292-2771
Fax (614) 292-3780

To: Office of Academic Affairs

From: Carolyn J. Merry, Chair, Department of Civil and Environmental Engineering and Geodetic Science

Date: June 23, 2010

Re: Semester Proposal for Department of Civil and Environmental Engineering and Geodetic Science

Academic Programs and Approvals

The Department of Civil and Environmental Engineering and Geodetic Science submits semester conversion proposals for the academic programs listed below. All of the program proposals received strong support by the faculty (votes and date of vote provided in parentheses) and I, as Department Chair, support the approval of these semester conversion proposals as well.

B.S. Civil Engineering (11 yes, 1 no; 0 abstain; April 2, 2010)
B.S. Environmental Engineering (13 yes; 0 no; 0 abstain; April 2, 2010)
B.S. Geomatics Engineering (withdrawn-9 yes; 0 no; 1 abstain)
Minor Environmental Engineering (11 yes; 0 no; 0 abstain, April 16, 2010)
Minor Surveying and Mapping (15 yes; 0 no; 0 abstain, May 14, 2010)
M.S. Civil Engineering (15 yes; 0 no; 0 abstain, May 14, 2010)
Ph.D. Civil Engineering (13 yes; 2 no; 0 abstain, May 14, 2010)
Civil Engineering Degree (withdrawn; 8 yes; 1 no; 0 abstain, April 23, 2010)

Students pursuing a combined BS/MS program must follow all college and university rules. The department will allow up to 8 hours of independent research applied toward the BSCE or BS Environmental Engineering degree, provided at least 6 credit hours of courses normally applicable toward professional elective requirements are senior petitioned toward the MS degree.

The department is withdrawing the B.S. Geomatics Engineering degree. The B.S. Geomatics degree is currently in the process of being de-activated due to lack of enrollment. We expect the few remaining students in the program to matriculate through the program prior to Summer, 2012. The department is also withdrawing the "Civil Engineer" degree administered by the College of Engineering due to lack of enrollment. There are currently no students in this program.

Semester Proposal Process

The development of the semester conversion proposals for the academic programs in the Department of Civil and Environmental Engineering and Geodetic Science were carried out by the Undergraduate and Graduate Studies Committees in the Department. In revising the

curriculum, the committees considered such things as: (a) the success of our graduates in their professional careers, especially as indicated by the results on the Fundamentals of Engineering (FE) Exam, Principles and Practice (PE) exam, and job placement; (b) the need to continue to fulfill Accreditation Board for Engineering and Technology (ABET) general and program criteria for our undergraduate degree programs, and be responsive to comments made during recent accreditation visits by ABET; (c) various measures of achievement of educational outcomes and program objectives as part of the department's on-going efforts in outcomes assessment; (d) educational goals as expressed in: American Society of Civil Engineers (ASCE) Statement 465, ASCE Civil Engineering Body of Knowledge for the 21st Century, ASCE Code of Ethics, 2006 ASCE Summit on the Future of Civil Engineering, American Academy of Environmental Engineers Body of Knowledge, recent National Academy studies and publications, (e) The Ohio State University, College of Engineering, and Civil and Environmental Engineering and Geodetic Science strategic plans and budgetary constraints; (f) faculty and other resources; (g) and similar programs at other universities.

The department began serious discussions of the revised curricula in Spring of 2009 and continued through Spring of 2010. A department website was set up on Carmen as a storehouse for information and discussion topics on the semester conversion process and the departments various semester conversion proposals. The department also appointed a person (Chair of Undergraduate Studies) to serve as a point of contact for the semester conversion and to sit on the College of Engineering Quarters-to-Semesters (Q2S) Taskforce.

In addition to faculty input, the committees also solicited feedback from current students through the OSU student chapter of the American Society of Civil Engineers (ASCE), student chapter of the Water Environmental Federation (WEA), the Civil Engineering Honor Society (Chi Epsilon), the student chapter of the American Academy of Environmental Engineers, and targeted requests from specific students. Input from past graduates was obtained from the Civil Engineering Alumni Association, which serves as our "Industrial Advisory Committee." The Undergraduate and Graduate Studies Committees then developed academic program proposals and proposal revisions, based on the feedback received. Individual faculty were then charged with developing specific course syllabi. Syllabi were subsequently reviewed by the Undergraduate and Graduate Studies Committees, Department Chair, and College of Engineering Committee on Academic Affairs. The department had extensive discussions for each proposal that culminated in a faculty vote.

Once approved at the department level, proposals were submitted to the College of Engineering Committee on Academic Affairs (CCAA) for review and College-level approval. Our proposals were reviewed in CCAA subcommittee A. We then worked with the subcommittee to address all concerns and suggestions. Our proposals were then brought to the full committee (CCAA), with the recommendation of the subcommittee, for a vote.

Sincerely,

Carolyn J. Merry
Professor and Chair

THE OHIO STATE UNIVERSITY

Civil and Environmental Engineering and Geodetic Science

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Phone (614) 292-2771
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DATE: June 21, 2010

TO: John Lippold, Chair of CCAA Subcommittee A

FROM: Harold Walker, Civil and Environmental Engineering and Geodetic Science

RE: B.S. Civil Engineering Semester Conversion Proposal

The Department of Civil and Environmental Engineering and Geodetic Science has completed its revision of the semester conversion proposal for the B.S. in Civil Engineering degree, considering the comments of Subcommittee A.

The majority of comments from Subcommittee A on the first draft of the proposal were relatively minor, mainly involving correcting typographical errors or making minor clarifications. We made all of the suggested minor changes and re-worded a few sections for better clarity in response to these comments.

The committee also noted in the first draft some errors in the credit hours in both the existing quarter-based bingo sheet and semester curriculum. We have corrected these errors and have also provided a narrative explanation of the credit hours supporting the CAA required table in section 11, as also suggested by subcommittee A.

The committee also requested we re-think our policy for physics during the transition as we are increasing the physics requirement from 2 quarters to 2 semesters. Our original policy would have required some students to take Physics 133 to get credit for Physics I, which would effectively added a course to the quarter curriculum. Our revised policy now reads, "Students will be considered to have completed the semester-curriculum Physics requirement by successfully completing Physics 131 and 132 in the quarter-based curriculum. Students who have completed only Physics 131 will be required to complete Physics II in the semester-based curriculum. We will advise our students to complete Physics 131 and 132 prior to conversion to semesters."

Only a few typographical errors were noted after the review by Subcommittee A of the second draft of the proposal. Subcommittee A indicated the changes to the second draft of the proposal were acceptable, and made no additional comments or suggestions for revision.

Program Proposal: B.S. in Civil Engineering

GENERAL PROGRAM INFORMATION

1. Identify the name of the program (current and proposed names, if different)

B.S. in Civil Engineering

2. Identify the degree title (current and proposed names, if different)

B.S. in Civil Engineering

3. Identify the academic unit(s) responsible for administrating the program

Department of Civil and Environmental Engineering and Geodetic Science

4. Specify the type of program

Undergraduate degree program or major

5. Select the appropriate semester conversion designation

Converted with minimal changes to program goals and/or curricular requirements

PROGRAM REQUIREMENTS

6. List program learning goals

Program Objectives

The Department of Civil and Environmental Engineering and Geodetic Science seeks to educate graduates who will be ethical, productive, and contributing members of their profession and of society. This education should form the basis for professional and personal development after graduation, as encompassed by the following objectives.

1. Graduates will apply engineering fundamentals acquired in their undergraduate program to succeed in
   - Engineering careers in the public sector, private sector, or academia
   - Non-engineering careers in research, government, education, public policy, business, law, or medicine that benefit from engineering education

2. Graduates will be motivated toward lifelong learning and the pursuit of significant, recognized post-B.S. professional development, such as
   - Professional engineering licensure
   - Graduate studies in engineering or science or other professional fields that benefit from analytic and scientific fundamentals

3. Graduates will engage in outreach to improve engineering practice or society through
   - Activity in professional organizations
   - Activity in service and community organizations

Program Outcomes

At graduation, undergraduate students seeking a B.S. Degree in Civil Engineering from the Department of Civil and Environmental Engineering and Geodetic Science are expected to have attained the following program outcomes:

a. An ability to apply knowledge of mathematics, science, and engineering

b. An ability to design and conduct experiments, as well as to analyze and interpret data

c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d. An ability to function on multidisciplinary teams

e. An ability to identify, formulate and solve engineering problems

f. An understanding of professional and ethical responsibility

g. An ability to communicate effectively

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

i. A recognition of the need for, and ability to engage in life-long learning

j. A knowledge of contemporary issues

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

7. List the semester courses (department, title, credit hours) that constitute the requirements and other components of the program.

Department/Unit	Title	Credit Hours
Mathematics	Engineering Calculus I	5
Mathematics	Engineering Calculus II	5
Mathematics	Differential Equations	3
Physics	Physics I	5
Physics	Physics II	5
Chemistry	Chemistry for Engineers	4
Engineering	Engineering Survey	1
Engineering	Introduction to Engineering I	2
Engineering	Introduction to Engineering II	2
Computer Science and Engineering	Computer Programming	2
Additional Science Elective	Additional Science Elective	4
Mechanical Engineering	Statics	2
Mechanical Engineering	Strength of Materials	3
Mechanical Engineering	Dynamics	3
Civil Engineering	Probabilistic Applications and Data Interpretation in Civil and Environmental Engineering	3
Civil Engineering	Numerical Analysis Methods for Civil and Environmental Engineering Applications	4
Civil Engineering	Professional Aspects of Civil and Environmental Engineering	1
Civil Engineering	CE Materials	3
Civil Engineering	Fluid Mechanics	3
Civil Engineering	Structural Engineering Principles	3
Civil Engineering	Economic Evaluation and Optimization in Civil and Environmental Engineering	3
Civil Engineering	CE Capstone Design I	2
Civil Engineering	CE Capstone Design II	2
Civil Engineering	CE Select Core 1	3
Civil Engineering	CE Select Core 2	3
Civil Engineering	CE Select Core 3	3
Civil Engineering	CE Select Core 4	3
Civil Engineering	CE Select Core 5	3
Civil Engineering	CE Select Core 6	3
Civil Engineering	Technical Electives	18
GEC	Writing Level I	3
GEC	Writing Level II	3
GEC	Literature	3
GEC	Arts	3
GEC	Historical Study	3
GEC	Social Science I	3
GEC	Social Science II	3
GEC	Culture & Ideas: Ethics	3
	Total Semester Hours =	**130**

- *General Education Curriculum*. The designated General Education Curriculum course ("Culture and Ideas: Ethics") will be chosen from a set to be designated by the College of

Engineering once other departments' offerings and General Education approved courses are known.

- *Civil Engineering Select Core*. Students will chose a total of 6 courses from a list of courses approved by the Civil Engineering Undergraduate Studies Committee. A preliminary list of approved courses include:

CE2400 Intro to Geomatics	CE3700 Trans Eng and Analysis
CE3160 Water Resources Engineering	CE3810 Construction Eng and Manag
ENVENG3200 Fund of Env Engineering	CE4320 Structural Steel Design
CE3540 Geotechnical Engineering	or CE4350 Reinforced Concrete Design

Note: Either CE4320 or CE4350 may be applied toward the select core, but not both.

- *Technical Electives*. 18 hours of technical electives will be chosen in consultation with the students faculty advisor from a list of courses to be determined by the B.S. Civil Engineering Undergraduate Studies Committee.

- *Additional Science Elective*. At least 4 credit hours of additional science is required. Students may choose from a list of courses to be approved by the B.S. Civil Engineering Undergraduate Studies Committee.

8. Append a current (quarter-based) and proposed (semester-based) curriculum advising sheet for the program, formatted to meet the unit's standards.

See Appendix A for a current (quarter-based) curriculum advising sheet and Appendix B for the proposed (semester-based) curriculum advising sheet.

9. Provide a curriculum map that shows how, and at what level (e.g., beginning, intermediate, advanced), the program's courses facilitate students' attainment of program learning goals. A table format is recommended.

A curriculum map is provided in Appendix C.

10. Provide a rationale for proposed program changes (either significant or minimal) and a description of how the changes will benefit students and enhance program quality. Include date of last significant program revision. [Word limit: 750]

A curriculum evaluation committee was established by the Department of Civil and Environmental Engineering and Geodetic Science to review the B.S. Civil Engineering curriculum on December 20, 2005. The curriculum evaluation committee carried out an extensive review of the curriculum culminating in a Final Report in May, 2007. In reviewing the curriculum, the committee considered (a) the success of our graduates in their professional careers, especially as indicated by the results on the Fundamentals of Engineering (FE) Exam and Principles and Practice (PE) exam, (b) the need to continue to fulfill Accreditation Board for Engineering and Technology (ABET) general and program criteria and be responsive to comments made during recent accreditation visits by ABET, (c) various measures of achievement of educational outcomes and program objectives as part of the departments on-going efforts in outcomes assessment, (d) educational goals as expressed in: American Society of Civil Engineers (ASCE) Statement 465; ASCE Civil Engineering Body of Knowledge for the 21st Century; ASCE Code of Ethics; 2006 ASCE Summit on the Future of Civil Engineering; recent National Academy studies and publications, (e) Ohio State University and College of Engineering strategic plans and budgetary constraints, (f) faculty and other resources, (g) and Civil Engineering programs at other universities. The recommendations made by the committee were phased in over the academic year, 2008-2009.

Given the significant program review that that ended in 2007, only minor modifications to the existing curriculum are proposed as we transition to semesters. Minor changes to the program upon conversion include;

- In the quarters-based curriculum, Civil Engineering students take 4 quarters of calculus and a 5th quarter of differential equations. Based on the expected offerings by Mathematics, our students will take the 2 semester calculus sequence Engineering Calculus I & II and a third semester course on differential equations.
- The physics requirement for Civil Engineering students is being increased from 2 quarters (Physics 131 and 132) to 2 semesters. We recently decreased the physics requirement for Civil Engineering majors from 3 quarters to 2 quarters. It was felt that additional reduction to a single semester would not give the students adequate background for the major.
- Civil Engineering students are required to take an "additional science" course in addition to chemistry and physics as part of the ABET accreditation requirement. Students currently take ES121 Dynamic Earth in the quarters-based curriculum. In the semester-based curriculum, we anticipate allowing students to choose from a few science courses to satisfy this requirement. A list of acceptable courses will be developed by the Civil Engineering Undergraduate Studies Committee, once the courses are developed, but will likely include introductory courses in Earth Science, Environmental Science and Geodetic Science.
- We are eliminating the requirement for students to take Engineering Thermal Science in the semester-based curriculum. We believe some of the topics in this course will be covered in the Civil Engineering course on Fluid Mechanics. The content that will not

be covered is not essential to other courses in the major. We believe the credit hours saved are better used elsewhere in the curriculum.

- We are eliminating a required quarter-based course, CE540 Systems Analysis. Some of the content of CE540 will be incorporated into the semester-based courses CE3080 Economic Evaluation and Optimization in Civil and Environmental Engineering and CE3060 Numerical Analysis Methods for Civil and Environmental Engineering Applications.
- We have introduced the idea of a "CE Select Core" into the curriculum. Students will chose a total of 6 courses (18 credit hours) from a list of courses approved by the Civil Engineering Undergraduate Studies Committee. A preliminary list of approved courses include:

CE2400 Intro to Geomatics	CE3700 Trans Eng and Analysis
CE3160 Water Resources Engineering	CE3810 Construction Eng and Manag
ENVENG3200 Fund of Env Engineering	CE4320 Structural Steel Design
CE3540 Geotechnical Engineering	or CE4350 Reinforced Concrete Design

Note: Either CE4320 or CE4350 may be applied toward the select core, but not both.

- The remaining curriculum will be translated, course for course, from the quarters-based curriculum to the semester-based curriculum.

11. Provide a table to aid the Council on Academic Affairs reviewers as they check for credit hour changes.

	Number of qtr-cr-hrs in current program	Calculated result for 2/3 of current qtr-cr-hrs	Number of sem-cr-hrs required for proposed program
Total cr-hrs required for completion of program	198	132	130
Pre-requisite cr-hrs required for admission to program which are not counted toward total hrs	1	0.67	0
Required cr-hrs offered by the unit	87	58	60
Required cr-hrs offered outside the unit	111	74	70

The total credit hours for the existing quarter-based B.S. Civil Engineering degree are 198, or 132 semester-equivalent hours. It should be noted that the quarter-based "bingo sheet" indicates a range of 196-198 credit hours, due to the possibility that students can substitute Chem 125 (4 credit hours) for Chem122 (5 credit hours), and also Math 415 (4 credit hours) for Math 255 (5 credit hours). The proposed semester-based curriculum consists of a total of 130 credit hours. In the existing quarter-based degree, there is 1 credit hour (ENG100 Engineering Survey) that is required but not counted toward the total credit hours. In the proposed semester-based curriculum, students will be required to complete a 1 credit hour Engineering Survey course, however, the course will be counted toward the total credit hours. Currently, 87 required credit

hours are offered by the unit which translates to 58 semester-equivalent hours. The proposed semester-based curriculum will include 60 required hours taken within Civil and Environmental Engineering. The quarter-based curriculum requires 111 credit hours (74 semester-equivalent credit hours) be taken outside the unit, corresponding to GEC's and pre-civil engineering courses. The semester-based curriculum will require 71 credit hours outside of Civil and Environmental Engineering.

12. Provide a rationale for a change in credit hours if the difference is more than 4 semester credit hours between the values listed in columns B and C for any row in the table above. [Word limit: 500]

No difference in credit hours greater than 4 semester hours exists for any row in the table above.

TRANSITION POLICY

13. Include a policy statement from the chair of the department / unit that assures those students who began their degree under quarters that the transition to semesters will not delay their graduation nor disrupt progress toward a degree. This may include a description of how individual transition advising plans will be developed and possible use of bridge courses. It should address students in the program and students taking service courses offered by the department / unit.

"No B.S. Civil Engineering student who began their degree program under quarters will have progress toward graduation impeded by the transition to semesters. Graduation requirements beginning Summer 2012 will be those in force for B.S. Civil Engineering majors under semesters; but every quarter-credit-hour that would have counted toward the B.S. Civil Engineering major under the quarter-based curriculum will count (as 2/3 of a semester-credit-hour) toward the requirements for graduation under the semester-based B.S. Civil Engineering curriculum. Additional advising support will be provided for B.S. Civil Engineering majors to assist in planning course schedules for the last year of quarters (2011-2012) and for at least the first year of semesters (2012-2013). If it is determined that the "normal" conditions covered by the generic B.S. Civil Engineering transition worksheet would result in a particular student facing an unavoidable delay in graduation compared to quarters, due to circumstances related to the change to semesters rather than the student's failure to make satisfactory progress through the program, then a revision of specific requirements will be worked out for that student by the advising staff with approval by the B.S. Civil Engineering Undergraduate Studies Committee."

- Carolyn Merry, Chair of Civil and Environmental Engineering and Geodetic Science

The overarching objective of our transition policy is to ensure that student progress toward graduation will not be impeded by the conversion process. As in all previous curriculum changes, transition issues will be anticipated and planned for as a part of the conversion process. Our transition policy is based on the following principles:

- All students who graduate under semesters, even during the first semester, will do so by meeting the requirements of the semester program.

- Each semester program requirement may be met either by taking an appropriate semester course (or sequence), or by substituting a substantially equivalent quarter course (or sequence) for the corresponding semester course (or sequence).
- Excess equivalent credit-hours resulting from such substitutions—either positive or negative—will be credited against technical elective requirements.

Course (or Sequence) Equivalence

The worksheet in Appendix D provides a listing of quarter-based courses (or sequences) and the semester program requirement they will fulfill. The worksheet will be used be each student affected by the transition in order to identify their semester course requirements. The worksheet will be used to: (1) determine the semester course requirements satisfied by quarter-based offerings taken by the student, and (2) determine the excess credit hours obtained by taking the quarters-based version of some courses. The excess credit hours will be used to adjust the required number of technical elective hours in the students program in order to ensure that the student is takes an equivalent number of credit hours in the semester curriculum.

Mathematics. Students will be given credit for Engineering Calculus I by taking Math 151 and Math 152. Students with credit for only Math 151 will need to take a bridge course (if offered by Math) in order to obtain credit for Engineering Calculus I. Students will be given credit for Engineering Calculus II by taking Math 153 and Math 254. Students with credit for only Math 153 will need to take a bridge course (if offered by Math) in order to obtain credit for Engineering Calculus II. Students will be given credit for differential equations by taking either Math 415 or Math 254.

Physics. Students will be considered to have completed the semester-curriculum Physics requirement by successfully completing Physics 131 and 132 in the quarter-based curriculum. Students who have completed only Physics 131 will be required to complete Physics II in the semester-based curriculum. We will advise our students to complete Physics 131 and 132 prior to conversion to semesters.

Chemistry. Students will be given credit for the semester-based Chemistry for Engineers by successfully completing Chemistry 121 and Chemistry 125. Students with credit for only Chemistry 121 will need to take a bridge course (if offered by Chemistry) in order to obtain credit for Chemistry for Engineers.

Earth Science. Students will be given credit for a semester-based "additional science" course by taking ES121.

Mechanical Engineering. Students will be given credit for the semester-based courses on Statics, Strength of Materials, and Dynamics by taking ME410, ME420, and ME430, respectively. Students with credit for ME500 will be allowed to count these credits toward their technical elective requirement.

Civil and Environmental Engineering. The following Civil and Environmental Engineering courses have direct semester-based equivalents: CE405, CE406, CE413, CE431, CE451, CE460, CE576, CE660.01, and CE660.02. Students with credit for CE400, CE516, CE520, CE531, CE535, CE554, CE570 will be able to apply them to meet the CE Select Core requirements in the semester-based curriculum. Note however, that both CE531 and CE535 cannot be counted toward the select core. If both courses are taken, one of them can be counted towards the technical electives. Students with credit for CE540 will be allowed to count these credits toward their select core or technical elective requirements.

Student Advising

Effective student advising will be an essential element in a successful transition for each student. During the transition period, we will provide additional advising resources for the students. We will be prepared to have transition bingo sheets and advising plans in place for students to follow, that bridge the quarter-to-semester curriculum at various stages in their program (sophomore, junior, senior).

ASSESSMENT CONVERSION

14. Summarize how the program's current quarter-based assessment practices will be modified, if necessary, to fit the semester calendar [Word limit: 150]. ***(Note: For example, if there are embedded assessments in selected courses, a modified assessment plan may identify the new semester courses which will include testing student attainment of program goals.)*** **All undergraduate degrees and majors should have an assessment plan on file with the Office of Academic Affairs; preliminary assessment planning (item #15.b. i through iii) is encouraged for all other programs.**

We do not envision any modifications to the assessment practices presently in place and being developed for the quarter-based system.

15. Indicate, for an undergraduate degree program or major proposal, whether the program has a plan on file with the Office of Academic Affairs

Yes, we have a plan on file with OAA.

i. Program learning goals

Program Objectives

The Department of Civil and Environmental Engineering and Geodetic Science seeks to educate graduates who will be ethical, productive, and contributing members of their profession and of society. This education should form the basis for professional and personal development after graduation, as encompassed by the following objectives.

1. Graduates will apply engineering fundamentals acquired in their undergraduate program to succeed in
   - Engineering careers in the public sector, private sector, or academia
   - Non-engineering careers in research, government, education, public policy, business, law, or medicine that benefit from engineering education

2. Graduates will be motivated toward lifelong learning and the pursuit of significant, recognized post-B.S. professional development, such as
   - Professional engineering licensure
   - Graduate studies in engineering or science or other professional fields that benefit from analytic and scientific fundamentals

3. Graduates will engage in outreach to improve engineering practice or society through

- Activity in professional organizations
- Activity in service and community organizations

Program Outcomes
At graduation, undergraduate students seeking a B.S. Degree in Civil Engineering from the Department of Civil and Environmental Engineering and Geodetic Science are expected to have attained the following program outcomes:

a. An ability to apply knowledge of mathematics, science, and engineering

b. An ability to design and conduct experiments, as well as to analyze and interpret data

c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d. An ability to function on multidisciplinary teams

e. An ability to identify, formulate and solve engineering problems

f. An understanding of professional and ethical responsibility

g. An ability to communicate effectively

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

i. A recognition of the need for, and ability to engage in life-long learning

j. A knowledge of contemporary issues

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

ii. The means the program uses or will use to evaluate how well students are attaining program goals. For some examples, please refer to the following list of Means to Evaluate Achievement of program Goals (page 6 of template).

Professional licensure is very important in the Civil Engineering profession. To achieve licensure, an individual is required to pass the Fundamentals of Engineering (FE) exam, obtain professional experience, and then pass the Professional Engineering (PE) exam. We presently monitor on an annual basis the percentage of our students who take the Fundamentals of Engineering exam and their performance statistics (pass rate and percentage of correct answers) relative to national statistics and statistics produced from what are determined to be “peer” institutions. We similarly monitor on an annual basis the performance of our graduates who take the PE exam.

In addition, we use the following instruments for evaluation:

- Responses to Alumni Surveys: These surveys are administered by the College of Engineering and designed with input from the assessment committees of the various college departments.
- Exit Surveys: These surveys have been collected in the past, but they are presently being redesigned to produce more meaningful information
- Course questionnaires to assess student perceptions of outcomes achievement: We have developed questionnaires to elicit student impressions of how courses relate to program outcomes. We are pretesting these questionnaires in selected courses with the intention to move to administering the questionnaires in all undergraduate courses.
- Student evaluation of instruction (SEI): University-wide SEIs are administered in all courses.

iii. How the program uses or will use the evaluation data to make evidence-based improvements to the program periodically. For some examples, please refer to the following list of Uses of Assessment Data (page 7 of template).

The department Outcomes Assessment Committee provides the results of the FE and PE results and the surveys presented above to the faculty. In addition, the committee conducts longitudinal analysis of the FE and PE longitudinal results to identify any deficiencies in specific areas of the curriculum. If deficiencies are identified, the committees would meet with the Undergraduate Curriculum Committee and the groups of faculty members responsible for the courses associated with specific deficiencies to determine if the deficiencies can be remedied by improving individual courses or if new courses need to be developed. (Presently, we have seen no such patterns in our *ad hoc* analysis of the quantitative data.)

The Outcomes Assessment Committee also reviews summary statistics compiled from the Alumni Surveys and will review such responses to the developed Exit Surveys to identify program deficiencies. Similarly, once the outcomes questionnaires are implemented to cover all courses, the Outcomes Assessment Committee will compare the student perceptions to the outcomes addressed in each course to the outcomes intended to be addressed, as indicated in the course syllabus. The intention is to ensure adequate coverage of the outcomes across the curriculum. If adequate coverage is not obtained, the committee would meet with the faculty to determine if minor changes to existing courses could address the deficiencies or if new courses must be developed.

In addition, the department chair reviews SEI results (and will review responses to the outcomes questionnaires) for each faculty member. The chair discusses results with the individual faculty members in the annual review meeting.

We note that the department provides an annual report from its Outcomes Assessment Committee to the College's Outcomes Assessment Committee summarizing: (a) assessment activities conducted during the year; (b) information produced from the assessment activities; (c) program changes implemented or under development during the year; (d) activities anticipated for the upcoming year; (e) activities specifically designed to address concerns or weaknesses, if any, identified in the most recent accreditation review.

iv. Projected quarter by which the program will submit a full assessment plan using the survey form, to be submitted no later than Summer 2012.

We expect a full assessment plan to be submitted no later than Summer 2012.

Appendix A
Current (quarters-based) Advising Sheet

Civil Engineering Sample Curriculum - 2009-2010

Name: _____ E-mail: _____@osu.edu

YEAR	AUTUMN	WINTER	SPRING
1	Math 151 (Calc. & Analytic Geom.) . 5____ Engineering 181 (Intro. to Eng. I)..3____ Engineering 100.04 (Eng. Survey)1____ GEC ..... 5____	Math 152 (Calc. & Analytic Geom.)..5____ Engineering 183 (Intro. Eng. II)....3____ Physics 131 (Particles & Motion) ...5____ GEC..... 5____	Math 153 (Calc. & Analytic Geom.) . 5____ Chem. 121 (General Chemistry).... 5____ Physics 132 (Elec. & Magnetism) .. 5____ English 110 (1st yr. English Comp.) 5____
2	Math 254 (Calc. & Analytic Geom.) . 5____ *ME 410 (Statics)* ..... 4____ Earth Sci 121 (Dynamic Earth)..... 5____ GEC..... 5____	EG 167 (Prob. Solv. Prog. Eng.)..... 4____ Or CSE 202 or CSE 294P *ME 420 (Strength of Materials)* ..... 4____ Chem. 122 (General Chemistry)..... 5____ Or Chem. 125 (Chem. for Engrs.)	*CE 405 (Observational Analysis)*..... 4____ *CE 400 (Intro to Geomatics)*..... 4____ *ME 430 (Dynamics)* ..... 4____ *CE 460 (Prof. Aspects of CEE)*..... 1____ GEC..... 5____
3	***CE 413 (Fluid Mechanics)***..... 4____ ***CE 451 (CE Materials)***..... 4____ ***CE 540 (CE Systems)***..... 4____ *CE 431 (Structural Eng. Principles)*.. 3____	***CE 406 (Fund. of CE Analysis)***..... 4____ ***CE 570 (Trans. Eng. & Analysis)***.... 4____ ***CE 576 (CE Econ. & Planning)***..... 4____ ***CE 516 (Water Resources Eng.)***.... 4____	***CE 520 (Dsgn. of Trtmt. Facilities)*** 4____ *CE 535 (Bsc. Reint. Concrete Dsgn.)* 5____ ***CE 554 (Geotechnical Eng.)*** ..... 4____ Math 255 (Diff. Eq. & their Apps.)....5____ Or Math 415 (Ord. & Port. Diff. Eq.)
4	*ME 500 (Thermal Sciences)*..... 4____ *Technical Elective*..... ~4____ *Technical Elective*..... ~4____ *Technical Elective*..... ~4____	*Technical Elective*..... ~4____ *Technical Elective*..... ~4____ *CE 660.01(Capstone Design)*..... 3____ GEC..... 5____	*Technical Elective*..... ~4____ *Technical Elective*..... ~4____ *CE 660.02 (Capstone Design)*..... 3____ GEC..... 5____

Courses in **bold** are offered once a year. Courses in *italics* are monitored courses in which you must maintain a cumulative point hour-ratio of 2.0. CE 400, 405, 431, 460 and 535 are offered twice a year. Quarterly course offerings are subject to change. Please check the on-line course bulletin and master schedule for pre-requisite requirements and course availability. Please note that students who need preparatory work before beginning Math 151 will need additional time to complete this curriculum.

GENERAL EDUCATION (35 hours)

English & Communication Skills (10 hrs)

English 110.xx (5) ____
2nd Writing Course (5) ____

Students must take 25 hours across Social Sciences, Historical Study, and Arts & Humanities with a minimum of 5 hours and maximum of 10 hours per category.

Social Sciences (5-10 hours)

Economics 200 (Required) ( ) ____
_____ ( ) ____

Historical Study (5-10 hours)

_____ ( ) ____
_____ ( ) ____

Arts & Humanities (5-10 hours)

_____ ( ) ____
_____ ( ) ____

Ethics
(May overlap with another GEC category)
_____ ( ) ____

Social Diversity
(May overlap with another GEC category)
_____ ( ) ____

Technical Electives (28 hours)

_____ ( ) ____
_____ ( ) ____
_____ ( ) ____
_____ ( ) ____
_____ ( ) ____
_____ ( ) ____
_____ ( ) ____
_____ ( ) ____

Technical Writing (14 hours)
(Counted in Civil core)

CE 405 (4) ____
CE 406 (4) ____
CE 660.01 and .02 (6) ____

Hours Required:

Pre-Civil	54
Civil Core	79-81
General Education	35
Technical Electives	28
TOTAL HOURS	**196-198**

Admission to the Civil and Environmental Engineering program requires a minimum cumulative point-hour ratio (CPHR) of 2.0 as well as a minimum secondary point-hour ratio (SPHR) of 2.0 in the following pre-major courses: *Math 151, 152, 153, 254; Physics 131, 132; ME 410; EarthSci 121; Chemistry 121; Engineering 181,183 & EG 167.* English 110.xx and Engineering 100.04 must also be completed. Formal application is required.

Students are accepted into the major autumn and spring quarters only. Applications to Major are available at http://www.ceeas.ohio-state.edu/CEUNDERGRAD/forms.cfm . Applications are due in spring or summer for autumn entry and winter for spring entry. Contact the Undergraduate Advisor (HI 495) if you have any question.

Appendix B
Proposed (semester-based) Advising Sheet

B.S. Civil Engineering Sample Curriculum - Semester (2012-2013)

YEAR	AUTUMN		SPRING	
1	MATH XXXX Engineering Calculus I	5	MATH XXXX Engineering Calculus II	5
	ENG 1181 Intro to Engineering I	2	ENG 1182 Intro to Engineering II	2
	PHYSICS XXXX Physics I	5	PHYSICS XXXX Physics II	5
	ENG 1100 Engineering Survey	1	CSE 1221 Computer Programming	2
	GEC	3	GEC	3
	total =	16	*total* =	17
2	MATH XXXX Differential Equations	3	ME 2030 Dynamics	3
	CHEM XXXX Chemistry for Engineers	4	ME 2020 Strength of Materials	3
	ME 2010 Statics	2	CE2060 Numerical Methods for CEE	4
	CE 2050 Prob & Data Analysis in CEE	3	GEC	3
	CE 2090 Professional Aspects of CEE	1	GEC	3
	CE Core 1	3		
	total =	16	*total* =	16
3	CE 3510 CE Materials	3	CE 3080 Economics and Optimization	3
	CE 3130 Fluid Mechanics	3	CE CORE 4	3
	CE 3310 Structural Engineering Principles	3	CE CORE 5	3
	CE CORE 2	3	Additional Science Elective	4
	CE CORE 3	3	GEC	3
	total =	15	*total* =	16
4	CE 4000.01 Capstone Design I	2	CE 4000.02 Capstone Design II	2
	CE CORE 6	3	Technical Elective	3
	Technical Elective	3	Technical Elective	3
	Technical Elective	3	Technical Elective	3
	Technical Elective	3	GEC	3
	GEC	3	GEC	3
	total =	17	*total* =	17
			TOTAL SEMESTER CREDIT HOURS =	130

Admission. Admission to the Civil Engineering program requires a minimum cumulative point-hour ratio (CPHR) of 2.0 as well as a secondary point-hour ratio (SPHR) of 2.0 in the following pre-major courses: Engineering Calculus I and II, Physics I and II, and Introduction to Engineering I and II.

CE Select Core. Students will chose a total of 6 courses (18 credit hrs) from a list of courses approved by the Civil Engineering Undergraduate Studies Committee. A preliminary list of approved courses include:

CE2410 Intro to Geomatics	CE3700 Trans Eng and Analysis
CE3160 Water Resources Engineering	CE4810 Construction Eng and Manag
ENVENG3200 Fund of Env Engineering	CE4320 Structural Steel Design
CE3540 Geotechnical Engineering	or CE4350 Reinforced Concrete Design

Note: Either CE4320 or CE4350 may be applied toward the select core, but not both.

Technical electives. 18 hours of technical electives to be chosen in consultation with the students faculty advisor from a list of courses to be determined by the B.S. Civil Engineering Undergraduate Studies Committee.

Additional Science Elective. At least 4 credit hours of additional science is required. Students may choose from a list of courses to be approved by the B.S. Civil Engineering Undergraduate Studies Committee.

Appendix C
Curriculum Map

Course Number	a	b	c	d	e	f	g	h	i	j	k
ENGINEER 1181	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ENGINEER 1182	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CIVILEN 2050	***	***			***		**			*	**
CIVILEN 2060	***	***	*	*	***				*	**	***
CIVILEN 2090						***	*		**	**	
CIVILEN 2410	***	***	*	***	***	*	**	*		*	*
CIVILEN 3130	***	*	**		***						***
CIVILEN 3160	***	**		*	***						***
CIVILEN 3310	***		***		***						***
CIVILEN 3510	***	***	**	**			*		*		
CIVILEN 3540	***		**		***						***
CIVILEN 3700	***	**	**		**	*	**		*	*	**
CIVILEN 4000.01	**		***	***	***		**				***
CIVILEN 4000.02	**		***	***	***		**				***
CIVILEN 4320	***		***		***	*	**	*	*		***
CIVILEN 4350	***	***	***		***	*	*	*	*	*	**
CIVILEN 4810	*	*	*	**	***	***	**	**	**	**	***
ENVENG 3200	**	**	*		**	*		*	*	*	**
CSE 1221	**	*	***		***		*		*		***
MECHENG 2010	***		*		***		*				*
MECHENG 2020	***		*		***						*
MECHENG 2030	***				***		*		**		*

Appendix D
Quarter-to-Semester Transition Worksheet

BS Civil Engineering

Quarters-to-Semesters Equivalency Worksheet

Courses Completed	Quarters-Based Course	Qtr cr-hr	Sem cr-hr	Semesters-Based Equivalent	Sem cr-hr	cr-hr diff	cr-hr excess
	GEC 1	5	3.33	GEC 1	3	0.33	0.00
	GEC 2	5	3.33	GEC 2	3	0.33	0.00
	GEC 3	5	3.33	GEC 3	3	0.33	0.00
	GEC 4	5	3.33	GEC 4	3	0.33	0.00
	GEC 5	5	3.33	GEC 5	3	0.33	0.00
	GEC 6	5	3.33	GEC 6	3	0.33	0.00
	GEC 7	5	3.33	GEC 7	3	0.33	0.00
				GEC 8	3	-3.00	0.00
	MATH 151 & MATH 152	10	6.67	Engineering Calculus I	5	1.67	0.00
	MATH 153 and MATH 254	10	6.67	Engineering Calculus II	5	1.67	0.00
	MATH 415	4	2.67	Differential Equations	3	-0.33	0.00
	PHYSICS 131 & PHYSICS 132	10	6.67	Physics I	5	1.67	0.00
				Physics II	5	-5.00	0.00
	CHEM 121 & CHEM 125	9	6.00	Chemistry for Engineers	4	2.00	0.00
	ENG 181	3	2.00	ENG1181 Introduction to Engineering I	2	0.00	0.00
	ENG 183	3	2.00	ENG1182 Introduction to Engineering II	2	0.00	0.00
	ENG 100	1	0.67	Survey of Engineering	1	-0.33	0.00
	EG 167	4	2.67	CSE 1221 Computing	2	0.67	0.00
	ME 410	4	2.67	ME2010 Statics	2	0.67	0.00
	ME420	4	2.67	ME2020 Strength of Materials	3	-0.33	0.00
	ME430	4	2.67	ME2030 Dynamics	3	-0.33	0.00
	ME500	4	2.67				
	ES121	5	3.33	Additional Science Elective	4	-0.67	0.00
	CE400	4	2.67	CE Select Core 1	3	-0.33	0.00
	CE405	4	2.67	CE2050 Observational Analysis	3	-0.33	0.00
	CE406	4	2.67	CE2060 Fund CEE Analysis	4	-1.33	0.00
	CE413	4	2.67	CE3130 Fluid Mechanics	3	-0.33	0.00
	CE431	4	2.67	CE3310 Structural Engineering Prin.	3	-0.33	0.00
	CE451	4	2.67	CE3510 Civil Engineering Materials	3	-0.33	0.00
	CE460	1	0.67	CE 2090 Professional Aspects of CEE	1	-0.33	0.00
	CE516	4	2.67	CE Select Core 2	3	-0.33	0.00
	CE520	4	2.67	CE Select Core 3	3	-0.33	0.00
	CE535	5	3.33	CE Select Core 4	3	0.33	0.00
	CE540	4	2.67	CE Select Core or Tech Elective	3	-0.33	0.00
	CE554	4	2.67	CE Select Core 5	3	-0.33	0.00
	CE570	4	2.67	CE Select Core 6	3	-0.33	0.00
	CE576	4	2.67	CE3080 Econ Eval and Optim in CEE	3	-0.33	0.00
	CE660.01	3	2.00	CE4000.01 CE Capstone Design I	2	0.00	0.00
	CE660.02	3	2.00	CE4000.02CE Capstone Design II	2	0.00	0.00
	Technical Elective 1	4	2.67	Technical Elective 2	3	-0.33	0.00
	Technical Elective 2	4	2.67	Technical Elective 3	3	-0.33	0.00
	Technical Elective 3	4	2.67	Technical Elective 4	3	-0.33	0.00
	Technical Elective 4	4	2.67	Technical Elective 5	3	-0.33	0.00
	Technical Elective 5	4	2.67	Technical Elective 6	3	-0.33	0.00
	Technical Elective 6	4	2.67				
	Technical Elective 7	4	2.67				
	Total =	198		Total =	130		
						Excess Semester Credit Hrs =	0.00

THE OHIO STATE UNIVERSITY

Civil and Environmental Engineering and Geodetic Science

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Phone (614) 292-2771
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DATE: June 21, 2010

TO: John Lippold, Chair of CCAA Subcommittee A

FROM: Harold Walker, Civil and Environmental Engineering and Geodetic Science

RE: B.S. Environmental Engineering Semester Conversion Proposal

The Department of Civil and Environmental Engineering and Geodetic Science has completed its revision of the semester conversion proposal for the B.S. in Environmental Engineering degree, considering the comments of Subcommittee A.

The majority of comments from Subcommittee A on the first draft of the proposal were relatively minor, mainly involving correcting typographical errors or making minor clarifications. We made all of the suggested minor changes and re-worded a few sections for better clarity in response to these comments.

The committee also noted in the first draft some errors in the credit hours in both the existing quarter-based bingo sheet and semester curriculum. We have corrected these errors and have also provided a narrative explanation of the credit hours supporting the CAA required table in section 11, as also suggested by subcommittee A.

The committee also requested we re-think our policy for chemistry during the transition. While we are maintaining the total amount of chemistry in the curriculum (26 quarter equivalent hours), we are shifting the focus towards General Chemistry and allowing students more choice in upper division chemistry courses. As a result, students will be required to take a year of General Chemistry in semesters, while currently they take only Chem 121 and 125. To not penalize students, our policy will be to accept Chem 121 and 125 as meeting the General Chemistry requirement in semesters. However, Subcommittee A asked for clarification as to whether the Chemistry Department would accept this course sequence as a substitution. While the Chemistry department has no formal policy as of yet, it is unlikely that they would consider Chem 121 and 125 as fulfilling the year-long general chemistry sequence. However, every indication suggests that Chem 121 and 125 would serve as suitable prerequisites for the elective upper division chemistry courses available to our students during the transition, as they do now.

In response to Subcommittee A, we revised the proposal to reflect the concerns of the committee and our conversions with the Department of Chemistry. Therefore, we will advise our students to complete either the Chem 121 and 125 sequence or the 121/122/123 sequence prior to conversion to semesters. For either sequence, students will be required to complete 26 quarter-equivalent hours of Chemistry. Students that only take Chem 121, they will be required to

complete the second semester of General Chemistry (and possibly a bridge course) to satisfy the General Chemistry requirements.

Only a few typographical errors were noted after the review by Subcommittee A of the second draft of the proposal. Subcommittee A indicated the changes to the second draft of the proposal were acceptable, and made no additional comments or suggestions for revision.

Program Proposal: B.S. in Environmental Engineering

GENERAL PROGRAM INFORMATION

1. Identify the name of the program (current and proposed names, if different)

B.S. in Environmental Engineering

2. Identify the degree title (current and proposed names, if different)

B.S. in Environmental Engineering

3. Identify the academic unit(s) responsible for administrating the program

Department of Civil and Environmental Engineering and Geodetic Science

4. Specify the type of program

Undergraduate bachelors degree program or major

5. Select the appropriate semester conversion designation

Converted with minimal changes to program goals and/or curricular requirements

PROGRAM REQUIREMENTS

6. List program learning goals

Program Objectives

The Department of Civil and Environmental Engineering and Geodetic Science seeks to educate graduates who will be ethical, productive, and contributing members of their profession and of society. This education should form the basis for professional and personal development after graduation, as encompassed by the following objectives.

1. Graduates will apply engineering fundamentals acquired in their undergraduate program to succeed in
   - Engineering careers in the public sector, private sector, or academia
   - Non-engineering careers in research, government, education, public policy, business, law, or medicine that benefit from engineering education

2. Graduates will be motivated toward lifelong learning and the pursuit of significant, recognized post-B.S. professional development, such as
   - Professional engineering licensure
   - Graduate studies in engineering or science or other professional fields that benefit from analytic and scientific fundamentals

3. Graduates will engage in outreach to improve engineering practice or society through

- Activity in professional organizations
- Activity in service and community organizations

Program Outcomes

At graduation, undergraduate students seeking a B.S. degree in Environmental Engineering from the Department of Civil and Environmental Engineering and Geodetic Science are expected to have attained the following program outcomes:

a. An ability to apply knowledge of mathematics, science, and engineering

b. An ability to design and conduct experiments, as well as to analyze and interpret data

c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d. An ability to function on multidisciplinary teams

e. An ability to identify, formulate and solve engineering problems

f. An understanding of professional and ethical responsibility

g. An ability to communicate effectively

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

i. A recognition of the need for, and ability to engage in life-long learning

j. A knowledge of contemporary issues

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

7. **List the semester courses (department, title, credit hours) that constitute the requirements and other components of the program.**

Department/Unit	Title	Credit Hours
Mathematics	Engineering Calculus I	5
Mathematics	Engineering Calculus II	5
Mathematics	Differential Equations	3
Physics	Physics I	5
Chemistry	General Chemistry I	5
Chemistry	General Chemistry II	5
Chemistry	Survey of Organic Chemistry	4
Engineering	ENG 1100 Engineering Survey	1
Engineering	ENG 1181 Introduction to Engineering I	2
Engineering	ENG 1182 Introduction to Engineering II	2
Computer Science and Engineering	CSE 1221 Computer Programming	2
Environment and Natural Resources	Soil Science	4
Chemical and Biomolecular Engineering	CHBE5771 Air Pollution	2
Mechanical Engineering	ME2040 Statics and Introduction to Mechanics of Materials	4
Mechanical Engineering	ME2030 Dynamics	3
Microbiology	Basic and Applied Microbiology	5
Civil Engineering	CE2050 Probabilistic Applications and Data Interpretation in Civil and Environmental Engineering	3
Civil Engineering	CE2060 Numerical Analysis Methods for Civil and Environmental Engineering	4
Civil Engineering	CE3130 Fluid Mechanics	3
Civil Engineering	CE3160 Water Resources Engineering	3
Environmental Engineering	ENE2090 Professional Aspects of Civil and Environmental Engineering	1
Environmental Engineering	ENE2100 Environmental Engineering Analytical Methods	3
Environmental Engineering	ENE3200 Fundamentals of Environmental Engineering	3
Environmental Engineering	ENE3210 Environmental Engineering Unit Operations	3
Environmental Engineering	ENE4200 Environmental Engineering Unit Operations Lab	1
Environmental Engineering	ENE 5110 Environmental Biotechnology	3
Environmental Engineering	ENE 5170 Sustainability and Pollution Prevention Practices	3
Environmental Engineering	ENE3080 Economic Evaluation and Optimization in Civil and Environmental Engineering	3
Environmental Engineering	ENE4090 Environmental Engineering Capstone Design	3
Environmental Engineering	Technical Electives	12
GEC	Writing Level I	3
GEC	Writing Level II	3
GEC	Literature	3
GEC	Arts	3
GEC	Historical Study	3
GEC	Social Science I	3
GEC	Social Science II	3
GEC	Culture & Ideas: Ethics	3
	Total Semester Hours =	**129**

- The designated General Education Curriculum course ("Culture and Ideas: Ethics") will be chosen from a set to be designated by the College of Engineering once other departments' offerings and General Education approved courses are known.

- "Technical Electives" will be selected from Civil and Environmental Engineering upper division undergraduate courses (3000 or above), and from a set of non-CEE courses to be designated by the CEE Undergraduate Studies Committee once other departments' course offerings are known. At least 6 of the 12 required technical elective credit hours must be CEE courses. At least 3 of the 12 required technical elective credit hours must be taken from a list of pre-approved courses with significant chemistry content (e.g., physical chemistry, analytical chemistry, organic chemistry, environmental chemistry, and soil or geochemistry).

8. Append a current (quarter-based) and proposed (semester-based) curriculum advising sheet for the program, formatted to meet the unit's standards.

See Appendix A for a current (quarter-based) curriculum advising sheet and Appendix B for the proposed (semester-based) curriculum advising sheet.

9. Provide a curriculum map that shows how, and at what level (e.g., beginning, intermediate, advanced), the program's courses facilitate students' attainment of program learning goals. A table format is recommended.

A curriculum map is provided in Appendix C.

10. Provide a rationale for proposed program changes (either significant or minimal) and a description of how the changes will benefit students and enhance program quality. Include date of last significant program revision. [Word limit: 750]

The Bachelor of Science of Environmental Engineering was approved by the Ohio Board of Regents in the summer of 2009, and the first students were admitted to the major in Autumn, 2009. In Winter 2010, the Accreditation Board for Engineering and Technology (ABET) extended the accreditation from the existing Environmental Engineering major option within the B.S. Civil Engineering degree to this new degree program. As a result, only minimal changes to the B.S. Environmental Engineering degree are proposed upon conversion to the semester format.

A change in the chemistry content of the degree was made, however, the total credit hours of chemistry in the degree remain unchanged. The quarter-based curriculum requires 26 hours of chemistry (17.3 semester-equivalent hours). The semester-based curriculum will require 17 semester credit hours of chemistry. After discussions with the Chemistry department, we have chosen to shift the focus of the chemistry content to provide a greater foundation in general chemistry and organic chemistry. Students will also be required to take one additional chemistry elective (3 credit hours) to be selected from a pre-approved list of courses to be determined once the course offerings from other units are finalized. The ability of students to choose from a number of additional chemistry classes will provide greater flexibility in the curriculum, and will better serve the students. Finally, the required chemistry content in the proposed semester curriculum is more consistent with Environmental Engineering programs nationwide.

Requirements for Physics were reduced from a full year in the quarter-based curriculum to one semester in the semester-based curriculum. We feel our students are better served by taking an additional science or engineering technical electives than the second semester of physics. The second semester of physics would not serve as a pre-requisite for any courses in the B.S. Environmental Engineering curriculum.

A course on Civil and Environmental Engineering Systems (ENE540) was eliminated from the curriculum. This course will not be offered in a semester format. Elements of this course will instead be included in Economic Evaluation and Optimization in Civil and Environmental Engineering and Numerical Analysis Methods for Civil and Environmental Engineering Applications.

The technical electives portion of the curriculum is slightly larger in the semesters-based curriculum. We believe this is an improvement in the program, as students could only select 2 courses as technical electives in the quarter-based curriculum. Now, students will be able to select 4 courses with 1 course from a list of pre-approved chemistry offerings.

11. Provide a table to aid the Council on Academic Affairs reviewers as they check for credit hour changes.

	Number of qtr-cr-hrs in current program	Calculated result for 2/3 of current qtr-cr-hrs	Number of sem-cr-hrs required for proposed program
Total cr-hrs required for completion of program	192	128	129
Pre-requisite cr-hrs required for admission to program which are not counted toward total hrs	1	0.67	0
Required cr-hrs offered by the unit	57	38	42
Required cr-hrs offered outside the unit	135	90	87

The total credit hours for the existing quarter-based B.S. Environmental Engineering degree are 192, or 128 semester-equivalent hours. The proposed semester-based curriculum consists of a total of 129 credit hours.

In the existing quarter-based degree, there is 1 credit hour (ENG100 Engineering Survey) that is required but not counted toward the total credit hours. In the proposed semester-based curriculum, students will be required to complete a 1 credit hour Engineering Survey course, and the course will be counted toward the total credit hours.

Currently, 57 required credit hours are offered by the unit which translates to 38 semester equivalent hours. It should be noted that we have included the 8 hours of required technical electives in this total, as most students take courses within the unit to satisfy this requirement. However, it is possible for students to take courses outside of the unit to fulfill the technical elective requirement. The proposed semester-based curriculum will include 42 required hours taken within Civil and Environmental Engineering. This total includes Environmental Engineering core courses. In addition, students will be required to complete at least 6 of their technical elective hours within Civil and Environmental Engineering. The remaining 6 hours of technical electives required is accounted for in the “required credit hours offered outside the unit,

as 3 of the hours correspond to an "advanced chemistry" elective and the remaining 3 hours are open.

The quarter-based curriculum requires 135 credit hours (90 semester-equivalent credit hours) be taken outside the unit, corresponding to GEC's, pre-civil engineering courses (including Math, Physics, Chemistry, Engineering, Computer Science, and Mechanical Engineering), and required courses in the major offered outside the unit (including Microbiology, Soil Science, and Chemical and Biomolecular Engineering). The semester-based curriculum will require 87 credit hours outside of Civil and Environmental Engineering, which includes all of units mentioned above, plus also 6 hours of the technical elective credit as described in the preceding paragraph.

12. Provide a rationale for a change in credit hours if the difference is more than 4 semester credit hours between the values listed in columns B and C for any row in the table above. [Word limit: 500]

There is only a minor change (< 4 credit hours) in total credit hours, required credit hours offered by the unit or double-counted credit hours in the semester-based curriculum. However, we provide a description of the minor changes to aid in the review process.

A small decrease in credit hours offered outside the unit is proposed for the semester curriculum. However, it should be noted that up to 6 of the technical elective hours can be taken outside the unit, and in fact at least 3 credit hours are required to be taken outside the unit in an area of chemistry. This change is proposed in order to: (1) better meet the program objectives and outcomes and accreditation requirements, (2) create a program more consistent with Environmental Engineering programs nationwide, (3) create greater flexibility for student scheduling, and (4) achieve these previous goals without increasing the total credit hours in the program.

Below is a summary of the changes in credit hours for specific course offerings or units:

- *Physics*. Students will take only one semester of freshman physics. The second semester of physics does not serve as a pre-requisite for any courses in the BS Environmental Engineering curriculum. We feel this change better prepares our students for careers in Environmental Engineering and the licensure exams.
- *Mathematics*. Students will take slightly less total credit hours in Mathematics, per the MOU developed between the College of Engineering and the Department of Mathematics.
- *Chemistry*. The total credit hours devoted to chemistry remain unchanged. The quarters-based curriculum required 26 hours of chemistry (17.3 semester-equivalent hours). The semester-based curriculum will require 17 credit hours of chemistry courses. The semester-based curriculum will require 1 year of General Chemistry, 1 semester of Organic Chemistry, and an additional chemistry elective to be selected from a pre-approved list of courses to be determined once the course offerings from other units are finalized. The semester-based curriculum emphasizes General Chemistry more (2 semesters versus 2 quarters) than the quarter-based curriculum, and will provide a choice of additional chemistry for the last chemistry class. We expect that this list will include courses in analytical chemistry, physical chemistry, and soil and geochemistry. In the quarter-based curriculum, students are required to take analytical and physical chemistry. We believe, and the chemistry department has concurred, that Environmental Engineering students will be better served with a

stronger background in General Chemistry. Also, Chem125 Chemistry for Engineers was not a recognized elective for some of the upper division chemistry courses, which caused difficulties for students matriculating through the curriculum. The ability of students to choose from a number of additional chemistry classes will provide greater flexibility in the curriculum, and will better serve the students. Finally, the required chemistry content in the proposed semester curriculum is more consistent with Environmental Engineering programs nationwide

- *Engineering*. A slight increase in credit hours taken in Engineering will be realized as students will be able to count toward their degree a 1 credit Engineering Survey course.
- *Mechanical Engineering.* Students will take one less semester equivalent credit hour in Mechanical Engineering because we have opted for the combined course in Statics and Strength of Materials, but students will largely obtain the same content in Statics, Strength of Materials and Dynamics, and so will be sufficiently prepared for licensing exams.
- *Computer Science and Engineering*. Our students will take a 2 credit hour course in programming which is a slight decrease in hours based on the current requirement of a single 4 credit hour course (2.7 semester hour equivalents).
- *Microbiology*. We will maintain an Introductory Microbiology course in our curriculum which we expect to be 5 credit hours in semesters (though the exact credit hours are unknown at this time), which will be an increase in credit hours as students currently take a single 5 credit hour course in the quarters-based curriculum.
- *Soil Science*. We will maintain a Soil Science course in our curriculum which we expect to be 4 credit hours in semesters, which will be an increase in credit hours as students currently take a single 5 credit hour course in the quarter-based curriculum.
- *Chemical and Biomolecular Engineering.* Students will take a 2 credit hour semester version of the 3 credit hour quarter-based course in Air Pollution, resulting in no change in credit hours.

TRANSITION POLICY

13. Include a policy statement from the chair of the department / unit that assures those students who began their degree under quarters that the transition to semesters will not delay their graduation nor disrupt progress toward a degree. This may include a description of how individual transition advising plans will be developed and possible use of bridge courses. It should address students in the program and students taking service courses offered by the department / unit.

"No B.S. Environmental Engineering student who began their degree program under quarters will have progress toward graduation impeded by the transition to semesters. Graduation requirements beginning Summer 2012 will be those in force for B.S. Environmental Engineering majors under semesters; but every quarter-credit-hour that would have counted toward the B.S. Environmental Engineering major under the quarter-based curriculum will count (as 2/3 of a semester-credit-hour) toward the requirements for graduation under the semester-based B.S. Environmental Engineering curriculum. Additional advising support will be provided for B.S. Environmental Engineering majors to assist in planning course schedules for the last year of quarters (2011-2012) and for at least the first year of semesters (2012-2013). If it is determined

that the "normal" conditions covered by the generic B.S. Environmental Engineering transition worksheet would result in a particular student facing an unavoidable delay in graduation compared to quarters, due to circumstances related to the change to semesters rather than the student's failure to make satisfactory progress through the program, then a revision of specific requirements will be worked out for that student by the advising staff with approval by the B.S. Environmental Engineering Undergraduate Studies Committee."

- Carolyn Merry, Chair of Civil and Environmental Engineering and Geodetic Science

The overarching objective of our transition policy is to ensure that student progress toward graduation will not be impeded by the conversion process. As in all previous curriculum changes, transition issues will be anticipated and planned for as a part of the conversion process. Our transition policy is based on the following principles:

- All students who graduate under semesters, even during the first semester, will do so by meeting the requirements of the semester program.
- Each semester program requirement may be met either by taking an appropriate semester course (or sequence), or by substituting a substantially equivalent quarter course (or sequence) for the corresponding semester course (or sequence).
- Excess equivalent credit-hours resulting from such substitutions—either positive or negative—will be credited against technical elective requirements.

Course (or Sequence) Equivalence

The worksheet in Appendix D provides a listing of quarter-based courses (or sequences) and the semester program requirement they will fulfill. The worksheet will be used be each student affected by the transition in order to identify their semester course requirements. The worksheet will be used to (1) determine the semester course requirements satisfied by quarter-based offerings taken by the student, and (2) to determine the excess credit hours obtained by taking the quarters-based version of some courses. The excess credit hours will be used to adjust the required number of technical elective hours in the students program in order to ensure that the student is takes an equivalent number of credit hours in the semester curriculum.

Mathematics. Students will be given credit for Engineering Calculus I by taking Math 151 and Math 152. Students with credit for only Math 151 will need to take a bridge course (if offered by Math) in order to obtain credit for Engineering Calculus I. Students will be given credit for Engineering Calculus II by taking Math 153 and Math 254. Students with credit for only Math 153 will need to take a bridge course (if offered by Math) in order to obtain credit for Engineering Calculus II. Students will be given credit for differential equations by taking either Math 415 or Math 254.

Physics. Students will be given credit for the semesters-based Physics I by taking Physics 131 and 132, or by taking Physics 131 and an appropriate bridge course to be offered by the physics department. Students with credit for Physics 133 will be allowed to count these credit hours toward their technical electives.

Chemistry. In the quarter-based curriculum, students are required to take a total of 26 credit hours of chemistry. During the transition, students will be required to complete 26 quarter credit hours (or 17 semester-equivalent hours) of chemistry, through a combination of General Chemistry and other chemistry courses. For General Chemistry, we will strongly encourage students to take the Chemistry 121,122, 123 sequence, however, we will accept the Chemistry

121 and 125 sequence as fulfilling the General Chemistry requirement. We will aggressively advise students to complete either sequence prior to conversion to semesters.

Students who complete only Chemistry 121 will be required to complete the second semester of General Chemistry. In preliminary conversations with the Chemistry Department, students with credit for only Chemistry 121 will be required to take an accelerated version of Chemistry 122 in summer of 2012, or a self study or bridge type course, in order to enroll in the second semester of General Chemistry. Students with credit for Chemistry 121 and 122 will be required to take the second semester of General Chemistry, as Chem 122 does not satisfy the pre-requisite requirements for later chemistry courses.

Students who take Chemistry 231 will be given credit for the required semester-based Survey of Organic Chemistry course. If students do not take Chemistry 231, they will be required to take the semester equivalent course.

Students with credit for Chemistry 221, 231, 520, 521, or 587 may apply these credit hours towards their technical elective requirements in the semester curriculum. Students will be required to take one or more of these courses in order to complete at least 26 quarter hours (or 17 semester-equivalent hours) of chemistry.

Microbiology. Students will be given credit for a semester-based course in microbiology by taking Micro509.

Mechanical Engineering. Students will be given credit for the semester-based combined course for Statics and Strength of materials by taking the quarter-based courses ME410 and ME420. Students with only one of these courses will be able to take semester-based versions of the missing course. Students will be given credit for the semester-based Dynamics course by successful completion of ME430.

Chemical and Biomolecular Engineering. Students will be given credit for the semester-based course in Air Pollution by taking CHBE771.

Civil and Environmental Engineering. The following Civil and Environmental Engineering courses have direct semester-based equivalents: CE405, CE406, CE413, CE460, CE516, CE576, ENE511, ENE610, ENE619, ENE620, ENE711, ENE717. CE540 will be eliminated from the semester curriculum. Students with credit for this course will be able to apply the credit towards their technical elective requirement. Any technical elective courses taken in the quarter-based curriculum will be counted toward the students technical elective requirements in the semester-based curriculum.

Student Advising

Effective student advising will be an essential element in a successful transition for each student. During the transition period, we will provide additional advising resources for the students. We will be prepared to have transition advising plans in place for students to follow, that bridge the quarter-to-semester curriculum at various stages in their program (sophomore, junior, senior).

ASSESSMENT CONVERSION

14. **Summarize how the program's current quarter-based assessment practices will be modified, if necessary, to fit the semester calendar** [Word limit: 150]. *(Note: For example, if there are embedded assessments in selected courses, a modified assessment plan may identify the new semester courses which will include testing student attainment of program goals.)* All undergraduate degrees and majors should have an assessment plan on file with the

Office of Academic Affairs; preliminary assessment planning (item #15.b. i through iii) is encouraged for all other programs.

We do not envision any modifications to the assessment practices presently in place and being developed for the quarter-based system.

15. Indicate, for an undergraduate degree program or major proposal, whether the program has a plan on file with the Office of Academic Affairs

Yes, we have a plan on file with OAA.

i. Program learning goals

Program Objectives
The Department of Civil and Environmental Engineering and Geodetic Science seeks to educate graduates who will be ethical, productive, and contributing members of their profession and of society. This education should form the basis for professional and personal development after graduation, as encompassed by the following objectives.

1. Graduates will apply engineering fundamentals acquired in their undergraduate program to succeed in
   - Engineering careers in the public sector, private sector, or academia
   - Non-engineering careers in research, government, education, public policy, business, law, or medicine that benefit from engineering education

2. Graduates will be motivated toward lifelong learning and the pursuit of significant, recognized post-B.S. professional development, such as
   - Professional engineering licensure
   - Graduate studies in engineering or science or other professional fields that benefit from analytic and scientific fundamentals

3. Graduates will engage in outreach to improve engineering practice or society through
   - Activity in professional organizations
   - Activity in service and community organizations

Program Outcomes
At graduation, undergraduate students seeking a B.S. Degree in Environmental Engineering from the Department of Civil and Environmental Engineering and Geodetic Science are expected to have attained the following program outcomes:

a. An ability to apply knowledge of mathematics, science, and engineering

b. An ability to design and conduct experiments, as well as to analyze and interpret data

c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d. An ability to function on multidisciplinary teams

e. An ability to identify, formulate and solve engineering problems

f. An understanding of professional and ethical responsibility

g. An ability to communicate effectively

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

i. A recognition of the need for, and ability to engage in life-long learning

j. A knowledge of contemporary issues

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

ii. The means the program uses or will use to evaluate how well students are attaining program goals. For some examples, please refer to the following list of Means to Evaluate Achievement of program Goals (page 6 of template).

Professional licensure is very important in the Environmental Engineering profession. To achieve licensure, an individual is required to pass the Fundamentals of Engineering (FE) exam, obtain professional experience, and then pass the Professional Engineering (PE) exam. We presently monitor on an annual basis the percentage of our students who take the Fundamentals of Engineering exam and their performance statistics (pass rate and percentage of correct answers) relative to national statistics and statistics produced from what are determined to be "peer" institutions. We similarly monitor on an annual basis the performance of our graduates who take the PE exam.

In addition, we use the following instruments for evaluation:

- Responses to Alumni Surveys: These surveys are administered by the College of Engineering and designed with input from the assessment committees of the various college departments.
- Exit Surveys: These surveys have been collected in the past, but they are presently being redesigned to produce more meaningful information
- Course questionnaires to assess student perceptions of outcomes achievement: We have developed questionnaires to elicit student impressions of how courses relate to program outcomes. We are pretesting these questionnaires in selected courses with the intention to move to administering the questionnaires in all undergraduate courses.
- Student evaluation of instruction (SEI): University-wide SEIs are administered in all courses.

iii. How the program uses or will use the evaluation data to make evidence-based improvements to the program periodically. For some examples, please refer to the following list of Uses of Assessment Data (page 7 of template).

The department Outcomes Assessment Committee provides the results of the FE and PE results and the surveys presented above to the faculty. In addition, the committee conducts longitudinal analysis of the FE and PE longitudinal results to identify any deficiencies in specific areas of the curriculum. If deficiencies are identified, the committees would meet with the Undergraduate Curriculum Committee and the groups of faculty members responsible for the courses associated with specific deficiencies to determine if the deficiencies can be remedied by improving individual courses or if new courses need to be developed. (Presently, we have seen no such patterns in our *ad hoc* analysis of the quantitative data.)

The Outcomes Assessment Committee also reviews summary statistics compiled from the Alumni Surveys and will review such responses to the developed Exit Surveys to identify program deficiencies. Similarly, once the outcomes questionnaires are implemented to cover all courses, the Outcomes Assessment Committee will compare the student perceptions to the outcomes addressed in each course to the outcomes intended to be addressed, as indicated in the course syllabus. The intention is to ensure adequate coverage of the outcomes across the curriculum. If adequate coverage is not obtained, the committee would meet with the faculty to determine if minor changes to existing courses could address the deficiencies or if new courses must be developed.

In addition, the department chair reviews SEI results (and will review responses to the outcomes questionnaires) for each faculty member. The chair discusses results with the individual faculty members in the annual review meeting.

We note that the department provides an annual report from its Outcomes Assessment Committee to the College's Outcomes Assessment Committee summarizing: (a) assessment activities conducted during the year; (b) information produced from the assessment activities; (c) program changes implemented or under development during the year; (d) activities anticipated for the upcoming year; (e) activities specifically designed to address concerns or weaknesses, if any, identified in the most recent accreditation review.

iv. Projected quarter by which the program will submit a full assessment plan using the survey form, to be submitted no later than Summer 2012.

We expect a full assessment plan to be submitted no later than Summer 2012.

Appendix A
Current (quarters-based) Advising Sheet

Environmental Engineering Sample Curriculum - 2009-2010

Name: _____ E-mail: _____@osu.edu

YEAR	AUTUMN	WINTER	SPRING
1	Math 151 (Calc. & Analytic Geom.) . 5____ Chem. 121 (General Chemistry) ..... 5____ Engineering 181 (Intro. to Eng. I)..3____ Engineering 100.17 (Eng. Survey)1____ GEC.....5____	Math 152 (Calc. & Analytic Geom.)..5____ Chem. 125 (Chemistry for Engrs.)...4____ Engineering 183 (Intro. Eng. II)....3____ GEC.....5____	Math 153 (Calc. & Analytic Geom.) . 5____ Physics 131 (Particles & Motion)... 5____ EG 167 (Prob. Solv. Prog. Eng.) ..... 4____ Or CSE 202 or CSE 294P English 110 (1st yr. English Comp.) 5____
2	Math 254 (Calc. & Analytic Geom.) . 5____ Physics 132 (Elec. & Magnetism) .. 5____ ME 410 (Statics) ..... 4____ GEC.....5____	Math 415 (Ord. & Part. Diff. Eq.).....4____ Physics 133 (Thermal/Quantum) ...5____ ME 420 (Strength of Materials) .....4____ GEC.....5____	CE 405 (Observational Analysis)..... 4____ **Chem. 231** (Intro. Organic Chem.).3____ ME 430 (Dynamics) ..... 4____ **ENE 511** (Intro. to Enviro. Eng.) ... 3____
3	Chem. 221 (Analytical Chemistry) .. 5____ **ENE 413** (Fluid Mechanics)..... 4____ **ENE 540** (CE & ENE Systems) ..... 4____ GEC.....5____	**Chem. 520** (Physical Chemistry)..3____ **CE 406** (Fund. of CE Analysis) .....4____ **ENE 516** (Water Resources Eng.)..4____ **ENR 300** (Soil Science).....5____	**Chem. 521** (Physical Chemistry) . 3____ ENE 460 (Prof. Aspects of CEE).....1____ **ENE 520** (Dsgn. of Trtmt. Facilities)4____ GEC ..... 5____
4	Micro. 509 (Basic Microbiology)..... 5____ **ENE 610** (Natural & Pollut. Waters) 3____ Technical Elective ..... 1-5____ Technical Elective ..... 1-5____	**CHBE 771** (Air Pollution) .....3____ **ENE 576** (CEE Econ. & Planning)..4____ **ENE 620** (Trtmt. Plant Design Lab) 2____ **ENE 711** (Bioremed. Used Water)..4____	**Chem. 587** (Analytical Chem. II) .. 3____ **ENE 619** (ENE Capstone Design) . 4____ **ENE 717** (Solid Waste Mgmt.)..... 4____ Technical Elective ..... 1-5____

Courses in **bold** are offered once a year. Quarterly course offerings are subject to change. Please check the on-line course bulletin and master schedule for pre-requisite requirements and course availability. Please note that students who need preparatory work before beginning Math 151 will need additional time to complete this curriculum.

GENERAL EDUCATION (35 hours)
English & Communication Skills (10 hrs)
English 110.xx (5) ____
2nd Writing Course (5)

Students must take 25 hours across Social Sciences, Historical Study, and Arts & Humanities with a minimum of 5 hours and maximum of 10 hours per category.

Social Sciences (5-10 hours)
Economics 200 (Required) (5) ____
_____ ( ) ____

Historical Study (5-10 hours)
_____ ( ) ____
_____ ( ) ____

Arts & Humanities (5-10 hours)
_____ ( ) ____
_____ ( ) ____

Ethics
(May overlap with another GEC category)

Social Diversity
(May overlap with another GEC category)
_____ ( ) _____

Technical Electives (8 hours)
_____ ( ) _____
_____ ( ) _____
_____ ( ) _____
_____ ( ) _____

Technical Writing (4 hours)
(Counted in Environmental core)

ENE 619 (4) ____

Hours Required:

Pre-Environmental	**58**
Environmental Core	**91**
General Education	**35**
Technical Electives	**8**
TOTAL HOURS	**192**

Admission to the Environmental Engineering program requires a minimum cumulative point-hour ratio (CPHR) of 2.0 as well as a minimum secondary point-hour ratio (SPHR) of 2.0 in the following pre-major courses: *Math 151, 152, 153, 254; Physics 131, 132, 133; Chemistry 121, 125; Engineering 181,183, Eng Graphics 167 & ME410.* English 110.xx and Engineering 100.17 must also be completed. Formal application is required.

Technical Electives: 8 hours to be chosen from this list.
Chem 251, 252, 253
Entomology 694, 762
Soil Science 680
Env. Eng: 613, 618, 714, 719, 720, 722, 723, 750, 760, 771
Earth Sciences: 651, 717, 718, 719, 751, 752, 754
Ind, Sys & Weld En: 757
Food, Agr & Bio Eng: 625, 650, 652
Nat Res: 201, 355, 627, 675, 752, 770

Contact the Undergraduate Advisor (HI 496) with questions about admittance to the major.

Revised 5/22/09

Appendix B
Proposed (semesters-based) Advising Sheet

B.S. Environmental Engineering Sample Curriculum - Semesters (2012-2013)

YEAR	AUTUMN		SPRING	
1	MATH XXXX Engineering Calculus I	5	MATH XXXX Engineering Calculus II	5
	ENG 1181 Intro to Engineering I	2	ENG 1182 Intro to Engineering II	2
	ENG 1100 Engineering Survey	1	PHYSICS XXXX Physics I	5
	CHEM XXXX General Chemistry I	5	CHEM XXXX General Chemistry II	5
	GEC	3		
	total =	16	*total* =	17
2	MATH XXXX Differential Equations	3	ME 2030 Dynamics	3
	ME 2040 Statics/Mechanics of Materials	4	CSE 1221 Computer Programming	2
	CHEM XXXX Survey Organic Chemistry	4	**ENE 2100 Env Eng Analy Methods**	3
	GEC	3	**ENE 2090 Prof Aspects of CEE**	1
	GEC	3	MICRO XXXX Microbiology	5
			GEC	3
	total =	17	*total* =	17
3	**CE 2050 Prob Data Interp in CEE**	3	**CE 2060 Analysis Methods for CEE**	4
	CE 3130 Fluid Mechanics	3	**CE 3160 Water Resources Eng**	3
	ENE 3200 Fund of Environmental Eng	3	**ENE 3210 Env Eng Unit Operations**	3
	ENR XXXX Soil Science	4	Technical Elective	3
	GEC	3	GEC	3
	total =	16	*total* =	16
4	**ENE 5110 Environ Biotechology**	3	**ENE 4090 Capstone Design**	3
	ENE 4200 Env Eng Unit Operations Lab	1	**ENE 3080 Econ Optimization in CEE**	3
	ENE 5170 Sustain Poll Prev Practices	3	CHBE 5771 Air Pollution	2
	Technical Elective	3	Technical Elective	3
	Technical Elective	3	GEC	3
	GEC	3		
	total =	16	*total* =	14
			TOTAL SEMESTER CREDIT HOURS =	**129**

Course offerings. Courses in **bold** are offered once per year. Course offerings are subject to change. Please check the on-line course bulletin and master schedule for pre-requisite requirements and course availability.

Admission. Admission to the Environmental Engineering program requires a minimum cumulative point-hour ratio (CPHR) of 2.0 as well as a secondary point-hour ratio (SPHR) of 2.0 in the following pre-major courses: Engineering Calculus I and II, Physics I, General Chemistry I and II, Introduction to Engineering I and II, and ME XXXX Statics/Strength of Materials.

Technical electives. 12 hours of technical electives to be chosen in consultation with the students faculty advisor from a list of courses to be determined by the B.S. Environmental Engineering Undergraduate Studies Committee. At least 3 hours of technical electives must be selected from a list of additional Chemistry courses. At least 6 hours of technical electives must be taken within Civil and Environmental Engineering.

Contact the Undergraduate Advisor (HI 495) with questions about admittance to the major.

Appendix C
Curriculum Map

Course Number	a	b	c	d	e	f	g	h	i	j	k
ENGINEER 1181	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ENGINEER 1182	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CHBE 5771	*	*	*		*		*	*		*	*
CIVILEN 2050	***	***			***		**			*	**
CIVILEN 2060	***	***	*	*	***				*	**	***
CIVILEN 3130	***	*	**		***						***
CIVILEN 3160	***	**		*	***						***
ENVENG 2090						***	*		**	**	
ENVENG 2100	***	***	*	**	**		*	*	*	*	***
ENVENG 3080	**	*	*		**			*	*	*	**
ENVENG 3200	**	**	*		**	*		*	*	*	**
ENVENG 3210	***		***		***			*		*	***
ENVENG 4090	**		***	*	***		**				***
ENVENG 4200	**	***	***	***			***				
ENVENG 5110	**	*	***		***						***
ENVENG 5170	***		***		***		*	***			**
CSE 1221	**	*	***		***		*		*		***
MECHENG 2030	***				***		*		**		*
MECHENG 2040	***		*		***		*				*

Appendix D
Quarters-to-Semesters Transition Worksheet

BS Environmental Engineering

Quarters-to-Semesters Equivalency Worksheet

Courses		Qtr	Sem		Sem	cr-hr	cr-hr
Completed	Quarters-Based Course	cr-hr	cr-hr	Semesters-Based Equivalent	cr-hr	diff	excess
	GEC 1	5	3.33	GEC 1	3	0.33	0.00
	GEC 2	5	3.33	GEC 2	3	0.33	0.00
	GEC 3	5	3.33	GEC 3	3	0.33	0.00
	GEC 4	5	3.33	GEC 4	3	0.33	0.00
	GEC 5	5	3.33	GEC 5	3	0.33	0.00
	GEC 6	5	3.33	GEC 6	3	0.33	0.00
	GEC 7	5	3.33	GEC 7	3	0.33	0.00
				GEC 8	3	-3.00	0.00
	MATH 151 & MATH 152	10	6.67	Engineering Calculus I	5	1.67	0.00
	MATH 153 and MATH 254	10	6.67	Engineering Calculus II	5	1.67	0.00
	MATH 415	4	2.67	Differential Equations	3	-0.33	0.00
	PHYSICS 131	5	3.33				
	PHYSICS 132	5	3.33	Physics I	5	-1.67	0.00
	PHYSICS 133	5	3.33			3.33	0.00
	CHEM 121	5	3.33	General Chemistry I	5	-1.67	0.00
	CHEM 125	4	2.67	General Chemistry II	5	-2.33	0.00
	ENG 181	3	2.00	ENG1181 Introduction to Engineering I	2	0.00	0.00
	ENG 183	3	2.00	ENG1182 Introduction to Engineering II	2	0.00	0.00
	ENG 100	1	0.67	ENG1100 Survey of Engineering	1	-0.33	0.00
	EG 167	4	2.67	CSE1221Computing	2	0.67	0.00
	ME 410 & ME 420	8	5.33	ME2040 Statics, Strength of Materials	4	1.33	0.00
	ME430	4	2.67	ME2030 Dynamics	3	-0.33	0.00
	CE405	4	2.67	CE2050 Prob App Data Interp in CEE	3	-0.33	0.00
	CE406	4	2.67	CE2060 Numerical Methods in CEE	4	-1.33	0.00
	ENE413	4	2.67	CE3130 Fluid Mechanics	3	-0.33	0.00
	ENE511	3	2.00	ENE3200 Fund Environmental Eng.	3	-1.00	0.00
	ENE460	1	0.67	ENE2090 Prof Aspects of CEE	1	-0.33	0.00
	ENE516	4	2.67	CE3160 Water Resources Engineering	3	-0.33	0.00
	ENE 520	4	2.67	ENE3210 Env Eng Unit Operations	3	-0.33	0.00
	CE540	4	2.67			2.67	0.00
	CE576	4	2.67	ENE3080 Econ Eval and Optim in CEE	3	-0.33	0.00
	ENE610	3	2.00	ENE2100 Env Eng Analy Methods	3	-1.00	0.00
	ENE 619	4	2.67	ENE 4090 Environmental Eng. Capstone I	3	-0.33	0.00
	ENE620	2	1.33	ENE4200 Env Eng Unit Operations Lab	1	0.33	0.00
	ENE 711	4	2.67	ENE 5110 Environmental Biotechnology	3	-0.33	0.00
	ENE 717	4	2.67	ENE5170 Sustain Poll Prev Practices	3	-0.33	0.00
	CHBE 771	3	2.00	CHBE5771 Air Pollution	2	0.00	0.00
	ENR 300	5	3.33	Soil Science	4	-0.67	0.00
	CHEM 221	5	3.33			3.33	0.00
	CHEM 231	3	2.00	Survey of Organic Chemistry	4	-2.00	0.00
	CHEM 520	3	2.00			2.00	0.00
	CHEM 521	3	2.00			2.00	0.00
	CHEM 587	3	2.00			2.00	0.00
	MICRO 509	5	3.33	Basic and Applied Microbiology	5	-1.67	0.00
	Technical Elective 1	4	2.67	Technical Elective 1	3	-0.33	0.00
	Technical Elective 2	4	2.67	Technical Elective 2	3	-0.33	0.00
				Technical Elective 3	3	-3.00	0.00
				Technical Elective 4	3		
	Total =	193		Total =	129		
						Excess Semester Credit Hrs =	0.00

THE OHIO STATE UNIVERSITY

Civil and Environmental Engineering and Geodetic Science

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2070 Neil Avenue
Columbus, OH 43210-1275

Phone (614) 292-2771
Fax (614) 292-3780

DATE: June 11, 2010

TO: John Lippold, Chair of CCAA Subcommittee A

FROM: Harold Walker, Civil and Environmental Engineering and Geodetic Science

RE: Environmental Engineering Minor Semester Conversion Proposal

The Department of Civil and Environmental Engineering and Geodetic Science has completed its revision of the semester conversion proposal for the Minor in Environmental Engineering, considering the comments of Subcommittee A. All of the comments from Subcommittee A on the first draft of the proposal were relatively minor, mainly involving correcting typographical errors or making minor clarifications. We made all of the suggested changes and re-worded a few sections for better clarity. Subcommittee A indicated the changes to the second draft of the proposal were acceptable, and made no additional comments or suggestions for revision.

Program Proposal: Environmental Engineering Minor

GENERAL PROGRAM INFORMATION

1. Identify the name of the program (current and proposed names, if different)

Minor in Environmental Engineering

2. Identify the degree title (current and proposed names, if different)

Minor in Environmental Engineering

3. Identify the academic unit(s) responsible for administrating the program

Department of Civil and Environmental Engineering and Geodetic Science

4. Specify the type of program

Minor

5. Select the appropriate semester conversion designation

Converted with minimal changes to program goals and/or curricular requirements

PROGRAM REQUIREMENTS

6. List program learning goals

- Students will learn and be able to apply the problem solving methods and procedures used in Environmental Engineering.
- Students will be knowledgeable of a wide range of topics important in environmental engineering, such as sustainability, pollution prevention, air and water quality modeling, control technologies for air, water and solid waste pollution, environmental health engineering, water and environmental chemistry, ecological engineering, and hazardous and radioactive waste management.

7. List the semester courses (department, title, credit hours) that constitute the requirements and other components of the program.

Required courses (9 semester hours)

Department/Unit	Title	Credit Hours
Civil and Environmental Engineering and Geodetic Science	ENE2100 Analytical Methods in Environmental Engineering	3
Civil and Environmental	ENE3200 Fundamentals of Environmental	3

Engineering and Geodetic Science	Engineering	
Civil and Environmental Engineering and Geodetic Science	ENE3210 Unit Operations in Environmental Engineering	3

Elective courses (at least 6 semester hours)

Department/Unit	**Title**	**Credit Hours**
Civil and Environmental Engineering and Geodetic Science	ENE5180 Ecological Engineering and Science	3
Civil and Environmental Engineering and Geodetic Science	ENE4200 Unit Operations in Environmental Engineering Laboratory	1
Civil and Environmental Engineering and Geodetic Science	ENE5110 Environmental Biotechnology	3
Civil and Environmental Engineering and Geodetic Science	ENE5140 Hazardous Waste Management	3
Civil and Environmental Engineering and Geodetic Science	ENE5170 Sustainability and Pollution Prevention Practices	3
Civil and Environmental Engineering and Geodetic Science	CE5230 Transport Phenomenon	3
Civil and Environmental Engineering and Geodetic Science	ENE5200 Principles of Risk Assessment	3
Chemical and Molecular Biological Engineering	CHBE5771 Air Pollution	2
Chemical and Molecular Biological Engineering	CHBE5772 Principles of Sustainable Engineering	3
Earth Science	ESXXXX Geochemistry of Natural Waters	3
Earth Science	ESXXXX Hydrogeology	3
Environment and Natural Resources	ENRXXXX Soil Science	4
Environment and Natural Resources	ENRXXXX Soil Chemistry	4
Environment and Natural Resources	ENR XXXX Fate of Pollutants in Soils and Natural Waters	3
Food, Agricultural and Biological Engineering	FABEXXXX Ecosystems for Waste Treatment	3

8. Append a current (quarter-based) and proposed (semester-based) curriculum advising sheet for the program, formatted to meet the unit's standards.

The current (quarter-based) advising sheet is provided in Appendix A and the proposed (semester-based) advising sheet is shown in Appendix B.

9. Provide a curriculum map that shows how, and at what level (e.g., beginning, intermediate, advanced), the program's courses facilitate students' attainment of program learning goals. A table format is recommended

Course	**Learning Goal #1. Introduction to EnE Problem Solving Methods.**	**Learning Goal #2. Exposure to EnE Topics.**
ENE2100 Analytical Methods in Environmental Engineering	Intermediate	Intermediate
ENE3200 Fundamentals of Environmental Engineering	Beginning	Beginning
ENE3210 Unit Operations in Environmental Engineering	Intermediate	Intermediate
ENE5180 Ecological Engineering and Science	Advanced	Advanced
ENE4200 Unit Operations in Environmental Engineering Lab	Advanced	Advanced
ENE5110 Environmental Biotechnology	Advanced	Advanced
ENE5140 Hazardous Waste Management	Advanced	Advanced
ENE5170 Sustainability and Pollution Prevention Practices	Advanced	Advanced
CE5230 Transport Phenomenon	Advanced	Intermediate
ENE5200 Principles of Risk Assessment	Intermediate	Advanced
CHBE5771 Air Pollution	Intermediate	Intermediate
CHBE5772 Principles of Sustainable Engineering	Advanced	Advanced
Geochemistry of Natural Waters	Advanced	Intermediate
Hydrogeology	Advanced	Intermediate
Soil Science	Beginning	Intermediate
Soil Chemistry	Intermediate	Intermediate
Fate of Pollutants in Soils and Natural Waters	Beginning	Intermediate
Ecosystems for Waste Treatment	Intermediate	Intermediate

10. Provide a rationale for proposed program changes (either significant or minimal) and a description of how the changes will benefit students and enhance program quality. Include date of last significant program revision. [Word limit: 750]

Only minor changes are being made to the Environmental Engineering minor program. The credit hours are being increased slightly, from 13.3 semester equivalent hours (20 quarter hours/1.5 = 13.3) to 15 semester hours to be consistent with the majority of classes being 3 credit hours. The courses constituting the minor generally reflect the courses within the quarter version of the program. We have added a few additional course selections as technical electives to increase the flexibility and choices of the students in the minor program, especially for those students pursing the minor from outside the College of Engineering. Also, we have renamed the 3 required courses in the minor. However, the content of these three courses is consistent with the quarter offerings.

11. Provide a table to aid the Council on Academic Affairs reviewers as they check for credit hour changes.

	Number of qtr-cr-hrs in current program	Calculated result for 2/3 of current qtr-cr-hrs	Number of sem-cr-hrs required for proposed program
Total cr-hrs required for completion of program	20	13.3	15
Pre-requisite cr-hrs required for admission to program which are not counted toward total hrs	0	0	0
Required cr-hrs offered by the unit	10	6.7	9
Required cr-hrs offered outside the unit	0	0	0

There is no significant change in credit hours in the semester curriculum as compared to the quarters-based curriculum.

12. Provide a rationale for a change in credit hours if the difference is more than 4 semester credit hours between the values listed in columns B and C for any row in the table above. [Word limit: 500]

The change in credit hours is less than 4 semester hours.

TRANSITION POLICY

13. Include a policy statement from the chair of the department / unit that assures those students who began their degree under quarters that the transition to semesters will not delay their graduation nor disrupt progress toward a degree. This may include a description of how individual transition advising plans will be developed and possible

use of bridge courses. It should address students in the program and students taking service courses offered by the department / unit.

"No Environmental Engineering minor student who began their program under quarters will have progress toward the completion of their minor impeded by the transition to semesters. Requirements for completing the minor beginning Summer 2012 will be those in force for Environmental Engineering minor students under semesters; but every quarter-credit-hour that would have counted toward the Environmental Engineering minor under the quarter-based curriculum will count (as 2/3 of a semester-credit-hour) toward the requirements for graduation under the semester-based Environmental Engineering minor curriculum. Additional advising support will be provided for Environmental Engineering minor students to assist in planning course schedules for the last year of quarters (2011-2012) and for at least the first year of semesters (2012-2013). If it is determined that the "normal" conditions covered by the generic Environmental Engineering minor transition worksheet would result in a particular student facing an unavoidable delay in graduation compared to quarters, due to circumstances related to the change to semesters rather than the student's failure to make satisfactory progress through the program, then a revision of specific requirements will be worked out for that student by the advising staff with approval by the Environmental Engineering Undergraduate Studies Committee."

- Carolyn Merry, Chair of Civil and Environmental Engineering and Geodetic Science

The overarching objective of our transition policy is to ensure that student progress toward completing the Environmental Engineering minor will not be impeded by the conversion process. As in all previous curriculum changes, transition issues will be anticipated and planned for as a part of the conversion process. Our transition policy is based on the following principles:

- All students who graduate under semesters, even during the first semester, will do so by meeting the requirements of the semester program.
- Each semester program requirement may be met either by taking an appropriate semester course (or sequence), or by substituting a substantially equivalent quarter course (or sequence) for the corresponding semester course (or sequence).
- Excess equivalent credit-hours resulting from such substitutions—either positive or negative—will be credited against elective requirements.

<u>Course (or Sequence) Equivalence</u>

The worksheet in Appendix C provides a listing of quarter-based courses and the semester program requirement they will fulfill. The worksheet will be used by each student affected by the transition in order to identify their semester course requirements. The worksheet will be used to: (1) determine the semester course requirements satisfied by quarter-based offerings taken by the student, and (2) determine the excess credit hours obtained by taking the quarter-based version of some courses. The excess credit hours will be used to adjust the required number of technical elective hours in the students program in order to ensure that the student is taking an equivalent number of credit hours in the semester curriculum.

Currently, two courses in the quarter-based curriculum of the minor (CE719 Water Quality Modeling and CE771 Nuclear Waste Management) do not currently have proposed

semester versions. In the case that these two courses are not offered in semesters, students will be allowed to count the semester-equivalent credits towards their minor technical electives, as shown in the transition worksheet.

ASSESSMENT CONVERSION

14. Summarize how the program's current quarter-based assessment practices will be modified, if necessary, to fit the semester calendar [Word limit: 150]. ***(Note: For example, if there are embedded assessments in selected courses, a modified assessment plan may identify the new semester courses which will include testing student attainment of program goals.)*** **All undergraduate degrees and majors should have an assessment plan on file with the Office of Academic Affairs; preliminary assessment planning (item #15.b. i through iii) is encouraged for all other programs.**

We do not anticipate needing to significantly modify our quarter-based assessment practices to fit the semester calendar.

15. Indicate, for an undergraduate degree program or major proposal, whether the program has a plan on file with the Office of Academic Affairs

We are not required to have a plan on file for a minor program. Our assessment plan consists of the following elements:

i. Program learning goals

- Students will learn and be able to apply the problem solving methods and procedures used in Environmental Engineering.
- Students will be knowledgeable of a wide range of topics important in environmental engineering, such as sustainability, pollution prevention, air and water quality modeling, control technologies for air, water and solid waste pollution, environmental health engineering, water and environmental chemistry, ecological engineering, and hazardous and radioactive waste management.

ii. The means the program uses or will use to evaluate how well students are attaining program goals. For some examples, please refer to the following list of Means to Evaluate Achievement of program Goals (page 6 of template).

We use the following means to evaluate how well students are attaining the program goals:

- The undergraduate studies committee evaluates and updates the curriculum on a yearly basis.
- Course questionnaires to assess student perceptions of outcomes achievement. We have developed questionnaires to elicit student impressions of how courses relate to program outcomes. We are pretesting these questionnaires in selected courses with

the intention to move to administering the questionnaires in all undergraduate courses.

- Student Evaluation of Instruction (SEI): University-wide SEIs are administered in all courses.

iii. How the program uses or will use the evaluation data to make evidence-based improvements to the program periodically. For some examples, please refer to the following list of Uses of Assessment Data (page 7 of template).

We will utilize the assessment data to modify or update the curriculum requirements, as well as to make recommendations with respect to updating specific course content.

iv. Projected quarter by which the program will submit a full assessment plan using the survey form, to be submitted no later than Summer 2012.

We are not required to submit an assessment report for an undergraduate minor.

Appendix A
Current (quarters-based) Advising Sheet

UNDERGRADUATE MINOR IN ENVIRONMENTAL ENGINEERING

offered by the
ABET-Accredited Program in Environmental Engineering
Department of Civil and Environmental Engineering and Geodetic Science

Introduction

An undergraduate Minor in Environmental Engineering is offered by the ABET-Accredited Program in Environmental Engineering within the Department of Civil and Environmental Engineering and Geodetic Science. At least 20 hours must be taken; three courses totaling 10 hours are required, and at least 10 hours are to be selected from a list of approved elective courses.

Rationale
Environmental pollution is pervasive. Graduates from many undergraduate programs at OSU will encounter environmental engineering-related pollution problems in their job setting. Most likely are graduates from chemistry, ecology, environmental science, geology, microbiology, physics, statistics, and zoology, in addition to other engineering departments/programs. The Minor in Environmental Engineering introduces students in those fields to the problem-solving methods and procedures used in environmental engineering. A wide range of topics are addressed, e.g., sustainability, pollution prevention, air and water quality modeling, control technologies for air, water, and solid waste pollution, environmental health engineering, water and environmental chemistry, ecological engineering, and hazardous and radioactive waste management. Students can select from elective courses most appropriate to their major field.

Purpose
The purpose of the Minor is to allow students from a wide range of undergraduate majors to obtain an introductory background in sustainability, pollution prevention, environmental modeling, and pollution control technologies most appropriate to their major field.

Benefits for Students
By taking the Minor in Environmental Engineering, students should add considerably to their major program skills, and become more valuable to their future employer. Science majors will gain an understanding of engineering problem-solving methods and procedures, as well as standard pollution control technologies. Other engineering majors will become more aware of the environmental effects of technologies in their major field, and how to reduce these effects.

Curriculum Requirements
Detailed information on required and elective courses is provided in the attached Table. A total of at least 20 hours must be taken to fulfill the Minor in Environmental Engineering. Three courses are required for a total of 10 credit hours, with the remaining 10 hours or more to be selected from a list of elective courses. The three required courses cover such fundamental topics as sustainability, pollution prevention, environmental and occupational health engineering, air pollution modeling and control, water quality modeling, noise pollution, radiological health engineering, hazardous waste engineering, water treatment, wastewater treatment, and water chemistry. Elective courses allow expansion on all of these topics, as well as introducing ecological engineering, solid waste management, and other specialized areas of environmental engineering.

CURRICULUM FOR THE
UNDERGRADUATE MINOR IN ENVIRONMENTAL ENGINEERING
offered by the
ABET-Accredited Program in Environmental Engineering
Department of Civil and Environmental Engineering and Geodetic Science

Undergraduate students not enrolled in the ABET-accredited program in environmental engineering who wish to earn a Minor in Environmental Engineering must take **at least 20 hours** from the courses listed below.

REQUIRED COURSES (10 hours):***

Course Number	Title	Credit Hours	Prerequisites	Quarter Offered
CE 511	Introduction to Environmental Engineering	3	Chem 122 or 125 and Math 152	SP
CE 520	Design of Treatment Facilities	4	Chem 122 or 125	SP
CE 610	Analysis of Natural and Polluted Waters	3	Chem 122 or 125 and Math 152	AU

ELECTIVE COURSES (at least 10 hours)***

Course No.	Title	Credit Hours	Prerequisites	Quarter Offered
CE 618	Ecological Engineering and Science	4	Jr. standing with at least one course in one of the following subject areas: biology, ecology, engineering, or geology.	WI
CE 620	Treatment Plant Design Laboratory	2	CE 610; prereq: CE 520	WI
CE 711	Biological Processes for Used Water Treatment	4	CE 520 or equiv.	WI
CE 714	Hazardous Waste Management	3	CE 520	SP(odd yrs)
CE 717	Municipal and Industrial Solid Waste Management	4	Prereq or concur: CE 520	SP
CE 719	Water Quality Modeling	3	CE 520 or equiv with written permission of instructor	AU (even yrs)
CE 771	Radioactive Waste Management	3	Nuclr En 505 or Nuclr En 606 or permission of instructor	AU
ChBE 771	Air Pollution	3	Senior standing in engineering or permission of the instructor	WI
ChBE 772	Principles of Sustainable Engineering	3	Senior standing in engineering or permission of the instructor	SP

***Because CE520 is required in the civil engineering program, students in that program must take an additional 4 credit hours of the listed Elective Courses to fulfill the Minor

Appendix B
Proposed (semester-based) Advising Sheet

UNDERGRADUATE MINOR IN ENVIRONMENTAL ENGINEERING

offered by the
ABET-Accredited Program in Environmental Engineering
Department of Civil and Environmental Engineering and Geodetic Science

Introduction

An undergraduate Minor in Environmental Engineering is offered by the ABET-Accredited Program in Environmental Engineering within the Department of Civil and Environmental Engineering and Geodetic Science. At least 15 semester hours must be taken; three courses totaling 9 hours are required, and at least 6 hours are to be selected from a list of approved elective courses.

Rationale

Environmental pollution is pervasive. Graduates from many undergraduate programs at OSU will encounter environmental engineering-related pollution problems in their job setting. Most likely are graduates from chemistry, ecology, environmental science, geology, microbiology, physics, statistics, and zoology, in addition to other engineering departments/programs. The Minor in Environmental Engineering introduces students in those fields to the problem-solving methods and procedures used in environmental engineering. A wide range of topics are addressed, e.g., sustainability, pollution prevention, air and water quality modeling, control technologies for air, water, and solid waste pollution, environmental health engineering, water and environmental chemistry, ecological engineering, and hazardous and radioactive waste management. Students can select from elective courses most appropriate to their major field.

Purpose

The purpose of the Minor is to allow students from a wide range of undergraduate majors to obtain an introductory background in sustainability, pollution prevention, environmental modeling, and pollution control technologies most appropriate to their major field.

Benefits for Students

By taking the Minor in Environmental Engineering, students should add considerably to their major program skills, and become more valuable to their future employer. Science majors will gain an understanding of engineering problem-solving methods and procedures, as well as standard pollution control technologies. Other engineering majors will become more aware of the environmental effects of technologies in their major field, and how to reduce these effects.

Curriculum Requirements

Detailed information on required and elective courses is provided in the attached Table. A total of at least 15 hours must be taken to fulfill the Minor in Environmental Engineering. Three courses are required for a total of 9 credit hours, with the remaining 6 hours or more to be selected from a list of elective courses. The three required courses cover such fundamental topics as sustainability, pollution prevention, environmental and occupational health engineering, air pollution modeling and control, water quality modeling, noise pollution, radiological health engineering, hazardous waste engineering, water treatment, wastewater treatment, and water chemistry. Elective courses allow expansion on all of these topics, as well as introducing ecological engineering, solid waste management, and other specialized areas of environmental engineering.

CURRICULUM FOR THE UNDERGRADUATE MINOR IN ENVIRONMENTAL ENGINEERING

Required courses (9 semester hours)

Course Number	Title	Credit Hours	Pre-requisites for minor students
ENE2100	Analytical Methods in Environmental Engineering	3	General Chem II
ENE 3200	Fundamentals of Environmental Engineering	3	General Chem II
ENE3210	Unit Operations in Environmental Engineering	3	General Chem II

Elective courses (at least 6 semester hours)

Course Number	Title	Credit Hours	Pre-requisites for minor students
ENE5180	Ecological Engineering and Science	3	Rank 3 or higher and 1 course in one of the following: biology, ecology, engineering or geology
ENE4200	Unit Operations in Environmental Engineering Laboratory	3	ENE 2100, ENE3210, ENE5110
ENE5110	Environmental Biotechnology	3	ENE3200
ENE5140	Hazardous Waste Management	3	ENE3210
ENE5170	Sustainability and Pollution Prevention Practices	3	ENE3210
ENE5230	Transport Phenomenon	3	Differential equations, CE3160
ENE5200	Principles of Risk Assessment	3	
CHBE5771	Air Pollution	2	Rank 4 in engineering
CHBE5772	Principles of Sustainable Engineering	3	Rank 4 in engineering
ESXXXX	Geochemistry of Natural Waters	3	Chem 122 and Math 152
ESXXXX	Hydrogeology	3	Chem 121 and Math 153
ENRXXXX	Soil Science	4	Chem 101 or 121
ENRXXXX	Soil Chemistry	4	ENR300, Chem 123
ENRXXXX	Fate of Pollutants in Soils and Natural Waters	3	2 qtrs chemistry, 1 qtr biology
FABEXXXX	Ecosystems for Waste Treatment	3	EEOB413, or ENR725, or FABE625, or ENE 3210

Appendix C
Quarters-to-Semesters Transition Worksheet

BS Environmental Engineering
Quarters-to-Semesters Equivalency Worksheet

Courses		Qtr	Sem		Sem	cr-hr	cr-hr
Completed	**Quarters-Based Course**	**cr-hr**	**cr-hr**	**Semesters-Based Equivalent**	**cr-hr**	**diff**	**excess**
	Required Courses						
	ENE 511	3	2.00	ENE3200 Fund Environmental Eng.	3	-1.00	0.00
1	ENE 520	4	2.67	ENE3210 Env Eng Unit Operations	3	-0.33	-0.33
	ENE610	3	2.00	ENE2100 Env Eng Analy Methods	3	-1.00	0.00
	Technical Electives						0.00
	ENE 618	4	2.67	ENE5180 Ecological Eng and Science	3	-0.33	0.00
	ENE 620	2	1.33	ENE4200 Unit Ops in Env Eng Lab	1	0.33	0.00
	ENE 711	4	2.67	ENE5110 Environmental Biotechnology	3	-0.33	0.00
	ENE 714	3	2.00	ENE5140 Hazardous Waste Management	3	-1.00	0.00
	ENE 717	4	2.67	ENE5170 Sustainability Poll Prev Pract	3	-0.33	0.00
	ENE 719	4	2.67		3	-0.33	0.00
	ENE 771	3	2.00		3	-1.00	0.00
	CHBME 771	3	2.00	CHBE5771 Air Pollution	2	0.00	0.00
	CHBME 772	3	2.00	CHBE5772 Principles of Sustain Eng	3	-1.00	0.00
	Total =	40		Total =	33		
						Excess Semester Credit Hrs =	-0.33