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**DATE:** June 11, 2010

**TO:** John Lippold, Chair of CCAA Subcommittee A

**FROM:** Harold Walker, <sup>Hal</sup>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)*

<b>Department/Unit</b>	<b>Title</b>	<b>Credit Hours</b>
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)*

<b>Department/Unit</b>	<b>Title</b>	<b>Credit Hours</b>
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**

<b>Course</b>	<b>Learning Goal #1. Introduction to EnE Problem Solving Methods.</b>	<b>Learning Goal #2. Exposure to EnE Topics.</b>
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 pursuing 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.

Course (or Sequence) Equivalence

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