

August 27, 2002

David W. Pershing
Senior Vice President for Academic Affairs
205 Park Bldg.
Campus

RE: Proposal to Establish a Graduate Certificate in Environmental Engineering

Dear Vice President Pershing:

At its meeting on August 26, 2002, the Graduate Council voted to approve a proposal to establish a graduate certificate program in Environmental Engineering. This 15-hour interdisciplinary program will be administered by the Environmental Engineering Graduate Program, which is housed within the Department of Civil and Environmental Engineering. The certificate program is designed to provide post-baccalaureate students from Engineering and Science with an interdisciplinary educational experience in environmental engineering.

A copy of the proposal is attached for your approval and transmittal to the Academic Senate.

Sincerely,

David S. Chapman
Assoc. V.P. for Graduate Studies
Dean, The Graduate School

Encl.

XC: D. Bjorkman, Assoc. Dean, School of Med.	J. Klewicki, Chair, Mech. Eng.
F. Brown, Dean, Mines & Earth Sciences	T. Kontuly, Chair, Geography
R. Newman, Dean, Humanities	M. Magill, Chair, DFPM
S. Ott, Dean, Social & Beh. Science	K. McCarter, Chair, Mining Eng.
R. Roemer, Assoc. Dean, Engineering	J. Miller, Chair, Met. Eng.
A. Darling, Chair, Communication	L. Reaveley, Chair, CVEEN
M. Chan, Chair, Geology & Geophysics	P. Smith, Chair, Chem/Fuels
K. Erturk, Chair, Economics	C. Forster, Geol/Geophysics
R. Hrebenar, Chair, Political Science	A. Hong, CVEEN

Graduate Certificate in Environmental Engineering A Revised Proposal

August 27, 2002

1. Needs Analysis

The field of Environmental Engineering has evolved over the past few decades from a sanitary engineering focus on “end-of-pipe” treatment of wastewater to a broader emphasis on interdisciplinarity and fundamentals. More recently, the field has expanded to include understanding and modifying complex human-environmental systems. Rapid population growth in the United States and elsewhere provides a continuing need for broadly educated and technically competent professionals who can identify and develop solutions to interdisciplinary problems that arise as humankind modifies the natural environment. Because the problems that we face are often poorly understood when viewed from a narrow disciplinary perspective, it is critical that increasing numbers of engineering and science professionals develop a sound interdisciplinary understanding of the ways that their discipline-specific technical knowledge can be integrated into the policymaking and planning processes associated with population growth. The educational background needed for this integration is not typically found in discipline-specific post-baccalaureate education.

The University of Utah Environmental Engineering Graduate Program (EEGP: <http://www.mines.utah.edu/enveng>) that will oversee the Certificate in Environmental Engineering (CEE) is designed, in part, to meet needs that underlie the goals of the National Science Foundation (NSF) program in Integrative Graduate Research and Traineeship (IGERT).

“The [NSF] program is intended to catalyze a cultural change in graduate education, for students, faculty, and universities, by establishing new, innovative models for graduate education in a fertile environment for collaborative research that transcends traditional disciplinary boundaries. It is also intended to facilitate greater diversity in student participation and preparation and to contribute to the development of a diverse, globally-aware, science and engineering workforce.”

Through the proposed certificate, and the existing Environmental Engineering degree program, the EEGP provides a flexible educational environment for graduate students to experiment with interdisciplinary teams and topics. The EEGP Advisory Board states that the Environmental Engineering degree program contains the interdisciplinary aspects that are key to pursuing careers in Environmental Engineering and related fields. The current

board members strongly endorse providing opportunities for those with engineering or non-engineering backgrounds to gain detailed understanding of environmental engineering theory and practice while also developing proficiency in working with policy makers, planners and the people who live in urban communities. The proposed certificate accomplishes this goal by enabling graduate students to obtain a traditional disciplinary degree (e.g., mechanical engineering or physics) while adding an interdisciplinary context. Thus, the certificate provides an important alternative to the existing Environmental Engineering degree program for those graduate students who wish to retain their disciplinary identity (e.g., mechanical engineer or physicist) while developing their interdisciplinary competence.

The proposed CEE comprises the interdisciplinary core of the Environmental Engineering degree program. Thus, the CEE provides those who do not require a first, or second, graduate degree to acquire interdisciplinary knowledge and skills that complement their previous academic degrees and work experience. We expect that working professionals and matriculated graduate students will use the certificate to build the interdisciplinary awareness of engineering, physical science, law, planning and communications needed to be successful in an increasingly complex future. The EEGP Advisory Board notes that the proposed certificate provides a formal opportunity for working professionals to begin expanding their post-baccalaureate education without fully engaging in a graduate degree program. We expect that some who complete the certificate program will ultimately return to use the certificate coursework as a foundation for subsequent graduate degree programs.

Because Environmental Engineering education encompasses a wide range of disciplines, it is difficult to measure student demand for the proposed certificate. Over the past 6 years the EEGP has maintained an average of 10 students in the Environmental Engineering degree program. Interest in the degree program generates about 40 applications per year. We expect a similar level of interest in the proposed certificate program with perhaps 10 students pursuing the certificate at any point in time.

2. Educational Objectives

The Environmental Engineering Certificate Program is designed to provide post-baccalaureate students from Engineering and Science with an interdisciplinary educational experience in environmental engineering. The Graduate Certificate is not a degree, however, it can be taken concurrently by matriculated graduate students pursuing Master's or Ph.D. degrees in Engineering or Science. Note that non-matriculated graduate students may obtain the Graduate Certificate as a standalone certificate that builds on previously obtained undergraduate or graduate degrees.

A key feature of the Environmental Engineering Certificate Program is that opportunities are provided to work and study with students and faculty from a wide range of engineering and non-engineering disciplines. Rather than becoming more specialized, Certificate holders are expected to broaden skills obtained in other degrees and become better able to communicate with and work in teams comprising people from other disciplines.

3. Impact on Existing Programs

The Environmental Engineering Certificate Program will be administered by the Environmental Engineering Graduate Program (EEGP) which already provides opportunities for graduate students to gain interdisciplinary knowledge and teamwork skills as part of their graduate degree in Environmental Engineering. We anticipate that the Certificate Program will enhance the character of the EEGP by increasing the community of scholars studying interdisciplinary topics in Environmental Engineering. In addition, we expect that new, non-matriculated graduate students will be attracted to the EEGP.

4. Courses

15 hours or more of designated course work are required for the Environmental Engineering Certificate Program. No new courses need to be developed. None of the proposed courses are currently delivered using distance education. Since this is unlikely to change in the near future, many of the courses are offered at late afternoon and evening times in order to be more convenient for those who are pursuing the certificate while working in the local community. Note that successfully completing the Certificate Program may require that some students complete one or more undergraduate courses needed as prerequisites for some of the technical core courses in Environmental Chemistry and Environmental Engineering.

Required Core Course

XXXX 6555/7 Env. Eng. Seminar two semesters in first year (0.5 credit per semester) [cross-listed as CVEEN 6555, CHFEN 6557, GEO 6555, MET EN 6555, MN EN 6555]

Health/Risk Core (Select one course)

FPMD 6700 Environmental Health Problems (2)
FPMD 6750 Occupational Safety and Health (2)
FPMD 6752 Introduction to Industrial Toxicology (2)
FPMD 6756 Hazardous Substances (3)

Law, Policy and Communications Core (Select one course)

Environmental Law Area

URBPL 5360 Environmental Planning Law and Policy (3)

Interdisciplinary Communications & Policy Area

POL S 6322 Environmental Policy (3)
XXXX xxxx System Dynamics and Environmental Policy (3) [cross-listed as CVEEN 6660, GEO 6340, GEOG 6370, POL S 6323, URBPL 5370]
URBPL/GEOG 5350 Public Lands and Environmental Policy (3)
COMM 6000-1 (Fall '02) Environmental Conflict (3)
COMM 6000-2 (Fall '02) Negotiation Theory and Practice (3)
COMM 6000-1 (Spring '03) Studies in Communication (3)
COMM 6150 Dialogue and Cultural Communication (3)
COMM 6360 Environmental Communication (3)

ECON 6250 Environmental and Natural Resource Economics (3)

Environmental Chemistry Core Course (Select one course)

CVEEN 6610 Water Chemistry and Laboratory Analysis (3)

GEO 6370 Environmental Organic Geochemistry (3)

CVEEN 6620 Equilibrium Processes in Aquatic Systems (3)

Environmental Engineering Processes Core (Select two courses with the intent of obtaining breadth across all three process areas; physical, biological, chemical)

CHFEN 6103/CVEEN 6603* Biochemical Engineering (3)

CHFEN 6305 Air Pollution Control Engineering (3)

CVEEN 6650 Biological Treatment (3)

CVEEN 7620 Physical and Chemical Treatment Processes for
Water Quality Control (3)

GEO 6390 Subsurface Remediation and Hazardous Waste Management (3)

* Note that CHFEN 6104/CVEEN6604 Biochemical Engineering Laboratory (1)
is a co-requisite for CHFEN 6103/CVEEN 6603

5. Assessment

A principal program objective is to provide Certificate holders with the skills needed to become valuable members of interdisciplinary engineering teams. The Environmental Engineering Seminar provides insight into real world, interdisciplinary environmental engineering projects. The 'Health/Risk Core' courses introduce environmental engineers to concepts of human health, health risk, and toxicology. Courses in the 'Law/Policy/Communications Core' enable students to work in multidisciplinary contexts where relationships between human behavior, natural systems and technology are important. Core courses in 'Environmental Geochemistry' and 'Environmental Engineering Processes' provide fundamental knowledge that is key to many environmental engineering technical areas.

We will assess the success of the Certificate Program to meet the educational objectives by monitoring enrollment, by having all graduates complete an exit survey and circulating a post-graduate survey to alumni. The exit survey will be designed to assess levels of interdisciplinary thinking, teamwork/communication skills and cross-disciplinary technical knowledge. A follow-up survey will be circulated to program alumni one or two years after graduation to assess how knowledge gained in completing the Environmental Engineering Certificate has helped them in their professional careers.

6. Faculty

Faculty associated with, or contributing to, the Certificate Program includes those teaching the courses indicated above, EEGP faculty, and other interested parties drawn from Colleges and Departments throughout the University of Utah campus.

Ralph Becker, GEOG/URBPL	JoAnn Lighty, CHFEN
Milind Deo, CHFEN	Dean Lillquist, FPMD
Saskia Duyvesteyn, MET EN	Dan McCool, POL S
Phil Emmi, GEOG/URBPL	Jan Miller, MET EN
Craig Forster, GG	Eric Pardyjak, ME EN
Don Hayes, CVEEN	Tarla Peterson, COMM
Leonard Hawes, COMM	Geoff Silcox, CHFEN
Andy Hong, CVEEN	Kip Solomon, GG
Bill Johnson, GG	Dale Stephenson, FPMD
Paul Jewell, GG	Ed Trujillo, CHFEN
Joe Klewicki, ME EN	
Gabriel Lozada, ECON	

7. Coordinator

The coordinator of the Certificate Program will be the Chair of the Executive Committee of the Environmental Engineering Graduate Program. The current Chair is Dr. Andy Hong (curriculum vita attached). Dr. Don Hayes (curriculum vita attached) will become Chair beginning July 1, 2003. The EEGP Executive Committee comprises members drawn from the engineering departments participating in the EEGP (CHFEN, CVEEN, GEO, MET E, ME EN and MG EN).

8. Advisory Committee

The existing Environmental Engineering Graduate Program Advisory Board will provide advice on both the Certificate and Degree Programs. Current members of the 5-person Advisory Board include representatives from environmental engineering consulting firms, state agencies, university programs and industry.

9. Budget

Costs associated with implementing and maintaining the Certificate Program will be supported by the departments participating in the EEGP (Civil & Environmental Engineering, Chemical & Fuels Engineering, Mechanical Engineering, Geology & Geophysics, Metallurgical Engineering, Mining Engineering). Administrative burden associated with the Certificate Program will be small and is readily added to the ongoing burden of maintaining the EEGP in the Department of Civil & Environmental Engineering. The Environmental Engineering Seminar is taught on a rotation basis by faculty drawn from the participating departments. All other courses outlined above are regularly offered by the respective departments. The limited effort required to review programs of study proposed by students is readily absorbed in the ongoing maintenance of degree-seeking Environmental Engineering graduate students.

10. Program Entrance

An applicant for admission must meet the following minimum requirements:

- 1) A bachelor's, master's or Ph.D. degree in Engineering or Science from a fully accredited college or university,
- 2) An undergraduate GPA of at least 3.0 (exceptions may be granted to this requirement, for example with respect to mature entry students),
- 3) Recommendation of the EEGP Executive Committee after reviewing the applicants' transcripts,
- 4) Coursework pre-requisites must be completed before admission:
 - Physics: Physics for Scientists and Engineers
 - Mathematics: Ordinary Differential Equations and Linear Algebra
 - Chemistry: General Chemistry (Organic Chemistry highly recommended)
 - Computing: Computer Skills
- 5) Prior to admission, each student will be informed of any coursework deficiencies that must be completed early in the Certificate Program. Deficiencies can arise in the areas of Engineering Fundamentals and Statistics if such courses have not been obtained in previous degrees. Deficiencies will be noted if the following courses are not indicated in the applicant's transcripts.
 - Fluid Mechanics
 - Strength of Materials* or Dynamics
 - Thermodynamics
 - Statistics

* Note that ME EN 1300 'Statics & Strength of Materials' satisfies this requirement

An applicant may be a matriculated or a non-matriculated graduate student at the University of Utah. Note that successfully completing the Certificate Program may require that some students complete one or more undergraduate courses needed as prerequisites for some of the technical core courses in Environmental Chemistry and Environmental Engineering.