

Notice of Change for Addition of a Minor in Environmental Engineering

Date: February 1, 2016

A. PROGRAM INFORMATION

1. Name of institution: University of Rhode Island

2. Name of department, division, school or college

Department: Civil and Environmental Engineering

College: College of Engineering

3. Intended initiation date of program change. Include anticipated date for granting first degrees or certificates, if appropriate.

Initiation date: September 2016

First degree date: December 2016

4. Intended location of the program: Kingston Campus, College of Engineering, Bliss Hall

5. Summary description of proposed program (not to exceed 2 pages).

Environmental Engineering involves the study of clean water, clean air, waste management and preservation of resources, in ways that minimize effects detrimental to the earth's environment. Currently, the Department of Civil and Environmental Engineering offers a B.S. in Civil Engineering. With the increase in environmental awareness and in particular the need for clean water in a world with increasing population, there is a strong demand for a background in environmental engineering.

Currently, only three state universities in New England offer a B.S. degree program in environmental engineering (University of New Hampshire, University of Vermont, and University of Connecticut). Therefore, a minor in environmental engineering at URI will allow us to remain competitive within New England and help us build capacity for a future B.S. degree.

This minor is open only to engineering students. Requirements of the minor are satisfied by completing 18 credit hours from the course list shown below. A minimum grade point average of 2.50 must be earned in these courses. At least half of the credits must be earned at the University of Rhode Island.

Students will need to complete the environmental engineering minor form and have it signed by the Environmental Engineering Minor Coordinator, Dr. Vinka Craver, and the Civil and Environmental Engineering Department Chair.

The course requirements for the undergraduate environmental engineering minor are as follows.

A. Fundamental Science: Select 2 courses

MCE 341	Fundamentals of Thermodynamics
CHM112	General Chemistry II
CHE 212	Chemical Process Calculations
CHM 227	Organic Chemistry Lecture I

B. Environmental Engineering Fundamentals (Required for non-CVE students)

CVE 370*	Hydraulic Engineering
CVE 374*	Environmental Engineering

** not counted toward minor for CVE students*

C. Environmental Engineering Design: Select up to 4 courses

CVE323H	Sustainable Solutions for Developing Communities
CVE 470	Water and Wastewater Transport Systems
CVE 471	Water and Wastewater Treatment Systems
CVE 474	Water Quality Sampling and Analyses
CVE 475	Water in the Environment
CVE 477	Environmental Sustainability and Green Engineering
CVE 482	Innovative Remediation Technologies
CVE 484	Environmental Hydrogeology – Fate and Transport of Contaminants
CVE 491/492	Special Problems

D. Supporting Courses: May select 1 course

CPL/LAR 434	Introduction to Environmental Law
CPL 485	Environmental Planning
EEC 430	Water Resource Economics
GEO 305	Global Climate Change
GEO 462	Aqueous Geochemistry
GEO 483	Hydrogeology
ISE 460	Design for the Environment
NRS 409	Concepts in GIS and Remote Sensing
NRS 410	Fundamentals of GIS
NRS 412	Soil-Water Chemistry
NRS 415	Remote Sensing of The Environment
NRS 461	Watershed Hydrology and Management
OCG 480	Introduction to Marine Pollution

If applicable, please include the existing URI catalog language and proposed catalog language changes that relate to your request.

Existing URI Catalog Language: NONE

Proposed URI Catalog Language:

Minor in Environmental Engineering. Qualified engineering students may pursue a minor in environmental engineering. Students declaring this minor must complete a minimum of 18 credits consisting of courses in fundamental science, environmental engineering fundamentals and design, and other supporting courses. Additional information can be found at <http://egr.uri.edu/cve/undergrad/>. A minimum grade point average of 2.50 must be earned in courses counted toward the minor.

6. Signature of the President

David M. Dooley



MEMORANDUM

TO: Mayrai Gindi, Chair, Civil & Environmental Engineering

FROM: David C. Smith, Associate Dean, Graduate School of Oceanography

DATE: 9 February 2016

SUBJECT: OCG 480

Digitally signed by David C.
Smith
DN: cn=David C. Smith,
o=University of Rhode Island,
ou=Graduate School of
Oceanography,
email=assoc_dean@gso.uri.edu,
c=US
Date: 2016.02.09 16:19:21 -05'00'

The Graduate School of Oceanography is pleased to support your efforts to create a Minor in Environmental Engineering. I think our class “Introduction to Marine Pollution” (OCG 480) will fit in very well with the goals of the minor and we look forward to having your students in our class.

February 8, 2016

To Whom It May Concern,

As Chair of the Department of Natural Resources Science (NRS), I strongly support the proposal by the Department of Civil and Environmental Engineering for a Minor in Environmental Engineering.

Our department will make available a number of our classes as “supporting” classes from which potential Minor students can choose. These include

- NRS 409 Concepts in GIS and Remote Sensing
- NRS 410 Fundamentals of GIS
- NRS 412 Soil Water Chemistry
- NRS 415 Remote Sensing of the Environment
- NRS 461. Watershed Hydrology and Mgmt

Sincerely,

Arthur J
Gold

Digitally signed by Arthur J Gold
DN: cn=Arthur J Gold, o=URI,
ou=Natural Resources Science,
email=agold@uri.edu, c=US
Date: 2016.02.08 17:34:27 -05'00'

Arthur J. Gold Ph.D.
Professor and Chair



February 5, 2016

Dr. Thomas B. Boving
Department of Civil and Environmental Engineering
University of Rhode Island
Kingston, RI 02881

Dear Dr. Boving:

The new minor in Environmental Engineering sounds like a great addition to the Engineering program. We are very pleased that our classes can support this minor. Certainly our GEO 305 and 462 classes would be available for a few CVE students each time the classes are offered.

Sincerely,




David E. Fastovsky
Professor and Chair

Cc: Dr. Simon Engelhart, Instructor GEO 305
Dr. Dawn Cardace, Instructor, GEO 462



MEMO

To: Dr. Thomas Boving
Professor

From: Dr. James J. Opaluch 
Professor and Chair

Date: February 9, 2016

Re: Proposed Environmental Engineering Minor

As ENRE Department Chair, I strongly support the proposed minor in Environmental Engineering, and I also support inclusion of EEC 430 Water Resource Economics as an elective within the minor. We anticipate no problems providing an adequate number of seats to support CVE students in the class.

Best of luck with the new minor, and let me know if there is anything else we can do to assist on this.

THE
UNIVERSITY
OF RHODE ISLAND

COLLEGE OF
ARTS AND SCIENCES



DEPARTMENT OF LANDSCAPE ARCHITECTURE

Rodman Hall, 94 West Alumni Avenue, Kingston, RI 02881 USA p: 401.874.2142 f: 401.874.4931 uri.edu/artsci

February 11, 2016

Dr. Mayrai Gindy, Chair
Department of Civil & Environmental Engineering
University of Rhode Island

Dear Dr. Gindy,

I am very pleased to write this letter in support of the proposed Minor in “Environmental Engineering”. We believe the new minor will be a great addition to the other undergraduate minors offered at the University of Rhode Island with a focus on the “environment”. We are pleased to know that you have included in your proposed minor CPL 434 and CPL 485 courses offered through the Department of Landscape Architecture. Dr. Bill Gordon teaches both of these two courses and welcomes the students pursuing the new minor in his courses. If you have any questions about these two courses, please contact Dr. Gordon in our department.

Sincerely,

Farhad Atash, Ph.D.
Professor of Planning
Department of Landscape Architecture



February 5, 2016

Dr. Thomas B. Boving
Department of Civil and Environmental Engineering
University of Rhode Island
Kingston, RI 02881

Dear Dr. Boving:

The new minor in Environmental Engineering sounds like a great addition to the Engineering program. We are very pleased that our classes can support this minor. Certainly, our GEO 305, 462, and 483 classes would be available for CVE students each time the classes are offered.

Sincerely,



David E. Fastovsky
Professor and Chair

Cc: Dr. Simon E. Engelhart, Instructor, GEO 305
Dr. Dawn Cardace, Instructor, GEO 462
Dr. Anne I. Veeger, Instructor, GEO 483

A Proposal for a Creation of Minor in Environmental Engineering

A. PROGRAM INFORMATION

1. Name of institution

University of Rhode Island

2. Name of department, division, school or college

Department: **Civil and Environmental Engineering (CVE)**

College: **College of Engineering (COE)**

3. Title of proposed program and Classification of Instructional Programs (CIP) code

Minor in Environmental Engineering (#CIP 14.1401)

4. Intended initiation date of program change. Include anticipated date for granting first degrees or certificates, if appropriate.

Initiation date: **September 2016**

First degree date: **December 2016**

5. Intended location of the program

URI Main Campus, College of Engineering

6. Description of institutional review and approval process

	<u>Approval Date</u>
Department	2/15/16
College	3/9/16
CAC/Graduate Council	
Faculty Senate	
President of the University	

7. Summary description of proposed program (not to exceed 2 pages)

Minor in Environmental Engineering

This effort is led by faculty from the Department of Civil and Environmental Engineering (CVE) at the College of Engineering (COE). Students in the Environmental Engineering (EE) minor will primarily take courses offered by faculty in CVE but can also take courses offered by Chemistry (CHM), Chemical Engineering (CHE), Mechanical, Industrial, and Systems Engineering (MCE), Community Planning (CPL), Environmental Economics (EEC),

Geosciences (GEO), Natural Resource Science (NRS), and Oceanography (OCG). This interdisciplinary approach will allow students to gain the skills needed to specialize in areas of environmental engineering, such as water and wastewater treatment, bioremediation, waste management and water-climate nexus. Vinka Oyanedel-Craver, Associate Professor of Civil and Environmental Engineering, will serve as the director of this minor.

The engineering and management of environmental resources that protect human health and systems are some of the biggest challenges facing young engineering professionals. Demand for environmental engineers is growing and expected to continue growing in the future as the environment is undergoing dramatic change and new, resilient structures need to be built to support society. This minor will provide engineering students with interest in environmental engineering an opportunity to specialize in this area, and therefore increase their competitiveness with companies seeking this type of expertise.

The EE minor comprises a minimum of 18 credit hours, including two “**Fundamental Science**” courses from a list of four courses, two “**Environmental Engineering Fundamentals**” courses (CVE 370 and CVE 374), and up to four “**Environmental Engineering Design**” courses from an approved list. Students may also select one course from a list of approved “**Supporting Courses**”.

Only engineering students may pursue this minor in environmental engineering. Students declaring this minor must earn a minimum cumulative grade point average of 2.50 in courses counted toward the minor. Students are responsible for meeting the prerequisite requirements for individual courses, as applicable.

Formalizing a minor in environmental engineering will help fulfill the vision of the URI Academic Strategic Plan 2016-2021, particularly (1) enhancing student success by providing an opportunity for students to increase their competitiveness, (2) expand research, scholarship and creative work by providing an already active group of environmental engineering faculty with trained undergraduate students in their field of interest, (3) grow a global presence by increasing the leverage of environmental engineering faculty currently involved in international research and academic activities, and (4) embrace diversity and social justice by offering a concentration in environmental engineering which attracts women at a much higher percentage as compared with all other engineering fields.

Learning Goals:

On completion of the minor in Environmental Engineering, students will have the knowledge and skills to:

- Understand issues that impact the environment including water and wastewater treatment, bioremediation, waste management and water-climate nexus.
- Design environmental engineering systems that include considerations of risk, uncertainty, sustainability, life-cycle principles, and environmental impacts

8. Signature of the President

David M. Dooley

9. Person to contact during the proposal review

Name: Vinka Oyanedel-Craver
Address: Bliss Hall 213, 1 Lippitt Rd.
Phone: 401-874-2784
Email: craver@uri.edu

10. Signed agreements for any cooperative arrangements made with other institutions/agencies or private companies in support of the program.

None

B. RATIONALE: There should be a demonstrable need for the program.

1. Explain and quantify the needs addressed by this program, and present evidence that the program fulfills these needs.

The demand for environmental engineers is growing and is expected to continue growing in the future as the environment is undergoing dramatic change and new, resilient systems need to be engineered to support society. The American Association for Engineering Education (ASEE) reports that between 2005 and 2014, the number of B.S. degrees awarded in environmental engineering nearly doubled (Yoder BL (2014), Engineering by the Numbers, American Society for Engineering Education. Available online at www.asee.org/colleges). Furthermore, if the combined Civil and Environmental Engineering degree is considered, the growth is shown to quadruple.

Currently, the Civil and Environmental Engineering Department only offers a B.S. degree in civil engineering. Students interested in environmental engineering who enroll in our program are often let down once they realize we don't offer a B.S. degree in environmental engineering. This EE minor offers an opportunity for these students to formally specialize in this area of study.

In addition, only three state universities in New England offer a B.S. degree program in environmental engineering (University of New Hampshire, University of Vermont, and University of Connecticut). Therefore, this minor in EE at URI will help keep us competitive and is likely to attract quality students from Massachusetts and Maine.

C. INSTITUTIONAL ROLE: The program should be clearly related to the published role and mission of the institution and be compatible with other programs and activities of the institution.

1. Explain how the program is consistent with the published role and mission of the institution and how it is related to the institution's academic planning.

This minor is consistent with the goals outlined in the URI Academic Strategic Plan 2016-2021. As stated in the summer, the EE minor will help (1) enhance student success by providing an opportunity for students to increase their competitiveness, (2) expand research, scholarship and creative work by providing an already active group of environmental engineering faculty with trained undergraduate students in their field of interest, (3) grow a global presence by increasing the leverage of environmental engineering faculty currently involved in international research and academic activities, and (4) embrace diversity and social justice by offering a concentration in environmental engineering which attracts women at a much higher percentage as compared with all other engineering fields.

D. INTERINSTITUTIONAL CONSIDERATIONS: The program should be consistent with all policies of the Board of Governors pertaining to the coordination and collaboration between public institutions of higher education. (Consult the Board of Governors' *Coordination Plan for Academic Programs in Rhode Island Public Institutions of Higher Education* [www.ribghe.org/publicreg.htm] for guidelines and restrictions regarding the types and levels of programs the institutions are allowed to offer.)

1. Estimate the projected impact of program on other public higher education institutions in Rhode Island (e.g. loss of students or revenues), provide a rationale for the assumptions made in the projections, and indicate the manner in which the other public institutions were consulted in developing the projections.

There is no projected impact to other public higher educational institutions in Rhode Island.

2. Using the format prescribed by RIOHE, describe provisions for transfer students (into or out of the program) at other Rhode Island public institutions of higher education. Describe any transfer agreements with independent institutions. The institution must also either submit a Joint Admissions Agreement transition plan or the reason(s) the new program is not transferable. (See *Procedure for Strengthening the Articulation/Transfer Component of the Review Process for New Programs* which can be found at www.ribghe.org/publicreg.htm.)

Any transfer student would be required to fulfill all of the requirements of the EE minor.

3. Describe any cooperative arrangements with institutions offering similar programs. (Signed copies of any agreements pertaining to use of faculty, library, equipment, and facilities should be attached.)

None

4. If external affiliations are required, identify providing agencies. (Indicate the status of any arrangements made and append letters of agreement, if appropriate.)

None required

5. Indicate whether the program will be available to students under the New England Board of Higher Education's (NEBHE) Regional Student Program (RSP).

The program will be available to all enrolled students at the University of Rhode Island.

E. **PROGRAM:** The program should meet a recognized educational need and be delivered in an appropriate mode.

1. Prepare a typical curriculum display for one program cycle for each sub-major, specialty or option, including the following information:
 - a. Name of courses, departments, and catalog numbers and brief descriptions for new courses, preferably as these will appear in the catalog. In keeping with each institution's timetable for completion of student outcomes assessment, each institution should provide an assessment plan detailing what a student should know and be able to do at of the program and how the skills and knowledge will be assessed. For example, if a department brings forth a new program proposal but that department is not slated to have its student outcomes assessment completed until 2008, the program could be approved but with the provision that the department return no later than 2008 and present to the Academic and Student Affairs Committee its student outcomes for that particular program.

There are no new courses proposed with this program. The required and supporting courses are listed below.

b. Required courses in area of specialization and options, if any.

Fundamental Science: Select 2 courses

MCE 341	Fundamentals of Thermodynamics
CHM112	General Chemistry II
CHE 212	Chemical Process Calculations
CHM 227	Organic Chemistry Lecture I

Environmental Engineering Fundamentals (Required for non-CVE students)

CVE 370*	Hydraulic Engineering
CVE 374*	Environmental Engineering

* not counted toward minor for CVE students

Environmental Engineering Design: Select up to 4 courses

CVE323H	Sustainable Solutions for Developing Communities
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CVE 475	Water in the Environment
CVE 477	Environmental Sustainability and Green Engineering
CVE 482	Innovative Remediation Technologies
CVE 484	Environmental Hydrogeology – Fate and Transport of Contaminants
CVE 491/492	Special Problems

b. Course distribution requirements, if any, within program, and general education requirements.

Supporting Courses: May select 1 course

CPL/LAR 434	Introduction to Environmental Law
CPL 485	Environmental Planning
EEC 430	Water Resource Economics
GEO 305	Global Climate Change
GEO 462	Aqueous Geochemistry
GEO 483	Hydrogeology
ISE 460	Design for the Environment
NRS 409	Concepts in GIS and Remote Sensing
NRS 410	Fundamentals of GIS
NRS 412	Soil-Water Chemistry
NRS 415	Remote Sensing of The Environment
NRS 461	Watershed Hydrology and Management
OCG 480	Introduction to Marine Pollution

- d. Total number of free electives available after specialization and general education requirements are satisfied.

0 credits

- e. Total number of credits required for completion of program or for graduation. Present evidence that the program is of appropriate length as illustrated by conformity with appropriate accrediting agency standards, applicable industry standards, or other credible measure, and comparability of lengths with similar programs in the state or region.

18 credits. This is the common number of credits of most minors at the University of Rhode Island.

- f. Identify any courses that will be delivered or received by way of distance learning. (Refer to www.ribghe.org/publicreg.htm for the *Standards for Distance Learning in the Rhode Island System of Public Higher Education*.)

None

2. Describe certification/licensing requirements, if any, for program graduates and the degree to which completion of the required course work meets said requirements. Indicate the agencies and timetables for graduates to meet those requirements.

None required

3. Include the learning goals (what students are expected to gain, achieve, know, or demonstrate by completion of the program) and requirements for each program.

On completion of the minor in Environmental Engineering, students will have the knowledge and skills to:

- Goal I: Understand issues that impact the environment including water and wastewater treatment, bioremediation, waste management and water-climate nexus.
- Goal II: Design environmental engineering systems that include considerations of risk, uncertainty, sustainability, life-cycle principles, and environmental impacts

4. Demonstrate that student learning is assessed based on clear statements of learning outcomes and expectations.

Learning outcomes for the learning goal for the Minor are:

- Goal I *Outcome*: Students will know how to identify and assess issues that impact the environment including water and wastewater treatment, bioremediation, waste

management and water-climate nexus by gathering, analyzing and interpreting data using standard software.

- Goal II *Outcome*: Students will be able to design environmental engineering systems by using data and engineering analyses to write a comprehensive report that includes considerations of risk, uncertainty, sustainability, life-cycle principles, and environmental impacts.

F. FACULTY AND STAFF: The faculty and support staff for the program should be sufficient in number and demonstrate the knowledge, skills, and other attributes necessary to the success of the program.

1. Describe the faculty who will be assigned to the program. Indicate total full-time equivalent (FTE) positions required for the program, the proportion of program faculty who will be in tenure-track positions, and whether faculty positions will be new positions or reassignment of existing positions.

The program will be primarily supported by existing faculty at the Department of Civil and Environmental Engineering, with some participation from faculty in Chemistry (CHM), Chemical Engineering (CHE), Mechanical, Industrial, and Systems Engineering (MCE), Community Planning (CPL), Environmental Economics (EEC), Geosciences (GEO), Natural Resource Science (NRS), and Oceanography (OCG).

No additional faculty or staff are required to facilitate the minor, which is completely contained from existing courses and existing positions.

G. STUDENTS: The program should be designed to provide students with a course of study that will contribute to their intellectual, social and economic well-being. Students selected should have the necessary potential and commitment to complete the program successfully.

1. Describe the potential students for the program and the primary source of students. Indicate the extent to which the program will attract new students or will draw students from existing programs and provide a specific rationale for these assumptions. For graduate programs, indicate which undergraduate programs would be a potential source of students.

Most students are expected to be drawn from Civil and Environmental Engineering and Chemical Engineering departments in the College of Engineering. Students from other engineering disciplines can also participate as long as they fulfill the requirements of the minor.

L. EVALUATION: Appropriate criteria for evaluating the success of a program should be development and used.

- 1. List the performance measures by which the institution plans to evaluate the program. Indicate the frequency of measurement and the personnel responsible for performance measurements. Describe provisions made for external evaluation, as appropriate.**

The measures of performance will be based on two criteria. We will gauge success of the program on the number of students that complete the minor and we will design a brief questionnaire that evaluates the program from the student's perspective.

THE
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OF RHODE ISLAND

COLLEGE OF
ARTS AND SCIENCES

THINK BIG  WE DO™

DEPARTMENT OF LANDSCAPE ARCHITECTURE

Rodman Hall, 94 West Alumni Avenue, Kingston, RI 02881 USA p: 401.874.2142 f: 401.874.4931 uri.edu/artsci



February 11, 2016

Dr. Mayrai Gindy, Chair
Department of Civil & Environmental Engineering
University of Rhode Island

Dear Dr. Gindy,

I am very pleased to write this letter in support of the proposed Minor in “Environmental Engineering”. We believe the new minor will be a great addition to the other undergraduate minors offered at the University of Rhode Island with a focus on the “environment”. We are pleased to know that you have included in your proposed minor CPL 434 and CPL 485 courses offered through the Department of Landscape Architecture. Dr. Bill Gordon teaches both of these two courses and welcomes the students pursuing the new minor in his courses. If you have any questions about these two courses, please contact Dr. Gordon in our department.

Sincerely,

Farhad Atash, Ph.D.
Professor of Planning
Department of Landscape Architecture



MEMO

To: Dr. Thomas Boving
Professor

From: Dr. James J. Opaluch 
Professor and Chair

Date: February 9, 2016

Re: Proposed Environmental Engineering Minor

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February 5, 2016

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Department of Civil and Environmental Engineering
University of Rhode Island
Kingston, RI 02881

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Sincerely,



David E. Fastovsky
Professor and Chair

Cc: Dr. Simon E. Engelhart, Instructor, GEO 305
Dr. Dawn Cardace, Instructor, GEO 462
Dr. Anne I. Veeger, Instructor, GEO 483

February 8, 2016

To Whom It May Concern,

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- NRS 410 Fundamentals of GIS
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- NRS 415 Remote Sensing of the Environment
- NRS 461. Watershed Hydrology and Mgmt

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Arthur J
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email=agold@uri.edu, c=US
Date: 2016.02.08 17:34:27 -05'00'

Arthur J. Gold Ph.D.
Professor and Chair



MEMORANDUM

TO: Mayrai Gindi, Chair, Civil & Environmental Engineering

FROM: David C. Smith, Associate Dean, Graduate School of Oceanography

DATE: 9 February 2016

SUBJECT: OCG 480

Digitally signed by David C.
Smith
DN: cn=David C. Smith,
o=University of Rhode Island,
ou=Graduate School of
Oceanography,
email=assoc_dean@gso.uri.edu,
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