Proposal for a New Graduate Course

Department: Geology
Graduate Program: Environmental Studies (EVSS)

Course Number & Title: EVSS 631, Pollution in the Environment
Total hours/week: 3
Number of Credits: Lectures: 3, Lab: 0

Will this course be cross-listed with an undergraduate or other graduate course? □ YES X NO
*If yes, please complete an attach to this proposal a Permission to Cross-List a Graduate Course form.*

Course will first be offered: FALL 2010

Catalog description (Please limit to 50 words): Multidisciplinary study of fundamental physical, chemical, and biological processes that affect transport and fate of human-induced and natural pollutants in the environment. This course is for students that have strong interests in environmental sciences, with basic preparation in sciences such as chemistry, geology, and/or biology.

Prerequisites (or other restrictions): CHEM 101/101L or CHEM 111/111L, BIOL 101/101L, MATH 111; or equivalent courses.

Rationale/justification for course (consider the following issues):

a. What are the goals and objectives of the course?
   The main goal of this course is to help students understand fundamental physical, chemical, and biological processes that affect transport and fate of both human-induced and natural pollutants in the environment. The objective is to provide quantitative instruction and practice between the faculty and students. This will focus on (1) applying basic science principles to "real-world" problems and (2) discussing case studies and data in societal contexts.

b. How does the course support the mission statement of the department and the organizing principles of the department program?
   Inspection and understanding of specific physical, chemical, and biological conditions in the environment is an important part of the training required for professionals dealing with environmental issues. This course will prepare students with respect to one-half of the mission of the Environmental Studies program, to provide integrative science training.

Are other departments affected by this course? □ YES X NO
*If more space is needed for any section, please attach additional sheets to this form.*

November 2007
Is this course part of a joint program? ☑ YES ❌ NO If yes, at what institution?

Method of teaching:
Given its complex nature, this course will take a multidisciplinary approach to address environmental pollution issues. Also, for the same reason, this will serve as a broad survey and will mostly focus on the geological environment. Students will, however, have the opportunity to pursue any of the topics from this course in detail on their own as a research project. Below is a “mind map” of the course structure:

Lectures will comprise about 65% of class time, student presentations (individual and in small groups) of pertinent scholarly works and case studies will be 20%, and quantitative projects and reports of results will be 15%. Students will present an original scholarly work of a topic of their choosing (relating to pollution issues) in the form of a research paper and class presentation of the major findings. There will be two term exams as part of the assessment of student learning.

If more space is needed for any section, please attach additional sheets to this form.

November 2007
Expected changes

a. Address potential enrollment pattern shifts in the Department or University-wide as it relates to the offering of this course.
   No major shifts expected; this course is proposed to replace Aqueous Geochemistry (EVSS 641) as “Science Core” option in the Environmental Studies Master’s (MES) program.

b. Address potential shifts in staffing of the departments as it relates to the offering of this course.
   No expected staffing issues are expected; Geology faculty are available to offer this course every year.

Requirements for additional resources made necessary by this course. (Note: course requiring additional resources will need special justification.)

a. Staff
   None.

b. Budget
   None.

c. Library
   Possible future requests for periodical access related to course material. However the current holdings and database access were sufficient when the course was offered previously.

Attach course syllabus, reading list, or any additional documentation that can help the committee evaluate this proposal. A syllabus is mandatory.

Signature of Program Director: ___________________________  Date: _____________
Signature of Department Chair: ___________________________  Date: _____________
Additional Chair’s Signature*: _____________________________  Date: _____________
Signature of Schools’ Dean: _______________________________  Date: _____________
Additional Schools’ Dean Signature*: ______________________  Date: _____________
Signature of the Provost: _________________________________  Date: _____________
Signature of Budget Director**: ____________________________  Date: _____________

*For interdisciplinary courses.
**Business Affairs Office

Return form to the Graduate School Office for Further Processing

Signature of Chair of the Faculty Committee on Graduate and Continuing Education
______________________________  Date: _____________
Signature of Chair of Grad Council: ___________________________  Date: _____________
Signature of the Faculty Secretary: ____________________________  Date: _____________

If more space is needed for any section, please attach additional sheets to this form.

November 2007
Instructors
Dr. Vijay Vulava
Phone: 843.953.1922
Email: VulavaV@cofc.edu
Office: SCIC 343
Office Hours: 11-12 h MWF or by appointment

Dr. Tim Callahan
Phone: 843.953.8278
Email: CallahanT@cofc.edu
Office: SCIC 337
Office hours: 10:00-11 h TR or by appointment

Lecture Times and Location:

Course Goals and Structure
The main goal of this course is to help understand fundamental physical, chemical, and biological processes that affect transport and fate of both human-induced and natural pollutants in the environment. This course is designed for students that have strong interests in environmental sciences and have had basic preparation in sciences such as chemistry, geology, and/or biology. This course will provide the scientific basis that will allow making prudent decisions in managing and mitigating pollution of the natural world. In general, pollution is defined as excessive accumulation or release of various physical, chemical, and biological substances within or into the environment with, sometimes, catastrophic consequences. Pollution is ubiquitous and can occur on or within land, oceans, and in the atmosphere. Given its complex nature, this course will take a multidisciplinary approach to address environmental pollution issues. Also, for the same reason, this will serve as a broad survey and will mostly focus on the geological environment. You will, however, have the opportunity to pursue any of the topics from this course in detail on your own as a research project. Below is a “mind map” of the course structure:

1. Processes affecting fate and transport of pollutants
   - Extent of global pollution
     - Intro to soil, water, and geological environment
   - Biotic characteristics
     - Physical, chemical, and biological processes
     - Environmental monitoring
     - Environmental toxicology
     - Risk assessment
     - Environmental Law and regulation

2. Monitoring, assessment, and regulation
   - Soil and water pollution
   - Soil and groundwater remediation
   - Ecosystem and land restoration
   - Industrial and municipal waste treatment and disposal
   - Land application of biosolids and animal wastes
   - Drinking water treatment
   - Genetically engineered crops and microbes

3. Pollution mitigation
   - Anti-biotic resistant bacteria and gene transfer
   - Pharmaceuticals and endocrine disruptors

4. Pollution treatment and management

5. Emerging pollutants

SEP - A 2019
While we will strive to cover most of these topics, the structure will be fluid and will change based on your interests and needs. Much of the class time during lectures will be devoted to introduction of the concepts and to discussions and analyses of assigned readings from either the textbook or from research papers. You will solve several critical-thinking exercises to better understand fundamental environmental concepts. Consequently, you must come to class prepared by reading the appropriate book chapters and attempting to work the assigned exercises. This way, you will be a full partner in the learning enterprise.

Even though there is no laboratory associated with this class, we will organize 2-3 field trips outside of scheduled class time to visit various sites in the Charleston area (water treatment plant, groundwater treatment site, etc.). On these trips you will have hands-on opportunities to learn about techniques that are used to assess basic pollution parameters.

Textbook:

Prerequisites
CHEM 101 and 102 (or equivalent) or BIOL 101 and 102 (or equivalent) or GEOL 101 or 103 and 105 (or equivalent).

Course Schedule (Tentative)

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics Covered</th>
<th>Chapters</th>
<th>Other Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to soils, subsurface, &amp; water</td>
<td>1, 2, 3</td>
<td>Demonstration and exercise with porous media</td>
</tr>
<tr>
<td>2</td>
<td>Biotic characteristics, Physical processes</td>
<td>5, 6</td>
<td>Experiment w/ flume</td>
</tr>
<tr>
<td>3</td>
<td>Chemical &amp; biological characteristics</td>
<td>7, 8</td>
<td>Readings assigned</td>
</tr>
<tr>
<td>4</td>
<td>Types of contaminants</td>
<td>9, 10, 11</td>
<td>Research Paper outline due, readings assigned</td>
</tr>
<tr>
<td>5</td>
<td>Birdsall-Dreiss Distinguished Lecture</td>
<td></td>
<td>Demo of critical review, readings assigned</td>
</tr>
<tr>
<td>6</td>
<td>Monitoring, toxicology, &amp; risk assessment</td>
<td>12, 13, 14</td>
<td>Student paper review, readings assigned</td>
</tr>
<tr>
<td>6</td>
<td>Soil pollution &amp; restoration</td>
<td>16, 20</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>Mid-Term Exam</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>Spring Break</td>
</tr>
<tr>
<td>9</td>
<td>Ground water &amp; surface water pollution</td>
<td>17, 18</td>
<td>Student paper review, readings assigned</td>
</tr>
<tr>
<td>10</td>
<td>Soil &amp; ground water remediation</td>
<td>19</td>
<td>Student paper review</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>Saturday Field Trip</td>
</tr>
<tr>
<td>11</td>
<td>Industrial &amp; wastewater treatment</td>
<td>25, 26</td>
<td>Research Paper due</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td>In-class Field Trip</td>
</tr>
<tr>
<td>13</td>
<td>Waste &amp; drinking water treatment</td>
<td>27, 28</td>
<td>Student Presentations</td>
</tr>
<tr>
<td>14</td>
<td>Emerging Contaminants</td>
<td>29, 30</td>
<td>Student Presentations, Final Research Paper due,</td>
</tr>
<tr>
<td>15</td>
<td>Emerging Contaminants</td>
<td>31</td>
<td>Last Day of Classes</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td>Final Exam, 4-7 PM</td>
</tr>
</tbody>
</table>
Assessment

Your performance in this course will be assessed based on your understanding of pollution-related concepts and applications. This will involve a combination of (i) solving critical-thinking exercises, (ii) exams, (iii) research paper and presentation associated with your research projects, and (iv) class participation.

- Critical-thinking exercises will include solving problems and synthesis and interpretation of published data – there will be one every week (except during exams) for 15% of total grade
- One mid-term exam worth 25% of total grade
- Final exam worth 30% of total grade
- A 6000-word research paper that us an original synthesis of an idea, an extensive research paper related to a pollution related case-study, or an idea for your own pollution-themed thesis work – 25% of total grade
- Presentation of your research towards end of the term – 5% of total grade

The grade you earn at the end of the semester will be based on this scale.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>92-100</td>
</tr>
<tr>
<td>B+</td>
<td>91-88</td>
</tr>
<tr>
<td>C+</td>
<td>80-76</td>
</tr>
<tr>
<td>F</td>
<td>&lt; 70</td>
</tr>
<tr>
<td>B</td>
<td>87-82</td>
</tr>
<tr>
<td>C</td>
<td>75-70</td>
</tr>
</tbody>
</table>

Expected Outcomes (or What you will get from this course)

On successful completion of this course, you will be able to

- Critically understand processes related to environmental pollution
- Interpret the behavior of naturally complex environmental systems
- Critically analyze environmental data and explain your findings and conclusions to your peers
- Collaboratively develop research projects
- Develop other ancillary skills:
  - Become familiar with journals and technical sources in subject
  - Become proficient in conducting literature reviews
  - Improve your presentation and science writing skills

CofC’s Honor Code and Academic Integrity

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student’s actions are clearly related more to a misunderstanding will handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed by both the instructor and the student will be forwarded to the Dean of Students and placed in the student’s file.

Cases of suspected academic dishonesty will be reported directly by the instructor and others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for
academic dishonesty will receive a XF in the course, indicating failure of the course due to academic
dishonesty. This grade will appear on the student’s transcript for two years after which the student may
petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended
(temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration--working together without permission-- is a form
of cheating. Unless the instructor specifies that students can work together on an assignment and/or test, no
collaboration is permitted. Other forms of cheating include possessing or using an unauthorized study aid
(such as a PDA), copying from others’ exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any
assignment in this class without obtaining prior permission from the instructor.

Students can find the complete Honor Code and all related processes in the Student Handbook at