Weaving Sustainability Concepts into
ENCE 100: Introduction to Civil & Environmental Engineering

Submitted to the Chesapeake Project to satisfy Faculty Fellow requirements

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Introduction to Civil & Environmental Engineering (ENCE 100) is a 1-credit required class for ENCE majors. It is also open to students who are considering the major or who wish to learn about infrastructure and the contribution of Civil & Environmental Engineering to society. Much of the class is devoted to introducing the challenges addressed and services provided by six specialty areas in our Department: Structural, geotechnical, water resources, environmental, transportation, and engineering project management. For several years, the class has included units on "Professions and Professionalism" and "Engineering Ethics."

The two big ideas in this class are:

1. Civil & Environmental Engineering (CEE) is a profession that serves the public.
2. CEE designs, builds, operates, and maintains infrastructure, the basic framework that makes modern life possible.

Recently the American Society of Civil Engineers (ASCE) added language about sustainability to the first Fundamental Canon of Engineering Ethics:

*Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.*

*ASCE Board of Directors: Sustainable Development is the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development.*

As of Fall 2016, I will add a third big idea to ENCE 100:

3. The CEE profession has an ethical responsibility to foster sustainability.

My revision to ENCE 100 for Fall 2016 is an interweaving of example applications of sustainability principles to civil and environmental infrastructure. I plan to introduce two relevant sustainability rating systems: Institute for Sustainable Infrastructure’s Envision (http://sustainableinfrastructure.org/) and U.S. Green Building Council’s LEED (http://www.usgbc.org/leed). Within the class’s existing lecture structure that introduces the six specialties, I have selected an example ISI Envision-recognized project to highlight for each specialty.
Rather than a single lecture on sustainability principles, each example will allow me to highlight a particular principle, such as energy flows, material cycling, waste as food/fuel, renewable vs. nonrenewable resources, or greenhouse gases and global warming. I hope to plant the seeds of an understanding that these principles can be – and are being – addressed and incorporated, just like any other design procedure.

In the spirit of “repetition is the key to learning,” the examples also reinforce definitions/terminology and recurring themes in the class. For example, the Envision Platinum Sun Valley Watershed Multi-Benefit Project addresses “watershed” and “floodplain,” two aspects of the natural environment that I define in an early lecture. The Envision Silver Line J Pipeline Project includes innovative geotechnical methods to reduce excavated materials taken off site; the project description uses terms such as “pipe embedment,” “trench backfill,” “borrow material” and connects to earth materials research at the University of Texas. A recurring theme in ENCE 100 is that all the specialties are required for large infrastructure projects; the Envision examples illustrate this theme beautifully, as it is sometimes hard to isolate a single specialty in each.

**Sustainability learning outcomes**
Each student will be
(a) … aware that the American Society of Civil Engineers includes sustainability in the first Fundamental Canon of Engineering Ethics.
(b) … able to give an example of incorporating a sustainability principle in their favorite specialty area, or any of the six civil & environmental infrastructure specialties.

**How I will test these outcomes**
My Final Exam already includes questions addressing Big Ideas #1 and #2. It will not be difficult to expand these questions to include Big Idea #3. (*I prefer not to provide those test questions here, as I understand that this little report may be available online. However, I am happy to follow up with statistics if there is interest.*)

Following pages:
- New slides to be included in my “Introduction to the Class” lecture (details of the Envision system may be moved to a later class meeting.)
- Revised class syllabus; *revisions in red for Chesapeake Project information only*; they will appear as normal text in the syllabus provided to class.
ASCE Code of Ethics

- Fundamental Canon 1:
  Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.

Sustainable Development

- ASCE Board of Directors: “Sustainable Development is the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development.”

Civil Engineers have an ethical responsibility to foster SUSTAINABILITY

Sustainability: Who is the “Public”?

Population Growth Throughout History

One planet.

How can Civil & Environmental Engineering help to
- meet human needs
- protect health, safety, and welfare
- conserve and protect natural environment and resources?

Professional Commitment to Sustainability

http://www.asce.org/sustainability/

ENVISION: A Rating System for Sustainable Infrastructure

http://sustainableinfrastructure.org


downloaded 6/29/2016
Sustainable Infrastructure Examples in ENCE 100

- This class will look at examples of ENVISION-awarded projects for each specialty area in CEE
Instructor
Dr. Kaye L. Brubaker
Room 1180 Glenn L. Martin Hall (EGR)
Phone: (301) 405-1965
Fax: 301-405-2585 (Dept. Fax – please advise by phone or email if you send a fax)
Email: kbru@umd.edu
Office Hours: TBA

Class Meeting Time & Place
Friday 1:00-1:50 p.m.
1202 Glenn L. Martin Hall (EGR)

Web Site
http://elms.umd.edu (Canvas/ELMS – Password-protected)

Recommended Books
There is no required textbook for this class. Any assigned readings or web resources will be posted or linked on Canvas/ELMS.
Recommended:

*Introduction to Infrastructure: An Introduction to Civil and Environmental Engineering*, by Michael R. Penn and Philip J. Parker. The book is available hard copy in the University bookstores, as an e-book from Coursesmart.com, or for purchase or rental in Kindle form at Amazon.com.


Goal
The goal of this class is to acquaint you with the Civil and Environmental Engineering profession, the history and importance of the profession’s contribution to society, professional ethics and sustainability, the Department’s curriculum, and the many resources available in the Department, College, and University for career exploration and building a successful career.

Sustainability
According to the American Society of Civil Engineers, “Sustainable Development is the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development.” Reflecting the profession’s commitment, this class will interweave example applications of sustainability principles into our discussions of various aspects of infrastructure.
Grading Method and Policies
The grade for this class will be computed as follows (see explanations below):

- Class participation: 45%
- Assignments: 40%
- Final Exam: 15%

Assignments are due at the beginning of class on the due date.

The class participation score is based largely on being attentively present in class. Respect the instructor, your colleagues, and our learning environment. Refrain from browsing the web, playing games, phoning/texting, working on other classes, sleeping, conversing, etc. A “participation quiz/worksheet” will be given in each class. This quiz/worksheet is individual work.

Academic Integrity
A scholarly community built on individual responsibility and mutual trust is the foundation for learning. The University of Maryland has approved a Code of Academic Integrity (http://www.shc.umd.edu/SHC/StudentAcademicDishonesty.aspx), which prohibits cheating on exams or assignments, plagiarizing papers, buying papers, submitting fraudulent documents and forging signatures. The University Code applies to this class.

In this class or any other, if you find yourself in a desperate situation that might lead you to violate the Code, please contact the instructor. Whether the issue is lack of understanding, pressure, or procrastination, it is better to address it head-on than to violate the integrity of the community and develop unethical habits.

This class’s policy on collaboration: Many students find that working with others is an aid to their learning. In addition, the ability to communicate and work with others is highly valued in professional practice. Each class assignment will be clearly identified as group or individual work. In-class “Participation Quiz/Worksheets” are individual work; consultation with classmates is not allowed. For group assignments, each student is expected to contribute his/her proportionate share to the group assignment and understand all parts of the project, not just his/her own.

Illness or Medically Necessary Absences
Please read the UM policy on excused absences: http://www.umd.edu/catalog/index.cfm/show/content.section/c/27/ss/1584/s/1540

In the event that you must miss a class due to illness, the policy in this class is as follows:

1. For every medically necessary absence from class, make a reasonable effort to notify me before the class. When returning to class, you must provide a note identifying the date of and reason for the absence, and acknowledging that the information in the note is accurate. Email is acceptable for this purpose.
2. If you are absent more than 2 times, you must provide documentation signed by a health care professional.

Religious Observances
In accordance with University policy, students shall be given an opportunity, whenever feasible, to make up in a reasonable time any academic assignment that is missed due to individual participation in religious observances. It is your responsibility to inform me in advance (one week) of any intended absences or due date adjustments for religious observances.

For observances such as funerals, you are asked to provide written confirmation of personal connection.
Making Up Missed Classes
If you miss class for any reason, it is your responsibility to review the online material and obtain notes, handouts, etc., for the missed class, and – if clarification is needed – to contact the instructor during office hours.

Disabilities and Special Needs
The University has a legal obligation to provide appropriate accommodations for students with disabilities. If you have special needs related to a learning disability or physical disability, please inform me as soon as possible so that I can arrange accommodations. If problems or particular needs arise during the semester, please make me aware of them as soon as possible so I can work with you to address them.

My Role as a Teacher
I will try to organize and lead clear, informative, and interesting presentations and discussions on the class topic. I will treat everyone fairly and with respect. I will assign homework and a final exam/assessment that exercise concepts discussed in class and essential skills for academic and professional success. I will do my best to grade and return materials promptly. I will make every effort to be available to you outside of class during my office hours and by e-mail; however, please try to avoid unscheduled visits during non-office-hours times.

Your Role as a Student
You are expected to attend class, read any assigned materials before class, and turn in completed assignments on the due date. Come to class ready to think and participate. If something is unclear, please ask questions (in class, by e-mail, or during office hours).

If you are experiencing difficulties in keeping up with the academic demands of your class schedule (or if you would like to learn to study more effectively), contact the Learning Assistance Service, 2202 Shoemaker Building, 301-314-7693. Their educational counselors can help with time management, reading, math learning, note taking and exam preparation skills. All their services are free to UM students. http://www.counseling.umd.edu/LAS/
### Tentative Class Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
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<tbody>
<tr>
<td>Sep. 2</td>
<td>Why Are We Here? Introduction to Class. <strong>Big ideas: Society, Infrastructure, Sustainability.</strong> Semester assignment.</td>
</tr>
<tr>
<td>Sep. 9</td>
<td>Where Can You Fit In? Opportunities with Student Organizations</td>
</tr>
<tr>
<td>Sep. 12</td>
<td><em>Last day to drop a class without a “W”</em></td>
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| Sep. 16  | The Natural Environment; Water Resources specialty  
            | Renewable and non-renewable resources  
            | Institute for Sustainable Infrastructure’s Envision rating system  
            | [Teams finalized for semester assignment.] |
| Sep. 23  | Water Resources specialty  
            | **Sustainability Example: Sun Valley Watershed Multi-Benefit Project** |
| Sep. 30  | Environmental specialty  
            | **Sustainability Example: Grand Bend Area Wastewater Treatment Facility** |
| Oct. 7   | Environmental and Energy Infrastructure                               |
| Oct. 14  | Structural specialty  
            | **Sustainability Example: Tucannon Wind Farm**  
            | U.S. Green Building Council’s LEED rating system; Michigan DOT Bridge  
            | Sustainability |
| Oct. 21  | Geotechnical specialty  
            | **Sustainability Example: Line J, Section 1 Pipeline project**        |
| Oct. 28  | Transportation Infrastructure; Transportation specialty  
            | **Sustainability Example: Port Metro Vancouver’s Low Level Road**    
            | New York State’s GreenLITES |
| Nov. 4   | Construction; Engineering Project Management specialty  
            | **Sustainability Example: Green Build Project at San Diego International Airport** |
| Nov. 11  | Who Are We? CEE at Maryland, Department, Curriculum, Accreditation     |
| Nov. 18  | Professional Registration: What, Why, How?                           |
| Nov. 25  | *Thanksgiving Break – No Class*                                       |
| Dec. 2   | How Do We Do The Right Thing? Ethics of the Profession                |
| Dec. 9   | What’s It Like “Out There”? Young Engineers Guest Panel              |
| Tues., Dec. 20 | 1:30 – 3:30 pm Final Exam                                           |