

**CE 321 Introduction to Environmental Engineering, Fall 2008**

*Instructor:*

Dr. David Brandes, Associate Professor of Civil & Environmental Engineering  
Office: AEC 320, MW3:00-5:00 Th4:00-5:00 and by appt.  
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*When & Where:*

Lectures: MWF 10&11, AEC 315  
Lab: Th8-11, 1-4, 6-9 AEC 117A (Environmental Engineering Lab)

*Course Overview:*

CE 321 is the first of a series of required lab courses in each of the six sub-fields of Civil Engineering. It is also a core course for the Environmental Science minor. Environmental engineers seek practical solutions to a variety of problems related to environmental pollution and sustainability.

In this course we will identify and analyze a variety of these problems, and describe some engineering solutions. Because of the introductory and interdisciplinary nature of the course, we will cover a wide range of topics, including hydrology, ecology, environmental chemistry and water quality, water and wastewater treatment processes, solid waste disposal, stream and groundwater pollution, hazardous waste management, and risk assessment. Weekly laboratories will include field sampling and laboratory analyses and local field trips. We will adopt a watershed approach to looking at these issues, focusing our labs on the Bushkill Creek watershed adjacent to campus. Students will work in teams of three on a research project and will make a poster presentation of their research late in the semester.

*Learning Objectives:*

- 1) Develop an understanding of key concepts in physics, hydrology, chemistry, and ecology that are fundamental to environmental engineering
- 2) Apply science and engineering principles to a variety of environmental problems, including water and wastewater treatment, solid and hazardous waste management, and stream and groundwater pollution
- 3) Develop fundamental civil engineering skills including laboratory and field testing, and analysis and interpretation of data
- 4) Develop effective communication skills through a poster presentation of the research project
- 5) Develop knowledge of contemporary/emerging issues in environmental engineering

*Course Website:* <http://ww2.lafayette.edu/~brandesd/class/ce321/enveng.html>

*Course Schedule:* see website

*Contemporary/Emerging Issues in Environmental Engineering:*

Environmental engineering is an evolving field. Formerly it was known as "sanitary engineering", due to its early focus on wastewater collection and treatment. In recent decades, environmental engineers work on a wide variety of pollution problems, including not only treatment methods but also understanding how contaminants are transported through various environmental media (e.g., soil, groundwater, surface water, air, biota) pollution prevention, and sustainability. In the course we will discuss several contemporary or emerging issues within environmental engineering, such as "endocrine-disrupting compounds" and the issue of perhaps the most concern in the modern world – energy, fossil fuels and climate change. Your research project in particular gives you an opportunity for more focused research on such issues. *Also, you are encouraged to bring current news articles to class for discussion!*

*Text:*

Davis and Masten, 2009. *Principles of Environmental Engineering and Science*, Second Edition, McGraw Hill. Handouts from other texts, magazines, and journals may be provided as additional reading material on some topics.

*Grading:*

Two mid-term exams and final: 100 pts each

Homework: 50 pts

Labs: 50 pts

Semester project: 100 pts

Attendance, participation, and effort will also play a role in your final grade (e.g., it may be the difference between a B+ and an A-). More than two unexcused absences from class will reduce your final grade. Attendance is required at all laboratories. Late work will be accepted with full credit only if you have made prior arrangements with me. A penalty of 10% will be applied for each day that the assignment is late.

Exams

Each exam will cover only the material since the previous exam. However, some topics from earlier parts of the course provide the basis for later material, and in that sense, the exams are comprehensive. All exams are closed book and closed notes - the best way to prepare is to study your class notes, homework problems, and lab exercises. I will provide you with an equation sheet to use during the exam if necessary.

Homework

Assignments will be given weekly and are due one week from the date assigned.

Students are encouraged to work together on homework problems, which are to be done neatly, on engineering paper (or computer output), with solutions clearly presented.

Note: working together does not mean copying - you must do your own written work! Make sure that units are included with all numerical answers and are consistent. It is also a good idea to check the "reasonableness" of your answer after you are done your calculations. Solutions will be posted outside my office or on the web.

### Laboratory

The labs for this class include chemistry labs, field trips for sampling, and visits to local sites of interest (water treatment plant, wastewater treatment plant, landfill, etc.) in the Bushkill Creek watershed. A few of the labs will consist of computer exercises in the CE computer lab (AEC 302). A written report of some kind will be required for each lab. I will provide a handout with detailed instructions at the beginning of the lab period, and the write-up will be due at the beginning of lab the following week.

### Semester project

Students will work in teams of three to research an environmental engineering topic of current and/or local concern (see suggested project topics on the course website). The team will create a professional quality poster and make a brief poster presentation to a panel of Lafayette faculty, students, and outside professionals. The choice of topic and three references are due by the end of week 3. A one-page summary and list of references is due at the first exam, and a draft poster is due at the second exam. Presentations will be made at an evening session near the end of the semester. Additional poster guidelines and information will be provided in a separate handout.

### *Note on Academic Dishonesty:*

The college has clear written policies on academic dishonesty (see Student Handbook, pages 7, 20, and Appendix II). It is particularly important to provide citations for any material you use in your lab reports and poster presentation.

*"Engineers ... shall strive to comply with the principles of sustainable development"*  
- ASCE Code of Ethics, Canon 1

*"The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustees of these resources, the Commonwealth shall conserve and maintain them for the benefit of all people."*  
- Article 1, Section 27 of the Pennsylvania Constitution

## **Laboratory Procedures and Safety – CE 321**

Dr. David Brandes

The laboratory portion of CE 321 will meet in the environmental engineering lab (AEC 117). Lab activities will vary from week to week. No matter what we are doing, please be conscious of health and safety hazards, and be considerate of others' safety as well as your own. Lafayette College has a written Lab Safety guide and a Chemical Hygiene Plan, which are available for your review.

### Guidelines for the Environmental Engineering Lab (AEC 117)

No eating or drinking is allowed

Do not use equipment in the laboratory until you get the go-ahead from the instructor

All lab work must be performed when the instructor is present, unless specific arrangements have been made in advance. Do not, under any circumstances, work alone in the lab

Safety glasses must be worn in the lab. Do not wear sandals or shorts

Know the location of the exits, first aid kit, safety shower, and eye wash. If chemical is spilled on your skin, flush immediately with tap water

Gloves must be worn when handling concentrated acids or bases (caustics). Always add acid or base slowly to water; do not add water to concentrated acid or base

Never return chemicals to the stock bottles, or insert a pipet or dropper directly into a stock bottle. First pour the chemical into a small beaker, then use the pipet

Broken glass should be reported to the instructor, and placed in the square metal glass container, not in the trashcan

Inorganic wastewaters can be diluted and poured in the sink with the water running; for organic wastes, use the designated waste container in the exhaust hood

Bench areas must be tidy and chemicals returned to their proper cabinets after lab

All glassware must be rinsed and placed in the sink after lab

### Guidelines for Field Trips

Do not go directly to the site; meet first at the designated site on campus (front of AEC)

Be on time or expect to be left behind - some of the field trips will require the full three hours!

Always bring a notebook or clipboard and take notes, you will need them for your write-up

Do not wear shorts or sandals on the field trips to the water treatment plant, the wastewater plant, or the landfill

I will arrange for rental vehicles (typically minivans) for the field trips – additional College-certified student drivers will be required due to the class size

Do not venture into Bushkill Creek under high flow conditions! Use caution and be sure of your footing when in the stream

Avoid poison ivy (hairy vines, smooth, shiny dark green leaves in threes), which causes a nasty rash

Ticks are common in tall grass, weeds and woods throughout the Easton area, and may carry Lyme disease. Check yourself thoroughly when we return from the field!

In the event of heavy rain or snow, I will try to reschedule the field trip for the following week