# Lafayette College
# Department of Civil and Environmental Engineering

Updated 8/31/19

**CE 321: Introduction to Environmental Engineering and Science** **Fall 2019**

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| *Instructors:* | Course Instructor<br>Arthur D. Kney, Ph.D., P.E., BCEE<br>Office: 318 AEC<br>Phone: (610) 330-5439 | Laboratory Instructor<br>Jennifer Rao, MS<br>Office: 104 AEC<br>Phone: (908) 566 6234 |
| *Lectures:* | 3 Lectures/Wk – MWF from 8:00 – 8:50 a.m.<br>MWF from 9:00 – 9:50 a.m. | (Rm. 315 AEC)<br>(Rm. 315 AEC) |
| *Laboratory:* | Tuesday from 8:00-10:50 a.m. and 1:10-4:00 p.m.<br>Thursday from 1:10-4:00 p.m. | (RISC 230)<br>(RISC 230) |
| *Office Hours*: | Kney: Mon. 11:00 - 11:50 a.m. or Wed. 3:10 - 4:00 p.m. or by appointment<br>Rao: Tue. and Thurs. 4:00 to 5:00 pm or by appointment | |
| *Text (Required)* | 1) Silyn-Roberts H. *Professional Communications - A Handbook for Civil Engineers.* ASCE Press. 2005. | |
| *Text (On Reserve)* | 1) Davis, M. L. and S. J. Masten. *Principles of Environmental Engineering and Science*. Third Edition. McGraw-Hill. 2014. | |
| *Reference Texts:* | 1) Davis, M. L., D. A. Cornwell. *Introduction to Environmental Engineering*. Fourth Edition. McGraw-Hill. 2008.<br>2) Masters, G. M., W. P. Ela. *Introduction to Environmental Engineering and Science*. Third Edition. Prentice-Hall. 2008.<br>3) Mihelcic, J. R. and J.B. Zimmerman. *Environmental Engineering, Fundamentals, Sustainability, Design*. Wiley. 2010.<br>4) Tchobanoglous, G. and E.D. Schroeder. Water Quality, Addison Wesley Longman. 1985.<br>5) Vesilind, P. A., S. M. Morgan. *Introduction to Environmental Engineering*. Second Edition. Thomson-Brooks/Cole. 2004. | |

*Prerequisites:* Mathematics 162, **Chemistry 121**, or permission of instructor.

*Course Website*: http://sites.lafayette.edu/kneya/courses/courses-taught/ce-321
All homework assignments and homework solutions will be posted on the Course Website.

*Course Moodle Site:* https://moodle.lafayette.edu
All lecture videos and handouts will be posted on the Class Moodle Site. Laboratory information will be posted on the laboratory Moodle Site. Hard copies of handout will be supplied by instructor.

*Overview:* CE 321 is the first of a series of required lab courses in each of the seven sub-fields (construction management, environmental, geotechnical, structural, surveying, transportation, and water resources) 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.

*Course Description:* CE 321 introduces the student to applications of engineering principles to a variety of environmental topics. The topics will revolve around local issues within the Bushkill Watershed; therefore we will adopt a watershed approach to better understand the various topics. Topics include environmental chemistry, hydrology, risk assessment, water supply and pollution control, solid and hazardous wastes, and environmental management. Laboratories consist of field trips, computer modeling exercises, sample collection, and chemical analysis methods.

*Purpose:* Environmental Engineering and Science is a required course for those in pursuit of a Bachelor of Science (BS) degree in Civil Engineering. This course is also a core component for those in pursuit of a minor in Environmental Science. CE 321 is designed to be taken in a student's sophomore year.

*Course Objective:* CE 321 is designed to instill a general understanding of environmental engineering and science through class discussion/lectures, an interactive/multidisciplinary class project and an assortment of hands-on laboratories. Students will demonstrate an understanding of the use of fundamental tools through general tests, quizzes, laboratory activities, special projects and discussions. Additionally, an objective of the course is to illustrate the importance of the field in future environmental science and civil engineering courses through various activities and exercises.

*Student Outcomes*: Once completing CE 321 must be able to demonstrate an ability to:

1) apply science and engineering principles to a variety of complex environmental problems, including reactor modeling, nutrient transport, water/wastewater treatment. (Specifically demonstrated through exams)
2) demonstrate an understanding of key concepts in chemistry, biology, hydrology, geology, and ecology that are fundamental to environmental engineering while considering public health and welfare, as well as global, cultural, social, environmental, and economic factors. (Exam 2 – Problem Solving and Short Answer Question)
3) demonstrate effective written and oral communication skills through a team-based poster project.
4) demonstrate an appreciation for realistic design constraints within environmental engineering that address economic and sustainable engineering practices through class discussions tied to contemporary and emerging issues as well as numerous design problems. (Specifically demonstrated through Homework #1 and Student Survey)
5) demonstrate the ability to acquire and apply new knowledge as needed using appropriate interactive, hands-on learning strategies. (Specifically demonstrated through Cheston and Paxinosa Elementary Outreach Event (labs 1 and 6) and Student Survey)

*Grading:*

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| Two mid-term exams: | 20 % each |
| Final Exam | 20 % |
| Homework: | 10 % |
| Laboratory Exercises*: | 15 % |
| Cheston Project Poster: | 5 % |
| Attendance, quizzes, participation, effort (AQPE)**: | 10% |

*Attendance is **required** at all laboratories. A zero will be given for any missed laboratories.

**More than *two absences* from class will result in a grade reduction of **1%** for each unexcused class from the AQPE grade.

<u>*Mid-term and Final Exams*</u>: Each exam will cover only material up to the previous exam. However, some topics from earlier parts of the course provide the fundamentals 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; an equation sheet.

*Homework*: Assignments will be weekly/biweekly and will be due one week from the date assigned. Students are encouraged to work together on homework problems. (Note: working together does not mean copying – each student must do his/her own work!) Homework assignments are to be done in a neat, professional manner (i.e., on engineering paper or printed computer output) with solutions clearly explained - accompanied by supporting figures and graph when needed. Make sure that correct and consistent units are included with all numerical answers. It is also a good idea to check the "reasonableness" of your work after you are done your calculations and provide additional comment to answers that seem unreasonable. (SEE HOMEWORK GUIDELINES) Homework is typically due at the beginning of class on the due date. Late homework or lab assignments will be accepted only if the student has made prior arrangements with instructor. There will be a grade penalty of 10% for each day (weekday or weekend day) an assignment is late. Late means not handed in at assigned time (one minute past time due = one day late). Solutions will be posted on Dr. Kney's course website: http://sites.lafayette.edu/kneya/courses/courses-taught/ce-321/

*Laboratory Exercises*: 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.). 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; however, this will not always be a formal lab report. A handout with detailed instructions will be provided prior to, or at the beginning of each lab period, and the write-up will be due at the beginning of lab the following week.

*Cheston Project – Lesson and Poster Presentation:*

*Water Quality in our lakes, rivers, streams and even oceans is dependent on how humans use land. As water passes over and through the ground, eventually making its way to the various bodies of water, it picks up "pollutants" such as sediments, dissolved salts and soluble chemicals that may be present. Therefore, by understanding land-use and how it can impact water quality we might better manage land around our lakes, rivers, streams and oceans.*

*Through this mini-lesson elementary students will learn about two key contributors to water quality, turbidity (i.e., a measurement that tells us how many solids (sediments) are floating around in the water) and conductivity (i.e., a measurement that helps us understand what concentration (mass/volume) of dissolved salts are present in the water). College students will provide hands-on experiments, visual aids, and explanations around practiced lessons to educate how each of these pollutants impact water quality to our elementary school partners.*

Objectives of this project include:

1) students demonstrate proficiency of water quality lessons learn through the delivery of an education module to Easton Area Cheston and Paxinosa Elementary School children
2) provide students information about the importance of community engagement as well as inspire students to start and/or continue a path to active and engaged citizenship.
3) students demonstrate effective written and oral communication skills through a poster presentation.

The Cheston Project includes the following:

- Introduction of project during Laboratory #1
- Group Lesson Development Weeks 2 through 5
    - Thursday, September 26, 7 to 9 PM – Practice Session (2 groups will Present – Class will

discuss talking points and how best to connect with audience 5th Graders from Cheston Elementary)
    - Lesson Delivery Laboratory #6
- Cheston Poster Development Weeks 7 through 12
    - Poster guidelines and grading information will be provided within the first few weeks of classes
    - Poster Summary due at the beginning of Laboratory #7
    - Poster Draft due at the beginning of Laboratory, #10
    - Final Poster for printing sent to instructor beginning of Laboratory #12
    - Poster Session during Laboratory Period # 13

*Note on Academic Dishonesty*: Within the Civil and Environmental Engineering (CEE) Department there is a zero tolerance for academic dishonesty. Dishonesty is generally defined as plagiarism as well as copying of any kind on homework and/or exam. Academic dishonesty within the department of CEE will be punished to the most severe limitations of college policy. Lafayette College has clear written policies on academic dishonesty which can be found in the **Student Handbook**.

***Closing Statement*:** Until the last 60 or so years, the environmental impacts of the great technological and industrial advances of the past century were largely unknown or considered to be insignificant. Since the advent of the environmental movement in the late 1960s and a heightened public awareness of the limited resources of our planet, this has changed to the point where clean air and water is now of prime importance to the public. In recent years, recycling and other "green" practices have become mainstream in our society. Environmental engineers and scientists seek practical solutions to a variety of problems related to environmental pollution and sustainability.

**Where are we today? What can you do to make a difference?**

*"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**

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

*Federal Credit Hour Statement*: The student work in this course is in full compliance with the federal definition of a four *[two or one as appropriate for half and quarter unit courses]* credit hour course. Please see the Lafayette College Compliance webpage (http://registrar.lafayette.edu/additional-resources/cep-course-proposal/) for the full policy and practice statement.

*FERPA Information*: Moodle contains student information that is protected by the Family Educational Right to Privacy Act (FERPA). Disclosure to unauthorized parties violates Federal privacy laws. Courses using Moodle will make student information visible to other students in the class. Students are to be aware that this information is protected by these Federal privacy laws and must not be shared with anyone outside of the class. Questions can be referred to the Registrar's Office.

***Laboratory Safety Rules***

*Guidelines for the Environmental Engineering Lab (AEC 117):*

- No eating or drinking
- 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 to any lab session held in AEC 117.**
- 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 designated site on campus
- **Be on time or 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**
- The instructor will arrange for rental vehicles (typically minivans) for the field trips – **depending on class size additional College certified student drivers may be required**
- 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-of-three), 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*, field trips may be rescheduled. In general, we go rain-or-shine.

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