

ENE 262 – INTRODUCTION TO ENVIRONMENTAL ENGINEERING
John A. Reif, Jr. Department of Civil & Environmental Engineering
New Jersey Institute of Technology
Spring 2018

Instructor: Wen Zhang, Ph.D., P.E., BCEE

Office Hours: Tuesday/Thursday 2:00 pm to 2:00 pm or by appointment
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Lecture location/time: 11:30 am - 1:40 pm (Tuesday and Thursday) Central King Building 222 Jan 16, 2018 - May 10, 2018 Lec/Lab

ENE Lab TAs: Xiaonan Shi (xs98@njit.edu), Likun Hua (lk82@njit.edu), and Wanyi Fu (wf44@njit.edu)

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Description:

To introduce students to the interdisciplinary science, engineering, design and management concepts of engineered environmental systems. The course will cover environmental parameters, mass balance and natural systems, water quality management, water and wastewater treatment, air pollution control, noise pollution, and solid and hazardous waste management. Background material and laboratories in the environmental sciences and management areas will be covered. Group term papers and presentations will be required.

Prerequisites: Chem 125, Math 112, and Phys. 121

Course Objectives:

1. Provide students with the most relevant environmental regulations and standards; the driving forces behind environmental science and engineering projects.
2. Provide students with the scientific background needed to assess environmental quality in terms, of the physical, chemical and biological aspects.
3. Provide students with the tools necessary to understand mass balance in environmental systems.
4. Provide students with the basic scientific and engineering principles of water and wastewater treatment, air pollution control, noise pollution, and solid and hazardous waste management.
5. Introduce students to environmental report writing.

Textbook(s)/Materials Required:

- 1) Davis, M.L. and Cornwell, D.A., Introduction to Environmental Engineering, 5th Edition, McGraw Hill Companies, New York, NY, 2013, ISBN 978-0-07-340114-0
- 2) Handouts/slides

Grading:

Midterm exams	20%
Final Exam	20%
Three lab sessions and reports	15%
Six homework assignments	15%
Six projects and oral presentations	15%
Attendance and class participation (random sign-in sheet)	15%

No late homework is accepted with no exceptions. Students need to make proper arrangement to

meet homework or project deadlines. However, additional makeup assignment may be available.

Tentative course schedule (see Moodle for updates or accurate assignment)

Week	Class date	Topic	Reading Assignments
1	01/16 01/18	Introduction; Definitions, Regulations/Standards, and Natural Environmental Systems, and professional ethics and discussion Research or student competition opportunities	Ch. 1 Ch.13 Ch. 2
2	01/23 01/25	One-hour lecture by librarian speaker from NJIT library to demonstrate the reference use, scientific writing, and library resources. Basic Mass and Energy transfer and balance; reaction kinetics, reactors, unit conversion and practice	Ch.2 Ch.3 Ch.4 Ch.5
3	01/30 02/01	Water chemistry fundamentals	Ch.5
4	02/06 02/08	Water Chemistry continue First lab in Colton 414: alkalinity and hardness No homework due but need to preview the lab manual	Ch.5
5	02/13 02/15	Water Treatment and Water Pollution Lab report 1 due	Ch.5 Ch. 6
6	02/20 02/22	Second Lab in Colton 414: Jar test No homework due but need to prepare for the lab 2, midterm exam and homework 3 due next week.	
7	02/27 03/01	Midterm exam-1 <i>Special topic: plastic pollution lecture</i>	Ch. 6
8	03/06 03/08	Membrane filtration Wastewater Treatment Technologies	Ch. 6 Ch. 7
9	03/13 03/15	Spring break	
10	03/20 03/22	Midterm exam-2 <i>Special topic: Microbial fuel cells</i> Field trip might be arranged to replace a lecture class	
11	03/27 03/29	Air Pollution & Control	Ch.8
12	04/03 04/05	Third Lab in Colton 414: Dye discolorization via electrochemical oxidation	Ch.8
13	04/10 04/12	Noise Pollution & Control	Ch.9
14	04/17 04/19	Solid and Hazardous Waste Management	Ch.10
15	04/17 04/19	<i>Special topic: analytical instruments: students bring organic solution samples and test UV-vis and tour the GC operation</i>	
16	04/24 04/26	Risk assessment	
17	05/01 05/03	No class	
18	05/08	<u>Final Exam date/location TBD</u>	

Professional Component: Engineering Topics

Program Objectives Addressed: 1, 2

Course Objectives Matrix – ENE 262 Introduction to Environmental Engineering

Strategies and Actions	Student Learning Outcomes	Outcomes (a-k)	Prog. Object.	Assessment Methods/Metrics
Course Objective 1: Provide students with the most relevant environmental regulations and standards; the driving forces behind environmental science and engineering projects.				
Define environmental science and engineering	Understand the role of the environmental scientists and engineers among other engineering disciplines.	f, i, j	1	Homework, class, discussions and examinations.
Explain and discuss current and proposed relevant regulations and standards.	Learn how Federal/State environmental regulations and standards are developed as well as their impact.	i, j	1	Homework and examinations.
Course Objective 2: Provide students with the scientific background needed to assess environmental quality in terms of the physical, chemical and biological aspects.				
Provide an overview of environmental sciences and parameters.	Basic knowledge of reaction kinetics and physical, chemical and biological parameters in environmental pollution.	a, b, e	1, 2	Homework, class discussions, and examinations.
Conduct experiments in the environmental sciences.	Learn how to analyze and understand physical and chemical environmental parameters and processes necessary to engineer systems	a, b, c, d, k	1, 2	Laboratory group discussions and laboratory reports.
Course Objective 3: Provide students with the tools necessary to understand mass balance in environmental systems.				
Illustrate the mass balance approach.	Understand how environmental pollution is assessed using the mass balance scientific approach.	a, b, c, e, k	1, 2	Homework, class examples and examinations.
Course Objective 4: Provide students with the basic scientific and engineering principles of water and wastewater treatment, air pollution control, noise pollution, and solid and hazardous waste management.				
Introduce the scientific and engineering principles of water treatment.	Learn how to characterize source water, and the best available technologies (BAT) for physical and chemical treatment of drinking water.	a, b, e, h, j	1,2	Homework, class discussions and examinations.
Introduce the scientific and engineering principles of	Learn how to characterize wastewater, and the BAT for physical, chemical and biological	a, b, e, h, j	1, 2	Homework, class discussions, and examinations.

wastewater treatment.	treatment of wastewater.			
Introduce the scientific and engineering principles of air pollution and control	Learn the common air pollutants, and their pathways, and the various technologies available for control.	a, h, j	1	Homework, class discussions and examinations.
Introduce the scientific and engineering principles of noise pollution and control.	Learn the effects of noise on people and communities, as well as methods of noise measurement and control.	a, h, j	1	Class examples, and examinations.
Introduce the scientific and engineering principles of solid and hazardous waste management.	Learn the regulatory definitions of solid and hazardous wastes, and the methods used to characterize, handle wastes from their source to their final ultimate disposal or reuse.	a, h, j	1	Homework, class discussions, and examinations.
Course Objective 5: Introduce students to environmental report writing.				
Provide the mechanisms of environmental report writing.	Learn the appropriate and inappropriate terminology used in environmental report writing, sources of appropriate data, and write a case study.	a, d, g, h, i, j	1, 2	Class discussions, and case study paper.

CEE Mission, Program Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program objectives are reflected in the achievements of our recent alumni.

1 – Engineering Practice: Recent alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2 – Professional Growth: Recent alumni will advance their skills through professional growth and development activities such as graduate study in engineering, professional registration, and continuing education; some graduates will transition into other professional fields such as business and law through further education.

3 – Service: Recent alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, and humanitarian endeavors.

Our student outcomes are what students are expected to know and be able to do by the time of their

graduation:

- (a) an ability to apply knowledge of math, science, and engineering
- (b) an ability to design and conduct experiments, as well as interpret data
- (c) an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of ethical and professional responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use techniques, skills and modern engineering tools necessary for engineering practice

Revised 8/28/13