Spring 2021

ENE 262-004: Introduction to Environmental Engineering

Michael Furrey

ENE 262 – INTRODUCTION TO ENVIRONMENTAL ENGINEERING

Instructor: Mr. Michael Furrey
Office Hours: By appointment, 30 minutes before and after class (5:15pm – 5:30pm) and (9:35 – 10:05pm)
Agra Environmental and Lab Services
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Lecture location/time: Tuesdays 5:45pm to 9:50pm – January 19. 2021

ENE TA:Meghana P J
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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

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. ***Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in***

disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu*

Grading:

Midterm exams	20%
Final Exam	20%
Three lab sessions and reports	15%
Homework assignments	15%
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.

Week	Topic	Reading Assignments
1, 2	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, 3	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	Water chemistry fundamentals **First lab: alkalinity and hardness**	Ch.5
3	Water Treatment and Water Pollution Lab report 1 due	Ch.5 Ch. 6
4	**Second Lab: Jar test** No homework due but need to prepare for the lab 2, midterm exam and homework 3 due next week.	
5	**Midterm exam-1** *Special topic: plastic pollution lecture*	Ch. 6
6	Membrane filtration Wastewater Treatment Technologies	Ch. 6 Ch. 7
7	Air Pollution & Control (Guest Speaker)	Ch.8
7	Noise Pollution & Control (Guest Speaker)	Ch.9
7	Solid and Hazardous Waste Management (Guest Speaker)	Ch.10
8	**Final Exam date/location TBD**	

Professional Component: Engineering Topics
Program Objectives Addressed: 1, 2

Course Objectives Matrix – ENE 262 Introduction to Environmental Engineering

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures

Student Learning Outcome 1: Describe and discuss relevant environmental regulations ethics and standards; the driving forces behind environmental science and engineering projects.			
Define environmental science and engineering	4, 7	1	Homework, class, discussions and examinations.
Explain and discuss current and proposed relevant regulations, standards and ethical rules.	4	1	Homework and examinations.
Student Learning Outcome 2: Assess environmental quality in terms of the physical, chemical and biological aspects.			
Provide an overview of environmental sciences and parameters.	1, 2	1, 2	Homework, class discussions, and examinations.
Conduct experiments in the environmental sciences.	6, 5	1, 2	Laboratory group discussions and laboratory reports.
Student Learning Outcome 3: Illustrate mass balance in environmental systems.			
Illustrate the mass balance approach.	1, 2	1, 2	Homework, class examples and examinations.
Student Learning Outcome 4: Recognize 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.	2	1, 2	Homework, class discussions and examinations.
Introduce the scientific and engineering principles of wastewater treatment.	2	1	Homework, class discussions, and examinations.
Introduce the scientific and engineering principles of air pollution and control	2	1	Homework, class discussions and examinations.
Introduce the scientific and engineering principles of noise pollution and control.	2	1	Class examples, and examinations.
Introduce the scientific and engineering principles of solid and hazardous waste management.	2	1	Homework, class discussions, and examinations.
Course Objective 5: Practice environmental report writing.			
Provide the mechanisms of environmental report writing.	3	1, 2	Class discussions and case study paper.

CEE Mission, Program Educational 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 educational objectives are reflected in the achievements of our recent alumni:

1 – Engineering Practice: 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: Alumni will advance their skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as business and law through further education.

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

Our Student Outcomes are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Revised: 1/13/2021

Class Descriptions and Week Number (16 total):

Class 1 – Source Water Analysis and Protection
Class 2 – Safe Drinking Water Act
Class 3 – Wastewater Chemistry and Treatment
Class 4 – Clarification of Water and Wastewater
Class 5 – Filtration
Class 6 – Disinfection and Oxidation of Water
Class 7 – Corrosion Control
Class 8 – Air and Noise Pollution Control (March 16th 2021)
Class 9 - Solid and Hazardous Waste Management (March 23rd 2021)
Lab 1 – pH, Alkalinity and Hardness Testing and Lab Report
Lab 2 – Jar Testing and Lab Report
Class 10 – Water and Wastewater Chemistry Fundamentals
Class 11 – Emerging Contaminants
Class 12 - Residuals/Ethics for Engineers/Operators/Labs
Class 13 – Inorganic and Organic Water Treatment
Class 14 – Sustainability in the Water and Wastewater Industry