JOHN A. REIF, JR. DEPARTMENT OF
CIVIL AND ENVIRONMENTAL ENGINEERING

NJIT New Jersey Institute of Technology

ENE 262 – INTRODUCTION TO ENVIRONMENTAL ENGINEERING Fall2025

Section 001: CRN ; 10 AM – 2:20 PM; Room 114, Tiernan Hall

Tuesday beginning September 2 to December 16

Instructor: **Paul Schorr**, PE, PP, BS ChE, MS CE, M ASCE
schorr@njit.edu (609) 933-3900
Office hours, call 609-933-3900 anytime
Field Trips tbd: Passaic River at Little Falls,
Rockaway Valley RSA wastewater, PVWC water
Lab: Hardness, Alkalinity & Jar Testing, dates TBD, Colton Room 420
Teaching & Laboratory Assistant: TBD, ____@njit.edu

Prerequisites: Chemistry 125; Math 112, Physics 121

Required Text (T): Davis, M.I. and Cornwell, D.A., Introduction to Environmental Engineering,
5th Ed. or 6th ed., McGraw Hill Companies, New York, N.Y., 2013, ISBN 978-0-07-340114-0, or digital

Analog tools to be provided: mason's level

Supplemental References to be provided: American Water Works Assn. OPFLOW Certification Corner
Internet References: Passaic Valley Water Commission Annual Water Quality Report; United States Geological Survey N.J. Streamflow, Gage 01389005; New York City Division Water and Sewer Bond Prospectus; Rockaway Valley Regional Sewerage Authority; National Society of Professional Engineers, Board of Ethical Review; Report on Water Supply, Water Power, the Flow of Streams, and Attendant Phenomena, 1894, by Cornelius Clarkson Vermeule, Consulting Engineer; Bioastronautics Data Book, 2nd Ed. National Aeronautics and Space Administration; Instream Aeration, 1970, by William H.Whipple, Brigadier General, USACoE.

Objectives:

a. Provide **concepts and analytical tools** for equitable use of water, air and land resources during normal and extreme conditions, such as drought, floods, air inversions, heat waves, hazardous waste spills and pandemics that disrupt public health, safety and welfare;
b. Encourage use of **open and affordable materials** from NOAA, USEPA, USGS, NJDEP, New York City, Wikipedia, YouTube, university libraries, professional societies;
c. Provide **educational credits** for exams for the Introductory License to Operate a Water or Wastewater Treatment Plant (https://www.state.nj.us/dep/watersupply/dws_train.html) and approved courses by the State (https://www.nj.gov/dep/exams/docs/Courselist.pdf)
d. Use an **ENGINEERING APPROACH to PROBLEM SOLVING** for all assignments:
   1. **provide a title** page to identify – prob. #, name, class, date; professor, university,
   2. **restate** the problem, **define** knowns, unknowns, and assumed terms and their **units**;
   3. **draw to scale** a representation of the problem and solution;
   4. **propose** a qualitative and quantitative mathematical or graphical **solution procedure**;
   5. **substitute** numerical values into the solution procedure **to derive a suggested answer**;
   6. **provide a quantitative error** based on statistics, measurements, formulas, graphs;
   7. **provide a disclaimer** based on your limitations of time, skill and experience;
   8. **cite references** by page and author and **acknowledge contributions** of individuals.

e. **Provide** each student with experience in giving **oral presentations**.
f. **Compare design concepts from textbooks to newspapers and Licensed Operators**

ASSIGNMENTS: Each student will have one assignment each week from a List of Assignments, to be posted
before each class. The format must be the **Engineering Approach to Problem Solving:**

ABBREVIATIONS: **CC**= Certification Corner; **CV**= 1894 Report; **CS**= chap-sect; **D**= Discussion Questions; **E**= example**; Eq**= equation; **F**= Figure; **FE**= FE Exam; **N**= Newspaper; **NASA**= Bioastronautics; **NSPE**= Case Study; **P**= problems; **PVWC**=Water; **R**= Chapter Review; **T**= Table; **TBSA**= Sewerage; **USGS** = gage #.

Class Date Week # - month/day	**Topics**	**Text to be read before class**	**List of oral and written assignments**	**Concepts/Keywords**
1- 9/2	Book organization, Instructor background, Approach to problem solving, Operator Testing	**CS-Introduction** 1-11 (pgs 1-18) List or Elements, Periodic Table, About the Authors, Preface, Acknowledgements, Contents, Index, Appendix A, B, C	**F**1,2 4; **T** 3,4,5,6 **P**1,2,3,4,5, 6,7,8, 9,10,11; **D**1,2,3,4,5,6,7; **FE**1,4; **NSPE- 72-9;** **N-** Time cover; **NASA** – p.2; **USGS**-01389005	Ethics & transparency. Approach to Problem Solving. mass & energy. institutional vs hydrologic boundaries, water & air properties
2- 9/9	**CS - Materials & Energy Balances**: Unifying theories.	**CS** 1,2,3, time, (pgs 25-37)	**E** 1,2,3,4,5 **R** 1,2,3,4,5 **P** 1,5,9	Dimensional homogeneity.

	Materials. Balances. Time. **Wastewater** treatment **-** intro	**F** 8-13, **T** 8-9, **Eq** 8-38	**D** 1,3 **FE** 1, 4	loading = flow rate x concentration. kinetic+potential + internal energy= (Bernoulli's equation)
3- 9/16	**CS** – **Materials & Energy** Mixing, Reactions Losses Thermodynamics, Heat Transfer 2^{nd} Law Thermo **LIBRARIAN:** Use of AI; **CS** - **Risk Assessment**, probability, data collection, toxicity, exposure **FIELD TRIP #1 – Rivers & Canals**	**CS** – plug flow, CSTR (pgs. 37-53); units, conduction, convection, radiation (pgs. 57-70) **CS** 1, 2,3 (pgs. 89-103)	**E** 6,7,8,9,12,13,14 **F** 2,3,4,7,8,9,15 **T 4** (water) **R** 6,7,8 15,18; **P** 11,14, 19,22, 31,40 (Edinger) **D** 1 **R** 1,2,4,7,8 ; **Eq** 2,9 ; **R** 1, 4; **P** 1,7	Steady vs Unsteady states. Material & Energy flows from high to low- temp., elev., voltage, concentration; change of state - e.g. vapor/ condensate/ precipitation/ burden=concentration x exposure (age). mixing; toxicity acute nitrate, secondary - MTBE, OSHA - formaldehyde
4- 9/23	**CS-** Water Resources Engineering, : **FIELD TRIP #1:** PVWC canal, Passaic & Pompton Rivers & Wanaque South Intake	**CS** 1,2,3 (pgs124-126) CS 5 (pgs. 131-150) CS 6,7 (pgs159-169, 177-181)	**R** 1 to 9, 11 to 14, 19 to 23, 31; **P** 1,6,14,21,25,33, 37, 43,54; **D** 2, **FE** 1,3,4	Recharge; Vermeule; Harry's Brook, flood plain & groundwater; mason's level-slope; starting condition; Manning formula; Reynold's number
5- 9/30	**CS-** Water Chemistry. Wastewater Treatment intro **LAB**: - alkalinity & hardness	**CS** 1 to 6 (pgs. 216-241);	**R** 1 through 11 **P** 1 to 44 **R** 4, 7, 5	Water and wastewater treatment; charge conservation. **East Palestine** Ohio Hazardous wastes;
6- 10/7	Water Chemistry continued Water Treatment –	**CS** 5 **CS** 6 (pgs 250 to 282, 297 to 365);	**R** 2 through 45; **P** 1-11, **P** 30 to 66; **D** 1 to 6;	Volatility; density; solubility. diffusion Residence time; mixing; effluent standards;

	FIELD TRIP#2 Wastewater Regional Sewerage Authority?		**FE** 1 to 4 **R** 14,7,5	
7- 10/14	Water Treatment **LAB**: Jar tests	**CS** 6 continued	Clinton Bogert Eng & USEPA manuals	Scale up from lab bench/pilot/full; Concept to as-built;
8- 10/21	**FIELD: TBRSA?** Trip Water Pollution	**CS** 7 (pgs. 388-440); **New Jersey Water Quality Standards** - defines conventional water treatment	**R** 1-35; **P** 1 to 16, **P** 7-19 to P 7-47; **D** 1 to 7 **FE** 1 to 4	Analog vs digital simulation of BOD/DO for Instream Aeration; ORSANCO, East Palestine water impact
9- 11/4	Wastewater Treatment. **FIELD TRIP#WATER**	**CS** 8	RVRSA website California OWP.	Oxidation ditch, residence time =vol/ flow rate; UV rad
10- 11/11	Air Pollution Hazardous Waste	Chapter 9 (pgs. 455-557) Chapter 12	Nat.Trans.Safety Board ; Nomographs	East Palestine air dispersion by temp, wind, nomograph
11- 11/18	Air Pollution	Chapter 9 ; R8,9	USEPA Ohio EPA	First Responder/ Eng Operator/ **ETHICS**: Bridge on River Kwai
12- 11/25	Noise Pollution Solid Waste Mgt	Chapter 10 Chapter 11	Acapulco Hurricane	Institutional/ Eng/ Political Differences
13- 12/2	Sustainability and Green Engineering	Chapter 13	Climate Change. Building technology	Carbon sequestration, Transportation Eng Architectural Coor.
14 – 12/9	Final Presentations Team Projects.		Assignments TBD.	
15 - 12/16	Final exam		TBD	

GRADING (subject to revision) % of total grade Raw Score range for assignments

Final Exam/Special Project #1 15% 0-10; 1 point/step app. to problem solving

Team Field Trip Report - #3 10% 0-10; 1 point/step app.to problem solving

Assigned written problems #10 30% 0-10; 1 point/step app.to problem solving

Oral presentations - no more than 3 20% 0-10; 1 point/step app.to problem 3solving

Team/Individual lab reports – #2 15% 0-10; 1 point/step app.to problem solving

Certification Corner questions – #1 month 10% 0-10; 1 point/step app.to problem solving

A = 4.0	90 to 100%
B+ =	87 to 89%
B = 3.0	80 to 86%
C+ =	70 to 79%
C = 2.0	60 to 69%
D =	50 to 59%
F =	Below 50%

*The NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students.
The approach to problem solving requires that those individuals who have collaborated or contributed to assignments be acknowledged.
Plagiarism is defined as taking credit for work by others and will be considered a violation of the NJIT Honor Code. Use of AI must be specifically cited and answers independently verified
All disputes about points and grades must be written and specific to the exam, problem, report or presentation in question.
Changes to grades must be made with the approval of the Program Chair and within the University time frame for making changes.
WEBEX classes may be recorded to verify presence and participation. Chat may also be used to verify presence and participation.
The use of electronic devices that interferes with problem solving for individuals or teams is strictly prohibited.
Any reference obtained from an electronic device must be identified sufficiently to verify accuracy.
Written assigned problems or CC must be submitted electronically as WORD documents
Raw scores will be provided for assigments not letter grades
Field Trip reports and Lab reports must be submitted individually when specified.
>>

ADDITIONAL REFERENCES

https://abcnews.go.com/US/toxic-chemicals-train-derailed-ohio-originally-reported-data/story?id=97080179

https://www.youtube.com/watch?v=EV2fKrRFGRE

Outcomes Course Matrix - Prepared By: Adjunct Professor Schorr

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Describe and discuss environmental regulations, standards, ethics and the driving forces behind environmental science and engineering projects			
Define environmental science and engineering as practiced by agencies and individuals; read and rewrite problems in engineering terms. Listen to Operators and managers of systems that did not meet design expectations	1, 3	1, 3	Weekly assignments scored by use of Approach to Problem Solving.
Explain and discuss past, present and proposed environmental regulations, standards, techniques and ethics, in terms of "environmental justice", equitable allocation of resources in average and in extreme situations. Listen to Operators and managers of systems that did not meet design expectations	1, 2, 3, 4	1, 2, 3	Weekly assignments scored by use of approach to problem solving and final exam.
Student Learning Outcome 2: Assess environmental quality in physical, chemical and biological terms in engineered systems and facilities			
Understand environmental and engineering parameters, unit, assumptions and conversion factors (physical and time dimensions). Listen to Operators and managers of systems that did not meet design expectations.	**1, 2, 3**	**1, 2, 3**	Weekly assignments and exams scored by use of approach to problem solving
Conduct laboratory tests for turbidity, hardness and for coagulation/flocculation by jar testing, explain assumptions (visual colors codes), apply those results to design and operation of water and wastewater systems and sensors .	**1, 2, 5, 6**	**1, 2**	Weekly assignments and exams and laboratory work.
Student Learning Outcome 3: Illustrate mass balances in environmental and engineered systems			
Draw problem to scale in 1,2 or 3 dimensions, to show the flux (rate of flow) of chemicals between air, water and land, through an engineered treatment, storage, and distribution systems and through a biological system.	2, 3	1	Weekly assignments, virtual or actual field trips and exams

Conceptualize mathematical models, equations and empirical formulas to calculate the rate (volume per unit time) and amount of chemicals (concentration per unit volume) in and through systems and the cycles or trends that may be occurring	2, 3	1, 2	Weekly assignments and exams
Student Learning Outcome 4: Apply basic scientific and engineering principles of water and wastewater treatment, air pollution control, and hazardous waste management			
Apply the standards to the design of water, wastewater, air pollution and hazardous waste facilities by using visual examples. Listen to Operators and managers of systems that did not meet expectations.	1,	1	Weekly assignments, virtual or actual field trips and exams
Apply control technology to the operation of water, wastewater, air pollution, and hazardous waste facilities.	2	1	Weekly assignments, virtual or actual field trips and exams
Explain potential sources of error in design and operation of systems and equipment and techniques to monitor and respond to unexpected circumstances.	2, 3, 7	1, 2, 3	Weekly assignments, virtual or actual field trips and exams
Cite references and acknowledgement any assistance	1-7	1-7	Weekly assignments, field reports, exams

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 scholarships among our faculty and students
- to promote service to the engineering profession and society

Program Educational Objectives

Our **Program Educational Objectives** are reflected in the achievements of our recent alumni:

1. **Engineering Practice:** Alumni will successfully engage in the ethical practice of civil engineering within industry, government, and private practice, working towards safe, practical, resilient and 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 technical and interpersonal 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 academia, 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.

Student Outcomes

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 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 conclusion
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Updated 8/2025