



SYLLABUS ENE 262 – INTRODUCTION TO ENVIRONMENTAL ENGINEERING –1-5-2025

**Department of Civil and Environmental Engineering
New Jersey Institute of Technology**

**Spring 2025 – each Thursday beginning January 23 to May 15
Section 001: CRN**

Instructor: Adjunct Professor: **Paul Schorr**, PE, PP, BS ChE, MS CE, M ASCE; 609-933-3900 cell; schorr@njit.edu
Office hours, call cell, Thursday 1:45 PM to 2:45 PM Colton Hall
Class hours Thursday 8:30 AM to 1:30 PM, Class room Kupfrian #210
Field Trips tbd: Passaic River at Little Falls, Two Bridges RSA wastewater, PVWC water
Lab: Hardness, Alkalinity & Jar Testing, dates tbd, Colton Rm 420
Teaching & Laboratory Assistant: tbd

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; Two Bridges 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, USA CoE.

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, scale;
 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 of textbooks to news, labs, facilities, and Licensed Operators**

AI statement: The use of artificial intelligence (AI) is permitted in this course only when explicitly stated in assignments. If students use AI for any course-related work, they must cite it according to the guidelines provided on the [NJIT Library AI Citation page](#). If you have any questions about AI use in this course, please contact the course instructor before submitting any assignments. In cases where AI use is not allowed, students are expected to complete work without AI assistance to develop their skills in this subject area.

ASSIGNMENTS: Each student will have one assignment each week from a List of Assignments, to be posted before each class. The format of assignments 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- 1/23	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- 1/30	CS - Materials & Energy Balances: Unifying theories, Materials Balances, Time	CS 1,2,3, time, (pgs 25-37)	E 1,2,3,4,5 R 1,2,3,4,5 P 1,5,9 D 1,3 FE 1, 4	Dimensional homogeneity; loading = flow rate x concentration; kinetic+potential + internal energy= (Bernoulli's equation)
3- 2/6	CS – Materials & Energy Mixing, Reactions Losses Thermodynamics, Heat Transfer 2 nd Law Thermo CS Risk Assessment, probability, data collection, toxicity, exposure	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; mixing; toxicity acute-nitrate, secondary - MTBE, OSHA - formaldehyde
4- 2/13	CS Water Resources Engineering,	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- 2/20	CS Water Chemistry 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; East Palestine Ohio Hazardous wastes; charge conservation
6- 2/27	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; FE 1 to 4 R 14,7,5	Volatility; density; solubility; diffusion Residence time; mixing; effluent standards;

7- 3/6	Water Treatment Lab Jar tests	CS 6 continued	Clinton Bogert Engg & USEPA manuals	Scale up from lab bench/pilot/full; Concept to asbuilt;
8- 3/13	Field Trip		Passaic Valley Water Commission	
9- 3/20	Water Pollution	CS 7 (pgs 388-440);	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
10- 3/27	Wastewater Treatment	CS 8	RVRSA website California OWP;	Oxidation ditch, residence time / volume
11- 4/3	Wastewater Treatment	Chapter 8	Two Bridges field California OWP	Ultra Violet Radiation & DNA
12- 4/10	Air Pollution Hazardous Waste	Chapter 9 (pgs 455- 557) Chapter 12	National Transportation Safety Board	East Palestine air dispersion by temp, wind, nomograph
13- 4/17	Air Pollution	Chapter 9 ; R8,9	USEPA Ohio EPA	First Responder/ Engg Operator/ Bridge on River Kwai
14- 4/24	Noise Pollution Solid Waste Mgt	Chapter 10 Chapter 11	Acapulco Hurricane	Institutional/ Engg/ Political Differences
15- 5/1	Sustainability and Green Engineering	Chapter 13	Climate Change	Carbon sequestration, Transportation Engg Architectural Coor.
16 – 5/8	Final Presentations Team Projects; Final exam		Assignments 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 4	20%	0-10; 1 point/step app.to problem solving
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 assignments not letter grades

Field Trip reports and Lab reports must be submitted individually when specified.

<https://abcnews.go.com/US/toxic-chemicals-train-derailed-ohio-originally-reported-data/story?id=97080179>
<https://www.youtube.com/watch?v=EV2fKrRFGRE>

- an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusion
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Updated 1/6/2025

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