

COURSE OUTLINE
SPRING 2018
ENE 664 PHYSICAL & CHEMICAL WATER TREATMENT
Department of Civil & Environmental Engineering
New Jersey Institute of Technology

Text: Water Treatment Principles and Design, 3 rd edition, MWH, John Wiley & Sons, 2012, ISBN 978-0-470-40539-0	
Instructor: Adjunct Professor Paul Schorr, PE, PP ; Room: Colton Hall, Contact: 973-596-2444, administration; 609-933-3900 cell; email: schorr@njit.edu Office Hours: Wed 4:30 -5:30 pm and by appointment; Adjunct's office	

Date	Week	Chapt / Sect	Topics	Weekly Quiz: Tables (T); Figures (F); Examples (E)	New Jersey References
1-17	1	C 1 / 1.1 to 1.5	Preface- Introduction - History – Ethics – Professional Engineering Explain the impact of algal productivity on water treatment technology, Form SP Teams and assign work	T 1.1; T 1.2; F 1-1;	Special Water Treatment-1; NJSA 8:27 et seq. ; Special Problem (SP): algal productivity on the Passaic River
1-24	2	C 2 / 2.1 to 2.6	Physical & Chemical Quality of Water; Explain the physical and chemical precursors to algal productivity in ref. through equations	T 2.1; E 2.1; E 2.2; E 2.3; F 2.5; T 2.3; T 2.4; T 2.7; Analyze SP references	Prevention & Removal of Chlorination Byproducts; Lysed algal cells release organics that may form DNBYs or T&O organics
1-31	3	C 3 / 3.1, 3.2, 3.7, 3.8	Microbiological Quality of Water; Explain natural biological feedback and feedforward control on algal productivity and nutrients in treatment	E 3.1; T 3.1; T 3.3; F 3.2; F 3.3; F 3.4; F 3.6; T 3.7; F 3.13; T 3.10; T 3.11; T 3.12; Draw Critical Path for SP Algorithm	USGS 01389005; Passaic River Between Two Bridges and Little Falls; Conditions upstream of intake change from lake to channel habitat

2-7	4	C 4 / 4.1, to 4.6	Water Quality Management Strategies; Explain statistical analyses in neural network analysis	T 4.3; T 4.5; T 4.7; T 4.8; T 4.9; T 4.9; F 4.5 to 4.11; T 4.12; T 4.13; E 4.1; Gather SP Data from USGS site and prepare statistical analysis	NJSA 40: NJDEP website; Water Supply Plan; Surface Water Supply Transfer Network; Liquid Assets; Pumped storage changes habitat
2-14	5	C 5 / 5.1 to 5.6	Principles of Chemical Reactions; Explain neural network analysis to predict algal productivity and water treatment	E 5.1; E 5.2; E 5.3; F 5.1; E 5.5; E 5.6; E 5.7; E 5.8; E 5.9; E 5.10; E 5.11; E 5.12; Determine relative significance of water quality parameters	USGS 01389005; USGS Passaic River – Faust & Anderson; USGS Data collection frequency and statistical correlations
2-21	6	C 6 / 6.1, 6.2 6.3 6.4 6.5 6.6 6.7, 6.10,	Principles of Reactor Analysis and Mixing Explain hydrologic and hydraulic differences between lake and channel flow models	F 6.1; T 6.1; F 6.3; F 6.4; F 6.5; E 6.1; E 6.3; F 6.14; F 6.18; E 6.6; E 6.11 Use neural network to calibrate and verify parameters most relevant to algal productivity	Passaic River Streamflow varies from CSTR to PF
2-28	7	C 7 / 7.6, 7.7	Principles of Mass Transfer Draft findings	E 7.7; E 7.8 Graph results of neural network analysis	PVWC alters operations to treat algal bloom

3-7	8	C 8 / 8.4	Chemical Oxidation and Reduction Present Findings & Reports	E 8.9; E 8.10	
3-14	9	C 9 / 9.1 to 9.4	Coagulation and Flocculation	T 9.4; F 9.11 E 9.2; E 9.3	PVWC sand ballasted flocculation
3-21	10	C 10 / 10.1 to 10.7	Gravity Separation	E 10.7	
3-28	11	C 11 & 12 / 11.1 to 11.4; 12.1 to 12.4; 15.13	Granular Filtration Membrane Filtration Granular Adsorption	F 11.3; E 12.1 T 12.1; E. 15.13	
4-4	12	C 13 & C 18 & C 19	Disinfection & Advanced Ozonation & Disinfection Oxidation ByProducts	F 13.5; E 13.4 F 13.11; E 18.5 E 19.1; E 19.3	PVWC, SUEZ
4-11	13	C 14 & C 15 C 20	Air Stripping and Aeration Nitrate Oxidation Ditch	 T 20.1	Rahway Fairlawn, PVWC, RVRSA Wayne
4-18	14		REVIEW		
4-25	15		FINAL		

QUIZZES: 300 points (closed book) A 30 point quiz will be given at the end of class. There will be no make-up quizzes without previously written and approved documents. The passing grade for each quiz will be 21 points. All quizzes must use the “approach to problem solving” given in the first class.

SPECIAL PROBLEM CLASS PROJECT: 200 points A collaborative paper on algal productivity on the Passaic River will be presented as the midterm exam (week 8). The paper will adhere precisely to the format and analytical technique in “Factors affecting algal blooms in a man-made

lake and prediction using an artificial neural network” Jae K. Park, Elsevier, Measurement 53 (2014) 224-233. The use of xcell “solver” may be substituted for the neural network. Individual project participation will be based on an equitable initial distribution of work and agreed upon in writing with time and quality constraints.

WEEKLY CLASS AND PROJECT PARTICIPATION: 100 points

FINAL EXAM: 200 points - Open book

Other: Lecture reference material will be posted through Moodle (moodle.njit.edu)
 Some lectures may be in distance learning mode.
 Field trips to water facilities may be arranged

FINAL GRADE: A = > 90%
 B+ = > 87 %
 B = > 80%
 C = > 72%
 D = > 70%
 F = < 70%

The NJIT Honor Code will be upheld. Any violation will be brought to the immediate attention of the Dean of Students. Credit must be given for collaborating and contributing authors.

Students will be advised by the Instructor and must agree to any modifications or deviations from the syllabus throughout the semester.

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:** 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, civil 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 to analyze and 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, societal, and environmental 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