

# **ERE 440/640 WATER AND WASTEWATER TREATMENT**

Fall 2022

Class meeting times: Tue & Thu 12:30-1:50 pm  
Classroom: Baker 159

Instructor of record: Dr. Wendong Tao  
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Office hours: Mondays 11:00-12:00 pm or email for appointment

TA: Liam Hanley  
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Office hour: Wednesday 4:00-5:00 pm or email for appointment  
Office location: Baker 410

Grader and Lab: Pubudu Wickramasinghe  
Email: [pwickram@syr.edu](mailto:pwickram@syr.edu)

## **Course Description**

Three hours of lecture per week. Two laboratory exercises and one field trip. Design principles and practice of unit operations and processes for water and wastewater treatment. Study of the engineering concepts and design procedures for water and wastewater treatment. Graduate students in ERE640 will do an individual or group project. Spring. 3 credit hours.

## **Prerequisites**

ERE 440: ERE 275 Ecological Engineering; ERE 339 Fluid Mechanics

ERE 640: General chemistry, microbiology, water quality, and fluid mechanics or hydraulics

## **Course Learning Outcomes**

After completing this course, students will be able to:

1. Explain the importance of water and wastewater treatment in achieving sustainable cities and resilient watersheds;
2. Describe the principles of the common water and wastewater treatment processes;
3. Determine important design and operational parameters for water and wastewater treatment processes; and
4. Evaluate the pros and cons of unit processes and operations.
5. (for ERE640 only) Recommend engineering techniques and/or scientific tools for field and laboratory experiments to improve a treatment process.

## **Program Learning Outcomes – BS in ERE**

(I = Introduction, R = Reinforce, E = Emphasize; A = ABET Criteria 3 assessment)

1. [EA] an ability to identify, formulate, and solve complex engineering problems by

- applying principles of engineering, science and mathematics
2. [I] an ability to apply engineering design to produce solutions that meet specific 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 judgements, which must consider the impact of engineering solutions in a global, economic, environmental, and societal context
  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. [RA] 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

### **Textbook and Supplies**

**Required textbook:** Mackenzie Davis. 2020. Water and Wastewater Engineering: Design Principles and Practice, 2nd edition. McGraw-Hill Higher Education, ISBN13: 9781260132274 | ISBN10: 1260132277; hardcopy or eBook.

**Learning Guide (Lecture notes and lab manuals):** Required; electronic or self printing.

### **Appendix: Water treatment related regulations and guidelines**

(ERE440Appendix.pdf in the Information folder of the BlackBoard)

1)	National primary/secondary drinking water regulations	2
2)	Water sources and treatment of OCWA	8
3)	Industrial wastewater discharge permit (Onondaga)	11
4)	SPDES discharge permit (Metro Syracuse)	20
5)	SPDES general permit for stormwater discharges (MS4)	59
6)	SPDES multi-sector general permit for industrial stormwater	210
7)	U.S. EPA 2012 guidelines for water reuse	406
8)	New York State design standards for intermediate sized wastewater treatment systems	443
9)	Location of Metro Syracuse WWTP	712

### **Attendance Policy**

Every class will have new topic/coverage, which can be built up from an earlier lecture. Class attendance and participation in lab exercises and field trip are then required. In case you miss a

class without acceptable excuses and advance notice to the instructor, you are responsible for getting any announcements made in the class and there is no makeup for any missed labs.

### Course Schedule (tentative dates)

Week	Date	Topic/Activity	Textbook
1	Aug 30 Sep 1	Course introduction; Review of prerequisites General design considerations for water supply	Chapter 2
2	Sep 6 Sep 8	General design considerations; Coagulation; <a href="#">Assignment</a> Coagulation	Chapter 2 Chapter 6
3	Sep 13 Sep 15	Coagulation; Mixing Mixing; <a href="#">Design 1 (Chap 6)</a>	Chapter 6 Chapter 6
4	Sep 20 Sep 22	Mixing; Flocculation Sedimentation	Chapter 6 Chapter 10
5	Sep 27 Sep 29	Sedimentation; <a href="#">Lab #1 starts</a> Sedimentation; <a href="#">Design 2 (Chap 10)</a>	Chapter 10 Chapter 10
6	Oct 4 Oct 6	Granular filtration Granular filtration	Chapter 11 Chapter 11
7	Oct 11 Oct 13	Granular filtration; Membrane filtration; <a href="#">Design 3 (Chap 11)</a> Membrane filtration (MF and UF)	Chapter 11 Chapter 12
8	Oct 18 Oct 20	Membrane filtration (NF and RO) Membrane filtration (NF and RO); <a href="#">Design 4 (Chap 9&amp;12)</a>	Chapter 9 Chapter 9
9	Oct 25 Oct 27	Mid-term exam Lab #2 starts 12:30-3:20 pm	
10	Nov 1 Nov 3	Disinfection Disinfection; <a href="#">Design 5 (Chap 13)</a>	Chapter 13 Chapter 18
11	Nov 8 Nov 10	General considerations for ww treatment Headworks and Preliminary Treatment	Chapter 18 Chapter 20
12	Nov 15 Nov 17	Primary treatment; <a href="#">Design 6 (Chap 20 &amp; 21)</a> 2nd treatment (Suspended growth)	Chapter 21 Chapter 23
		Thanksgiving Recess	
13	Nov 29 Dec 1	2nd treatment (Suspended growth) 2nd treatment (Suspended growth); <a href="#">Design 7 (Chap 23)</a>	Chapter 23 Chapter 23
14	Dec 6 Dec 8	2nd treatment (Suspended growth) Treatment plant tour	Chapter 23
	Dec ?	Final Exam	

## Grading

- |    |                               |                |
|----|-------------------------------|----------------|
| 1. | One assignment                | 4%             |
| 2. | Seven design exercises        | $6\% \times 7$ |
| 3. | Two lab exercises and reports | $6\% \times 2$ |
| 4. | One tour of WWTP              | 2%             |
| 5. | Mid-term exam                 | 20%            |
| 6. | Final exam                    | 20%            |

Letter	% for ERE440	% for ERE640
A	>93	>94
A-	$\geq 89$	$\geq 90$
B+	$\geq 85$	$\geq 86$
B	$\geq 80$	$\geq 82$
B-	$\geq 75$	$\geq 78$
C+	$\geq 71$	$\geq 74$
C	$\geq 67$	$\geq 70$
C-	$\geq 63$	$\geq 65$
D	$\geq 60$	-
F	<60	<65

Participation in lab exercises is required for submitting a lab report, but no score will be given without a lab report even with lab exercises.

Late policy: The due dates for design exercises and lab reports will be announced in class. You will lose 10% of marks for one-day delay, 25% for two-day delay, and 50% for three-day delay, and 100% thereafter.

## Students with Learning and Physical Disabilities

SUNY-ESF works with the Office of Disability Services (ODS) at Syracuse University, who is responsible for coordinating disability-related accommodations. ODS is responsible for coordinating disability-related academic accommodations and will work with the student to develop an access plan. Since academic accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible to begin this process. To discuss disability-accommodations or register with ODS, please visit their website at <http://disabilityservices.syr.edu>. Please call (315) 443-4498 or email [disabilityservices@syr.edu](mailto:disabilityservices@syr.edu) for more detailed information.

## Academic Dishonesty

Academic dishonesty is a breach of trust between a student, one's fellow students, or the instructor(s). Examples of academic dishonesty includes but is not limited to plagiarism and

cheating, and other forms of academic misconduct. By registering for courses at ESF you acknowledge your awareness of the ESF Code of Student Conduct. More information regarding Academic Integrity, including the process for resolving alleged violations, can be found in the Student Handbook (<https://www.esf.edu/students/handbook/>).

### **Religious Holiday Observance**

All students have a right under NYS law and ESF college policy to observe the religious holidays of their choice, according to their individual faith. If students wish to observe a religious holiday, they should provide written notification to the instructor and/or TA (via email) of their intent to observe a particular religious holiday within the first two weeks of the semester, and prior to missing any required course meetings or activities. Reasonable requests for absence from course meetings or activities will be accommodated whenever possible, though students may be responsible for independently making up missed materials or activities on their own time, and in a timely fashion.

### **Covid-19 Guidance**

Students are required to follow the college's evolving Covid-19 protocols and restrictions, which can be found on the college website at: <https://www.esf.edu/restart/>