WATER & WASTEWATER TREATMENT, 3 credits
Meets on TuTh from 8:30 -9:45 AM (Section 001) and 10:00-11:15 AM (Section 002)

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Office Hours: Tuesday 11:15 am -12:15 pm and Wednesday 4-5pm; Other times by appointment

Course Description:
CEE 3321 is designed to provide students with the theory and applications of environmental engineering unit operations and processes. The primary goal of the course is to teach students how to utilize the knowledge they will acquire in this course to perform preliminary design of water and wastewater treatment plants.

Prerequisite: CEE 2311 (Environmental Engineering Science)

Co-requisites: CEE 3921 (Environmental Engineering Laboratory) and CEE 3107 (Mechanics III: Fluid Behavior)

Course Objectives:
At the end of this course, students should be able to:
1. construct mass balances on conventional water and wastewater treatment processes, in order to predict changes in physical, chemical, and biological water quality indicators.
2. analyze water quality indicators in order to perform preliminary design of municipal water and wastewater treatment processes, and assess the robustness of the design by using appropriate engineering design parameters.
3. identify several contemporary issues associated with public water supplies, water pollution, and wastewater treatment and discuss the relevance of these issues to the profession and society.
4. describe the national approach for managing the quality of drinking water (i.e., Safe Drinking Water Act (SDWA)), and the quality of surface waters (Clean Water Act (CWA)).

Texts:
No textbook is required. Class slides and reading materials will be posted on Blackboard. Recommended sources,
Hammer, Sr. & Hammer, Jr. (2011) *Water and Wastewater Technology*, 7th ed., Pearson Publishing Company, London, UK. (On reserve in Falvey Memorial Library)
Davis, M. (2010) *Water and Wastewater Engineering: Design Principles and Practice*, 1st ed., McGraw-Hill Education, New York, US.

Examinations and Grading:

Exam I	25%
Exam II	25%
Final Exam	30%
Homework (6-10 sets)	15%
Class participation	5%

Attendance/Homework/Exam Policy

No makeup exams will be given. If a family death or your severe illness prevents you from attending an exam, you will be given the average of your other exams as the grade for the missed exam. Unexcused absences for exams will result in a grade of zero. You are expected to attend every scheduled class. Class participation will be evaluated via in-class quiz and Q&A session.

Homeworks are due at 5PM on the due date. You can turn in problem sets in class or leave them outside my office in the envelope (140 Tolentine Hall). **Late homework will be subjected to 20% penalty regardless of the excuses (i.e.,** being sick or being overwhelmed with other activities, etc). No late homework will be accepted after 2 days from the due date. I would NOT respond to any emails regarding to homework extension. If you feel very strongly that you have a case, come and talk to me. Please refer to the academic ethic session before completing all assignments.

The overall final grades will be assigned according to the following scale.

94-100%	A		73-76%	C
90-93%	A-		70-72%	C-
87-89%	B+		67-69%	D+
83-86%	B		63-66%	D
80-82%	B-		60-62%	D-
77-79%	C+		Below 60%	F

If you have a diagnosed disability and plan to utilize academic accommodations, please contact Gregory Hannah, advisor to students with disabilities @ 610-519-3209 or visit the office on the second floor of the Connelly Center as soon as possible. The Office of Disability Services collaborates with students, faculty, staff, and community members to create diverse learning environments that are usable, equitable, inclusive and sustainable. The ODS provides Villanova University students with physical disabilities the necessary support to successfully complete their education and participate in activities available to all students.

VILLANOVA MISSION STATEMENT

"Villanova University is a Catholic Augustinian community of higher education, committed to excellence and distinction in the discovery, dissemination and application of knowledge. Inspired by the life and teaching of Jesus Christ, the University is grounded in the wisdom of the Catholic intellectual tradition and advances a deeper understanding of the relationship between faith and reason. Villanova emphasizes and celebrates the liberal arts and sciences as foundational to all academic programs. The University community welcomes and respects members of all faiths who seek to nurture a concern for the common good and who share an enthusiasm for the challenge of responsible and productive citizenship in order to build a just and peaceful world."

ACADEMIC ETHICS

The strength of the university depends on academic and personal integrity. In this course, you MUST be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition.

Report any violations you witness to the instructor. For the first offense, a student who violates the Code of Villanova University will receive 0 points for the assignment. The violation will be reported by the instructor to the Dean's office and recorded in the student's file. In addition, the student will be expected to complete an education program. For the second offense, the student will be dismissed from the University and the reason noted on the student's official transcript. You may consult the Code of Academic Integrity of Villanova University using the link below,

https://www1.villanova.edu/villanova/vpaa/studentservices/policies/integrity/code.html

Course Schedule (Subject to Change)

Wk	Date	Topic	HWs
PART I: FUNDAMENTALS OF ENVIRONMENTAL ENGINEERING PROCESSES			
1	26-Aug	Lecture 1: Course introduction	
	28-Aug	Lecture 2: Mass balance -- core concepts, reactor hydraulics	HW#1
2	2-Sep	Lecture 3: Mass balance -- reactor hydraulics, reaction kinetics	
	4-Sep	Lecture 4: Principles of coagulation and flocculation process	HW#1 Due
PART II: WATER TREATMENT PROCESSES			
3	9-Sep	Lecture 5: Coagulation and flocculation basin design I	HW#2
	11-Sep	Lecture 6: Coagulation and flocculation basin design II	
4	16-Sep	Lecture 7: Water softening	HW#2 Due
	18-Sep	Lecture 8: Gravity separation and Type I settling	
5	23-Sep	Lecture 9: Review	
	25-Sep	**EXAM I (Covers Week 1 through Week 4)**	
6	30-Sep	Lecture 11: Column tests for Type I settling	HW#3
	2-Oct	Lecture 12: Settler types and design	
7	7-Oct	Lecture 13: Principles of filtration and design	HW#3 Due
	9-Oct	Lecture 14: Adsorption and beyond	HW#4
8	14-Oct	**Semester break**	
	16-Oct		
9	21-Oct	Lecture 15: Chlorine chemistry and disinfection	HW#4 Due
	23-Oct	Lecture 16: Disinfection and Beyond	HW#5
10	28-Oct	Lecture 17: Review	HW#5 Due
	30-Oct	**EXAM II (Covers Week 4 through Week 10)**	
PART III: WASTEWATER TREATMENT PROCESSES			
11	4-Nov	Lecture 19: Clean Water Act (CWA) and introduction to wastewater treatment	
	6-Nov	Lecture 20: Introduction to biological treatment, stoichiometry and kinetics	
12	11-Nov	Lecture 21: Activated sludge processes	
	13-Nov	Lecture 22: Activated sludge design considerations	HW#6
13	18-Nov	Lecture 23: Activated sludge design considerations	
	20-Nov	Lecture 24: Biological nitrogen removal	HW#6 Due
14	25-Nov	Lecture 25: Anaerobic processes: Principles and design considerations	
	27-Nov	**Thanksgiving Break**	
PART IV: EMERGING AREAS FOR WATER AND WASTEWATER TREATMENT			
15	2-Dec	Lecture 29: Review	HW#7
	4-Dec	Lecture 27: Emerging topicsin water and wastewater treatment I	
16	11-Dec	Lecture 28: Emerging topicsin water and wastewater treatment II	HW#7 Due
FINAL EXAM: Dec 13th (Covers from Week 1 through the end)			