

ENVE 121 Biological Unit Processes

Spring Quarter 2013

Time and Place: Lectures, MWF: 3:10 pm – 4 pm, Sproul Hall 2351
Discussion, F: 8:10 am -9 am, Sproul Hall 2343

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Office Hour: Tues/Thur. 2:30 pm – 3:30 pm
Other times by appointment

Textbook: Wastewater Engineering: Treatment and Reuse, Metcalf & Eddy (McGraw-Hill, 2003)

Reference: Environmental Biotechnology: Principles and Applications, Rittmann and McCarty (McGraw-Hill, 2001)

Water Reuse, Metcalf & Eddy and AECOM (McGraw-Hill, 2007)

Biological Wastewater Treatment, Grady, Daigger and Lim (Marcel Dekker, 1999)

The objectives of this course are:

- (1) To become familiar with important biological treatment processes used in environmental engineering;
- (2) To understand the fundamental principles and approaches used to develop their design and predict their performances;
- (3) To understand aerobic and anaerobic degradation of organic compounds in liquid streams and destruction of solids, nitrogen removal, phosphorus removal and toxic organic degradation;
- (4) To examine and design suspended growth and attached growth processes;
- (5) To address residuals handling by anaerobic digestion;
- (6) To apply the principles developed and demonstrated in the course to municipal, industrial and hazardous waste problems.

Grading: Weekly homework assignments (30%)
Two midterm exams (each 15%)
Final exam (40%)

Session	Date	Topics	Reading
1	4/1	Introduction; wastewater engineering, treatment history	chapt 1
2	4/3	Wastewater constituents	chapt 1, 2
3	4/5	Calculations on wastewater parameters	chapt 2
4	4/5	Wastewater biological treatment, process analysis	chapt 2-8, 7-1
5	4/8	No class	Extra papers
6	4/10	No class	Extra papers
7	4/12	Discussion; introduction to process analysis	chapt 4
8	4/12	Microbial metabolism	chapt 7-3, 7-4
9	4/15	Microbial growth kinetics	chapt 7-5
10	4/17	Suspended growth processes	chapt 7-6
11	4/19	Discussion	chapt 7-6
12	4/19	Activated sludge processes	chapt 8-1,7-8
13	4/22	Activated sludge processes	chapt 7-9,7-10
14	4/24	Midterm Exam #1	
15	4/26	Discussion	chapt 7
16	4/26	Wastewater characterization	chapt 8-2
17	4/29	Fundamentals of BOD removal	chapt 8-3
18	5/1	Fundamentals of nitrification	chapt 8-3,8-4
19	5/3	Discussion	chapt 8-5
20	5/3	Nitrogen removal	chapt 8-5
21	5/6	Summary and practice: nitrogen removal	chapt 8-5
22	5/8	Biological phosphorous removal	chapt 8-6
23	5/10	Discussion	chapt 8
24	5/10	Biological phosphorous removal	chapt 8-6
25	5/13	Biological selectors	chapt 8-7
26	5/15	Secondary clarification design	chapt 8-7
27	5/17	Discussion	chapt 8
28	5/17	Membrane biological reactors	chapt 8-8
29	5/20	Midterm Exam #2	
30	5/22	Attached growth processes	chapt 7-7,9-1,9-2
31	5/24	Discussion	chapt 9-2,9-3,9-4
32	5/24	Attached growth processes	chapt 9-2,9-3,9-4
33	5/27	No class, Memorial Day	
34	5/29	Guest Lecture (Alicia Taylor): Septic tank systems	chapt 10-1,10-2
35	5/31	Anaerobic processes	chapt 7-12,10-1,10-2
36	5/31	Anaerobic suspended growth processes	chapt 10-3
37	6/3	Anaerobic attached growth processes	chapt 10-5
38	6/5	Anaerobic digestion	chapt 14-9
39	6/7	Discussion, final review	chapt 1,2,4,7,8,9,10
40	6/7	Final review	chapt 1,2,4,7,8,9,10
	6/11	Final Exam, 7 pm – 10 pm	