ENVE 121 Biological Unit Processes

Spring Quarter 2014

Time and Place: Lectures, MWF: 3:10 pm – 4 pm, MSE Hall 003
Discussion, F: 8:10 am – 9 am, Watkins Hall 1111

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Grader: Drew Story, Bourns Hall A212, sstory@engr.ucr.edu

Office Hour: Thursday 2 pm – 4 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)

Course Objectives:

(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 (25%)
Quizzes (15%)
Midterm exams (20%)
Final exam (35%)
Attendance (5%)

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