

ESM 214: Biological Waste Treatment

Fall 2016 BH1424 (Seminar Room) T/R 1 – 2:15 pm

Instructor: Trish Holden (holden@bren.ucsb.edu) Office: 3508 Bren Hall. Tel: 893-3195

Office hours: open door, or by appointment.

TA: Marina Feraud (mferaud@bren.ucsb.edu) Office: 2027 Bren Hall. Hours: R 2:30 – 4 pm

NOTE: Syllabus is living and can change.

Wk	Day	Topic
1	Sept 22	Course Intro
2	Sept 27	Environmental Systems, Reactions, Micro-Biology
	Sept 29	Population and Global Sanitation. Wastewater: Characteristics
3	Oct 4	Wastewater Collection; WW Treatment: Preliminary & Primary
	Oct 6	Wastewater Treatment: 2nd ^o (Activated Sludge; Fixed Film; MBRs)
4	Oct 11	Wastewater Treatment: Biological Nutrient Removal (BNR)
	Oct 13	BNR (cont.), Disinfection
5	Oct 18	FIELD TRIP 1: GSD WWTP, Goleta (12:30 pm – 2:30 pm)
	Oct 19 Make up class	Disinfection (cont.); Tertiary Trmt/ Recycling / Reclamation (BH 1424, 2:30 – 3:45 pm)
	Oct 20	Solids Management: Physical, Biological, Energy, Final Disposal
6	Oct 25	Wetlands, reed beds, etc.; On-site wastewater treatment
	Oct 27	Solid waste: landfills, composting, digestion
	Oct 28 Friday	FIELD TRIP 2: Engel and Gray Composting Facility, Santa Maria, CA Leave Bren 11:30 am, return late afternoon
7	Nov 1	Introduction to toxic waste / groundwater & soil pollution
	Nov 3	Biodegradation: organics
8	Nov 8	Biotransformation: metals
	Nov 10	In situ Bioremediation: chlorinated solvents
9	Nov 15	In situ Bioremediation: fuels
	Nov 17 Nov 18	In situ Bioremediation: phytoremediation of solvents and metals FIELD TRIP 3: Gill's Onions, Oxnard, CA Leave Bren 7:30 am, return by 12 pm
10	Nov 22	Ex situ Bioremediation: biofilters, slurry, land treatment, compost
	<i>Nov 24</i>	<i>Thanksgiving Day Holiday (no in class meeting)</i>
11	Nov 29	Course Review
	Dec 1 Dec 2 Friday	Field Trip Preparation (practitioner visit) FIELD TRIP 4: Santa Susana Field Laboratory, Stormwater Biofilter and In situ Bioremediation Leave Bren 8:00 am, return later in afternoon
12	Dec 5	Final Exam 12 – 3 pm, Seminar Room (1424 Bren Hall)

Course parameters: Preparation required before class meeting: reading materials on GauchoSpace and consulting other reference materials as needed. Class time used for

discussion and clarification. Field trips (2 required; 4 offered—student's choice of which 2 of 4 to take) for firsthand knowledge of biological treatment systems.

Requirements and grading: Participation in class (20%), HW assignments (2, at 20% each), final exam (20%). Field trips graded for attendance (20%: 2@10% each).

Resources: GauchoSpace materials, books, instructor / TA, Bren School Communication Center, particularly for written assignments:

http://www.bren.ucsb.edu/academics/comm_center.htm

Books (on reserve in the UCSB library; others in Bren reading room or UCSB library)** useful to the course material include:

Brock Biology of Microorganisms (any recent edition): a comprehensive advanced text in general microbiology. It is in its 14th edition.

<http://www.pearsonhighered.com/educator/product/Brock-Biology-of-Microorganisms-14E/9780321897398.page>

**Wastewater Engineering: Treatment and Resource Recovery, by Metcalf & Eddy: It is in its 5th edition.

http://highered.mheducation.com/sites/0073401188/information_center_view0/index.html

Biodegradation and Bioremediation, by Alexander. 2nd Edition. 1999.

<https://www.elsevier.com/books/biodegradation-and-bioremediation/alexander/978-0-12-049861-1>

Bioremediation and Natural Attenuation: Process Fundamentals and Mathematical Models, by Alvarez and Illman. 2005. This is available online, and chapters can be made available during the course.

<http://onlinelibrary.wiley.com/book/10.1002/047173862X>

Standard Methods for the Examination of Water and Wastewater. It is in its 22nd edition. This is the standard for how to characterize wastewater, and water.

<http://www.standardmethods.org/>