

F'18 ESM 214/L: Biological Waste Treatment

Lecture BH1424 T/R 12:30 – 1:45 pm; Lab R BH2015 (unless noted) 2 ~ 4:50pm

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

Office Hours: T 2 – 5 pm (except: 10/9 2 – 3 pm; 10/16 & 11/20 3 – 4 pm) or by appt.

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NOTE: Syllabus is living and can change.

Wk	Day	Topic
1	Sept 27	Course Intro; Past Practices
	lab	<i>Overview and safety (Room 2015 BH)</i>
2	Oct 2	Population and Global Sanitation. Wastewater: Characteristics
	Oct 4	Environmental Systems, Reactions, Microbiology
	lab	<i>Exercise 1 (Room 3035 BH): Systems Simulation</i>
3	Oct 9	Wastewater Collection; WW Treatment: Preliminary & Primary
	Oct 11	Wastewater Treatment: 2nd° (Activated Sludge; Fixed Film; MBRs)
	lab	<i>FIELD TRIP 1: GSD WWTP, Goleta (1:45 pm – 4:30 pm)</i>
4	Oct 16	Biological Nutrient Removal (BNR)
	Oct 18	Solids Management: Physical, Biological, Energy, Final Disposal
	lab	<i>Exercise 2 (Room 2015 BH): Microbiology and microscopy</i>
5	Oct 23	Disinfection
	Oct 25	Tertiary Trmt/ Recycling / Reclamation
	lab	<i>FIELD TRIP 2: MSD, Montecito (1:45 – pm – 4:30 pm)</i>
6	Oct 30	Wetlands, reed beds, etc.; On-site wastewater treatment
	Nov 1	Solid waste: landfills, composting, digestion
	lab	<i>FIELD TRIP 3: Engel and Gray, Santa Maria (1:45 pm – 6 pm)</i>
7	Nov 6	Introduction to toxic waste / groundwater & soil pollution
	Nov 8	Biodegradation: organics
	lab	<i>TBD</i>
8	Nov 13	In situ Bioremediation: fuels and chlorinated solvents
	Nov 15	Biotransformation: metals
	lab	<i>TBD</i>
9	Nov 20	Ex situ Bioremediation: biofilters, slurry, land treatment, compost
	Nov 22	<i>Thanksgiving Holiday (no lab)</i>
10	Nov 27	In situ Bioremediation: phytoremediation of solvents and metals
	Nov 29	Review
	lab	<i>(Student time: Paper and Presentation Prep)</i>
11	Dec 4	Final Presentations

Course parameters: Preparation required before class meeting: reading materials on GauchoSpace and consulting other reference materials as needed. Class time used for lecture and discussion. Field trips and lab Exercises to enhance working knowledge of biological treatment and issues; activities are designed to augment the course.

Requirements and grading: Class participation (10%), Exercises (3 reports, at 10% each), final paper and presentation (30 and 10%, respectively). Field trip attendance (20%).

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

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

Books (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 15th edition.

<https://www.pearson.com/us/higher-education/product/Madigan-Brock-Biology-of-Microorganisms-15th-Edition/9780134261928.html>

**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.

<https://smww.aphapublications.org/>

Course policies: Attending class is encouraged because the course is cumulative, i.e. the material builds and concepts are transferred from the first part of the course to the later parts. Preparing for class is encouraged, to maximize the value of the lectures. Engaging in class is encouraged, including asking questions since your questions may assist others' learning. Field trips are especially arranged for your learning, and you are encouraged to attend all of them. The 3 written Exercise reports are individual: it is your individual work and will be graded accordingly. The final paper and presentation are your works, individually, and will be graded accordingly. Academic honesty is required. Written communication is an important professional skill in ESM, and the final paper is meant to assist in developing that.