
ENVIRONMENTAL AND POLLUTION MICROBIOLOGY

11:375:411, 16:375:510

3 credits

Time: Spring Semester, 2014
MW, 6th period, 5:35 to 6:55 pm

Place: Foran Hall 138A, Cook Campus

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Office hrs: (LY) by arrangement
(AWP) by arrangement

<u>Date</u>	<u>Topic</u>	<u>Assignment</u>
Jan 22	Introduction	Ch. 1-4 (Brock 11, 12 & 13)
Jan 27	Chemistry of the environment and the cell	Ch. 1-4 (Brock 11, 12 & 13)
Jan 29	Phylogeny	Ch. 11 (B-11), Ch. 14 (B-12) Ch. 16 (B-13)
Feb 3	Microbial groups	Ch. 12, 13, 14 (B-11) Ch. 15, 16, 17, 18 (B-12) Ch. 17, 18, 19 (B-13)
Feb 5	Heterotrophy, autotrophy, phototrophy	Ch. 17 (B-11), Ch. 20, 21 (B-12) Ch. 13, 14 (B-13)
Feb 7	<i>Special Microbiology Symposium – Traves Hall, http://dbm.rutgers.edu/register2.php (free lunch!)</i>	
Feb 10	Heterotrophy, autotrophy, phototrophy 2	“
Feb 12	Introduction to Metabolism MiniEXAM 1 (40 min)	Ch. 5, 7 (B-11, 12), Ch. 4, 6 (B-13)
Feb 17	Metabolism <i>No lecture, do online exercise</i>	Ch. 8 (Brock 1), Ch. 9 (B-12) Ch. 8 (B-13)
Feb 19	Catabolism	Ch. 5 (B-11, 12), Ch. 4 (B-13)
Feb 24	Catabolism	“
Feb 26	Catabolism	“
Mar 3	Regulation <i>No lecture, do online exercise</i>	“
Mar 5	Adaptation	Ch. 8, 18, 31 (B-11) Ch. 9, 22, 12 (B-12) Ch. 8, 22, 11 (B-13)
Mar 10	Adaptation	“
Mar 12	MiniEXAM 2 (40 min)	
Mar 17, 19	SPRING BREAK	

Environmental and Pollution Microbiology 2

Mar 24	Growth in batch and continuous culture	Ch. 6, 28 (B-11), Ch. 6, 36 (B-12), Ch. 5, 35 (B-13)
Mar 26	Water and wastewater treatment	Bitton, Ch. 7-13; Ch. 28 (B-11), Ch. 36 (B-12) Ch. 35 (B-13)
Mar 31	Pathogens and waterborne diseases	Bitton, Ch. 4-6
Apr 2	Bioaerosols	pp. 831-846 (B-11) pp. 947-963 (B-12) pp. 926-947 (B-13) Bitton, pp. 309-315
Apr 7	Selective enrichments and biotic and abiotic factors	Ch. 17, 18, 19 (B-11) Ch. 20, 22, 23 (B-12) Ch.13, 22, 23 (B-13)
Apr 9	EXAM 3	
Apr 14	Remediation, field applications	Ch 19 (B-11), Ch. 24 (B-12, B-13))
Apr 16	Remediation case studies and emerging technologies	TBA
Apr 21	POSTER SESSION 1	
Apr 23	POSTER SESSION 2	
Apr 28	Metals and microbes 1	TBA
Apr 30	Metals and microbes 2	TBA
May 5	EXAM 4	

Resources:

1. Brock, Biology of Microorganisms, Madigan, Martinko, Parker, 11th ed. (2006)
2. Brock, Biology of Microorganisms, Madigan, Martinko, Dunlap, Clark 12th ed. (2009) (on reserve in library)
3. Brock, Biology of Microorganisms, Madigan, Martinko, Stahl, Clark, 13th ed. (2012) (on reserve)
3. Wastewater Microbiology, Bitton (on reserve)

Requirements:

1. Four exams: Feb 12, Mar 12(40 min, 60+60 pts), April 9 (80 pts), May 5 (80 pts)
(Point value for each exam is subject to change) (280 points in total)
2. Problem sets (4) (60)
3. Poster session (100)
4. Graduate students: 2 short papers, 5-8 pages each (100)
Topics to be selected by student and approved by instructor
Due: Mar 24, May 5
Take either April 9 or May 5 exam, not both
(please notify us in writing which exam you are not taking)

Objective:

This course is intended to provide fundamental knowledge about microorganisms in the natural and engineered environment and their role in the cycling of elements, both natural and anthropogenically introduced into the environment. We will focus on understanding their role in the biodegradation of contaminant chemicals and the application of processes that take advantage of the microbiological biodegradation processes.

Plagiarism:

When information for your poster or paper (data, text, figures, tables) is copied from another document, it must be referenced appropriately. If it is directly quoted as text, it needs to be identified with quotation marks as well. Figures or tables may be copied from source material, but they must be properly referenced.

Internet resources:

It is easy to use search engines on the Internet to obtain information for your poster or paper. Information found on the Internet, however, is of varying quality. The most reliable reference is a scientific article that is subject to "peer review." Namely, experts have reviewed it and recommended it to the journal editor that the paper is well written, and that it contributes new findings to the field. This process usually requires several revisions, in which the author responds and makes changes to clarify points brought up by the reviewers. In this manner, quality and impact of publications is maintained. Most web pages are not subject to such a process and anyone can post any information. Therefore, web pages posted by individuals or unknown organizations, in general, should not be used as references. Many legitimate organizations can be used as web reference, for example, government entities such as the EPA, Dept. of Energy, NOAA. In addition, web access to library resources and scientific journals is now routine and can be used.

Learning goals:

1. Acquire in-depth understanding of microbial processes in soil, sediment and aquatic environments.
2. Develop scientific expertise and literacy to evaluate, interpret and assess microbial activity in impacted and un-impacted environments.
3. Learn how to be critical, quantitative and independent in interpreting contemporary environmental issues.
4. Improve professional and communication skills.

Assessment outline:

Learning goal	Instructional activity	Assessment activity
1) Understanding microbial processes	Learning of basic microbiology and biodegradation principles through lectures, examples, readings, problem sets.	Evaluated through performance on problem sets, 4 exams and poster session.
2) Develop scientific expertise and literacy	Transmitted through lectures, examples, readings, discussion in class.	Evaluated through performance on problem sets, 4 exams and poster session.
3) Critical quantitative, independent thinking	Through lectures, discussion, problem sets, seminar attendance.	Assessed by performance on problem sets, exams, poster session and seminar critiques.
4) Professional and communication skills	Through lectures, discussion, seminar attendance, group project.	Assessed by performance on exams, group poster session, seminar write-ups.