

MICR/MBMB 477: Microbial Ecology - course syllabus -

Lectures: Tue, Thu 9:35 – 10:50 in LS-II room 450

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Office hours: Tue, Thu 11:00 – 12:00 in LS-II room 191

Course description: Concepts of ecology applied to microorganisms; methods in microbial ecology; interactions of microbes with their living and non-living environment; microbial habitats and functions. Roles and regulation of microbes in natural and man-made environments, from cellular to community level. Prerequisite: MICR 301 or instructor's consent (based on proven background in both microbiology and ecology).

Course objectives:

- to introduce the field of microbial ecology and environmental microbiology
- to explore the functional ubiquity and diversity of microorganisms

Textbooks: Since no single textbook covers all aspects of this course, the best material for home study are the notes you take in class. Outline versions of the slides presented in lecture will be posted on Blackboard. Among books, the following are the most useful:

- Madigan et al. (2011) Brock Biology of Microorganisms, 13th ed. (Pearson), chapters 22 – 25. [also great to refresh the memory and brush up some general microbiology]
- Barton LL & Northup DE (2011) Microbial Ecology (Wiley-Blackwell, list price \$100). [each chapter includes suggestions for further reading]
- Begon M, Townsend CR & Harper JL (2006) Ecology – From Individuals to Ecosystems, 4th ed. (Blackwell, list price \$100). [explains general concepts of ecology very well, however, minimalistic on microbes]
- Kirchman DL (2008) Microbial Ecology of the Oceans (Wiley, list price \$105). [collection of 14 review articles on marine microbial ecology; in-depth reading on select topics]

While no particular textbook is required, you are expected to prepare for class from literature sources of your choice. The course contents presented in lecture should also be reinforced by reading suitable book chapters, journal articles or trustable online resources, complementing your notes.

Grades: Evaluation of student performance will be based on two sectional exams (100 points each), a comprehensive final exam (160 points), attendance and participation (40 points). Typical exam questions ask for 1 to 10 sentences of text or simple drawings. No make-up exams will be given.

total points	400 – 360	359 – 320	319 – 280	279 – 240	< 240
final grade	A	B	C	D	F

Final exam: Friday, 11 May 2012, 10:10 – 12:10 in LS-II room 450

LECTURE SCHEDULE 2012

date	subject
17 Jan	Introduction to microbial ecology: overview, motivation, history, applications etc.
Concepts of (microbial) ecology	
19 Jan	Aut- and synecology of macro- and microorganisms: definitions, terminology, concepts
24 Jan	Individuals and populations: productivity, growth, distribution, activity
26 Jan	Communities: colonization, succession, diversity, structure
31 Jan	Microbial functions in ecosystems and global cycles
Methods in microbial ecology	
02 Feb	Habitat characterization
07 Feb	Characterization of microbial communities: culture-based methods, biomarkers, cell stains
09 Feb	Characterization of microbial communities: PCR, sequencing, molecular fingerprints
14 Feb	Characterization of microbial communities: FISH, real-time PCR, pyrosequencing
16 Feb	Activity measurements
21 Feb	Statistical methods
23 Feb	catch-up and review session
28 Feb	EXAM #1
Microbial interactions	
01 Mar	Interactions of microorganisms with their physical and chemical environment
06 Mar	Microbial guilds and biogeochemical cycles
08 Mar	
	Spring Break

date	subject
20 Mar	Interactions with the biotic environment: symbiosis, competition, parasitism, predation
22 Mar	Interactions within microbial communities: quorum sensing, syntrophy, antibiotics
27 Mar	Interactions of microorganisms with algae and plants
29 Mar	Interactions of microorganisms with animals and humans
03 Apr	catch-up and review session
05 Apr	EXAM #2
Ecology of natural and engineered microbial habitats	
10 Apr	Marine ecosystems: ocean surface, tidal flats, deep-sea
12 Apr	Marine ecosystems: coral reefs
17 Apr	Freshwater ecosystems: lakes, rivers, swamps, bogs
19 Apr	Terrestrial ecosystems: rocks and soil, prairie, forest, taiga
24 Apr	Extreme environments: deserts, hydrothermal vents, glaciers, deep subsurface
26 Apr	Landfills, wastewater treatment reactors, bioremediation
01 May	Culture collections, food ecosystems, biogas reactors
03 May	review session, course/instructor evaluation
11 May	FINAL EXAM