

MICROBES AND THEIR ENVIRONMENT MICR 485 LECTURE

Instructor: Marek Kirs
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Lecture: MWF 11:30-12:20 PM

Location: Biomedical Sciences Complex (BIOMD) T208

Prerequisites: BIOL 171 and CHEM 272, or consent

Course description: Microbes are everywhere and they run our planet! They're in the air you breathe, in the soil you walk on, and in the water you swim. It has been suggested that at least a trillion species of microorganisms inhabit Earth. In this class, we will explore the tremendous diversity of microbes and learn how these tiny organisms have the power to change their local environments and the whole planet. Every life form on Earth is dependent on them. We will use a multidisciplinary and integrative approach to understanding of the continuum of life microbial life: viruses, bacteria, archaea, fungi and protists. We will learn how they function alone, in context of each other, with their hosts, and together how they cause huge changes in both natural and human-influenced environments and how this impacts our daily lives.

Course structure: The course consists of 3 hours/week lectures. There are four exams in total, and each exam counts for 20% of your grade. Exams will assess your various thinking skills with multiple choice, true/false, fill in the blanks, matching, and short answers. There will be class discussions and case studies integrated into the lectures. A generous amount of optional reading materials are provided for those who are interested to gain additional depth of knowledge. The final project & presentation will be worth 20% of your grade.

Course objectives:

1. Acquire depth and breadth of knowledge about the biology of diverse groups of microorganisms that dwell in various environments, the roles that they play in manipulation of essential ecosystem processes, and how they contribute to overall environmental health.
2. Integrate important principles as well as methodologies from various disciplines within life sciences such as ecology, evolution, biochemistry, organismal biology, and genetics to explain microbial processes.
3. Analyze and contextualize the potentials of microorganisms and how they contribute as well as damage natural environments, affect human society, and affect the overall future health of the planet.
4. Develop solutions using microbiology to solve impending societal and environmental issues.
5. Demonstrate skills in speaking, listening, and questioning.

Student learning objectives:

1. Demonstrate understanding of microbiology from genes to ecosystems and how it is fundamental to environmental health.
2. Demonstrate the ability to identify problems and develop solutions using the fundamental principles associated with microbiology to solve environmental issues.
3. Demonstrate proficiency in oral communication through group discussions, general classroom participation, and final presentation.

Textbook: Not required.

Makeups: Exams and quizzes may be made up but only with university accepted documents. It is at the discretion of the instructor to determine acceptable reasons for makeups outside of accepted documents. You must make prior arrangements if you know you will miss a class. It is up to the student to arrange a makeup with the instructor. Makeups must be taken prior to the next exam or quiz.

Academic integrity:

Cheating will result in a 0 score for exams and quizzes, and will result in disciplinary action. The class adheres strictly to UH Manoa's policies on academic integrity at <https://manoa.hawaii.edu/studentsuccess/conduct-code/policies/>

Grading components:

Exams (4)	80%
Final Presentation	20%
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Total	100%

Letter Grade Assignment:

A+= 97-100, A= 93-96, A- = 90-92
 B+ = 87-89, B = 84-86, B- = 80-83
 C+= 77-79, C = 74-76, C- = 70-73
 D+ = 67-69, D = 64-66, D- = 60-63
 F = <60

MICR 485 Microbes and their Environment

Date	Lecture #	Module	Instructor	
January 8			Kirs	First day of instructions
January 10	1	Microbial Diversity	Kirs	Introduction. Biosphere and origin of life; Taxonomy, Systematics, and Nomenclature, Diversity
January 12	2	Microbial Diversity	Kirs	Bacteria & Archaea
January 15				Martin Luther King Jr. Day (No class)
January 17	3	Microbial Diversity	Kirs	Cyanobacteria, microbial eukaryotes
January 19	4	Microbial Diversity	Kirs	Fungi & Oomycetes
January 22	5	Microbial Diversity	Kirs	Viruses, including phages
January 24	6	Methods	Kirs	L1. Aseptic techniques, Water and Soil sample collection, dilution series, MPN, membrane filtration, spread and streak plates
January 26	7	Methods	Kirs	L2. Introduction to molecular methods
January 29			Kirs	Review Session
January 31			Kirs	EXAM #1 (lectures 1-7)
February 2	8	Biogeochemical Cycles	Kirs	Microbes and Carbon Cycle
February 5	9	Biogeochemical Cycles	Kirs	Microbes and Carbon Cycle, Microbes and Nitrogen Cycle
February 7	10	Biogeochemical Cycles	Kirs	Microbes and Nitrogen Cycle
February 9	11	Biogeochemical Cycles	Kirs	Microbes and Phosphate and Sulphur Cycles,
February 12	12	Biogeochemical Cycles	Kirs	Microbes and Iron and other metals
February 14	13	Methods	Guest	Methods in Water Microbiology #1
February 16	14	Methods	Guest	Methods in Water Microbiology #2
February 19				President's Day (No class)
February 21	15	Methods	Guest	Methods in Water Microbiology #3
February 23			Kirs	Review Session
February 26			Kirs	EXAM #2 (lectures 8-15)
February 28	16	Environments	Kirs	Is everything everywhere?
March 1	17	Environments	Kirs	Water and Microbes
March 4	18	Environments	Kirs	Water Environments (Seas and Oceans)
March 6	19	Environments	Kirs	Freshwater Environments (streams, lakes, groundwater)
March 8	11	Environments	Kirs	Groundwater cont./Pollution of Aquatic Systems
March 11	21	Environments	Kirs	Pollution of Aquatic Systems
March 13	22-part1	Environments	Kirs	Waterborne Pathogens, Disease Transmission and Global Change
March 15	22-part2	Environments	Kirs	Waterborne Pathogens, Disease Transmission and Global Change
March 18				Spring Recess (No class)
March 20				Spring Recess (No class)
March 22				Spring Recess (No class)
March 25	23-part1	Environments	Kirs	Water Quality Regulations, Epidemiological Studies, QMRA.
March 27	23-part2	Environments	Kirs	Recreational Water Quality and Hawaii
March 29				Good Friday (No class)
April 1		Environments	Kirs	Review session
April 3		Environments	Kirs	EXAM #3 (lectures 16-23)
April 5	24	Environments 2	Kirs	Biodegradation and Bioremediation
April 8	25	Environments 2	Kirs	Microbes in Water Treatment & Disinfection

April 10	26	Environments 2	Kirs	Phytoplankton blooms and phycotoxins
April 12	27	Environments 2	Kirs	Soils
April 15	28	Environments 2	Kirs	Soils - Rhizosphere/Mycorrhizae
April 17	29	Environments 2	Kirs	Corals
April 19	30	Environments 2	Kirs	Human microbiota
April 22		No CLASS		
April 24		Presentations 1	Kirs	Presentations by: Yang, Tsubota, Thompson, Tadaki,
April 26		Presentations 2	Kirs	Presentations by: Schwengel, Rimando, Rdialul, Palchetti, Nakahara-Akita
April 29		Presentations 3	Kirs	Presentations by: Nagtalon, Murguia, Ginoza, Geurts, Garcia-Tobar
May 1		Presentations 4	Kirs	Presentation by: Cruz, Farrell & Review Session
May 6			Kirs	EXAM 4 (lectures 24-30). BIOMD T208: 12:00 - 2:00PM