

Prerequisite: Biol. 111 is a prerequisite

Instructor: Dr. Tom Kieft

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Lab: Jones Annex 302

Office hours: M&W 10-11 and 1-2

Learning Objectives. Following the completion of this course, students should have an appreciation for and understanding of

1. the major groups of microorganisms and the evolutionary relationships among these groups
2. structures of microbial cells and the functions of these structures
3. responses of microbes to environmental parameters
4. metabolic diversity among microorganisms, with emphasis on biogeochemical cycles of elements
5. methods used in environmental microbiology.
6. the roles of microorganisms in environmental pollution and bioremediation

Text: Madigan, M. M., K.S. Bender, D.H. Buckley, W.M Sattley, and D.A. Stahl. 2018. *Brock Biology of Microorganisms*, 15th Edition, Pearson. (The 13th and 14th editions are acceptable, but you'll be responsible for determining which chapters to read.)

Course materials on the web: Some course materials, including old exams, will be made available via Canvas (<https://nmt.instructure.com>). These materials include old exams, PowerPoint files, homework assignments, and handouts.

Grading:

Your grade will be based on five exams and a combined single score for your attendance, homework, and quizzes, making six total scores, each counting equally. Your lowest of these six scores will be dropped. Your final grade will be based on the average of your five remaining scores, with each one being given equal weighting (20% each; 5 x 20% = 100%).

Tentative exam schedule: Date

First exam:	Feb 7
Second exam:	Feb 28.
Third exam:	March 27
Fourth exam:	April 17
Fifth exam (comprehensive, 2-hour):	during finals week.

(The finals schedule is set by the Registrar; plan to be here throughout finals week.)

Course grades will be based on the following scale: 90-100% A, 80-89% B, 70-79% C, 60-69% D, ≤59% F. If necessary, the scale will be shifted down (curved) until the top 10% of students receive an A.

No make-up exams will be given. If a student misses one exam due to a bona fide illness or family emergency (must be documented via the Dean of Students), then the student's grade will be computed using the remaining exams. No extra-credit or alternative assignments will be given.

Exams will cover any and all material from lectures and reading assignments. The final will be comprehensive.

Course policies:

Exams will cover any and all material from lectures and reading assignments. The final will be comprehensive. No make-up exams will be given. If a student misses an exam due to a *bona fide* illness or family emergency (documentation required), then scores from the remaining exams will be prorated.

Counseling and Disability Services. Reasonable Accommodations: New Mexico Tech is committed to protecting the rights of individuals with disabilities. Qualified individuals who require reasonable accommodations are invited to make their needs known to the Office of Counseling and Disability Services (OCDS) as soon as possible. In

addition, New Mexico Tech offers mental health and substance abuse counseling through the Office of Counseling and Disability Services. The confidential services are provided free of charge by licensed professionals. To schedule an appointment, please call 835-6619.

Academic Honesty: New Mexico Tech's Academic Honesty Policy can be found on page 79 of the NMT catalog (<https://www.nmt.edu/registrar/catalogs/2018-2019%20FINAL%209-7-2018.pdf>) and starting on page 11 in the NMT Student Handbook (<https://www.nmt.edu/policies/docs/studentpolicies/NMT%20Student%20Handbook%202018-19%20August.pdf>). You are responsible for knowing, understanding, and following this policy.

Keep up with the reading assignments. Attend all lectures. Take notes.

Cell Phones: Turn off the ring function and use only in an emergency. Don't text in class.

Course outline with reading assignments:

Topic	Chapter(s) in Madigan <i>et al.</i>
Introduction	Ch. 1
Origin of life, early evolution of life on Earth	Ch. 13
Microbial evolution, phylogeny	Chs. 1, 13
Microbial structure and function	Ch. 2
Viruses	Ch. 8
Protists	Ch. 18
Microbial growth, growth media, sterilization, Nutrition, growth media, isolation methods Sterilization, disinfection Microbial growth, quantifying microbes Growth kinetics Environmental parameters: temperature, pH, salinity, oxygen, etc.	Chs. 3, 5
Microbial metabolic diversity Microbial energetics, oxidation and reduction Fermentation and aerobic metabolism More on fermentation Metabolic diversity: anaerobic respiration Metabolic diversity: chemoautotrophy Metabolic diversity: photoautotrophy, carbon dioxide fixation	Chs. 3, 14
Metabolic diversity, biogeochemical cycling: C, N, S, Fe, Mn	Ch. 15
Biogeochemical cycling: heavy metals, metal recovery, Hg, Si, etc.	Ch. 21, Sect. I; Ch. 22
Molecular microbiology	Ch. 4
Methods in environmental microbiology	Ch. 19
Microbial ecology, biofilms, microhabitats	Ch. 19
Environments: water, lakes, rivers, oceans	Ch. 20
Environments: soil, subsurface, air	Ch. 20
Wastewater treatment	Ch. 22, Sect. III
Plant-Microbe Interactions	Ch. 23, Sect. II
Animal-Microbe Interactions	Ch. 23 Sections III, IV, V
Pollution & Bioremediation	Ch. 22 Section II
Public Health Microbiology: Water- and food-borne diseases	Ch. 32