

Biology 327/527
Microbial Diversity and Ecology
Fall Semester 2012

Professor: Dr. Eric Matson

Office: Halsey Science 253

Contact: Email: matsone@uwosh.edu

Office Hours: Thurs. 1:00 – 2:00 p.m.; Fri. 10:30 a.m. – 12:30 p.m.
Other times by appointment.

Lecture: Mon., Wed., and Fri. 9:10 – 10:10 a.m.

Required text: **Microbial Ecology: An Evolutionary Approach**. First edition by J. Vaun McArthur.
ISBN 978-0-12-369491-1.

About Bio 327/527: This is a 3-credit class that will utilize primary literature extensively and involve in-class discussions. You are expected to attend each lecture. You will be responsible for certain material covered in the text as well as additional papers as assigned.

Use of D2L: Papers, documents, and web links for the course will be posted to D2L.

Exam policy: **There are no makeup exams.** Exceptions will be made only for extreme circumstances (e.g. death of a close relative or a documented medical event). Students are expected to contact the instructor in writing in advance of the exam that they will miss, including justification and documentation of the need for a makeup exam. Only in such cases will a makeup exam consisting of a different, but similar set of questions, be administered.

Course Description: This course will delve into the ecology and diversity of microorganisms living in natural and engineered environments. We will explore concepts of species diversity and their functions in microbial communities, as well as how these communities influence and are influenced by their environment. Attention will be given to how microorganisms acquire resources for cell maintenance and growth, interact with each other and their environment, and how scientists investigate complex microbial communities to understand their structure and functions.

Prerequisite: It is recommended that students take one semester of microbiology (e.g. Bio 233) and/or general bacteriology (e.g. Bio 309) prior to taking bio 327. It is possible (but not advisable) to take this course out of sequence.

Etiquette and Polices: A 300-level course is not designed to “weed out” students but rather to mold students into intelligent thinkers and scholars. In this course you should behave as such. Please be prompt to class, turn off cell phones, and avoid leaving early. If you are taking this course, it is assumed that you are interested in the field of microbiology. Ask questions, engage in class discussions, seek additional information, and see me during office hours if needed. Intellectual apathy will only serve to limit what you get from this course. This is a long lecture and we are all adults. If you need to step out to make a phone call or use the restroom feel free to do so, but do it quietly. If you feel the need to talk to one another, please take your conversation outside. While there is no formal attendance requirement, attendance in the lecture is expected. Earning a high grade in the class will be difficult, if not impossible, without regular attendance. If you miss lecture, it is your responsibility to obtain notes from a fellow student.

Academic Dishonesty: Cheating on an exam, plagiarizing, or any other form of academic dishonesty will be dealt with in accordance with the current UWO Student Discipline Code. The instructor reserves the right to assign a grade of "F" for the course should circumstances warrant.

Examinations: There will be three exams for the course (two mid-terms and a final). The exams will consist of multiple choice, short answer, and long answer. The exams will cover material presented in lectures, demonstrations, papers and textbook chapters. Each exam will be worth 100 points and will be cumulative. Five **unannounced** quizzes will also be administered. Each quiz will be worth 20 points. An additional 100 points will come from participation in discussions on papers. **There are thus 500 points for Bio 327.**

Graduate credit: For students taking the co-listed Bio 527 for graduate credit, an additional project will be assigned. Students will meet with the instructor early in the semester to discuss project options. Students will prepare a proposal for the project, a write-up of the results, and will present their projects in class at the end of the term. This project will be worth 100 points. **There are thus 600 points for Bio 527.**

Grading:

A	100%-94%	4.00	*Instructor reserves the right to adjust grades of the entire class if necessary (e.g. curve).
A-	93%-88%	3.67	
B+	87%-86%	3.33	
B	85%-81%	3.00	
B-	80%-78%	2.67	
C+	77%-76%	2.33	
C	75%-71%	2.00	
C-	70%-69%	1.67	
D+	68%-66%	1.33	
D	65-63%	1.00	
D-	62-60%	0.67	
F	<60%	0.00	

Study hard but effectively and intelligently. Read ahead and don't cram. If there is something you don't understand ask me! If there is a topic in which you are particularly interested bring it up in or out of class, perhaps I can present it to the class. Don't be afraid to ask questions. **You are a scholar and this is your education!**

A word on Microbial Ecology and Diversity and the Liberal Arts... A liberal arts education refers to studies in a college or university intended to provide general knowledge and develop intellectual capacities. A liberal arts education prepares students to work in a variety of jobs. This is different from other types of education where students develop professional or vocational skills for a specific job. The College of Liberal Arts and Sciences emphasizes a liberal arts education. It promotes a liberal arts education model proposed by Carol

Geary Schneider, president of the Association of American Colleges and Universities since 1998. Schneider stresses the idea that ALL students receive an education of lasting value, relevant for the 21st century. In her model learning should be: 1) "analytical, contextual and holistic thinking;" 2) "effective communication using multiple literacies and forms of expression;" 3) "critical reflection/informed action as citizens, producers, human beings;" 4) "ethical action for local and global communities;" and 5) "integrative learning."

Bio 327/527 is intended to expose students to the field of microbial ecology and diversity, the challenges facing the field, and the benefits the field provides. We will extend our studies beyond the text book to focus on emerging areas of research and current environmental challenges related to microbial ecology. To do so, the course material will include primary literature, examples from current events, and in-class discussions.

Bio 327/527 Schedule (Fall 2012)

September

Week of 5 - 7

Introduction to Bio 327/527

Introduction to microbial ecology

Week of 10 - 14

Scale and scope of the microbial world

Domains of life and species concepts

Readings – Text: Chapter 1 and 3

Discussion – Prokaryotes: The unseen majority. Whitman et al PNAS 1998

Week of 17 - 21

Growth in the laboratory vs. growth in nature

Factors influencing population density and survival

Readings – Text: Chapter 4 and 5

Discussion - Long-term survival during stationary phase: evolution and the GASP phenotype. Finkel Nature Reviews

Bio 527: Discuss independent project during office hours

Week of 24 - 28

Bacterial gene transfer in the role of reproduction

Role of viruses in bacterial disease

Gene transfer and the influence on human disease

Reading - Text: Chapter 6

Discussion - Gene transfer agents - (to be announced)

October

Week of 1 - 5

Microbes living together in communities

Measures of microbial populations: diversity, richness, evenness, and abundance

Accessing and interpreting microbial diversity

Readings - Text: Chapter 7 and 11

Exercise - Measuring microbial diversity

Bio 527: Project proposals due Friday, October 5

Week of 8 - 12

Microbial population stability and function

Bacterial communication

Readings - Text: Chapter 10 and 12

Exam 1: Fri. Oct. 12. 100 points (short and long answer)

Week of 15 - 19

Pathogens and predators of microbial cells
Influence of viruses on microbial populations

Discussion: Viruses and algal blooms (to be announced)

Week of 22 - 26

Nutrient cycles and ecosystem services

Readings - Text: Chapter 13

Week of 29 - Nov. 2

Nutrient cycles and species interactions

Readings - Text: Chapter 14

Discussion: Light/dark cycles in microbial mats (to be announced)

November

Week of 5 - 9

Earth's microbial habitats
Life in extreme environments

Exam 2: Fri. Oct. 12. 100 points (short and long answer)

Week of 12 - 16

Microbial communities in health and disease

Discussion: To be announced

Special topic discussion: Bioprospecting, putting microbes to work

Week of 19 - 23

Tools and techniques in Microbial Ecology

Thanksgiving Break No class Wednesday or Friday

Week of 26 - 30

Frontiers of microbial ecology
The human microbiome project
Concepts in molecular phylogenetics

Exercise - molecular phylogenetics (tentative)

December

Week of 3 - 7

Graduate Student Presentations

Open topics to be covered based on class interests

Positions in Microbiology/Microbial Ecology: where to look, what it takes

Week of 10 - 14

Exam 3: Mon. Dec. 7. 100 points (short and long answer)

Discussions: Based on class interest