

**Microbial Diversity and Ecology  
Fall Semester 2013**

**Professor:** Dr. Eric Matson

**Office:** Halsey Science 253

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**Office Hours:** **Wed. 1:00 – 3:00 pm and Fri. 10:30 – 11:30 am**  
Other times by appointment.

**Lecture:** **Mon., Wed., and Fri. 9:10 – 10:10 a.m. Room HS266**

**Required text:** **Microbial Ecology**, First edition by Larry Barton and Diana Northup  
ISBN 978-1-118-01584-1.

**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) 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. The exams will consist of multiple choice, short answer, and long answer questions. The exams will cover material presented in lectures, demonstrations, papers, and textbook chapters. Each exam will be worth 100 points. An additional 200 points will come from participation in discussions on papers, in-class exercises, and homework assignments. **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.** Graduate students will also be expected to complete additional short answer and essay questions on each of the exams.

#### **Grading:**

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

**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 2013)

## September

### Week of Sept. 2

Introduction to Bio 327/527  
Introduction to microbial ecology  
**Readings – Text: Chapter 1**

### Week of Sept. 9

Scale and scope of the microbial world  
Domains of life and species concepts  
**Readings – Text: Chapter 1, Chapter 2**  
**Discussion – Prokaryotes: The unseen majority. Whitman et al PNAS 1998**

### Week of Sept. 16

Growth in the laboratory vs. growth in nature  
Factors influencing population density and survival  
**Readings – Text: Chapter 3**  
**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 Sept. 23

Microbial habitats  
Population dynamics  
**Discussion – Diversity, stability, and resilience of the human gut microbiota. Lozupone et al., Nature Reviews**  
**Readings – Text: Chapter 4**

### Week of Sept. 30

Bacterial gene transfer in the role of reproduction  
Role of viruses in bacterial diseases  
Gene transfer and the influence on human disease  
**Reading – Text: Chapter 4**  
**Exam 1 – Friday, Oct. 4**

## October

### Week of Oct. 7

Studies in microbial ecology  
Culture dependent methods  
Culture independent methods  
**Reading – Text: Chapter 5**  
**Assignment – Microbial identification using molecular methods**

### Week of Oct. 14

Microbes living together in communities  
Measures of microbial populations: diversity, richness, evenness, and abundance  
Accessing and interpreting microbial diversity

**Readings - Text: Chapter 9**  
**Exercise - Measuring microbial diversity**  
**Bio 527: Project proposals due Friday, October 5**

**Week of Oct. 21**  
Microbial interactions  
Forms of symbiosis  
**Readings - Text: Chapter 10 and 12**

**Week of Oct. 14**  
Pathogens and predators of microbial cells  
Influence of viruses on microbial populations  
**Discussion: Viruses and algal blooms (to be announced)**

**Week of Oct. 21**  
Nutrient cycles and ecosystem services  
**Readings - Text: Chapter 13**

**Week of Oct. 28**  
Nutrient cycles and species interactions  
**Readings - Text: Chapter 14**  
**Discussion: Light/dark cycles in microbial mats (to be announced)**

**November**

**Week of Nov. 4**  
Earth's microbial habitats  
Life in extreme environments  
**Exam 2: Fri. Nov. 8. (100 points)**

**Week of Nov. 11**  
Microbial communities in health and disease  
**Discussion: To be announced**  
**Special topic discussion: Bioprospecting, putting microbes to work**

**Week of Nov. 18**  
Tools and techniques in Microbial Ecology

**Week of Nov. 25**  
Frontiers of microbial ecology

**Thanksgiving break Nov. 27 – Dec. 1**

The human microbiome project  
Concepts in molecular phylogenetics  
**Exercise - molecular phylogenetics (tentative)**

**December**

**Week of Dec. 2**  
**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**

**Dec. 9**

Discussions: Based on class interest

**Exam 3: Fri. Dec. 13. (100 points)**