**Biology 327/527**

**Microbial Ecology**

**Fall Semester 2015**

**Professor**: **Dr. Eric Matson**

**Office**: **Halsey Science 253**

**Contact:** **Email: matsone@uwosh.edu**

**Office Hours**: **Mon., Wed., Fri., 3:00 – 4:00 pm**

(Other times by appointment)

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

**About Bio 327/527:** This is a 3-credit class that will utilize primary literature extensively and will involve in-class discussions. You are expected to attend each lecture and participate in the discussions. You will be responsible for the material covered in the lectures and discussions as well as additional papers that are assigned. While no textbook is assigned for the course, any general microbiology textbook will contain review information relevant to the course and is recommended for students who have not taken a microbiology course in several semesters.

**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:**

A100%-94% \*Instructor reserves the right to adjust grades of

A- 93%-88% the entire class if necessary (e.g. curve).

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.** 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.

***NOTE: I am currently revising the course this semester and so the order of some of the material listed below may change. I will keep you posted of such changes, but I don’t think it will pose any kind of challenge.***

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| **Bio 327/527 Schedule (Fall 2014)** | | | |  | |
|  |  |  |  | |  | |
| **September** |  |  |  | |  | |
| **Week of** | **Sept. 7** |  |  | |  | |
|  | Introduction to Bio 327/527 | | |  | |
|  | Course organization  Introduction to microbial ecology | | | | |
|  | Domains of life and the concept of a “microbe” | | | | |
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| **Week of** | **Sept. 12** |  |  | |  | |
|  | Scale and scope of the microbial world | | | | |
|  | Microbial evolution and the concept of microbial species | | | | |
|  | **Discussion – Prokaryotes: The unseen majority. Whitman et al PNAS 1998** | | | | |
| **Week of** | **Sept. 19** | | |  | |
|  | Growth in the laboratory vs. growth in nature | | | | | | | | |
|  | Factors influencing population density and survival |  |  | |  | |
|  | **Discussion – To Be Announced** | | | | | | |
|  | **Bio 527: Discuss independent project during office hours** | | | | | | |
| **Week of** | **Sept. 26** | | |  | |
|  | Microbial habitats and stress tolerance | | | | | | | | | | |
|  | Population dynamics | | | | | | | |
|  | **Discussion – To Be Announced** |  |  | |  | |
| **October**  **Week of** | **Oct. 3** |  |  | |  | |
|  | Role of viruses in shaping bacterial populations |  |  | |  | |
|  | To be announced |  |  | |  | |
|  | **Exam 1 – Friday, Oct. 7** |  |  | |  | |
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| **Week of** | **Oct. 10** |  |  | |  | |
|  | Studies in microbial ecology |  |  | |  | |
|  | Culture dependent methods |  |  | |  | |
|  | Culture independent methods |  |  | |  | |
|  | **Discussion – To Be Announced**  **Bio 527: Project proposals due Friday, October 14** |  |  | |  | |
| **Week of** | **Oct. 17** |  |  | |  | |
|  | Interactions among microbes |  |  | |  | |
|  | Symbiosis and syntrophy |  |  | |  | |
|  | **Discussion – To be announced** | | |  | |
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| **Week of** | **Oct. 24** |  |  | |  | |
|  | Plant-microbe interactions | | | | |
|  | Rhizosphere  Plant pathogens  **Discussion – To be announced** | | | | |
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| **Week of** | **Oct. 31** | | | | | | | | |
|  | Animal-microbe interactions | | | | | | | | |
|  | Influence microbes on host functions |  |  | |  | |
|  | **Discussion – To be announced** | | | | | | |
| **November** |  | | | | | | |
| **Week of** | **Nov. 7** | | |  | |
|  | Microbial biogeography and biogeochemistry | | | | | | | | | | |
|  | Food webs and nutrient cycling (overview) | | | | | | | | | | |
|  | **Exam 2: Fri. Nov. 11 (100 points)** | | | | | | | |
| **Week of** | **Nov. 14** |  |  | |  | |
|  | Nutrient cycles |  |  | |  | |
|  | Carbon cycles |  |  | |  | |
|  | Nitrogen cycles |  |  | |  | |
|  | **Discussion: To be announced** |  |  | |  | |
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| **Week of** | **Nov. 21** |  |  | |  | |
|  | Nutrient cycles *(carry over material from previous week)* |  |  | |  | |
|  | **Thanksgiving Break – No Class on Wed./Fri.** |  |  | |  | |
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| **Week of** | **Nov. 28** |  |  | |  | |
|  | Sulfur cycles |  |  | |  | |
|  | Phosphorus cycles |  |  | |  | |
|  | Iron and other metal cycles |  |  | |  | |
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| **December** |  |  |  | |  | |
| **Week of** | **Dec. 5** |  |  | |  | |
|  | Biomineralization |  |  | |  | |
|  | Decomposition and Bioremediation |  |  | |  | |
| **Week of** | **Dec. 12** |  |  | |  | |
|  | Bioprospecting and Biofuels |  |  | |  | |
|  | Graduate student presentations  **Exam 3: Fri. Dec 16 (100 points)** |  |  | |  | |
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