

**PROPOSED SYLLABUS FOR BIOSCI 234  
MICROBIAL POPULATION BIOLOGY  
SPRING 2010 (3 cr.)**

Instructor: Dr. Seth Bordenstein, U7211, 322-9087, [s.bordenstein@vanderbilt.edu](mailto:s.bordenstein@vanderbilt.edu)

**Course description:** Earth is a “microbial planet” in the sense that the oldest and most abundant forms of life are the ones too small to be seen by the unaided eye. Microbes have not only impacted life during the last 60 years (since the introduction of antibiotics), but as far back as 3.8 billion years when the first single-celled life form arose. The new information, tools, methods, and interdisciplinary approaches to the study of microbes set the stage for broad applications to medicine, industry, agriculture, and the study of evolutionary biology. This course will be of fundamental interest to undergraduates interested in pursuing a major in the Biological Sciences. It teaches concepts necessary for understanding the spectacular abundance, diversity, relevance, and evolution of the microbial world.

**Learning outcomes:** Microbial Population Biology is designed for undergraduate students interested in the patterns and rules that describe the evolution, ecology, and diversity of microbial life. To that end, we will meet in a lecture format to cover topics including:

- The universality of microbial life
- The bacterial origins of eukaryotic cells and organelles
- Mobile genetic elements and lateral gene transfer
- Bacterial species concepts and sequencing technologies to detect microbes
- Microbe-host symbioses and the diversity of the human microbiome

**Textbook:** Brock Biology of Microorganisms, 12th edition, 2009, by Madigan, Martinko, Dunlap, and Clark. In addition, there will be occasional, assigned readings from the primary scientific literature.

**Prerequisites:** At least one of the following courses - 205, 210, or 238

**Grading:** There will be three in-class midterm exams. The lowest score will be dropped. There will be no make-up exams given for any reason. If you miss an exam due to illness, accident, injury, or death of a friend/family member, this exam score will be dropped. Therefore, you should prepare well for all exams to ensure that an unexpected absence on an exam day does not hurt your final grade. The comprehensive Final Exam is scheduled at the end of the semester. Students who miss the final exam will receive a grade of “F” for the course unless an acceptable, documented excuse such as serious injury, extreme illness, or death of a close friend or family member is provided.

Grades will be based on a total of 200 points, with a standard grading scale (A: 90-100%; B:80-89%, C: 70-79%, D: 60-69%, F: <60%). Boundaries for letter grades may be phase-shifted slightly according to point distributions. Grades will be based on a total of three exams and discussion participation, with the maximum points available from each as

follows:

- Exam 1 – 60 points
- Exam 2 - 60 points
- Final Exam - 75 points
- Class participation: 5 points

**Graduate credit:** Graduate students taking this course will be additionally required to write a seven page research report and present a seminar to the class based on their research report.

**Lecture schedule:**

<u>Date</u>	<u>Topic</u>	<u>Chapter</u>
Week 1	Welcome; Introduction to Microbes; Historical Perspective	1
Week 2	Tree of life; Evolution of Eukaryotic Cells	14
Week 3	Microbial species concepts; Sequencing Technologies	12,14
Week 4	Environmental microbiology	10,22
Week 5	Microbial Ecology and the Rare Biosphere, <b>EXAM I</b>	23
Week 6	Bacterial Genome Evolution	13
Week 7	Viral Ecology, Diversity, and Diversity	19
Week 8	Industrial Microbiology, <b>EXAM II</b>	25,26
Week 9	Spring Break	
Week 10	Animal-Microbe Symbioses	
Week 11	Applied Symbiosis Strategies	35
Week 12	Plant-Microbe Symbioses, <b>EXAM III</b>	24
Week 13	Human Microbiome I: The Body	28
Week 14	Human Microbiome II: The Gut and Obesity	
Week 15	Human Microbiome III: Probiotics	
Week 16	<b>FINAL EXAM</b>	