Biology 333: General Microbiology Sections 1, 2, and 3
Fall 2018
Class Syllabus

Course and Instructor Information

Lecture: W F 11:00-11:50, CBB 101
Lab: Section 1: T R 10:00-11:50, CBB 366
Section 2: T R 1:00-2:50, CBB 366
Section 3: T R 3:00-4:50, CBB 366
Final Exam: Tuesday, December 18, 10:15am-12:15pm

Instructor: Dr. Matt Rogge
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Office hours: W, F 10:00 – 10:50
Other times by appointment

Course Description

This course is designed based on American Society for Microbiology "Recommended Curriculum Guidelines for Undergraduate Microbiology Education" (ASM, 2012). This ensures that all students in the course receive an education in topics consistent with microbiology curricula used nationwide. The Guidelines provide a framework of microbiological concepts that are central to a complete undergraduate microbiology education. These concepts include **evolution, cell structure and function, metabolic pathways, information flow and genetics, microbial systems, and the impacts of microorganism**s. Furthermore, development of scientific and reasoning skills and microbiological laboratory skills are recommended for an undergraduate microbiology course. These concepts and skills are aligned with those recommended for a general biology education. Although the course is not structured such that those topics are followed in sequence, the topics covered in the course are directly related to those overarching concepts.

What you should acquire from this class

Students will understand that…

- The microbial world includes organisms from many taxonomic groups.
- Microbial organisms are involved in complex environmental interactions that can be both beneficial and detrimental.
- The study of microbes requires careful observation and precise techniques.
- The study of microscopic organisms involves the analysis of physiological, morphological, and genetic traits.
- Cells, organelles, and all major metabolic pathways found in higher level species evolved from early prokaryotic cells.

Learning outcomes

Knowledge:

Students will…

- Be able to distinguish features of prokaryotic and eukaryotic cells.
- Describe metabolic pathways used by microbes that allow them to live in diverse habitats, and how the metabolic activities contribute to a functional ecosystem.
- Recognize how microbial genetics affects physical traits of microbes and are used to classify and identify microbes.
- Recognize beneficial and detrimental interactions that microbes have with humans and other organisms in an environment.

Skills:

Students will…

- Demonstrate the ability to use aseptic technique in the handling and culture of microbes.
- Complete commonly used laboratory practices for the culture and identification of microbes.
- Perform standard practices to analyze the growth of microbes and treatments, both physical and chemical, that inhibit microbial growth.
- Relate laboratory techniques with experimentation to better understand the biology of microorganisms and their impacts.

Dispositions:

Students will…

- Identify the advantages and disadvantages of microbes to health and well-being of humans and other organisms.
- Recognize the ubiquitous occurrence of microbes in the environment and the necessary functions they perform in an ecosystem.
- Realize the effects of overuse and misuse antimicrobial agents and the potential negative impacts.

Prerequisites

This course has prerequisites of an introductory biology course, a principles of genetics course, and a general chemistry course. This class will build on many of the topics covered in those courses, and I expect that you come in prepared to build onto those ideas rather than having to go over those ideas again. As such, you will be provided with chapters and sections in the textbook that should be used to refresh your memory of those concepts. These sections **are not** explicitly covered during lecture sessions.

Required materials

Textbook:	Willey, et al. 2017. Prescott's Microbiology, 10th Edition. McGraw-Hill, New York, New York. Available from text rental.
Lab manual:	Microbiology in the Laboratory, A manual for Biology 333/533, Fall 2018 Edition, available in the bookstore
Other materials:	A black permanent marker is required for lab

Optional materials

An optional lab manual by Leboffe and Pierce, *A Photographic Atlas for the Microbiology Lab*, is available for purchase in the DUC bookstore. This book is not required for the class, but you may find it beneficial.

Attendance

Students are expected to attend all lecture and lab sessions. It is usually impossible to make up missed labs or lab assignments because of the unavailability of cultures, media, and reagents after the regularly scheduled labs. *Assume that if you miss a lab, you will not be able to make it up, even if the absence is health-related.*

ATTENDANCE FOR ALL GRADED ACTIVITIES IS REQUIRED. Makeups will only be administered in the event of illness or emergency, which ***will require documentation***. The professor reserves the right to change the format of any makeup assignments, including exams. If you are aware ahead of time of a conflict with a scheduled exam, a meeting with the instructor is required ***at least a week in advance*** of the exam to discuss the situation. **A makeup exam is not guaranteed.**

Open labs

The lab may be open when there are not any scheduled labs during normal business hours (9am-5pm). For safety reasons, students will not be allowed to use the lab without an instructor or another student present in the area. ***If you use Bunsen burners during open lab, be sure they are TURNED OFF before you leave.*** Before attempting to conduct lab work outside of the regularly scheduled lab period, check the lab schedule posted near

the lab entrance to be certain a class is not scheduled at the same time you plan to work. **Scheduled classes have priority over open lab work.** If a class is scheduled, please vacate the lab at least **10 minutes before** the beginning of the class so that students in the class can prepare themselves for class.

Microbiological safety
You will be working with live microorganisms that have the potential to be infectious to humans. Careless or sloppy work endangers other students and is unacceptable in any microbiology lab. Part of this class is learning about and using proper microbiological lab techniques as described by the Centers for Disease Control and other agencies, and students will be graded on their ability to perform these techniques. *Students that consistently use improper technique will receive point deductions and may be asked to leave the lab*.

Grading
Lab quizzes
There will be six lab quizzes worth a total of 90 points. Each quiz is worth 15 points. The quizzes will cover information and techniques demonstrated and used during lab sessions, as well as real-world application of the methods used in the exercises. The format of the quizzes will be any combination of multiple choice, short answer, matching, diagrams, and fill in the blank. Lab quizzes will *occasionally* cover specific results from previous labs, but most question/problems will be related to the ***application*** of the techniques covered, e.g., how cultures are interpreted, why media or culture conditions support or inhibit the growth. In other words, focus on **why** the tests are done, **how** they work, and **what** they show. There will be no makeup points for a missed quiz.
Total value: 90 points (18%)

Lab exercises
There will be five graded lab exercises (practical lab exercises – PLEs) each worth 10 or 15 points. More information regarding these exercises can be found in the lab manual and will be discussed in class. PLEs are ***individual*** exercises, not group exercises. You are expected to perform them on your own without help from others. There will be no makeup points for missing a PLE.
Total value: 60 points (12%)

Pop lab quizzes
You should come to lab prepared to do the work scheduled for the day. For randomly chosen lab sessions, there will be short pop quizzes given that cover the introductory information provided in the lab manual for that day's scheduled lab exercise. The quiz point values will vary but will not exceed 4 points per quiz. The format of the quizzes will be any combination of multiple choice, short answer, matching, diagrams, and fill in the blank. There will be no makeup points for missing a quiz.
Total value: 20 points (4%)

Lab worksheets
For some labs, worksheets can be submitted for grading. The questions or exercises found in the report sheets relate to recognition of how those types of laboratory techniques are useful for microbiological studies. There will be eleven labs that have worksheets associated with them. You must complete and submit ***five*** of those report sheets. Each submitted report sheet is worth 10 points. ***The worksheets are due at the beginning of next lab session***.
Total value: 50 points (10%)

Lab participation
Many lab activities are performed in groups. To ensure you are being a productive member of the group and involved in the preparation and analysis of experiments, you will be assigned points for your participation. There are about 30 labs in the semester, and ***participation*** (not simply attendance) in each lab is worth 1 point. If you are active within your group, you will get the point. If you are not actively participating in group work, you will receive 0 points for that day. Missing a lab for ***any*** reason will result in receiving 0 points that day.
Total value: 30 points (6%)

Exams

There will be four exams. The first three exams are 50 points each and cover only the material in that unit. The final is worth 100 points, with 25 points covering the chapters covered since the third exam and 75 points covering **cumulative** material from the semester. The lecture exams will only cover material that was discussed in lecture. Material discussed *only* in lab will not be on the exam but realize that some material covered in lecture can overlap with lab information. The format of the exams will be any combination of multiple choice, short answer, matching, diagrams, and fill in the blank.

Total value: 250 points (50%)

Enrichment points

Throughout the semester, you can perform extra credit (NOT bonus) assignments. These assignments are not required. These exercises are not graded but are checked for completeness. By putting forth the effort to do the assignment and following **all** provided guidelines, you will receive the full point value. Further information regarding these assignments will be distributed as due dates approach. Completing all assignments can increase your final grade by 1-3 percentage points.

- Pre-exam (20 pts) – Due by the beginning of the of the 4th lecture; can be submitted late, but no points will be awarded for a late submission.
- Pre-exam review (25 pts) – Due by the last lecture period (D2L dropbox) – Cannot be submitted for points if the Pre-exam was not completed.
- Lab check-out (5 pts) – Last day of lab

Total value: up to 50 points

TOTAL CLASS POINTS: 500 to 550 pts (depending on the number of enrichment assignments completed). Grades will be calculated by dividing the total points received by the total points possible and multiplied by 100 (a simple percentage). The following scale will be used to assign a final grade.

92 to 100%	A	80 to 81%	B-	68 to 69%	D+
90 to 91%	A-	78 to 79%	C+	60 to 67%	D
88 to 89%	B+	72 to 77%	C	<60%	F
82 to 87%	B	70 to 71%	C-		

Grades are assigned based on how well you perform on the graded exercises. I do not "give" a grade because you need it to get into med school, graduate school, or stay in your current program of study. **Note that some programs will not accept a C- as a passing grade.** If you want an A in the course, you will need to exhibit excellence in every aspect of the course. Average performance will result in an average grade (usually B- or C+). Achieving only *minimum* expectations is ***not*** exhibiting excellence and will result in an average grade.

ROUNDING: Percentages with a decimal value of 0.50 or higher will be rounded **up** to the next whole percentage (e.g., 89.50% → 90%). Percentages with a decimal value less than 0.50 will be rounded **down** to the next whole percentage (e.g., 89.499% → 89%). NO EXCEPTIONS.

Future Letters of Recommendation and References

In the future, you may need a former professor to write a letter of recommendation or be a reference for your employment application, application for graduate school, awards and scholarships, or other future endeavors. If you decide that you want to ask me to be a reference for you, you need to consider what you have provided for me to write or talk about. Were you an average, above-average, or excellent student? Were you engaged in class and excited about the material? Am I familiar with you outside of class and your goals for your life and career? Have you separated yourself from other students I have had in terms of interest, motivation, or academic success? What am I going to be able to say about you to convince someone else that you are better than other applicants? Furthermore, have you exhibited any negative characteristics that I might mention in my letter? The

information I give reflects my honest assessment of your work ethic, character, and knowledge, and I will not give false or misleading information because that will affect my ability to vouch for future students. Serving as a reference in no way guarantees that the reference will be a *positive* one. You need to consider these things for *any* person you hope to be a reference, not just me.

If you do ask me to be a reference or write a letter, I **require** the request to be in writing and an in-person meeting scheduled to discuss the position(s) for which you are applying. Before I give a recommendation, I **require** a current CV and/or transcript, copies of or links to forms I need to fill out, and all necessary contact information (names, addresses, phone numbers) required for me to submit the recommendation. Finally, I require these materials be delivered a minimum of **two weeks** before a recommendation is due. If any of these criteria are not met, I will not have time, nor will I be well enough informed to write a letter.

Graduate credit
Students taking the course for graduate credit will be assigned additional work and should discuss this work with the instructor as soon as possible.

Expectations
In lab and lecture, I expect you to be respectful of the other students around you. This means that when I am lecturing, you are quiet and attentive, allowing the other students to hear what they want or need to hear. Continual failure to be respectful of the other students will lead to point deductions.

You are responsible for attending lecture to ensure exposure to all the material covered. **You** are responsible for asking questions regarding topics you do not fully understand. I am willing and happy to meet with you outside of class to further explain any topics. You can stop by during office hours or call/email/see me after class to set up an appointment outside of office hours. If there is <u>any</u> way I can assist you in this class, do not hesitate to ask, and I will do my best to help. Do not risk falling so far behind that catching up is impossible.

UWSP values a safe, honest, respectful, and inviting learning environment. To ensure that each student has the opportunity to succeed, UWSP has developed a set of expectations for all students and instructors. This set of expectations is known as the *Rights and Responsibilities* document, and it is intended to help establish a positive living and learning environment at UWSP.

Academic integrity is central to the mission of higher education in general and UWSP in particular. Academic dishonesty (cheating, plagiarism, etc.) is taken very seriously. **Don't do it!** The minimum penalty for a violation of academic integrity is a failure for the assignment. For more information, see the UWSP "Student Academic Standards and Disciplinary Procedures" section of the *Rights and Responsibilities* document, Chapter 14.

How to be successful in this class

- Attend all scheduled lectures and labs, pay attention, and be an <u>active</u> learner.
- Look at the material you anticipate will be covered in class *before* you arrive to class. Some familiarity with the topics can help you better understand what is being discussed.
- Develop good note-taking skills. **Do not try to write down <u>*everything*</u> that is said or presented on the PowerPoint slides.** Sort through the information and make note of the important ideas and concepts being discussed. Reading and processing the information is the first step in learning the information.
- Print out the skeletonized PowerPoint presentations from D2L and bring them to class to supplement your notes.
- Learn to take notes with abbreviations so that you can spend enough time listening in addition to writing. Leave space in your notes so that you can go back and fill in more details later.
- Be engaged in the classroom. Write information in *your own words*, and answer questions asked by the instructor, even if it is quietly to yourself. If your answer is incorrect or you do not know the answer, make sure you understand why the correct answer is correct.

- Do not study *for exams*. Studying that way promotes memorization, not understanding. Instead, study for learning and understanding, and do it often. You need to develop critical thinking skills to succeed in a science-based course and career. No boss is going to walk into your workspace and ask you to define a list of terms. They will expect you to understand and apply the information, not define it.
- Do not try to memorize definitions. You will need to know what words mean to understand and answer questions, but I will never ask you to define a word.
- Begin studying for exams ***at least two weeks*** before the exam.
- Study frequently. Repetition is the key to learning *any* topic. Studying for 40 hours over the span of two weeks will be much more beneficial than studying for 40 hours the weekend before the exam.
- After you have studied and know some or most of the material, meet with other students in the class and actively *discuss* the information. Explain mechanisms, theories, concepts, etc to other students. The other students can help you fill in areas where you are deficient. You will find that explaining these things to someone else is one of the best ways to ensure you know and understand the information. Then have another student explain a different idea or concept and help them identify areas in which they are deficient.
- Begin studying your notes beginning with "big picture" ideas. Find the bigger concepts and make sure you have a basic understanding of those ideas. Once those bigger concepts are understood, add additional details relating to those ideas. By doing this, you construct "compartments" in your mind to store the details rather than simply trying to absorb all the details and hoping that they arrange themselves into a coherent idea. Ultimately, the difference between an A, B, or C grade is the level of detail that you know, but you should ***begin*** by focusing on the bigger picture and working in the details later.
- The level of detail that you will be required to know is the level of detail that is covered in lectures. The book has much more detailed information, which may help you better understand the material, but I will not ask about the details I do not cover.
- When you do not understand something, LOOK IN THE TEXTBOOK! The book can give more detailed explanations and images that may help you better understand the material. Alternatively, **use the internet**. You have a wealth of information at your fingertips, use it!
- When your notes do not make sense and the book does not help, schedule an appointment with me. I am here to help you learn. I do not expect you to be a microbiologist *before* taking the class. I understand that much of this material may be new to you, and one or two lectures may not be enough for you to fully grasp the concepts. Do not be too stubborn to ask for help or you risk falling behind.
- When answering questions on quizzes and exams, be sure you answer them ***clearly***. You should not expect me to interpret vague answers in your favor. **Your ability to explain something clearly is related to your knowledge of the subject**. If answers are not clear or direct, my interpretation is that you do not understand that topic very well.
- When I ask you to ***explain*** something, the answer should not be a one or two-word answer. A good explanation will incorporate answers to the following questions:
  - "**What** is happening?"
  - "**Why** is it happening?"
  - "**How** it is happening?"
  - Remember ***WHAT, WHY, and HOW***.
- Watch the following YouTube videos. The first is an hour-long lecture from psychology professor discussing how to study. The second is a 6 minute summary of the longer video.
  - https://www.youtube.com/watch?v=IlU-zDU6aQ0
  - https://www.youtube.com/watch?v=23Xqu0jXlfs

Access for all Students

The Americans with Disabilities Act (ADA) is a federal law requiring educational institutions to provide reasonable accommodations for students with disabilities.

If you have a disability and require classroom and/or exam accommodations, please register with the Disability and Assistive Technology Center and then contact me **AT THE BEGINNING OF THE COURSE**. I am happy to help in any way that I can, but you need to be registered. For more information, please visit the Disability and Assistive Technology Center, located on the 6th floor of the Learning Resource Center.

Use of electronics during class
Please turn off/mute/set to vibrate any electronic devices that could interrupt class (lab or lecture) before class begins. If it is a personal emergency, feel free to excuse yourself from the class and communicate outside of the classroom.

TENTATIVE LECTURE SCHEDULE
(Subject to change)

Week	Date	Topic	Chapter(s)
1	Sept 5	LABOR DAY – NO CLASS	
	Sept 7	Syllabus / Introduction to Microbiology	1
2	Sept 12	Introduction to Microbiology	1
	Sept 14	Cellular Structure of Bacteria	3
3	Sept 19	Cellular Structure of Bacteria/Archaea	3/4
	Sept 21	Virus and Prion Structure and Replication	6
4	Sept 26	Bacterial Nutrition and Growth	7
	Sept 28	Antimicrobial Therapy and Resistance	9
5	Oct 3	**EXAM 1**	
	Oct 5	Bacterial Catabolism	11
6	Oct 10	Bacterial Catabolism	11
	Oct 12	Bacterial Anabolism	12
7	Oct 17	Bacterial Genetics	13
	Oct 19	Bacterial Genetics: Regulation of Expression	14
8	Oct 24	Bacterial Genetics: Mechanisms of Genetic Variation	16
	Oct 26	Recombinant DNA Technology	17
9	Oct 31	**EXAM 2**	
	Nov 2	Microbial Genomics	18
10	Nov 7	Bacterial Diversity and Evolution	19
	Nov 9	Viral Diversity	27
11	Nov 14	Microbial Ecology	28, 29, 30, 31
	Nov 16	Microbial Ecology	28, 29, 30, 31
12	Nov 21	Microbial Interactions	32
	Nov 23	**THANKSGIVING BREAK – NO CLASS**	
13	Nov 28	Vertebrate Immune System Basics and Vaccines	33, 34
	Nov 30	Vertebrate Immune System Basics and Vaccines	33, 34
14	Dec 5	Infection and Pathogenicity	35
	Dec 7	**EXAM 3**	
15	Dec 12	Epidemiology	37
	Dec 14	TBD	
16	Dec 18	**FINAL EXAM, Tuesday, December 18, 10:15am-12:15pm**	

TENTATIVE LAB SCHEDULE

Week	Date	Topic	Page(s)
1	Sept 4	Lab Introduction Laboratory Safety The Scientific Method Fomites	III IV-VI XV-XVIII 1-5
	Sept 6	Culture Media	6-12
2	Sept 11	Aseptic Technique and Inoculation	13-22
	Sept 13	Microscopes and Measurement	23-33
3	Sept 18	**QUIZ 1** Basic Staining Techniques	 34-38
	Sept 20	Bacterial Morphology	39-43
4	Sept 25	Capsule, Endospore, Acid-Fast Stains	44-49
	Sept 27	**PLE #1 Morphological Unknown** Motility	50, IX 51-54
5	Oct 2	**QUIZ 2** Relationship of Oxygen to Growth	 55-60
	Oct 4	Environmental Parameters of Growth	61-68
6	Oct 9	Quantitating Microbial Populations	69-76
	Oct 11	Effects of Heat and UV on Bacterial Growth *PLE #1 Due*	77-84
7	Oct 16	Chemical Control of Microbial Growth	85-94
	Oct 18	**QUIZ 3** Chemotherapeutic Agent Sensitivity Testing	 95-100
8	Oct 23	Selective and Differential Media	101-104
	Oct 25	Bacteriophage	105-110
9	Oct 30	Bacterial Transformation	111-116
	Nov 1	**QUIZ 4** Biochemical Differentiation of Cocci	 117-121
10	Nov 6	Biochemical Differentiation of Gram-Negative Bacilli	122-132
	Nov 8	Biochemical Differentiation of Gram-Negative Bacilli	122-132
11	Nov 13	**PLE #2 Biochemical Unknown**	XI
	Nov 15	**PLE# 2 Biochemical Unknown**	XI
12	Nov 20	**QUIZ 5** Fungi	 133-137
	Nov 22	**THANKSGIVING BREAK – NO LAB**	
13	Nov 27	Normal Flora: Cocci *PLE #2 Due*	138-143
	Nov 29	Soil Microbiology	144-150
14	Dec 4	Microbiology of Water **PLE #4 Isolation Streak**	151-160
	Dec 6	Microbiology of Food *PLE #4 Due*	161-166
15	Dec 11	DNA Sequence Analysis **PLE#4 Serial Dilution Plate Count**	167-176
	Dec 13	**QUIZ 6** *PLE #4 Due* **PLE #5 Micropipetting** Lab Clean Up, check out	
16	Dec 19/21	**Finals Week – NO LAB**	