

Biology 333: General Microbiology
Summer 2017
Class Syllabus

Course and Instructor Information

Lecture: MTWRF 9:00 - 10:15, TNR 464

Lab: MTWRF 10:30 - 12:45, TNR 451

Instructor: Dr. Matt Rogge

Office: TNR 435

Phone: 346-2506

Email: mrogge@uwsp.edu

Office hours: By appointment

Course Description

The purpose of this course is to introduce the student to the general study of microorganisms. The course will focus on bacteriology, but topics including viruses and the vertebrate immune system will also be introduced. Lecture material will focus on prokaryotic cell structure and function, microbial metabolism, microbial interactions, the immune system, and pathogenesis. Laboratory exercises will focus on handling and culturing microbes, using cultural and cellular traits to identify bacteria, and applied microbiology.

What you should acquire from this class

Students will understand that...

- The microbial world includes organisms from many taxonomic groups
- The cellular structure of prokaryotic cells is considerably different from that of eukaryotic cells, but both cell types exhibit many similarities in cell chemistry, metabolism, and genetics
- 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

Learning outcomes

Knowledge:

Students will...

- Be able to distinguish prokaryotic from eukaryotic cells
- Describe the metabolic processes used by microbes that allow them to live in diverse habitats and how the metabolic activities contribute to a functional ecosystem
- Explain how microbial genetics affects observable traits in microbes and are used to identify microbes
- Describe beneficial and harmful interactions that microbes have with humans and other organisms in an ecosystem

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 how physical and chemical factors can inhibit microbial growth

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 of antimicrobial agents and the potential negative impacts to humans

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, 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.

Attendance

Students are expected to attend all lecture and lab sessions. It is difficult to make up missed labs or lab assignments due to the availability 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 AT ALL EXAMS IS REQUIRED.** Makeup exams 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 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 assignment is not guaranteed to be granted.**

Open labs

The lab is usually open when there are not any scheduled labs during normal business hours. 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 time period, check the lab schedule posted near the lab entrance to be sure a class is not scheduled at the same time. Classes have priority over open lab time.

Microbiological safety

We 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 a microbiology lab. Part of this class is learning about and using proper microbiological lab techniques as described by the Centers for Disease Control, and students will be graded on their ability to perform these techniques. Students that consistently use improper technique will receive point deductions.

Grading

Lab quizzes

There will be six weekly lab quizzes, each worth 15 points. The quizzes will cover information and techniques covered during lab sessions, as well as real-world application of the methods used in the exercises. The format of the quizzes will be multiple choice, short answer, matching, and fill in the blank. There will be no makeup points for missing a quiz. The material covered on lab quizzes will focus primarily on what tests were done, why they were done, and how they work. Specific results of laboratory exercises (memorizing specific results) are generally not part of quizzes.

Total value: 90 points (22.5% of final grade)

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.

Total value: 60 points (15% of final grade)

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 quizzes will be unannounced, and their point value will vary, but will not exceed 6 points per quiz. The format of the quizzes will be multiple choice, short answer, matching, and fill in the blank. There will be no makeup points for missing a quiz. The material covered on pop quizzes will focus on any of the **introductory material** for that day's lab, but will not cover specific procedures to be performed in lab.

Total value: 20 points (5% of final grade)

Lab participation

Many lab activities are performed in groups. To ensure you are being a team-player and involved in the preparation and analysis of experiments, you will be assigned points for your participation. There are 28 labs this summer, and participation 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 will result in receiving 0 points that day. You do not receive the point for simply *attending* the lab; you must be actively involved. If you have perfect attendance for all labs, you will receive an additional two (2) points.

Total value: 30 points (7.5% of final grade)

Exams

There will be three exams. The first two exams are 50 points each and cover only the material in that unit (see lecture schedule below). The final exam is worth 100 points, with 50 points covering the third unit of material and 50 points covering cumulative material from the first two exams. The exams 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. The only excuses for missing an exam will be a death in the family, violent illness, or accident, and written evidence of some kind **will be required** to make up a missed exam. NO EXCEPTIONS.

Total value: 200 points (50% of final grade – FINAL EXAM is 25% of final grade)

Enrichment points

Throughout the summer, you have the opportunity to perform extra assignments. These assignments are not required.

Pre-exam 10 pts – Due by the end of the first week of class

Scientific journal article summary 15 pts – Due by June 23

Class review 10 pts – Due by the last lecture period

Pre-exam review 10 pts – Due by the last lecture period

Lab check-out 5 pts – Last day of lab

Total value: up to 50 points

TOTAL CLASS POINTS: 400 to 450 pts (depending on the number of optional assignments you complete)

Grades will be calculated by dividing the total points received by the total points possible and multiplied by 100. The following scale will be used to assign a final letter grade at the end of the summer. Grades will not be curved. If you feel an error has been made in the grading of any exercise, you have 48 hours from the time you received the grade to submit in writing to the instructor your reasoning for belief of an error.

93 to 100%	A	80 to 82%	B-	67 to 69%	D+
90 to 92%	A-	77 to 79%	C+	60 to 66%	D
87 to 89%	B+	73 to 76%	C	<60%	F
83 to 86%	B	70 to 72%	C-		

Grades are assigned based on how well you perform on the graded exercises. I will not “give” better grades because you need it to get into med school, grad school, or stay in your current program of study. If you want an A in the course, you will need to exhibit **excellence** in every aspect of the course. Achieving only the *minimum* expectations is **not** exhibiting excellence; it is exhibiting average achievement and will result in an average grade (usually B-, C+, C, or C-). If you underperform in all or most aspects of the class, you should expect to receive a below average grade (D or F).

ROUNDING: Percentages with a decimal value of .50 or higher will be rounded **up** to the next whole percentage (e.g., 89.500% → 90%). Percentages with a decimal value of 0.49 or less 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 in a recommendation reflects my honesty and integrity, and I will not give false or misleading information about you, because that may 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

You are responsible for attending lecture in order to ensure exposure to all the material covered. You are responsible for asking questions for clarification of topics that you do not fully understand. I am more than 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 any way I can assist you in this class, do not hesitate to ask, and I will do my best to help. If you feel that you are falling behind in the class and not understanding the material as it is being presented, GET HELP IMMEDIATELY! Do not risk falling so far behind that catching back up is impossible.

UWSP values a safe, honest, respectful, and inviting learning environment. In order to ensure that each student has the opportunity to succeed, we have 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. Visit here for more information:

<http://www.uwsp.edu/stuaffairs/Pages/rightsandresponsibilities.aspx>

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 (zero) for the assignment. For more information, see the UWSP "Student Academic Standards and Disciplinary Procedures" section of the *Rights and Responsibilities* document, Chapter 14, which can be accessed here: <http://www.uwsp.edu/stuaffairs/Documents/RightsRespons/SRR-2010/rightsChap14.pdf>

How to be successful in this class

- Attend all scheduled lectures and labs, pay attention, and be an active learner.
- Look at the material you anticipate will be covered in class *before* you arrive to class. We cover a lot of material during the semester.
- Develop good note-taking skills. **Do not try to write down *everything* that is said or 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 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 on.
- 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.
- 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.

- 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, a B, and a C is the level of detail that you know, but you should ***begin*** by focusing on the bigger picture.
- The level of detail that you will be required to know is the level of detail that I cover in lectures. The book has much more detailed information, which may help you better understand the material I cover, 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, so 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 will risk falling behind.
- When answering questions, be sure you answer it ***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 fully understand that topic.
- 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=IIU-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. For more information about UWSP’s policies, visit:

<http://www.uwsp.edu/stuaffairs/Documents/RightsRespons/ADA/rightsADAPolicyInfo.pdf>

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 (the Library). You can also find more information here: <http://www4.uwsp.edu/special/disability/>

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. The use of electronics in lab is not recommended, because they could become contaminated with the microbes being used or that have previously been used in lab. If it is a personal emergency, feel free to excuse yourself from the class and communicate outside of the classroom. I do not allow the use of electronics to record my lectures (visual or audio) without prior approval. If I find that lectures or labs are being inappropriately recorded, your final grade will be dropped one full letter.

TENTATIVE LECTURE SCHEDULE

Week	Date	Topic	Chapter(s)
1	May 30	Syllabus / Introduction to microbiology	1, 19
	May 31	Introduction to microbiology and taxonomy	1, 19
	June 1	Introduction to microbiology and taxonomy	1, 19
	June 2	Cellular structure of bacteria	3
2	June 5	Cellular structure of bacteria	3
	June 6	Viruses and prions	6
	June 7	Viruses and prions	6
	June 8	Bacterial nutrition and growth	7
	June 9	Bacterial Metabolism	10, 11, 12
3	June 12	EXAM 1 (through chapter 7)	
	June 13	Bacterial Metabolism	10, 11, 12
	June 14	Bacterial Metabolism	10, 11, 12
	June 15	Bacterial Metabolism	10, 11, 12
	June 16	Bacterial genetics	13
4	June 19	Bacterial genetics	13
	June 20	Bacterial genetics: regulation of expression	14
	June 21	Bacterial genetics: regulation of expression	14
	June 22	Bacterial genetics: mechanisms of genetic variation	16
	June 23	Bacterial genetics: mechanisms of genetic variation	16
5	June 26	EXAM 2 (through chapter 14)	
	June 27	Microbial interactions	32
	June 28	Vertebrate immune system	33, 34
	June 29	Vertebrate immune system	33, 34
	June 30	Infection and pathogenicity	35
6	July 3	REVIEW SESSION	
	July 4	Infection and pathogenicity	35
	July 5	Antibiotic Resistance	9
	July 6	Antibiotic Resistance	9
	July 7	FINAL EXAM	

TENTATIVE LAB SCHEDULE

Week	Date	Topic	Pages
1	May 30	Introduction to the Lab	3-6
		Fomites	8-14
	May 31	Handwashing	15-19
	June 1	Culture media preparation	20-25
	June 2	QUIZ 1 Aseptic Technique	26-36
2	June 5	Microscopes and Measurement	41-52
	June 6	Basic Staining Techniques	53-57
	June 7	Bacterial Morphology	58-62
	June 8	Capsule, Endospore, Acid-Fast Stains	63-68
	June 9	QUIZ 2 PLE #1 (Morphological Unknown) Motility	69-71 72-75
3	June 12	Relationship of Oxygen to Growth	76-79
	June 13	Environmental Parameters of Growth	80-84
	June 14	Quantitating Microbial Populations	99-106
	June 15	Effects of Heat and UV on Bacterial Growth	85-91
	June 16	QUIZ 3 Chemical Control of Microbial Growth <i>PLE #1 Due</i>	92-98
4	June 19	Selective and Differential Media	37-40
	June 20	Biochemical Characterization	113-124
	June 21	PLE #2 (Morphological, Cultural, and Biochemical Unknowns)	125-126
	June 22	Read Biochemical Results	
	June 23	QUIZ 4 Read PLE #2 Biochems	
5	June 26	Soil Microbiology	138-141
	June 27	Microbiology of Water	142-148
	June 28	Microbiology of Food	149-152
	June 29	Bacteriophage	127-130
	June 30	PLE #3: Serial Dilution Plate Count QUIZ 5 Transformation <i>PLE #3 Due</i>	167-176
6	July 3	REVIEW SESSION	
	July 4	NO CLASS	
	July 5	Normal Flora: Cocci	153-158
		Dental Microbiology <i>PLE #2 due</i>	159-160
	July 6	Antibiotics PLE #4: Isolation Streak	161-163
	July 7	QUIZ 6 <i>PLE #4 Due</i> Lab Clean-up PLE #5, Pipetting	