Biology 233: Microbiology for Health Sciences
Spring 2019
Class Syllabus

Course and Instructor Information
Lecture: T Th 11:00-11:50, CBB 269
Lab: M W 10:00-11:50, CBB 366
Final Exam: Wednesday, May 15 8:00am-10:00am

Instructor: Dr. Matt Rogge
Office: CBB 345
Phone: 346-2506
Email: mrogge@uwsp.edu

Office hours: T, Th 10:00-10:50am
Other times by appointment

Course Description
The purpose of this course is to introduce the pre-health students to the study of microorganisms. The course will focus on bacteriology, but additional topics include viruses, prions, fungi, and the vertebrate immune system. Lecture will focus on prokaryotic cell structure and function, microbial metabolism, microbial interactions, and disease. Laboratory exercises will focus on handling and culturing microbes, using cultural and cellular traits to identify bacteria, and applied microbiology. All topics will focus specifically on human health-related microbes.

What you should acquire from this class
Students will understand that…
- Microbes can be both beneficial and detrimental to human health
- The microbial world includes organisms from many taxonomic groups, including bacteria, fungi, and protists
- The study of microbes requires careful observation and precise techniques, especially in relation to human health
- 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 that allow microbes to colonize multiple different ecosystems
- Recognize how microbial genetics affects observable traits in microbes and are used to identify microbes
- Recognize beneficial and detrimental interactions that microbes have with humans
- Identify characteristics of the immune system involved in fighting pathogens and developing immunity in response to vaccines
- Relate specific microbes to specific diseases, and recognize disease signs and symptoms

Skills:
Students will…
- Demonstrate the use of aseptic technique in handling and culturing 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 microbe growth

Dispositions:

Students will…

- Identify the advantages and disadvantages of microbes to health and well-being of humans and other organisms
- Describe the importance of vaccinations in community health
- Realize the effects of overuse antimicrobial agents and the potential negative impacts

Required materials

Textbook:	Foster, et al. 2018. Microbiology: The Human Experience, 1st Edition. W. W. Norton & Company, New York, New York. Available from text rental.
Lab manual:	Microbiology Lab Exercises, A Manual for Biology 233, Spring 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 will be 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, QUIZZES, AND PLEs IS REQUIRED**. Make-up exams/assignments 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 date is not guaranteed.**

Open labs

The lab is usually 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 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*.

NOTE: Because laboratory safety and etiquette are necessary in every lab (educational or professional), the laboratory introduction and safety information is fair game for all quizzes and exams administered throughout the semester.

Grading

Lab quizzes

There will be five lab quizzes worth a total of 75 points. Each quiz is 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 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 missing a quiz.
Total value: 75 points (16.67%)

Lab exercises

There will be five graded lab exercises (practical lab exercises – PLEs) each worth 10 or 15. 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 (13.33%)

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 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 (4.4%)

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. If you are active within your group, you 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, even if the absence is due to illness.
Total value: 25 points (5.6%)

Information Sourcing Assignment – **DUE MONDAY, APRIL 22**

You are to choose any topic related to a pathogenic microbe (bacterium, virus, parasite, etc) or disease caused by a microbe and find different types of information about that microbe. You are to find at least ***two*** scientific articles that discuss the disease/microbe (journal articles), ***two*** medically/scientifically related websites that describe or explain the disease or pathogen (government agencies, universities, health clinics, etc), ***two*** websites not associated with a government agency, university, clinic, etc (WebMD, Wikipedia, etc), and ***two*** popular media articles describing the disease/pathogen (newspaper articles, magazine articles, etc). In total, you should have a minimum of ***eight*** sources. Use these sources to write a brief summary of the disease/pathogen, how it is transmitted, and how it is treated (1 pages). Following that summary, compare the types of sources to each other (1 page). Which sources were more useful or beneficial? Which sources do you trust more, and why? What **evidence** is there that one source is more trustworthy than another? Explain any skepticism you have regarding any of the sources. Provide a URL to the articles and websites. The purpose of this exercise is to become familiar with how to find information to answer a question and how to determine if the source is trustworthy and accurate. You should develop some level of skepticism for certain types of information. More information will be provided later in the semester.
Total value: 20 pts (4.4 %)

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 50 points covering the fourth unit of material and 50 points covering cumulative material from the semester. The lecture exams cover material that was discussed in class. 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: 250 points (55.6%)

TOTAL CLASS POINTS: 450 pts

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 grade. Grades will not be curved.

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 described exercises. I do not "give" grades because you need a minimum grade to be eligible for Nursing School. **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 the *minimum* expectations is ***not*** exhibiting excellence; it is being average and will result in an average grade.

ROUNDING: Percentages with a decimal value of xx.50 or higher will be rounded **up** to the next whole percentage (e.g., 89.500% → 90%). Percentages with a decimal value less than xx.50 will be rounded **down** to the next whole percentage (e.g., 89.49999999% → 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 honesty, and I will not give false or misleading information, 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.

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 be quiet and allow 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 in order to ensure exposure to all the material covered. You are responsible for asking questions regarding topics 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. Do not risk falling so far behind that catching up is impossible.

UWSP values a safe, honest, respectful, and inviting learning environment. In order to ensure that each student can 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.

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.

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.
- Relate material in class to the outside world. Microbiology is a requirement for Nursing Schools, so ask yourself "Why is this information important?" Associating the information with real-world aspects will help you retain the material better. If you do not know how the material is relevant to your career, ASK!
- 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.
- 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, 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, 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, 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 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. 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. 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	Jan 22	Syllabus / Introduction to microbiology	1
	Jan 24	Microbes and Human History	1
2	Jan 29	Basic Concepts of Disease	2
	Jan 31	Chemistry of Life	4
3	Feb 5	Chemistry of Life	4
	Feb 7	Chemistry of Life	4
4	Feb 12	Prokaryotic and Eukaryotic cells	5
	Feb 14	Prokaryotic and Eukaryotic cells	5
5	Feb 19	Bacterial Nutrition and Growth	6
	Feb 21	Bacterial Metabolism	7
6	Feb 26	Bacterial Metabolism	7
	Feb 28	Bacterial Genetics	8
7	Mar 5	Bacterial Genetics	8
	Mar 7	Bacterial Genomes and Evolution	9
8	Mar 12	Bacterial Genomes and Evolution	9
	Mar 14	Eukaryotic Microbes	11
	Mar 19	**SPRING BREAK – NO CLASS**	
	Mar 21		
9	Mar 26	Viruses	12
	Mar 28	Antibiotics	13
10	Apr 2	Normal Flora	14
	Apr 4	Vertebrate Innate Immune System	15
11	Apr 9	Vertebrate Adaptive Immune System	16
	Apr 11	Immune Disorders and Vaccines	17
12	Apr 16	Pathogenesis	18
	Apr 18	Epidemiology	26
13	Apr 23	Skin and Eye Infections	19
	Apr 25	Infections of the Respiratory System	20
14	Apr 30	Systemic Infections	21
	May 2	Digestive Tract Infections	22
15	May 7	Urinary, and Reproductive Tract Infections	23
	May 9	Infections of the Nervous System	24
16	May 14 – 18	**FINAL EXAM, Wednesday May 15, 8:00am-10:00am**	

TENTATIVE LAB SCHEDULE

Week	Date	Topic	Page
1	Jan 21	MLK Day – NO LAB	
	Jan 23	Lab Introduction and Safety	9
		Fomites and Contamination Lab	12
2	Jan 28	Handwashing	18
	Jan 30	Culture Media	23
3	Feb 4	Aseptic Technique and Inoculation Practices	27
	Feb 6	**Quiz 1**	
		Microscopes	37
4	Feb 11	Basic Staining	45
	Feb 13	Bacterial Morphology and the Gram Stain	51
5	Feb 18	EXAM 1	
	Feb 20	Capsule, Endospore, and Acid-Fast Stains	56
6	Feb 25	**Quiz 2**	
		Relationship of Oxygen to Growth	62
		PLE 1	
	Feb 27	Environmental Parameters of Growth	66
7	Mar 4	Quantifying Microbial Cultures	71
	Mar 6	Control of Microbes Using Heat and UV Light	79
8	Mar 11	Chemical Control of Microbial Growth	84
		PLE 1 Due	
	Mar 13	**Quiz 3**	
		Fungi	91
	Mar 18-20	**SPRING BREAK – NO LAB**	
9	Mar 25	Chemotherapeutic Agent Sensitivity Testing	96
	Mar 27	EXAM 2	
10	Apr 1	Selective and Differential Culture	99
	Apr 3	Biochemical Analysis of Cocci	103
11	Apr 8	Biochemical Analysis of Gram-Negative Bacilli	106
	Apr 10	Biochemical Analysis of Gram-Negative Bacilli Interpretations	
12	Apr 15	PLE 2 Staining and Biochemical Inoculation	
	Apr 17	PLE 2 Biochemical Interpretation	
13	Apr 22	EXAM 3	
	Apr 24	**Quiz 4**	
		Human Normal Flora: The Cocci	114
		PLE 4 Due	
14	Apr 29	Microbiology of Water	120
		PLE 3 Isolation Streak	
	May 1	Microbiology of Food	125
		PLE 3 Due	
15	May 6	PLE 4 Serial Dilution Plating	
		FINAL EXAM REVIEW	
	May 8	**Quiz 5**	
		PLE 4 Due	
		PLE 5 Micropipetting	
		Finals Week – NO LAB	