

Term Information

Effective Term Summer 2018

General Information

Course Bulletin Listing/Subject Area Microbiology
Fiscal Unit/Academic Org Microbiology - D0350
College/Academic Group Arts and Sciences
Level/Career Undergraduate
Course Number/Catalog 4000.02
Course Title Basic and Practical Microbiology
Transcript Abbreviation Bsc & Prac Micrbio
Course Description Provides an understanding of microorganisms and their interaction with the human experience. Online/in-person hybrid version of M4000.01
Semester Credit Hours/Units Fixed: 4

Offering Information

Length Of Course 14 Week, 12 Week, 8 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? Yes
Is any section of the course offered Greater or equal to 50% at a distance
Grading Basis Letter Grade
Repeatable No
Course Components Laboratory, Lecture
Grade Roster Component Lecture
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites 3 cr hrs in Biology.
Exclusions Not open to students with credit for Microbiology 4000.01
Electronically Enforced No

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 26.0502
Subsidy Level Baccalaureate Course
Intended Rank Sophomore, Junior, Senior, Masters

Requirement/Elective Designation

General Education course:

Biological Science

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Describe the basic morphology of bacteria, their growth requirements, and how they adapt and reproduce
- Explain how environmental factors affect the culturing of microbes in a laboratory setting
- Understand the diversity of metabolism that exists in bacteria and describe the unique metabolic ways used only in the prokaryotic world
- Describe bacterial genetics with the emphasis on two main processes responsible for the diversity in the bacterial world: mutations and bacterial gene transfer
- Describe the basic morphology of viruses, how they reproduce and cause diseases
- Apply appropriate aseptic techniques when completing any exercise in laboratory
- Correctly carry out basic microbiology laboratory techniques including: staining, production of pure cultures, production of dilution series and enumeration of microbes, the filter disk method of testing bacterial susceptibility, and ELISA tests
- Correctly and safely use any equipment needed to carry out exercises in laboratory
- Demonstrate how to identify unknown bacteria using tests, media, and techniques introduced in laboratory
- Explain how unknown bacteria are identified through submission of a laboratory report that includes a flow chart and interpretation of results
- Explain how microbes are involved both constructively and destructively in foods
- Explain microbial symbiosis and describe some of the normal microbiota of the nose, mouth, and skin based on cultured samples from individual students
- Understand infection and disease control and the preventive techniques necessary to limit the spread of bacteria and viruses
- Describe and explain various ways to control the growth of microbes
- Describe how to track the spread of a simulated disease, and how to determine the index case
- Describe the systems of natural, or non-specific, and adaptive immunity and how they protect humans from disease
- Describe how microbes overcome the host body's immune mechanisms and how they are transmitted

Content Topic List

- Functional anatomy of prokaryotic cells
 - Microbial growth and metabolism
 - Microbial genetics
 - Viruses
 - Control of microbial growth and antimicrobial drugs
 - Innate and adaptive immunity
 - Microbial mechanisms of pathogenicity
 - Principles of disease and epidemiology
 - Laboratory exercises: microscopes and their uses
 - Laboratory exercises: microbial staining techniques and applications
 - Laboratory exercises: isolation of organisms from mixed cultures, nutritional requirements, use of differential and selective media, and identification of unknown bacteria
 - Laboratory exercises: environmental factors affecting growth: oxygen, temperature, pH, and osmolarity
 - Laboratory exercises: control of microbial growth
 - Laboratory exercises: microbes in food
 - Laboratory exercises: host interactions: symbiosis, parasitism, mutualism, human microbiome, and immune responses
 - Laboratory exercises: epidemiology
- No

Sought Concurrence

Attachments

- Cover_Letter2.pdf: Cover Letter
(Cover Letter. Owner: Kwiek, Jesse John)
- M4000_assessment_plan_submit.pdf: Updated Assessment Plan
(GEC Course Assessment Plan. Owner: Kwiek, Jesse John)
- GE_rationale_submit.pdf: GE Rationale
(Other Supporting Documentation. Owner: Kwiek, Jesse John)
- M4000 online Syllabus_submit.pdf: M4000.02 (hybrid) proposed syllabus
(Syllabus. Owner: Kwiek, Jesse John)
- MB4000-AU17.pdf: M4000.01 (in person) current syllabus
(Syllabus. Owner: Kwiek, Jesse John)
- Microbiology 4000 Pradhan.pdf: A&S Distance Learning Technical Feasibility Report
(Other Supporting Documentation. Owner: Kwiek, Jesse John)

Comments

COURSE REQUEST
4000.02 - Status: PENDING

Last Updated: Vankeerbergen, Bernadette
Chantal
01/24/2018

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Kwiek, Jesse John	01/11/2018 11:31 AM	Submitted for Approval
Approved	Kwiek, Jesse John	01/11/2018 11:31 AM	Unit Approval
Approved	Haddad, Deborah Moore	01/11/2018 12:13 PM	College Approval
Pending Approval	Nolen, Dawn Vankeerbergen, Bernadette Chantal Oldroyd, Shelby Quinn Hanlin, Deborah Kay Jenkins, Mary Ellen Bigler	01/11/2018 12:14 PM	ASCCAO Approval



11 January 2018

Dear Colleagues,

The Department of Microbiology would like to add a hybrid/blended section of Microbiology 4000.02, with 60% of the content offered online [lecture] and 40% of the content offered in-person [laboratory]. We expect that the online section of the lecture will make introductory microbiology more accessible to students. The existing Microbiology 4000 syllabus (now M4000.01) has been updated to reflect online delivery and policies, and the updated syllabus has been approved by Michael Kaylor; the existing syllabus is attached for your reference. We have updated the GE assessment plan to reflect the online delivery of the material; we are currently reviewing and updating the existing GE rationale and assessment plans. Thank you for your consideration.

Sincerely,

Jesse J. Kwiek
Associate Professor
Vice Chair for Teaching & Undergraduate Affairs
Department of Microbiology
Ohio State University
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484 West 12th Avenue
Columbus, OH 43210
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MICROBIOLOGY 4000: BASIC AND PRACTICAL MICROBIOLOGY SUMMER 2018

Instructors

Course Instructor: Madhura Pradhan, Ph. D.

Email: pradhan.2@osu.edu

Phone number: 614-292-1196

Office hours: 372 Biological Sciences Building, 484 W 12th Ave

Online office hours via Carmen Conference Thursdays, 1:30-2:30pm;

In person office hours Tuesdays, 1:30-2:30pm

By appointment: either in person or via carmen conference

Lab Coordinator: Dr. Mette Ibba

Email: ibba.2@osu.edu

Phone: 292-0509

Office: 374 Biological Sciences Building, 484 W 12th Ave

Office Hours: Email or call for appointment or just drop by.

Course format and description

Microbiology 4000 is a hybrid course combining the in-person activities of a laboratory with the advantage of online educational experience. Students meet in-person once a week for a three-hour lab session. The contents of the lecture component of the class are delivered online via Canvas. In this course, we explore microbial cell structure and function, dynamics of bacterial growth and physiology, microbial genetics, methods of control and antibiotics, viruses, immune system and host-microbe interactions, epidemiology and a representative group of infectious diseases.

General Education Course Information

Microbiology 4000 is a General Education Course (GE) in Natural Science and as such, is part of the Colleges of Arts and Sciences (ASC) General Education Program.

Course learning outcomes

Goals of ASC Natural Sciences Courses:

Natural science coursework fosters students' understanding of the principles, theories and methods of modern science, the relationship between science and technology, and the effects of science and technology on the environment.

Learning Objectives of ASC Natural Sciences Courses:

1. Students understand the basic facts, principles, theories, and methods of modern science.

2. Students learn key events in the history of science.
3. Students provide examples of the inter-dependence of scientific and technological developments.
4. Students discuss social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

Microbiology 4000 meets the GE Natural Science Learning Objectives in multiple ways. The course includes an overview of the basic biology, structure, and function of microorganisms with a concentration on bacteria and viruses. Principles and theories related to microbial growth, metabolism, genetics, and the human immune system are included. Students study modern scientific methods of culturing and identifying microbes in the laboratory part of the course. The lecture part of the course also explains how scientific methods are used in the field of microbiology and how these methods have been used historically in key discoveries such as pasteurization, vaccination and antibiotic therapy. Both lecture and lab provide opportunities for students to learn and experience how technological advances in microscopy, genetic engineering, and biochemical techniques have contributed to understandings of scientific principles of microbiology and vice versa. In lecture, current events from news media and recent scientific publications are used to help students appreciate the positive and negative roles of microorganisms in fields such as health and disease, the environment, industry, and food sciences. By the end of the course, students will have developed an understanding of how microorganisms are involved in nearly every aspect of their everyday life.

By the end of this course, students should successfully be able to (¹Lecture goal; ²Lab goal):

1. Describe the basic morphology of bacteria, their growth requirements, and how they adapt and reproduce.^{1,2}
2. Explain how environmental factors affect the culturing of microbes in a laboratory setting.^{1,2}
3. Understand the diversity of metabolism that exists in bacteria and describe the unique metabolic ways used only in the prokaryotic world.¹
4. Describe bacterial genetics with the emphasis on two main processes responsible for the diversity in the bacterial world: mutations and bacterial gene transfer.¹
5. Describe the basic morphology of viruses, how they reproduce and cause diseases.¹
6. Apply appropriate aseptic techniques when completing any exercise in lab.²
7. Correctly carry out basic microbiology laboratory techniques including: Gram staining, production of pure cultures, production of dilution series and enumeration of microbes, inoculation of various culture media, the filter disk method of testing bacterial susceptibility to various agents, and use of the ELISA test.²
8. Correctly and safely use any equipment needed to carry out exercises in lab.²
9. Demonstrate how to identify unknown bacteria using tests, media, and techniques introduced in lab.²
10. Explain how unknown bacteria are identified through submission of a lab report that includes a flow chart and interpretation of results.²
11. Describe biofilm, and explain how it is formed.
12. Explain how microbes are involved both constructively and destructively in foods.^{1,2}
13. Explain microbial symbiosis based on observations made in lab.²
14. Describe some of the normal microbiota of the nose, mouth, and skin.¹

15. Understand infection and disease control. Understand the preventative techniques necessary to limit the spread of bacteria and viruses.¹
16. Describe and explain various ways to control the growth of microbes.^{1,2}
17. Describe how to track the spread of a simulated disease, and how to determine the index case.^{1,2}
18. Describe the system of natural or non-specific immunity.¹
19. Describe Adaptive immunity; understand how it is acquired and how it protects us.¹
20. Describe how microbes overcome the host body's immune mechanisms and how they are transmitted.¹
21. Explain several aspects of immunity based on observations made in lab. Including: phagocytosis, precipitin, agglutination, and complement fixation.^{1,2}
22. Describe the etiological agent, pathogenesis, symptoms and treatment of microbial diseases of the respiratory system and the digestive system.¹

Required course materials

Lecture Text: “Microbiology: A Human Perspective”, 8th ed. by Nester et al.,

McGraw Hill Publishing Co. ISBN 9781259874994 (**e-Textbook plus Connect Access Code**). Available at the OSU bookstores or can be purchased by using the link: <http://connect.mheducation.com/class/d-bullwinkle--pradhanmwf>

Laboratory Manual: The printed and/or digital version of the lab manual “Basic and Practical Microbiology” as well as the Active Learning component are available for purchase at the University Readers Student Store <https://students.universityreaders.com/store/>. It is also available at the OSU bookstores.

Other requirements

Twice during the semester students will meet outside the class in order to take the midterm and final exams. The midterm exam is scheduled on (date), (time) in room _____. The exam is scheduled right after the end of the laboratory period. The final, as published by the University Registrar's office, will be held on (date, time, location).

Course technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <https://ocio.osu.edu/help/hours>, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** <http://ocio.osu.edu/selfservice>
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Privacy Policy for McGraw Hill Connect/Learnsmart: <https://youtu.be/MWw9RHU3knE>

Privacy Policy for Cognella site use for Laboratory:

http://digital.universityreaders.com/cr/Cognella_Active_Learning_Privacy_Policy.pdf

Baseline technical skills necessary for online courses

- Basic computer and web-browsing skills
- Navigating Carmen

Technology skills necessary for this specific course

- CarmenConnect text, audio, and video chat
- Recording, editing, and uploading video

Necessary equipment

- Computer: current Mac (OS X) or PC (Windows 7+) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed
- Microphone: built-in laptop or tablet mic or external microphone

Necessary software

- [Microsoft Office 365 ProPlus](#) All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Each student can install Office on five PCs or Macs, five tablets (Windows, iPad® and Android™) and five phones.
 - Students are able to access Word, Excel, PowerPoint, Outlook and other programs, depending on platform. Users will also receive 1 TB of OneDrive for Business storage.
 - Office 365 is installed within your BuckeyeMail account. Full instructions for A
- Adobe Reader and any plugins (e.g. Flash) needed to view videos

OSU Computer Resources

In order to create a video presentation or to create a voice-over presentation, you may want to use one of the Digital Unions on campus. The facilities on campus and their operating timings can be found at <https://odee.osu.edu/digital-union>

Grading scale

93–100: A	80–82.9: B-	67 –69.9: D+
90–92.9: A-	77–79.9: C+	60 –66.9: D
87–89.9: B+	73–76.9: C	Below 60: E
83–86.9: B	70 –72.9: C-	

Grades

Assignment or category	Points
Online Lecture (600 points)	
Course Introduction/Digital Tour	10
Weekly Online Learnsmart reading quizzes (complete 8 out of 10)	80
Online Canvas Quizzes based on lectures/videos/animations/case-study	150
In-class midterm exam	150
Online Video presentation	40
Participation in online discussion (2X)	20
In-class Final Exam	150
In-class Lab (400 points)	
12 Pre-lab quizzes	120
7 Lab Module quizzes	105
Summary of ID of Unknown bacteria	25
2 Lab manual checks	10
3 Lab Competency tests	15
Lab Final exam	125
Total	1000

See course schedule, below, for due dates

Faculty feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. You can call **614-688-HELP** at any time if you have a technical problem.

Grading and feedback

For large weekly assignments, you can generally expect feedback within **7 days**.

E-mail

I will reply to e-mails within **24 hours on school days**.

Discussion board

I will check and reply to messages in the discussion boards every **24 hours on school days**.

Student participation requirements

Because this is a hybrid course, your attendance is based on BOTH your online and in-class activity and participation. The following is a summary of your expected online participation:

- **Logging in: AT LEAST THREE TIMES PER WEEK**
Be sure you are logging in to the course in Carmen at least three times each week, including weeks with holidays or weeks with minimal online course activity. (During most weeks you will probably log in many times.) If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*.
- **Office hours: OPTIONAL**
All my office hours are optional. If you are required to discuss an assignment with me, please contact me at the beginning of the week if you need a time outside my scheduled office hours.
- **Participating in discussion forums: TWO TIMES PER SEMESTER**
During the entire semester, students are expected to participate twice in online discussion, on the topic provided by the instructor. This could be a topic in the news or a scientific article or a research paper. Student must post a response to the discussion question and then respond to at least one other student's post with substantive comments.

Course requirements for online Lecture and in-person Lab

All students in this hybrid course:

- are expected to attend all lab sessions. Lab attendance is mandatory for successful completion of this course.
- are expected to take one in-class **midterm** and one in-class **final exam**. In order to be eligible for an exam makeup, students must:
 - 1) Have a **VALID** excuse (illness, death, **unavoidable** academic or sports conflict, etc.). Excusable absences are ultimately decided by the Instructor.
 - 2) Email the Instructor **BEFORE** the regularly scheduled exam (at least **1 week** prior in situations where student is aware of a conflict).
 - 3) Provide written, original documentation for your absence (email attachments are NOT accepted).
 - 4) Complete the makeup exam within **5 DAYS** of the regularly scheduled exam. The format of the make-up exam may be different from the regularly scheduled exam.
- are expected to complete 8 out of 10 **Learnsmart** assignments throughout the semester. We will use Adaptive Learning Resource called Connect/ LearnSmart (from McGraw Hill) in this course for assessment purposes and to encourage student preparedness. This smart technology uses continuously adapting learning path individualized for each student. You will need an Access Code (that comes with electronic textbook) in order to gain access to Connect/LearnSmart technology. You will be assigned LearnSmart questions based on **10 chapters** throughout the semester, out of which you need to complete questions for **8 chapters** in order to get the full credit of 80 points (10 points/chapter), however partial credit will be given (ex. 50% complete = 5 pts). The credit is provided for the completion of the assignment and not the correctness, as the purpose of this assignment is to encourage students to read the book and be prepared. The

open and close/due dates are listed in the lecture schedule and on Carmen and most of the due dates fall on the Sunday before the topics are introduced in online lectures. The extent of questions asked for each chapter is not fixed since it will vary depending on the depth and complexity of the topics being covered. Each assignment will remain open over a period of approximately **one week** and must be completed **BEFORE** the deadline. It can be accessed multiple times during the open period and also after the submission/due date, if you'd like to review the questions just before the exam. You will not get credit for completion of the assignment after the due date. **NO EXCEPTIONS. NO MAKEUPS.** (Technical difficulties can be directed to McGraw Hill: 1-800-331-5094 (be sure to get a case number))

- are expected to watch online videos/animations/ lecture recordings, read through lecture notes, case study examples, take notes AND answer the quiz questions associated with these online activities. Each week, students will have at least two chapters to study. **Weekly quizzes** associated with these activities will be timed quizzes and students are expected to be prepared and have some level of mastery over the content. **Timed** quizzes may not allow time for students to look up the answers and hence it is strongly recommended for students to be fully prepared with content before approaching these quizzes. Students will be allowed to drop the two lowest grades from these quizzes.
- During the entire semester, students are expected to participate twice in online discussion, on the topic provided by the instructor. This could be a topic in the news or a scientific article or a research paper. Student must post a response to the discussion question and then respond to at least one other student's post with substantive comments.
- Create a 3-5 minute video using voice over presentation software. This presentation could be on a topic chosen from a list of topics provided by the instructor.
- The seven lab module quizzes question students about the exercises already performed in each of the individual modules (chapters) of the lab manual and serve to assess the students' gained knowledge.
- Summary of ID of unknown bacteria is a report written by each student that summarizes all steps the student performed in order to identify two unknown bacteria.
- The two lab manual checks are collections of pages from the students' lab manual to check answers to questions concerning the exercises the students have been completing.
- The three competency tests are hands-on tests students' acquired ability to work with microscopes
- to perform three-phase streak plates in order to obtain single isolated colonies
- to inoculate a culture using aseptic technique
- Lab final exam is comprehensive with questions covering material from all 7 modules in the lab manual.

Late assignments

- No late submission of assignments will receive credit including any of the online Learnsmart assignments or online timed quizzes.

- Students are provided with opportunities to complete extra work and drop the lowest grade. Therefore, there will be no make-up work provided. There will be no opportunities to turn in extra work for extra credit.
- Since you will have one week to complete the Learnsmart assignment and five days to complete the online timed quiz, technical difficulty or illness or any other reason will not be accepted as an excuse to make up missed work. Also, students are allowed to drop lowest grade for online quizzes. Any missed timed quiz or Learnsmart assignment will be considered as the dropped one.
- Submit your work early and avoid waiting till the last minute. Your internet not working at the last minute of submission is not a valid excuse.

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. Informality (including an occasional emoticon) is fine for non-academic topics.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Policies for this online course

- **Quizzes and exams:** You must complete the in-class midterm and final exams yourself, without any external help or communication.
- **Written assignments:** Your written assignments, including discussion posts, should be your own original work. In formal assignments, you should follow [MLA/APA/?] style to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in--but no one else should revise or rewrite your work.
- **Reusing past work:** In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- **Falsifying research or results:** All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.

- **Collaboration and informal peer-review:** The course includes many opportunities for collaboration with your classmates. While study groups and peer-review of major written projects is encouraged, remember that comparing answers on a quiz or assignment is not permitted. If you're unsure about a particular situation, please feel free just to ask ahead of time.
- **Group video presentation projects:** This course includes group projects, which can be stressful for students when it comes to dividing work, taking credit, and receiving grades and feedback. I have attempted to make the guidelines for group work as clear as possible for each activity and assignment, but please let me know if you have any questions.

Ohio State's academic integrity policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's *Code of Student Conduct*, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's *Code of Student Conduct* is never considered an "excuse" for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct.

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

If COAM determines that you have violated the University's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- The Committee on Academic Misconduct web pages ([COAM Home](#))
- *Ten Suggestions for Preserving Academic Integrity* ([Ten Suggestions](#))
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Academic Support services and Student Resources

The University offers a range of academic support services and resources to help students successfully handle the academic demands. A few examples of these services include Advising, Tutoring, Workshops to help students improve study skills. For further details, follow the links below or contact the office to take advantage of all these resources.

<http://advising.osu.edu/welcome.shtml>

<http://advising.osu.edu/welcome.shtml>

<http://ssc.osu.edu>

<http://Younkinsuccess.osu.edu/academic-services>

The college of Arts and Sciences has a comprehensive list of Student Resources on its own website.

<https://artsandsciences.osu.edu/academics/current-students/resources>

Arts and Sciences Advising and Academic Services

100 Denney Hall (West Lobby)

164 Annie and John Glenn Avenue, Columbus, OH 43210

Tel: (614) 292-6961; Fax: (614) 292-6303

Trigger warning

Some contents of this course may involve media that may be triggering to some students due to descriptions of and/or scenes depicting acts of violence, acts of war, natural disasters, outbreak of infectious diseases and its aftermath. If needed, please take care of yourself while watching/reading this material (leaving classroom to take a water/bathroom break, debriefing with a friend, contacting a Sexual Violence Support Coordinator at 614-292-1111, or Counseling and Consultation Services at 614-292-5766, and contacting the instructor if needed).

Expectations are that we all will be respectful of our classmates while consuming this media and that we will create a safe space for each other. Failure to show respect to each other may result in dismissal from the class.

Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to

offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu

Accessibility accommodations for students with disabilities

Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614- 292-3307, slds@osu.edu; slds.osu.edu

Requesting accommodations

If you would like to request academic accommodations based on the impact of a disability qualified under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, contact your instructor privately as soon as possible to discuss your specific needs. Discussions are confidential.

In addition to contacting the instructor, please contact the Student Life Disability Services at [614-292-3307](tel:614-292-3307) or ods@osu.edu to register for services and/or to coordinate any accommodations you might need in your courses at The Ohio State University.

Go to <http://ods.osu.edu> for more information.

Accessibility of course technology

This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- [Carmen accessibility](#)
- [McGraw Hill Connect/Learnsmart Accessibility](#)
<https://www.mheducation.com/about/accessibility.html>
- Cognella Accessibility: <https://www.canvaslms.com/accessibility>
- Streaming audio and video
- Synchronous course tools

Your mental health!

A recent American College Health Survey found stress, sleep problems, anxiety, depression, interpersonal concerns, death of a significant other and alcohol use among the top ten health impediments to academic performance. Students experiencing personal problems or situational crises during the quarter are encouraged to contact the College of Pharmacy Office of Student Services in room 150 Parks Hall (614-292-5001) OR OSU Counseling and Consultation Services (614-292-5766) for assistance, support and advocacy. This service is free and confidential.

Microbiology 4000: Lecture Schedule, Summer 2018

Note: The following schedule is subject to change.

Week Due	Topic	Chapter(s)	Assignments
	Introduction/ Humans and the Microbial World	1	
	Microscopy and Cell Structure	3	
1	Microscopy and Cell Structure	3	
	Dynamics of Prokaryotic Growth	4	
	Dynamics of Prokaryotic Growth	4	
	Metabolism: Enzymes Review	6	
	Metabolism: Carbohydrate Catabolism	6	
2	Metabolism: The Diversity of Prokaryotic Organisms	6	
	The Control of Microbial Growth	5	
	The Control of Microbial Growth	5	
	Bacterial Genetics	7	
	Bacterial Genetics	8	
3	Bacterial Genetics	8	
	Viruses, viroids and prions	13	
	Viruses, viroids and prions	13	
	Antimicrobial Medications	20	
	Antimicrobial Medications	20	
4	Epidemiology	19	
	Epidemiology	19	
Midterm Exam 1 (chapters 1,3,4,5,6,7,8,13,20)			
	The Innate Immune Response	14	
	The Innate Immune Response	14	
5	The Innate/The Adaptive Immune Response	14, 15	
	The Adaptive Immune Response	15	
	The Adaptive Immune Response: Humoral	15	

	Practical applications of Immunology	15
	The Adaptive Immune Response: Cell-mediated	15
6	Host-Microbe Interactions	16
	Host-Microbe Interactions	16
	Respiratory System Infections	21
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	Respiratory System Infections	21
7	Digestive System Infections	24
	Digestive System Infections	24
Aug. 4	FINAL EXAM (Tuesday, 10:00-11:45 am)	14, 15, 16, 19, 21, 24

Microbiology 4000 Lab Schedule – Summer 2018

Lab	Date	Laboratory Assignment
1	T - June 16	Exercise 1: The Compound Brightfield Microscope – Period 1 Exercise 2: Other Microscopes and Their Uses – Demonstration/Period 1 Exercise 3: Microbial Ubiquity and Diversity - Period 1 Supplement to Exercise 6: Dilution and Enumeration Supplement Micropipettors
2	R - June 18	Exercise 2: Other Microscopes and Their Uses – Discussion/Period 2 Exercise 3: Microbial Ubiquity and Diversity – Period 2 Exercise 6: Introduction to Streak and Spread Plate Techniques- Period 1 Aseptic technique mini quiz – Open on Carmen June 19 (F) to June 22 (M)
3	T - June 23	Exercise 4: Simple and Differential Staining Techniques – Period 1 Exercise 6: Introduction to Streak and Spread Plate Techniques - Discussion/Period 2 Exercise 7: The Acid-Fast Stain – Demonstration/Period 1 Exercise 8: The Capsule Stain – Period 1 Exercise 9: Observations of Endospores – Period 1 Exercise 10: Isolation of Microorganisms from Mixed Cultures- Period 1 Exercise 15: Bacterial Cytochrome Oxidase and Catalase Activity - Period 1

		<p>Competency Test 1: Microscope</p> <p>Quiz 1: Exercises 1 - 6 + Lab Safety-Open on Carmen June 24 (W) to June 27 (Sa)</p>
4	R - June 25	<p>Exercise 10: Isolation of Microorganisms from Mixed Cultures – Discussion/Period 2</p> <p>Exercise 11: Bacterial Nutritional Requirements and Media Classification - Period 1</p> <p>Exercise 12: Using Selective, Differential and Selective-Differential Media - Period 1</p> <p>Exercise 15: Bacterial Cytochrome Oxidase and Catalase Activity - Discussion/Period 2</p> <p>Competency Test 1: Microscope (continued)</p> <p>Competency Test 2: Inoculation</p>
5	T - June 30	<p>Exercise 10: Isolation of Microorganisms from Mixed Cultures – Discussion/Period 3</p> <p>Exercise 11: Bacterial Nutritional Requirements and Media Classification - Period 2</p> <p>Exercise 12: Using Selective, Differential and Selective-Differential Media - Period 2</p> <p>Exercise 13: Growth curve</p> <p>Exercise 14: Carbohydrate Utilization in Bacteria - Period 1</p> <p>Exercise 16: Protein Utilization in Bacteria - Period 1</p> <p>Exercise 17: Culturing Bacteria Under Anaerobic Conditions - Period 1</p> <p>Competency Test 3: 3-phase streak plate</p>
6	R - July 2	<p>Exercise 14: Carbohydrate Utilization in Bacteria - Discussion/Period 2</p> <p>Exercise 16: Protein Utilization in Bacteria – Discussion/Period 2</p> <p>Exercise 17: Culturing Bacteria Under Anaerobic Conditions - Discussion/Period 2</p> <p>Exercise 18: Nitrate Reduction in Anaerobic Respiration - Period 1</p> <p>Exercise 20: The Enterotube II and API 20E Systems – Demonstration/Period 1</p> <p>Exercise 21: The Identification of Unknown Bacteria - Period 1</p> <p>Quiz 2: Exercises 6 - 12 - Open on Carmen July 3 (F) to July 6 (M)</p>
7	T - July 7	<p>Exercise 18: Nitrate Reduction in Anaerobic Respiration - Discussion/Period 2</p> <p>Exercise 19: The Effects of pH on Microbial Growth - Period 1</p> <p>Exercise 21: The Identification of Unknown Bacteria - Period 2</p> <p>Exercise 23: The Effects of Osmotic Pressure on Microbial Growth – Period 1</p>

8	R - July 9	<p>Exercise 19: The Effects of pH on Microbial Growth - Discussion/Period 2</p> <p>Exercise 21: The Identification of Unknown Bacteria - Period 3</p> <p>Exercise 22: The Effects of Temperature on Bacterial Growth - Period 1</p> <p>Exercise 23: The Effects of Osmotic Pressure on Microbial Growth - Discussion/Period 2</p> <p>Suppl. to Exercise 23: A Demonstration</p> <p>Exercise 24: Viability of Bacteria Exposed to High Temperature - Period 1</p> <p>Exercise 25: The Effects of UV Radiation on Bacterial Growth – Period 1</p> <p>Quiz 3: Exercises 14 - 19 - Open on Carmen July 10 (F) to July 13 (M)</p>
9	T - July 14	<p>Exercise 21: The Identification of Unknown Bacteria - Period 4</p> <p>Exercise 22: The Effects of Temperature on Bacterial Growth - Discussion/Period 2</p> <p>Exercise 24: Viability of Bacteria Exposed to High Temperature–Discussion/Period 2</p> <p>Exercise 25: The Effects of UV Radiation on Bacterial Growth – Discussion/Period 2</p> <p>Exercise 26: Microbes and Food - Period 1</p>
10	R - July 16	<p>Exercise 21: The Identification of Unknown Bacteria - Period 5</p> <p>Exercise 26: Microbes and Food - Discussion/Period 2</p> <p>Exercise 27: The Effectiveness of Hand Washing - Period 1</p> <p>Exercise 28: The Effects of Mouthwashes and Rinses on Bacterial Growth –Period 1</p> <p>Exercise 29: The Effects of Disinfectants and Antiseptics on Bacterial Growth – Period 1</p> <p>Exercise 30: The Effects of Antibiotics on Bacterial Growth - Period 1</p> <p>Exercise 31: Observations of Natural Antibiotic Action - Period 1</p> <p>Case Study I</p> <p>Quiz 4: Exercises 20, 22, 23 - 26 - Open on Carmen July 17 (F) to July 20 (M)</p>

11	T - July 21	<p>Exercise 21: The Identification of Unknown Bacteria – Discussion/Period 6 Suppl. Exercise 21: How to prepare your summary</p> <p>Exercise 27: The Effectiveness of Hand Washing – Discussion/Period 2</p> <p>Exercise 28: The Effects of Mouthwashes and Rinses on Bacterial Growth – Dis./Period 2</p> <p>Exercise 29: The Effects of Disinfectants and Antiseptics on Bacteria – Dis./Period 2</p> <p>Exercise 30: The Effects of Antibiotics on Bacterial Growth –Discussion/Period 2</p> <p>Exercise 31: Observations of Natural Antibiotic Action –Discussion/Period 2</p> <p>Suppl. Exercise 33-35: Microbial Symbiosis</p> <p>Exercise 33: Mutualism - Demo</p> <p>Exercise 34: Normal Microbiota of the Nose and Mouth– Period 1</p> <p>Exercise 35: Microbial Symbiosis: Parasitism - Bacteriophage - Period 1</p> <p>Exercise 37: Phagocytic Activity Associated with the Inflammatory Response: Demo</p> <p>Exercise 38: Virulence Factors in Bacteria - Demo</p> <p>Exercise 39: The Host-Specific Immune Response - Precipitation and Agglutination</p> <p>Exercise 40: The Classical Pathway of Complement fixation – Demo</p>
12	R - July 23	<p>Exercise 21: The Identification of Unknown Bacteria - Period 7 (ASSIGNMENT DUE!)</p> <p>Exercise 30: The Effects of Antibiotics on Bacterial Growth - Period 3</p> <p>Exercise 35: Microbial Symbiosis: Parasitism - Bacteriophage - Period 2</p> <p>Case Study II</p> <p>Exercise 41: Epidemiology simulation</p> <p>Exercise 42: Using Elisa to Track an Epidemic</p> <p>Quiz 5: Ex. 21,30,31,34-35,37,40-42-Open on Carmen July 24 (F) to July 27 (M)</p>
	T - July 28	<p>Final Lab Exam 60 multiple choice questions and 1 calculation of cfu/ml</p>

Microbiology 4000: Basic and Practical Microbiology

Autumn 2017

The Ohio State University

Lecture meets for 3 classroom hours per week, on Monday, Wednesday, and Friday. Attendance in lecture and lab is **required** for successful completion of the course. We currently use Canvas as a supplement to both the lecture and lab portions of the class. On **OSU Carmen/Canvas** you will find the comprehensive syllabus and lecture material. On **Cognella Canvas** you will find all lab material, such as lab PowerPoint presentations, videos of lab techniques, flash cards, games, PreLab quizzes and Module quizzes. You can find a link to Cognella Canvas on the OSU Canvas homepage. **Important FAQs** can be found on Carmen (link on the homepage).

Materials needed for course

Lecture Text: “Nester’s Microbiology: A Human Perspective”, 8th ed. by Anderson et al., McGraw Hill Ed. (e-Textbook with online Connect Access).

Available at the OSU bookstores or can also be purchased directly by using the link in Carmen.

Laboratory Manual: A printed version of the lab manual “Basic and Practical Microbiology” as well as the Active Learning component are available for purchase at the University Readers Student Store <https://students.universityreaders.com/store/>. It is also available at the OSU bookstores.

Instructor Information

Course instructors: Dr. Tammy Bullwinkle

Email: bullwinkle.1@osu.edu

Phone: 292-5867

Office: 384B Biological Sciences Building, 484 W 12th Ave

Office Hours: Wed 1-3 pm and Thurs 3:00-4:00 pm (until Oct. 18th) or by appointment

Dr. Maria (Mia) Neil

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Office: 318 Biological Sciences Building, 484 W 12th Ave

Office Hours: Wed 1-3 pm (starting Oct. 18th) or by appointment

Lab Coordinator: Dr. Mette Ibba

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Office: 374 Biological Sciences Building, 484 W 12th Ave

Office Hours: Email or call for appointment or just drop by.

MICROBIOLOGY 4000: Lecture Schedule, Autumn 2017

NOTE: THE FOLLOWING SCHEDULE IS SUBJECT TO CHANGE.

Date	Topic	Chap	Connect HW	Instr
Aug. 23	Introduction to Course and Microbiology	1	Ch.3 opens 8/23 @ 6:00a	TB/MN/MI
Aug. 25	Intro to Micro/ Microscopy and Cell Structure	1,3		TB
Aug. 28	Cell Structure	3		TB
Aug. 30	Cell Structure	3	Ch. 4 opens 8/30 @ 6:00a	TB
Sep. 1	Prokaryotic Growth	4		TB
Ch.3 DUE 9/3 (Sun) @ 11:59p				
Sept. 4	Labor Day: NO CLASS			
Sept. 6	Prokaryotic Growth	4	Ch. 6 opens 9/6 @ 6:00a	TB
Sept. 8	Microbial Metabolism	6		TB
Ch. 4 DUE 9/10 (Sun) @ 11:59p				
Sept. 11	Microbial Metabolism	6		TB
Sept. 13	Microbial Metabolism	6		TB
Sept. 15	Microbial Metabolism	6		TB
Ch. 6 DUE 9/17 (Sun) @ 11:59p				
Sept. 18	EXAM 1 Monday During Lecture Chapters 1, 3, 4, 6			
Sept. 20	Bacterial Genetics: Prokaryotic Gene Exp.	7	Ch. 8 opens 9/20 @ @ 6:00a	TB
Sept. 22	Bacterial Genetics: Prokaryotic Gene Exp.	7,8		TB
Sept. 25	Bacterial Genetics: Mutations and Repair	8		TB
Sept. 27	Bacterial Genetics: Mutations and Repair/ HGT	8		TB
Sept. 29	Bacterial Genetics: HGT	8		TB
Oct. 2	Viruses, Viroids, and Prions	13	Ch. 13 opens 10/2 @ 6:00a	TB
Oct. 4	Viruses, Viroids, and Prions	13		TB
Oct. 6	Viruses, Viroids, and Prions	13		TB
Ch. 8 DUE 10/8 (Sun) @ 11:59p				
Oct. 9	Antimicrobial Drugs	20		TB
Oct. 11	Antimicrobial Drugs	20		TB
Oct. 13	Fall Break: NO CLASS			
Ch. 13 DUE 10/15 (Sun) @ 11:59p				
Oct. 16	EXAM 2 Monday During Lecture Chapters 7, 8, 13, 20			
Oct. 18	Innate Immunity	14	Ch. 14 opens 10/18 @ 6:00a	MN
Oct. 20	Innate Immunity	14		MN
Oct. 23	Innate Immunity	14		MN
Oct. 25	Adaptive Immunity	15	Ch. 15 opens 10/25 @ 6:00a	MN
Oct. 27	Adaptive Immunity	15		MN
Ch. 14 DUE 10/28 (Sun) @ 11:59p				
Oct. 30	Adaptive Immunity	15		MN
Nov. 1	Humoral and Cell-mediated Responses	15	Ch. 16 opens 11/1 @ 6:00a	MN
Nov. 3	Host-Microbe Interactions	16		MN
Ch. 15 DUE 11/5 (Sun) @ 11:59p				
Nov. 6	Host-Microbe Interactions	16		MN
Nov. 8	Epidemiology	19		MN
Nov. 10	Veteran's Day Observed: NO CLASS			
Ch. 16 DUE 11/12 (Sun) @ 11:59p				
Nov. 13	EXAM 3 Monday During Lecture Chapters 14, 15, 16			
Nov. 15	Epidemiology	19		MN
Nov. 17	Epidemiology/ Respiratory System Infections	19, 21		MN
Nov. 20	Respiratory System Infections	21		MN
Nov. 22	Thanksgiving: NO CLASS			
Nov. 24	Thanksgiving: NO CLASS			
Nov. 27	Respiratory/ Digestive System Infections	21, 24		MN
Nov. 29	Digestive System Infections	24		MN
Dec. 1	Digestive System Infections	24		MN
Dec. 4	Control of Growth	5		MN
Dec. 6	Control of Growth	5		MN
Dec. 14	FINAL EXAM (Not Cumulative) Chapters 19, 21, 24, 5		THURS @ 10:00 AM (11:30 AM lecture) THURS @ 4:00 PM (4:10 PM Lecture)	

Lab	Date	<p align="center">Microbiology 4000 Laboratory Schedule Prelab Quizzes Module Quizzes Assignments</p>
1	T - August 22 W - August 23 R - August 24	<p>Online Pre-Lab 1 Quiz (DUE IMMEDIATELY)</p> <p>Exercise 1-1: Lab safety rules and regulations – M1 (Module 1) Exercise 1-2: Where do the parts belong on the microscope – M1 Exercise 1-3: Using the microscope – M1 Exercise 1-4: Getting familiar with microbes and their sizes – M1 Exercise 1-5: Motility and pond water microbes – M1 Exercise 1-6: Fungi and molds – M1</p> <p>Online Module 1 Quiz (Due before class meets next)</p> <p>Online Pre-Lab 2 Quiz (Due before class meets next)</p>
2	T - August 29 W - August 30 R - August 31	<p>Exercise 2-1: Streaking bacteria organisms to obtain single isolated colonies – Day1/M2 Exercise 2-2: Streaking bacterial organisms to examine nutritional needs – Day1/M2 Exercise 2-3: Streaking microorganisms to examine temperature requirements – Day1/M2 Exercise 2-4: Isolating and characterizing of bacterial species from a mixed culture– Day1/M2 Exercise 2-5: Dilution and enumeration using spread plate technique- Day1/M2 Exercise 2-6: Simple stain – crystal violet - M2 Exercise 2-7: Differential stain – Gram stain - M2</p> <p>Practice use of Micropipettes</p> <p>Online Pre-Lab 3 Quiz (Due before class meets next)</p>
3	T - September 5 W - September 6 R – September 7	<p>Exercise 2-1: Streaking microorganisms to obtain single isolated colonies - Day2/M2 Exercise 2-2: Streaking bacterial organisms to examine nutritional need – Day2/M2 Exercise 2-3: Streaking microorganisms to examine temperature requirements – Day2/M2 Exercise 2-4: Isolating and characterizing of bacterial species from a mixed culture– Day2/M2 Exercise 2-5: Dilution and enumeration using spread plate technique- Day2/M2 Exercise 2-8: Acid-fast stain - M2 DEMO Exercise 2-9: Capsule stain - M2 Exercise 2-10: Observation of endospores - M2 Exercise 2-11: The endospore stain - M2 DEMO Exercise 2-12: The Flagella stain - M2 DEMO</p> <p>Competency Test 1: Microscope (In class)</p> <p>Online Pre-Lab 4 Quiz (Due before class meets next)</p>

4	<p>T - September 12 W - September 13 R – September 14</p>	<p>Exercise 2-4: Isolating and characterizing of bacterial species from a mixed culture – Day3/M2 Exercise 2-5: Dilution and enumeration using spread plate technique - Day3/M2</p> <p>Exercise 3-1: Sampling the environment - Day1/M3 Exercise 3-2: Biofilm formation using pond water sample - Day1/M3 Exercise 3-3: Isolation of a biofilm-forming bacterium from soil - Day1/M3</p> <p>Exercise 4-1: Carbohydrate utilization in bacteria – Day1/M4</p> <p>Online Module 2 Quiz (Due before class meets next)</p> <p>Competency Test 1: Microscope (continued) (In class) Competency Test 2: Inoculation (In class)</p> <p>Online Pre-Lab 5 Quiz (Due before class meets next)</p>
5	<p>T - September 19 W - September 20 R – September 21</p>	<p>Exercise 3-1: Sampling the environment - Day 2/M3 Exercise 3-2: Biofilm formation using pond water sample – Day2/M3 Exercise 3-3: Isolation of a biofilm-forming bacterium from soil – Day2/M3</p> <p>Exercise 4-1: Carbohydrate utilization in bacteria - Day2/M4 Exercise 4-2: Protein utilization in bacteria – Day1/M4 Exercise 4-3: Catalase and oxidase activities – Day1/M4 Exercise 4-4: Aerobic and anaerobic growth – Day1/M4</p> <p>Competency Test 3: 3-phase streak plate (In-class) Lab manual check – R&Q pages will be collected from Module 1 and 2</p> <p>Online Pre-Lab 6 Quiz (Due before class meets next)</p>
6	<p>T - September 26 W - September 27 R – September 28</p>	<p>Exercise 3-3: Isolation of a biofilm-forming bacterium from soil – Day3/M3</p> <p>Exercise 4-2: Protein Utilization in Bacteria – Day2/M4 Exercise 4-3: Catalase and oxidase activities – Day2/M4 Exercise 4-4: Aerobic and anaerobic growth – Day2/M4 Exercise 4-5: Anaerobic respiration and Nitrate reduction – Day1/M4</p> <p>Exercise 5-1: Identification of unknown bacteria in the clinic - Day1/M5 Exercise 5-2: Identification of unknown bacteria in the laboratory - Day1/M5</p> <p>Online Pre-Lab 7 Quiz (Due before class meets next)</p>
7	<p>T - October 3 W - October 4 R – October 5</p>	<p>Exercise 3-3: Isolation of a biofilm-forming bacterium from soil – Day4/M3</p> <p>Exercise 4-5: Anaerobic respiration and Nitrate reduction – Day2/M4 Exercise 4-6: Selective, differential and selective-differential media - Day1/M4</p> <p>Exercise 5–2: Identification of unknown bacteria in the laboratory - Day2/M5</p> <p>Exercise 6-1: Growth Curve – M6 Exercise 6-2: Effect of pH on bacterial growth - Day1/M6 Exercise 6-3: Effects of osmosis pressure on bacterial growth - Day1/M6 Potato slices Demo - M6</p> <p>Online Module 3.1 Quiz (Due before class meets next)</p> <p>Online Pre-Lab 8 Quiz (Due before class meets next)</p>

	T - October 10 W - October 11 R – October 12	No labs
8	T - October 17 W - October 18 R – October 19	<p>Exercise 3-3: Isolation of a biofilm-forming bacterium from soil – Day5/M3</p> <p>Exercise 4-6: Selective, differential and selective-differential media - Day2/M4</p> <p>Exercise 5–2: Identification of unknown bacteria in the laboratory - Day3/M5</p> <p>Exercise 6-2: Effect of pH on bacterial growth - Day2/M6</p> <p>Exercise 6-3: Effects of osmosis pressure on bacterial growth - Day2/M6</p> <p>Exercise 6-4: Effect of high temperature on viability of bacteria – Day1/M6</p> <p>Exercise 6-5: Effect of UV radiation on bacterial viability – Day1/M6</p> <p>Online Module 4 Quiz (Due before class meets next)</p> <p>Online Pre-Lab 9 Quiz (Due before class meets next)</p>
9	T - October 24 W - October 25 R – October 26	<p>Exercise 3-4: Examination of microbes in milk and juice- Day1/M3</p> <p>Exercise 3-5: Examination of microbes in meat and cheese- Day1/M3</p> <p>Exercise 3-6: The symbiotic relationship of bacteria in yogurt production – Day1/M3</p> <p>Exercise 5–2: Identification of unknown bacteria in the laboratory - Day4/M5</p> <p>Exercise 6-4: Effect of high temperature on viability of bacteria – Day2/M6</p> <p>Exercise 6-5: Effect of UV radiation on bacterial viability Day2/M6</p> <p>Exercise 6-6: The effectiveness of hand washing – Day1/M6</p> <p>Case study I - Handout</p> <p>Lab manual check – R&Q pages will be collected from Module 3.1 and 4</p> <p>Online Module 5 Quiz (Due before class meets next)</p> <p>Online Pre-Lab 10 Quiz (Due before class meets next)</p>
10	T - October 31 W - November 1 R - November 2	<p>Exercise 3-4: Examination of microbes in milk and juice - Day2/M3</p> <p>Exercise 3-5: Examination of microbes in meat and cheese - Day2/M3</p> <p>Exercise 3-6: The symbiotic relationship of bacteria in yogurt production – Day2/M3</p> <p>Exercise 5–2: Identification of unknown bacteria in the laboratory - Day5/M5</p> <p>Exercise 6-6: The effectiveness of hand washing – Day2/M6</p> <p>Exercise 6-7: Effects of mouthwashes and rinses on bacterial growth – Day1/M6</p> <p>Exercise 6-8: Effects of antiseptics and disinfectants on bacterial growth – Day1/M6</p> <p>Exercise 6-9: The effect of antibiotics on bacteria – Day1/M6</p> <p>Exercise 6-10: The action of natural antibiotics – Day1/M6</p> <p>Case Study I –Day 1</p> <p>Online Module 3.2 Quiz (Due before class meets next)</p> <p>Online Pre-Lab 11 Quiz (Due before class meets next)</p>

11	T – November 7 W - November 8 R - November 9	<p>Exercise 5–2: Identification of unknown bacteria in the laboratory - Day6/M5</p> <p>Exercise 6-7: Effects of mouth washes and rinses on bacterial growth – Day2/M6 Exercise 6-8: Effects of antiseptics and disinfectants on bacterial growth – Day2/M6 Exercise 6-9: The effect of antibiotics on bacteria – Day2/M6 Exercise 6-10: The action of natural antibiotics – Day2/M6</p> <p>Exercise 7-1: Mutualism – M7 Exercise 7-2: Parasitism – Day1/M7 Exercise 7-3: Phagocytosis and virulence factors – M7 Exercise 7-4: Antigen-antibody interactions – M7</p> <p>Normal Microbiota of the Nose and Mouth - Handout</p> <p>Case Study I – Day 2</p> <p>Case study II (read through Case Study II before Lab 12)</p> <p>Online Module 6 Quiz (Due before class meets next)</p> <p>Online Pre-Lab 12 Quiz (Due before class meets next)</p>
12	T – November 14 W - November 15 R - November 16	<p>Exercise 5–2: Identification of unknown bacteria in the laboratory - Assignment due</p> <p>Exercise 6-9: The effect of antibiotics on bacteria – Day3/M6</p> <p>Exercise 7-2: Parasitism – Day2/M7 Exercise 7-5: Case study II, Epidemiology and Elisa – M7</p> <p>Online Module 7 Quiz (Due before class meets next)</p>
13	T – November 28 W - November 29 R - November 30	<p>In-Class Lab Exam</p>

Microbiology 4000 Learning Outcomes

Successful students will be able to...

1. Describe the basic morphology of bacteria, their growth requirements, and how they adapt and reproduce.^{1,2}
2. Explain how environmental factors affect the culturing of microbes in a laboratory setting.^{1,2}
3. Understand the diversity of metabolism that exists in bacteria and describe the unique metabolic ways used only in the prokaryotic world.¹
4. Describe bacterial genetics with the emphasis on two main processes responsible for the diversity in the bacterial world: mutations and bacterial gene transfer.¹
5. Describe the basic morphology of viruses, how they reproduce and cause diseases.¹
6. Apply appropriate aseptic techniques when completing any exercise in lab.²
7. Correctly carry out basic microbiology laboratory techniques including: Gram staining, production of pure cultures, production of dilution series and enumeration of microbes, inoculation of various culture media, the filter disk method of testing bacterial susceptibility to various agents, and use of the ELISA test.²
8. Correctly and safely use any equipment needed to carry out exercises in lab.²
9. Demonstrate how to identify unknown bacteria using tests, media, and techniques introduced in lab.²
10. Explain how unknown bacteria are identified through submission of a lab report that includes a flow chart and interpretation of results.²
11. Describe Biofilm, and explain how it is formed.
12. Explain how microbes are involved both constructively and destructively in foods.^{1,2}
13. Explain microbial symbiosis based on observations made in lab.²
14. Describe some of the normal microbiota of the nose, mouth, and skin.¹
15. Understand infection and disease control. Understand the preventative techniques necessary to limit the spread of bacteria and viruses.¹
16. Describe and explain various ways to control the growth of microbes.^{1,2}
17. Describe how to track the spread of a simulated disease, and how to determine the index case.^{1,2}
18. Describe the system of Natural or non-specific immunity.¹
19. Describe Adaptive immunity; understand how it is acquired and how it protects us.¹
20. Describe how microbes overcome the host body's immune mechanisms and how they are transmitted.¹
21. Explain several aspects of immunity based on observations made in lab. Including: phagocytosis, precipitin, agglutination, and complement fixation.^{1,2}
22. Describe the etiological agent, pathogenesis, symptoms and treatment of microbial diseases of the Respiratory system and the Digestive system.¹

¹Lecture goal

²Lab goal

Guidelines for Final Grade

Points Available: The entire course is based on a 400 point system. 240 of the points are from lecture and 160 points are from lab assessments.

Lecture Exam 1	50 points
Lecture Exam 2	50 points
Lecture Exam 3	50 points
Lecture Exam 4 (Final, non-comprehensive)	50 points
Lecture Homework (Connect) – 8 @ 5pts ea.	40 points
PreLab Quizzes	45 points (1 and 4 pts per quiz)
7 Lab Module Quizzes	42 points (6 pts per quiz)
Unknown Summary (ID of unknown bacteria)	10 points
Assignments	4 points (2 pts each assignment)
3 Lab Competency Tests	9 points (3 pts per competency test)
Final Lab Exam	50 points
TOTAL	400 points

*Please see Attendance Policy on p. 10 of this syllabus

Grading Scale (Note: This is a guideline and may be subject to change)

<u>Final total points</u>	<u>Grade</u>	<u>Final total points</u>	<u>Grade</u>
372-400	A	308-319	C+
360-371	A-	292-307	C
348-359	B+	280-291	C-
332-347	B	268-279	D+
320-331	B-	240-267	D

The table below gives additional information concerning the point categories above. Please read the information carefully and ask if you have questions.

Table Concerning Point Categories (continued on the next page)

Lecture Exam Policy: All exams are as scheduled and are during regularly scheduled lecture or final exam times. Students are to take exams in the course section they are enrolled in.

In order to be eligible for an exam makeup, students must:

- 1) Have a **VALID** excuse (illness, death, **unavoidable** academic or sports conflict, etc.). Excusable absences are ultimately decided by the Instructor.
- 2) Email either Dr. Bullwinkle or Dr. Neil **BEFORE** the regularly scheduled exam (at least **1 week** prior in situations where student is aware of a conflict).
- 3) Provide written, original documentation for your absence (email attachments are NOT accepted).
- 4) Complete the makeup exam within **5 DAYS** of the regularly scheduled exam.

All makeups will be administered by the OSU Testing Center. Once approved for a makeup:

- 1) Contact the Testing Center and arrange an appointment: <http://registrar.osu.edu/testing/index.asp>
- 2) Forward the appointment confirmation email for approval by the Instructor. Making an appointment does not guarantee eligibility for exam credit, you need to be approved (see above). It is the student's responsibility to inform the Instructor of their appointment in a timely fashion.

3) Your exam will be at the Testing Center for your appointment. Bring your ID. It is student's responsibility to show up on time.

NOTE: The format of make-up exams may be different (short answer) than the regular exams.

Lecture Homework Assignments: We will use Adaptive Learning Resource called Connect/ LearnSmart (from McGraw Hill) in this course for assessment purposes and to encourage student preparedness. This smart technology uses continuously adapting learning path individualized for each student. You will need an Access Code (that comes with electronic textbook) in order to gain access to Connect/LearnSmart technology.

You will be assigned LearnSmart questions based on **8 chapters** throughout the semester, which you need to COMPLETE in order to get the full credit of 40 points (5 points/chapter), however partial credit will be given (ex. 50% complete = 2.5 pts). The open and close/due dates are listed in the lecture schedule (p. 2) and on Carmen. The extent of questions asked for each chapter is not fixed since it will vary depending on the depth and complexity of the topics being covered. Each assignment will remain open over a period of approximately **7-10 days** and must be completed **BEFORE** the deadline. It can be accessed multiple times during the open period and also after the submission/due date, if you'd like to review the questions just before the exam. You will not get credit for completion of the assignment after the due date. **NO EXCEPTIONS. NO MAKEUPS.**

Technical difficulties can be directed to McGraw Hill: 1-800-331-5094 (be sure to get a case number)

PreLab Quizzes and Module Quizzes: PreLab quizzes have to be completed each week in order to prepare for lab. Each quiz contains 8-12 questions; You can take a PreLab quiz **twice** before the due date. Module quizzes have to be completed after finishing all exercises within each individual module. You can take each of the Module quizzes only **once**. There will be giving no make-up quizzes and only under certain conditions, and with proper documentation, will a make-up PreLab/Module quizzes be given.

Lab Competency Tests: Learning basic microbiology laboratory techniques is an important part of your lab experience. During the semester you will be tested on three of these techniques: Use of the compound light microscope, aseptic technique, and three-phase streak plate. You will have plenty of opportunities to practice these techniques during lab. Please be sure to ask your lab TA to observe you as you practice and to critique your technique.

Lab Assignment 1 and 2: These assignments concern the post-exercise questions found in your lab manual. Twice during the semester your answers will be randomly collected from 2 – 4 exercises by your TAs and graded.

Assignment 3 - Identification of Unknown Bacteria: This assignment concerns the identification of two unknown bacterial species. The lab manual and Cognella Canvas will contain detailed information about the format to be use for this assignment.

Final Lab Exam: The examination will include questions about the techniques and touch on several different exercises from throughout the semester. More information concerning specific topics covered in the exam will be given in the lab period prior to the final lab exam and guidelines will be posted a few weeks prior to the exam. The exam consists of 50 multiple choice questions about lab exercise techniques and their interpretation.

Lab Safety: Although that the majority of microbes we will be working with in lab under normal conditions are harmless, it is important that you let us know if you are immunocompromised in any way, or if you are pregnant. You may want to contact your Primary Care Physician before lab starts too. We can give you a list of microbes that we will be working with that you can show to your physician. It is essential that everyone follow our safety procedures and guidelines at all times.

ATTENDANCE POLICY

Lecture attendance

Attendance in lecture is required for successful completion of the course. Exams are based on material covered during lecture. You are responsible for any class discussions, handouts, additional assignments, announcements, and schedule changes.

Attendance in the laboratory is mandatory. It is necessary for course completion to attend the labs. Due to the nature of this course, **make-up labs are not a possibility.** Missing one or more labs without a valid written excuse (e.g. doctor's note), will result in losing course points (4 pts per lab absence), which likely will influence your overall grade. For an excused absence from lab, please bring a valid written excuse within one week of the missed lab. You also lose points for being over 10 minutes late to lab (0.2 pts). If you are over 40 minutes late to lab it will count as a missed lab. If you have more than 4 unexcused or excused absences you may not be allowed to complete the lab course. Please, contact the lab coordinator and TA to see if you will be allowed to complete the course. Please, note that if your absences are due to a documented illness or other valid excused reasons, you may be eligible for an incomplete grade. (NOTE: Written records of your reason must be submitted.)

QUESTIONS CONCERNING GRADING OF COURSE MATERIALS

If you have any questions or concerns regarding grading of any of the lecture exams offered in this course, you must submit them in writing to the lecture instructor within one week from the date the grade for the exam is posted on Carmen. You must address all the concerns regarding the final exam before the final grade is posted on Carmen. Once the final grade is posted, no questions from the final will be addressed.

Any questions that you have regarding grading of lab materials must be submitted in writing to your lab TA or the lab coordinator within a week of the date the graded material (quiz, etc.) was returned to you.

Disability Statement

Any student who feels s/he may need an accommodation based on the impact of a disability should contact Dr. Neil/Bullwinkle (for lecture accommodations) or Dr. Mette Ibba (for lab accommodations) privately to discuss your specific needs. Please contact the Office for Disability Services at 614-292-3307 in room 098 Baker Hall to coordinate reasonable accommodations for students with documented disabilities.

Academic Misconduct Statement

- Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute "Academic Misconduct."
- The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an "excuse" for academic misconduct, so we recommend that you review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.
- If we suspect that a student has committed academic misconduct in this course, we are obligated by University Rules to report our suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct (i.e., committed academic

misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

Examples of academic misconduct most applicable to Microbiology 4000:

- Knowingly providing or receiving answers or information during or about a quiz or exam
- Possessing or using unauthorized items or material during a quiz or exam
- Copying any portion of an assignment from another student of Micro 4000 (current or past)
- Copying any portion of an assignment from a published source or web site
- Falsifying your identity or asking another student to falsify their identity
- Changing graded material or scores
- Falsifying documentation or lying about an excuse to miss an exam or lab
- Asking instructors to change your grade as a personal favor

Ignorance of the Universities Code of Student Conduct is not an excuse for academic misconduct. For more information see: <http://studentlife.osu.edu/csc/>. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact Dr. Bullwinkle, Dr. Neil, or Dr. Ibba.

General Education Course Information

Microbiology 4000 is a General Education Course (GE) in Natural Science and as such, is part of the Colleges of Arts and Sciences (ASC) General Education Program.

Goals of ASC Natural Sciences Courses:

Students understand the principles, theories, and methods of modern science, the relationship between science and technology, the implications of scientific discoveries and the potential of science and technology to address problems of the contemporary world.

Learning Objectives of ASC Natural Sciences Courses:

1. Students understand the basic facts, principles, theories, and methods of modern science.
2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.
3. Students provide examples of the inter-dependence of scientific and technological developments.
4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

Microbiology 4000 meets the GE Natural Science Learning Objectives in multiple ways. The course includes an overview of the basic biology, structure, and function of microorganisms with a concentration on bacteria and viruses. Principles and theories related to microbial growth, metabolism, genetics, and the human immune system are included. Students study modern scientific methods of culturing and identifying microbes in the laboratory part of the course. The lecture part of the course also explains how scientific methods are used in the field of microbiology and how these methods have been used historically in key discoveries such as pasteurization, vaccination and antibiotic therapy. Both lecture and lab provide opportunities for students to learn and experience how technological advances in microscopy, genetic engineering, and biochemical techniques have contributed to understandings of scientific principles of microbiology and vice versa. In lecture, current events from news media and recent scientific publications are used to help students appreciate the positive and negative roles of microorganisms in fields such as health and disease, the environment, industry, and food sciences. By the end of the course, students will have developed an understanding of how microorganisms are involved in nearly every aspect of their everyday life.

Microbiology 4000 GE Rationale

This course will be offered as a GE course, in the category of Natural Sciences.

1. GE Rationale:

a. Expected Learning Outcomes

- i. Students understand the basic facts, principles, theories and methods of modern science. [ELO1]
- ii. Students understand key events in the development of science and recognize that science is an evolving body of knowledge. [ELO2]
- iii. Students describe the inter-dependence of scientific and technological developments. [ELO3]
- iv. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world. [ELO4]

b. How the course will satisfy the stated Expected Learning Outcomes: Microbiology 4000 meets the GE Natural Science Learning Objectives in multiple ways. The course includes an overview of the basic biology, structure, and function of microorganisms with a concentration on bacteria and viruses [ELO1]. Principles and theories related to microbial growth, metabolism, genetics, and the human immune system are included [ELO1]. Students study modern scientific methods of culturing and identifying microbes in the laboratory part of the course [ELO2]. The lecture part of the course also explains how scientific methods are used in the field of microbiology and how these methods have been used historically in key discoveries such as pasteurization, vaccination and antibiotic therapy [ELO3]. Both lecture and lab provide opportunities for students to learn and experience how technological advances in microscopy, genetic engineering, and biochemical techniques have contributed to understandings of scientific principles of microbiology and vice versa [ELO2]. In lecture, current events from news media and recent scientific publications are used to help students appreciate the positive and negative roles of microorganisms in fields such as health and disease, the environment, industry, and food sciences [ELO4]. By the end of the course, students will have developed an understanding of how microorganisms are involved in nearly every aspect of their everyday life [ELO4].

2. How do the prerequisites provide an appropriate level of preparation for the proposed course? If there are no prerequisites, please indicate how this is consistent with the proposed level of the course.

The prerequisites for this course is 3h credit in biology. Previous coursework in biology should familiarize students with foundational concepts of biology, including cell structure, cellular metabolism, and the scientific method, each of which is elaborated in this class.

3. If the course is being proposed to fulfill the requirement for a course with a laboratory, please answer the following question: What type(s) of experiences will students have in the laboratory component of the course?

Microbiology 4000 explores microbial cell structure and function, dynamics of bacterial growth and physiology, microbial genetics, methods of control and antibiotics, viruses, immune system and host-microbe interactions, epidemiology and a representative group of infectious diseases. The laboratory experiences in this class provide opportunities for students to learn and experience how technological advances in microscopy, genetic engineering, and biochemical techniques have contributed to understandings of scientific principles of microbiology. Two specific examples are listed below; pages 13-17 of the syllabus contains a comprehensive list of laboratory experiences.

Example 1: The seventh course learning outcome provides a representative laboratory experience; it states that at the end of this course, student “*Correctly carry out basic microbiology laboratory techniques including: Gram staining, production of pure cultures, production of dilution series and enumeration of microbes, inoculation of various culture media, the filter disk method of testing bacterial susceptibility to various agents, and use of the ELISA test*”. To achieve this outcome, students are introduced to Acid-Fast staining (Labs 4 and 5). Students also learn to culture bacteria under extreme conditions (Labs 8 and 9) and they test the effects of chemicals on bacterial viability (Labs 10 and 11). These exercises directly address Microbiology Program Outcome 1 (Students acquire the ability to interrelate and apply the fundamental concepts of chemistry, physics and mathematics to the functions of living cells) and Outcome 4 (Students acquire the ability to design experiments to test hypotheses, perform analyses, interpret and analyze data, and present scientific information in written and oral formats). These exercises also align with GE Natural Science learning outcomes ELO1 and ELO3.

Example 2: The tenth course learning outcome provides a representative laboratory experience; it states that at the end of this course, student “*Explain how unknown bacteria are identified through submission of a lab report that includes a flow chart and interpretation of results*”). To achieve this outcome, students are introduced to Brightfield microscopy (Lab 1) and to various chemical stains that enable a microbiologist to identify and classify bacteria (Lab 3). Microscopic techniques are complemented by bacterial culture techniques (Labs 4 and 5). These exercises directly address Microbiology Program Outcome 2 (i.e. Students understand evolutionary processes, the diversity of microorganisms, and how microorganisms impact their environment, including their roles in human health and disease.) and Microbiology Program Outcome 3 (i.e. Students acquire the ability to design experiments to test hypotheses, perform analyses, interpret and analyze data, and present scientific information in written and oral formats). These exercises also align with GE Natural Science learning outcomes ELO2 and ELO3.

LEARNING OUTCOMES ASSESSMENT PLAN MICROBIOLOGY 4000 (HYBRID)

The four GEC goals/objectives for ASC Natural Sciences Courses are as follows:

1. Students understand the basic facts, principles, theories, and methods of modern science.
2. Students learn key events in the history of science.
3. Students provide examples of the inter-dependence of scientific and technological developments.
4. Students discuss social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

The tables below show assessment methods/definitions and how the Microbiology 4000 course material relates to the four GEC goals/objectives. We use a combination of indirect (surveys/participation) and direct methods of examining students' test/assignment scores to collect data concerning how well students actually performed. Any assessment where we do not meet the established goal (see "Desired Results" in **Table 1**) will be examined to see if we can determine why we did not meet the goal. Some of the possible reasons for not meeting the goal include inaccurate assessment method, ineffective teaching methods, unclear or poorly written assignments and inefficient grading rubrics. All of these possibilities will be discussed for each item and changes will be made as deemed appropriate. **Table 1** below shows in detail the methods we used to evaluate achievement of each of our goals and our criteria for determining if our goals were met. **Table 2** lists sample questions from lecture exam representing GEC objectives. **Table 3** lists sample questions from the lab practical exam. Tables 1 and 2 have been updated for the blended class (lecture online; laboratory in-person)

Table 1: Assessment methods and criteria to determine goal achievement (updates denoted by * and underline)

Assessment of?	Methods and Desired Results
Competency Tests	<u>Indirect Method</u> : Student survey from Carmen concerning lab technique <u>Desired Result</u> : 80% of students feel competent with lab techniques
	<u>Direct Method</u> : Lab competency test scores (compare this to Carmen survey) <u>Desired Result</u> : Average grade of 85% in each of 3 tests in selected student sample considered competent
Changes to Unknown Summary (Lab Report)	<u>Direct Method 1</u> : Unknown bacteria assignment scores <u>Desired Result</u> : Average grade of 75% in selected student sample
	<u>Direct Method 2</u> : Unknown assignment comparison with "old" versions? <u>Desired Result</u> : Average grade increase
Addition of Infectious Disease Assignment	<u>Direct Method 1</u> : Scores on Infectious Disease Assignment <u>Desired Result</u> : Overall score of 85% by all students
	<u>Direct Method 2</u> : Addition of lab practical question concerning this assignment <u>Desired Result</u> : 80% get question correct
GEC Objectives and Course Objectives	<u>Indirect Method</u> : Student survey from Carmen concerning GEC goals/objectives <u>Desired Result</u> : 75% agree or strongly agree that topic covered satisfactorily
	<u>Direct Method 1</u> : Specific set of lab practical exam and lecture exam questions chosen for each objective <u>Desired Result</u> : Students in sample get 75% of questions in set correct
	<u>Direct Method 2</u> : Examination of exam questions where over 40% of students got incorrect answer <u>Desired Result</u> : Determine why student missed question
	<u>Desired Result</u> : Determine why student missed question
* <u>Pre-Lecture Online Reading Assignment</u>	<u>Direct Method</u> : Evaluation of student response to specific questions linked to specific learning objectives <u>Desired Result</u> : Students in sample get 75% of questions correct
* <u>Post-Lecture Online Quizzes</u>	<u>Direct Method</u> : Evaluation of student response to specific questions linked to specific learning objectives <u>Desired Result</u> : Students in sample get 75% of questions correct
* <u>Animation, Videos, Case Study Based Online Assessments</u>	<u>Direct Method</u> : Evaluation of student response to specific questions linked to specific learning objectives <u>Desired Result</u> : Students in sample get 75% of questions correct
In-class Midterm and Final Exams	<u>Direct Method</u> : Evaluation of student response to specific questions linked to specific learning objectives <u>Desired Result</u> : Students in sample get 75% of questions correct
* <u>Canvas Discussion Board Participation</u>	<u>Indirect Method</u> : Each student needs to participate in at least two discussions that are posted in Canvas and moderated by the Instructor <u>Desired Result</u> : Increased student participation and engagement online
* <u>Current Events/News Based 'Small Things Considered'</u>	<u>Indirect Method</u> : Students will be asked to share (via Canvas) microbiology related breaking news or any daily encounters relevant to microbiology topics being discussed in the class

	<i>Desired Result:</i> Students' increased awareness of application of microbiology in daily life; 75% student participation
*Student Online Presentation (audio-visual)	<i>Indirect Method:</i> Using canvas tools, students will record an audiovisual presentation based on any microbiology topic of their choice <i>Desired Result:</i> Students being able to translate/apply classroom teachings to the world outside while working in a group

Table 2: Sample questions from lecture exam representing GEC objectives (updated)

GEC Objective	Exam Question
1	Which one of the following can be considered as prokaryotic?
1	Which one of the following structures is most commonly used by dental plaque causing bacteria to adhere to the dental surfaces?
2	An early technique used to sterilize substances that involved a series of boiling followed by periods of incubation, which eventually got rid of endospores is?
1, 2	<i>Helicobacter pylori</i> , a bacterium that causes gastric ulcers, uses which one of the following structures to wade through the thick mucus and survive the acidic conditions of stomach?
1	Which of the following microbes are typically the most difficult to control?
1,2	Genetic changes in bacteria are brought about by
2	The use of phenol as a wound disinfectant was first practiced by
2,3	The following four steps/rules for Koch's postulates can be arranged in the correct order as follows:
3	In a genetic engineering process, genes of interest are carried into a bacterium by vector/s such as
4	Sulfur oxidizing bacteria, such as <i>Thiobacillus</i> , that are chemolithotrophs and involved in bioleaching, produce which one of the following?
4	Bacteria may employ all of the following mechanisms to become antibiotic resistant except the one that involves
3,4	Which one of the following methods can be considered as Sanitization?
3,4	A plasmid that can be considered as the most suitable candidate for a genetic engineering project, such as the overproduction of human insulin in <i>E. coli</i> , is a/an
3,4	Because of the overuse of antibiotics bacteria are mutating more frequently and rapidly leading to antibiotic resistance: True/False
3,4	Vaccination induces which one of the following?
3	When an antibody binds to a toxin preventing toxin attachment, the resulting action is referred to as
3,4	The quality of antibody produced during secondary humoral response is improved because of

Table 3: Sample questions from lab practical exam (unchanged)

GEC objective	Lab Practical Exam question
1	Why would you use the part of this microscope labeled with a "D"?
1	Based on this stain, which of the following would be a possible name for organism "A"?
1	Assuming the Gram-stain was done correctly, identify the Gram reaction of the organisms labeled "B" shown here.
1	The smear pictured here most likely represents
1	Arrange the steps of the Gram stain procedure in the correct order:
1	What technique was used to prepare these plates?
1	Which of the following is most important in the production of isolated colonies on these plates?
1	A different organism was inoculated into each one of the four tubes pictured. Which of these organisms can ferment glucose and break down sulfur containing amino acids?
1	The growth in Tube #2 but not in Tubes #1, 3, and 4 indicates that the organism is a
1	According to the results in the thioglycollate tube, organism "X" is a/an
1	Based on how "X" grew in the thioglycollate tube, which organism inoculated onto the plates is likely organism "X"?
4	The grapefruit juice used on the plate was fresh-squeezed. If the juice had been pasteurized first, what difference might you have expected in the growth on the plate?
3	The growth seen on these plates indicates that using UV light used to control endospores
3	In laboratory, you also tested the response of <i>B. subtilis</i> vegetative cells and <i>S. aureus</i> vegetative cells to UV exposure. What might you expect when comparing the patterns of growth following UV exposure between these two cultures?
1	Results seen on the plate indicate that <i>E. coli</i> is
3	This medium was used in lab to determine (EMB)
4	Based on the results seen, if an organism of <u>unknown</u> Gram-reaction was spilled in lab, which of these disinfectants should NOT be used?
1	What kind of symbiotic relationship is demonstrated here?
3	The patterns observed on this plate are the result of
4	What type of hemolysis is shown on the blood agar plate?
4	A student inoculated a Snyder test agar tube by expectorating. Following incubation, the tube turned yellow (see Tube B). Which of the following is true concerning this result?
1	The relationship between <i>Escherichia coli</i> and the other microbe is classified as
3	The rate of phagocytosis of <i>Staphylococcus aureus</i> by the mouse cells could be increased if the bacteria were coated with
1	The white cloudiness observed in this capillary tube is the result of a _____ reaction.
3	Assuming that the ELISA protocol was followed correctly, the result seen in well C (light green color) represents which of the following?
4	Epidemiology question

Arts and Sciences Distance Learning Course Component Technical Review Checklist

Course: Microbiology 4000

Instructor: Dr. Madhura Pradhan

Summary: Hybrid Course Offering

Standard - Course Technology	Yes	Yes with Revisions	No	Feedback/ Recomm.
6.1 The tools used in the course support the learning objectives and competencies.	✓			<p>All tools and media that will be used for this course align to support the course learning objectives. This course will be delivered as a hybrid course with an in person lab component and exams. The required in person lab consists of a weekly 3 hour lab session.</p> <ul style="list-style-type: none"> • Carmen • Carmen Connect • McGraw Hill Learn Smart Online Quizzing Platform
6.2 Course tools promote learner engagement and active learning.	✓			<p>Course tools included in the syllabus promote learner engagement and active learning in the following ways:</p> <ul style="list-style-type: none"> • In person lab sessions • In person mid-term and final • Weekly online lectures, videos, animations • Weekly online timed reading comprehension quizzes • Prompted discussion posts and peer response discussion posts • Online office hours • Online video presentation • Case study examples

6.3 Technologies required in the course are readily obtainable.	✓		The technologies used in this course are core common tools provided by the university (Carmen, Carmen Connect). Additional third party applications are also required for this course (McGraw Hill Learn Smart Online Quizzing Platform); this application is available online with the required textbook through a standard web browser but requires a user account and code.
6.4 The course technologies are current.	✓		The technologies used in this course are core common tools provided by the university (Carmen, Carmen Connect). Additional third party applications are also required for this course (McGraw Hill Learn Smart Online Quizzing Platform); this application is available online with the required textbook through a standard web browser but requires a user account and code.
6.5 Links are provided to privacy policies for all external tools required in the course.	✓		Links have been provided in the "Course technology" section of the syllabus to the privacy policy for the McGraw Hill Learn Smart platform and Cognella. Since the students are required to make an account to use this tool they should be informed of privacy policies protecting their data.
Standard - Learner Support			
7.1 The course instructions articulate or link to a clear description of the technical support offered and how to access it.	✓		Links have been included in the "Course technology" section of

				<p>the syllabus to the technical support available to students for the tools used in this course.</p> <ul style="list-style-type: none"> • Carmen • Carmen Connect • McGraw Hill Learn Smart Online Quizzing Platform
7.2 Course instructions articulate or link to the institution's accessibility policies and services.	✓			a
7.3 Course instructions articulate or link to an explanation of how the institution's academic support services and resources can help learners succeed in the course and how learners can obtain them.	✓			b
7.4 Course instructions articulate or link to an explanation of how the institution's student services and resources can help learners succeed and how learners can obtain them.	✓			c
Standard – Accessibility and Usability				
8.1 Course navigation facilitates ease of use.	✓			<p>Recommend using the Carmen Distance Learning "Master Course" template developed by ODEE and available in the Canvas Commons to provide student-users with a consistent user experience in terms of navigation and access to course content.</p>
8.2 Information is provided about the accessibility of all technologies required in the course.	✓			<p>Links to the accessibility statements for the OSU core common tools, Cognella and McGraw Hill have been included in the "Accessibility" section of the course syllabus.</p>
8.3 The course provides alternative means of access to course materials in formats that meet the needs of diverse learners.	✓			<p>Recommend that resources be developed to address any requests for alternative means of access to course materials.</p>
8.4 The course design facilitates readability	✓			<p>Recommend using the Carmen Distance Learning</p>

				“Master Course” template developed by ODEE and available in the Canvas Commons to provide student-users with a consistent user experience in terms of navigation and access to course content.
8.5 Course multimedia facilitate ease of use.	✓			All assignments and activities that use the Carmen LMS with embedded multimedia facilitates ease of use. All other multimedia resources facilitate ease of use by being available through a standard web browser.

Reviewer Information

- Date reviewed: 12/12/2017
- Reviewed by: Mike Kaylor

Notes:

^aThe following statement about disability services (recommended 16 point font): Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614- 292-3307, slds@osu.edu; slds.osu.edu.

^bAdd to the syllabus this link with an overview and contact information for the student academic services offered on the OSU main campus. <http://advising.osu.edu/welcome.shtml>

^cAdd to the syllabus this link with an overview and contact information for student services offered on the OSU main campus. <http://ssc.osu.edu>. Also, consider including this link in the “Other Course Policies” section of the syllabus.