BIO 241 Fall 2016

General Microbiology 3 credits

Prerequisite(s): BIO 133

Class Information		Instructor Information			
Dates		**Instructor:**	Wendy Hutchins, MLT, PhD	**First day of classes:**	Wed., Sept 7, 2016
Tues & Thurs	9:45-11:00AM	**Email:**	Wendy.hutchins@ambrose.edu	**Last day to add/drop, or change to audit:**	Sun, Sept. 18, 2016
Labs Tues	12:00 – 3:00	**Phone:**	403-616-4474	**Last day to request revised exam:**	Mon, Oct 24, 2016
Final Exam day		**Office:**	TBA	**Last day to withdraw from course:**	Mon, Nov 14, 2016
Dec 21, 9 – 12 Rm A2212		**Office Hrs:**	11:00 – 12:00 Tues	**Last day to apply for time extension for coursework:**	Mon, Nov 21, 2016
				Last day of classes:	Mon, Dec 12, 2016

Textbook: Boundless Microbiology www.boundless.com/FNG3V4T8V3DFHA

Supplemental: Brock Biology of Microorganisms by Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl Benjamin Cummings (Pearson Canada, 13/2012) Downloadable as PDF. Be cautious of the sites you use to obtain this book as malware may be attached to some site links.

Course Description:

Microbiology explores the biology of microorganisms, namely viruses, bacteria, unicellular and microscopic multicellular eukaryotes. The course will review fundamental information about the biology of these organisms and will expand this knowledge base with microbial genetics, diversity and ecology. The field of applied microbiology will also be explored in topics regarding health, industry and the environment. The accompanying laboratory component will introduce a variety of laboratory techniques to identify microorganisms.

Expected Learning Outcomes:

For this course, we will be striving to reach the American Society for Microbiology Recommended Curriculum Guidelines for Undergraduate Microbiology 2012. These guidelines (attached) are divided into two parts. Part 1 identifies concepts and statements (#1 – 27), and Part 2 identifies competencies (#28 – 31) and skill areas (#32 – 38) for introductory microbiology.

Live Session Dates:

Unless otherwise arranged, all classes and laboratories are live.

Course Schedule:

See attached table for both Lecture and Laboratory topics and dates.

Requirements:

Lectures:
In class Quiz 1 Covers Lectures 2-8 = 25% of grade
In class Quiz 2 Covers Lectures 10-14 = 25% of grade
Final exam Covers Lectures 16-27 and may bring in aspects from labs = 50% of grade

Laboratories:
8 lab results hand ins 5% of total grade each = 40% of lab grade These will be short results reports on forms or with specific intent, method theory, troubleshooting and/or interpretation guidelines for each topic area.
Build a better bug - 60% of lab grade. This is an experimental design project with both team and individual components.
Half of this grade will be the group's project work. The other half will be an assessment of the individual's contribution to the whole.
Marking rubrics will be provided for self, peer, and group judging.

Attendance:

Students are expected to attend all classes in which they are registered.

Grade Summary:

See above section for how grades will be determined. The available letters for course grades are as follows:

Letter Grade	Description	
A+		≥95%
A	Excellent	≥90%
A-		≥85%
B+		≥80%
B	Good	≥75%
B-		≥70%
C+		≥65%
C	Satisfactory	≥60%
C-		≥55%
D		≥50%
F	Failure	<50%

Grades may be calculated to 0.5%. Requests for rounding up to gain another grade will be assessed against the whole class's performance.
Quiz and final exam questions are from questions prepared by the American Society for Microbiology thus well tested for quality of interpretation. All test questions will be assessed such that a question that is not answered correctly by at least 70% of the class will be discarded from the grade for that quiz or exam.

Because of the nature of the Alpha 4.00 system, there can be no uniform College-wide conversion scale. The relationship between raw scores (e.g. percentages) and the resultant letter grade will depend on the nature of the course and the instructor's assessment of the level of each class, compared to similar classes taught previously.
Please note that final grades will be available on student registration system. Printed grade sheets are not mailed out.

Other

The Boundless Textbook contains a huge amount of material beyond what will be covered in this course. None of the topics have been restricted to you so you will have all of that material available to you to answer any question or lack of background preparation you may have. Some sections will be assigned readings before lectures. Fair warning: It will be assumed in the lecture that you have read the assigned material.

Course Schedule

Number	Date	Lecture Topic	Laboratory Topic
			* Denotes a lab where results are to be handed in. Most will be short form and done during lab period.
1	08-Sep	Intro to course and expectations	
2	13-Sep	Microbiology History, Applications	Build a better bug
3	15-Sep	Sterilization and Disinfection	
4	20-Sep	Cell Structure	Culture and Microscopy
5	22-Sep	Chemistry Metabolism	
6	27-Sep	Metabolism	Culture and Microscopy *
7	29-Sep	NO CLASS	
8	04-Oct	Microbial Genetics	Transformation
9	06-Oct	**QUIZ**	
10	11-Oct	Microbial Genetics	Complementation plus Media *
11	13-Oct	Microbial Genetics	
12	18-Oct	Classifying (Biogram) LAB setup	Evolution, Phylogeny and Diversity/Classifying (Biogram) *
13	20-Oct	Evolution, Phylogeny and Diversity	
14	25-Oct	Viruses	Virus / PCR *
15	27-Oct	**QUIZ**	
16	01-Nov	Antimicrobials	Antibiogram *
17	03-Nov	Antimicrobial Resistance	
18	08-Nov	Epidemiology	Outbreak *
19	10-Nov	NO CLASS	
20	15-Nov	Immunology	The Cells in Blood *
21	17-Nov	Immunology	
22	22-Nov	Diseases and Diagnosis	Serology *
23	24-Nov	Diseases and Diagnosis	
24	29-Nov	Pathogenicity	**Build a better bug presentations**
25	01-Dec	Pathogenicity	
26	06-Dec	Microbial Ecology	Pandemic
27	08-Dec	Industrial Microbiology	

AMBROSE UNIVERSITY

Policies:

Communication

All students have received an Ambrose e-mail account upon registration. It is the student's responsibility to check this account regularly as the Ambrose email system will be the professor's instrument for notifying students of important matters (cancelled class sessions, extensions, requested appointments, etc.) between class sessions. If students do not wish to use their Ambrose accounts, they will need to forward all messages from the Ambrose account to another personal account.

Registration

During the **Registration Revision Period** students may enter a course without permission, change the designation of any class from credit to audit and /or voluntary withdraw from a course without financial or academic penalty or record. Courses should be added or dropped on the student portal by the deadline date; please consult the List of Important Dates. After that date, the original status remains and the student is responsible for related fees.

Students intending to withdraw from a course after the Registration Revision Period must apply to the Office of the Registrar by submitting a "Request to Withdraw from a Course" form or by sending an email to the Registrar's Office by the **Withdrawal Deadline;** please consult the List of Important Dates on the my.ambrose.edu website. Students will not receive a tuition refund for courses from which they withdraw after the Registration Revision period. A grade of "W" will appear on their transcript.

Students wishing to withdraw from a course, but who fail to do so by the applicable date, will receive the grade earned in accordance with the course syllabus. A student obliged to withdraw from a course after the Withdrawal Deadline because of health or other reasons may apply to the Registrar for special consideration.

Exam Scheduling

Students, who find a conflict in their exam schedule must submit a Revised Examination Request form to the Registrar's Office by the deadline date; please consult the List of Important Dates. Requests will be considered for the following reasons only: 1) the scheduled final examination slot conflicts with another exam; 2) the student has three final exams within three consecutive exam time blocks; 3) the scheduled final exam slot conflicts with an exam at another institution; 4) extenuating circumstances. Travel is not considered a valid excuse for re-scheduling or missing a final exam.

Electronic Etiquette

Students are expected to treat their instructor, guest speakers, and fellow students with respect. It is disruptive to the learning goals of a course or seminar and disrespectful to fellow students and the instructor to use electronics for purposes unrelated to the course during a class session. Turn off all cell phones and other electronic devices during class. Laptops should be used for class-related purposes only. Do not use iPods, MP3 players, or headphones. Do not text, read, or send personal emails, go on Facebook or other social networks, search the internet, or play computer games during class. Some professors will not allow the use of any electronic devises in class. The professor has the right to disallow the student to use a laptop in future lectures and/or to ask a student to withdraw from the session if s/he does not comply with this policy. Repeat offenders will be directed to the Dean. If you are expecting communication due to an emergency, please speak with the professor before the class begins.

Academic Policies

It is the responsibility of all students to become familiar with and adhere to academic policies as stated in the Academic Calendar. Personal information (information about an individual that may be used to identify that individual) may be required as part of taking this class. Any information collected will only be used and disclosed for the purpose for which the collection was intended. For further information contact the Privacy Compliance Officer at privacy@ambrose.edu.

Extensions

Although extensions to coursework in the semester are at the discretion of the instructor, students may not turn in coursework for evaluation after the last day of the scheduled final examination period unless they have received permission for a course Extension from the Registrar's Office. Requests for course extensions or alternative examination time must be submitted to the Registrar's Office by the deadline date; please consult the List of Important Dates. Course extensions are only granted for serious issues that arise "due to circumstances beyond the student's control."

Appeal of Grade

An appeal for change of grade on any course work must be made to the course instructor within one week of receiving notification of the grade. An appeal for change of final grade must be submitted to the Registrar's Office in writing and providing the basis for appeal within 30 days of receiving notification of the final grade, providing the basis for appeal. A review fee of $50.00 must accompany the appeal. If the appeal is sustained, the fee will be refunded.

Academic Integrity

We are committed to fostering personal integrity and will not overlook breaches of integrity such as plagiarism and cheating. Academic dishonesty is taken seriously at Ambrose University as it undermines our academic standards and affects the integrity of each member of our learning community. Any attempt to obtain credit for academic work through fraudulent, deceptive, or dishonest means is academic dishonesty. Plagiarism involves presenting someone else's ideas, words, or work as one's own. Plagiarism is fraud and theft, but plagiarism can also occur by accident when a student fails or forgets to acknowledge to another person's ideas or words. Plagiarism and cheating can result in a failing grade for an assignment, for the course, or immediate dismissal from the university college. Students are expected to be familiar with the policies in the current Academic Calendar that deal with plagiarism, cheating, and the penalties and procedures for dealing with these matters. All cases of academic dishonesty are reported to the Academic Dean and become part of the student's permanent record.

Note: Students are strongly advised to retain this syllabus for their records.

Recommended Curriculum Guidelines for Undergraduate Microbiology Education

AMERICAN SOCIETY FOR MICROBIOLOGY

2012

CONTRIBUTING AUTHORS

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ASM Recommended Curriculum Guidelines for Undergraduate Microbiology Education

In 2008-2009, two reports, *Vision and Change in Undergraduate Biology Education: A Call to Action* (American Association for the Advancement of Science) and *Scientific Foundations for Future Physicians* (Howard Hughes Medical Institute and the American Association of Medical Colleges), called for sweeping changes in how biology is taught in the 21st century. These reports urge faculty to refrain from presenting science as a sea of facts and work towards ensuring that students have a foundational understanding in biology. In addition, the reports state that to be scientifically literate, students need to understand five overarching concepts: evolution; structure and function; pathways and transformations of energy and matter; information flow, exchange, and storage; and systems.

In response, in 2009 ASM established a curriculum task force to update the ASM Curriculum Guidelines for Undergraduate Microbiology Education. That year, the task force set out to identify key concepts and skills that are (i) central to microbiology and (ii) useful to define curriculum learning goals for general microbiology. In 2010, the Task Force reviewed approximately 25 undergraduate microbiology courses for majors in both microbiology and/or biology programs and nursing and/or allied health programs.

During a January 2011 meeting in Washington D.C., the Task Force affirmed the five overarching concepts in biology mentioned above; members also identified a sixth overarching concept specific to microbiology – the impact of microbes. All six overarching concepts provide a framework for key microbiological topics that are deemed to be of lasting importance beyond the classroom. The Task Force identified 27 topics ("Fundamental Statements," #1 – 27 below) related to each overarching concept. These topics identify what students should have a deep understanding of, not just do or have surface knowledge of, as a result of studying a particular concept. The topics are deliberately framed as declarative statements and may be used to present major curriculum generalizations and recurrent ideas.

In addition to its focus on the conceptual understanding of microbiology, Task Force members identified two key skills, scientific thinking (#28 – 31 below) and microbiology laboratory skills (#32 – 38 below), for which students' development of competency would have enduring and lasting value beyond the classroom and laboratory. The task force presented the proposed concepts and skills at the ASM General Meeting and the ASM Conference for Undergraduate Educators in 2011, and finalized the document in 2012. The ASM Recommended Curriculum Guidelines for Undergraduate Microbiology Education were published in *Journal of Microbiology and Biology Education* (Merkel, JMBE May 2012, pp 32 – 38).

The ASM Recommended Curriculum Guidelines for Undergraduate Microbiology are divided into two parts. Part 1 identifies concepts and statements (#1 – 27), and Part 2 identifies competencies (#28 – 31) and skill areas (#32 – 38) for introductory microbiology.

Part 1: Concepts and Statements

Evolution

1. Cells, organelles (e.g., mitochondria and chloroplasts) and all major metabolic pathways evolved from early prokaryotic cells.
2. Mutations and horizontal gene transfer, with the immense variety of microenvironments, have selected for a huge diversity of microorganisms.
3. Human impact on the environment influences the evolution of microorganisms (e.g., emerging diseases and the selection of antibiotic resistance).
4. The traditional concept of species is not readily applicable to microbes due to asexual reproduction and the frequent occurrence of horizontal gene transfer.
5. The evolutionary relatedness of organisms is best reflected in phylogenetic trees.

Cell Structure and Function

6. The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).
7. Bacteria have unique cell structures that can be targets for antibiotics, immunity and phage infection.
8. Bacteria and Archaea have specialized structures (e.g., flagella, endospores, and pili) that often confer critical capabilities.
9. While microscopic eukaryotes (for example, fungi, protozoa and algae) carry out some of the same processes as bacteria, many of the cellular properties are fundamentally different.
10. The replication cycles of viruses (lytic and lysogenic) differ among viruses and are determined by their unique structures and genomes.

Metabolic Pathways

11. Bacteria and Archaea exhibit extensive, and often unique, metabolic diversity (e.g., nitrogen fixation, methane production, anoxygenic photosynthesis).
12. The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).
13. The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.
14. The growth of microorganisms can be controlled by physical, chemical, mechanical, or biological means.

Information Flow and Genetics

15. Genetic variations can impact microbial functions (e.g., in biofilm formation, pathogenicity and drug resistance).
16. Although the central dogma is universal in all cells, the processes of replication, transcription, and translation differ in Bacteria, Archaea, and Eukaryotes.

17. The regulation of gene expression is influenced by external and internal molecular cues and/or signals
18. The synthesis of viral genetic material and proteins is dependent on host cells.
19. Cell genomes can be manipulated to alter cell function.

Microbial Systems

20. Microorganisms are ubiquitous and live in diverse and dynamic ecosystems.
21. Most bacteria in nature live in biofilm communities.
22. Microorganisms and their environment interact with and modify each other.
23. Microorganisms, cellular and viral, can interact with both human and nonhuman hosts in beneficial, neutral or detrimental ways.

Impact of Microorganisms

24. Microbes are essential for life as we know it and the processes that support life (e.g., in biogeochemical cycles and plant and/or animal microbiota).
25. Microorganisms provide essential models that give us fundamental knowledge about life processes.
26. Humans utilize and harness microorganisms and their products.
27. Because the true diversity of microbial life is largely unknown, its effects and potential benefits have not been fully explored.

Part 2: Competencies and Skills

Scientific Thinking

28. Ability to apply the process of science
    a. Demonstrate an ability to formulate hypotheses and design experiments based on the scientific method.
    b. Analyze and interpret results from a variety of microbiological methods and apply these methods to analogous situations.
29. Ability to use quantitative reasoning
    a. Use mathematical reasoning and graphing skills to solve problems in microbiology.
30. Ability to communicate and collaborate with other disciplines
    a. Effectively communicate fundamental concepts of microbiology in written and oral format.
    b. Identify credible scientific sources and interpret and evaluate the information therein.
31. Ability to understand the relationship between science and society
    a. Identify and discuss ethical issues in microbiology.

Microbiology Laboratory Skills

32. Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
33. Use pure culture and selective techniques to enrich for and isolate microorganisms.
34. Use appropriate methods to identify microorganisms (media-based, molecular and serological).
35. Estimate the number of microorganisms in a sample (using, for example, direct count, viable plate count, and spectrophotometric methods).
36. Use appropriate microbiological and molecular lab equipment and methods.
37. Practice safe microbiology, using appropriate protective and emergency procedures.
38. Document and report on experimental protocols, results and conclusions.