

BIO218: Fundamentals of Microbiology (Burrack)
Spring 2016

BIO218 – Fundamentals of Microbiology Spring 2016

Meeting Times and Locations:

Classroom: Monday, Wednesday, Friday 12:30pm – 1:20pm in NHS – Rm. 201

Laboratory: Tuesday and Thursday in NHS - Rm. 225

Contact Information:

Professor: Laura Burrack

Office Location: NHS - Rm. 221A

Phone: x7325

Email: lburrack@gustavus.edu (Email is the preferred way to reach me. I try to respond to emails within 24 hours.)

Office hours: Monday 1:30-2:30pm, Tuesday 3:30-4:30pm, Thursday 10:30am-12:30pm

I am here to help you understand the material and be successful in the class (and beyond). I welcome talking with students outside of class and meeting in person is often the best way to communicate, especially for questions about the material. Feel free to come to me with specific questions about the class or with general questions about science or your future. You can drop by my office hours or e-mail to set up an appointment.

Course Materials:

- Textbook (required): *Microbiology with Disease by Body Systems*, 4th edition, Bauman, R. Publisher: Pearson/Benjamin Cummings.
- Occasionally additional readings from the popular press or microbiology literature will be provided.
- Course website:
 - Please regularly check our class website for documents such as additional readings and assignments. <http://moodle.gac.edu>. Lecture PowerPoint files and homework assignments will be available on Moodle in the page titled "2016 s-bio-218-001." Use your email username and password to log in.
 - If there is a problem with a *particular document*, please contact me. If you're having trouble getting Moodle to work *in general*, you should contact Gustavus Technology Services (GTS).
 - Course announcements will be made in class and via email. It is your responsibility to check your @gustavus.edu email regularly.
- Lab manuals (required): *Techniques in Microbiology: A Student Handbook*, 2007, Lammert, JM. Publisher: Benjamin Cummings. AND *Lab Exercises Supplement*, Qazi, S. and Lammert, JM. Available as a course packet.

Course Description:

A study of the interactions between microbes and humans, with a particular focus on human disease. Topics include the morphology and biochemistry of bacteria and viruses, how they cause human disease, how the body fights infection, and how infection can be controlled. Three hours of lecture and three hours of laboratory weekly. BIO-218 and BIO-380 cannot both be counted towards the Biology major. Pre-requisite: BIO-101.

Course Learning Objectives:

After this class, you will be able to:

- Describe the basic structural features of viruses, bacterial cells, and eukaryotic microorganisms. Explain how environmental conditions influence microbial growth.
- Describe the process of viral replication within a host cell.
- Apply knowledge about microbial structure and molecular genetics to understand the mechanism of action of antibiotics as well as mechanisms by which antibiotic resistance develops.
- Describe how host immune processes help protect us from microbial disease.
- Compare and contrast strategies used by different viruses, bacteria and eukaryotic microbes to invade the body and cause disease.
- Understand how microbial diseases might be controlled and prevented both from a scientific and health policy prospective. Explain the pathology and human health impact of a microbial disease to a general audience in a written article.
- Characterize microbes using common laboratory techniques and be able to identify an unknown species based on laboratory methods.

For a larger picture view of how BIO218 fits into the larger curriculum in the biology department and the college as a whole, please see: "BIO218: Learning Outcomes" posted on Moodle.

Weekly Summary Sheets:

A summary sheet will be handed out at the end of each week. The summary sheet is meant to highlight readings, assignments and laboratory details for the following week. Please note that the readings given for a particular day are to be completed in advance of the lecture for that day. A typical weekly summary sheet will contain:

1. Details on reading assignments for the upcoming week
2. A set of focus questions to prepare you for class (and therefore for quizzes and exams)
3. Indication of upcoming assignments and exams
4. Laboratory activities for the week

Assessment:

Lecture Points

1) Three mid-term exams	45 pts. each x 3 =	45 points
2) Semi-cumulative final exam		65 points
3) Quizzes; lowest of 9 dropped	5 pts. each x 8 =	40 points
4) Four assignments (due before each exam)	10 pts. each x 4 =	40 points
5) Infectious disease assignment		25 points

Lab points

5) Lab quizzes	10 pts. each x 5 =	50 points
6) Lab final		30 points
7) Unknown assignment		10 points
8) Lab skills assessment – up to 4 extra credit points		

395 points total

Final grades will be based on the percentage scale provided above and not on a "curve". Thus, you will not be competing with your fellow students for a pre-determined allocation of grades. As grading is completed, scores will be posted on Moodle. You can calculate your current grade at any time during the semester.

Grading Scale:

93-100%	A	77-79%	C+
90-92%	A-	73-76%	C
87-89%	B+	70-72%	C-
83-86%	B	65-69%	D+
80-82%	B-	60-64%	D
		below 60%	F

Course Exams: Four exams will be given. Question may include short-answer, matching, multiple-choice, true-false, data analysis and graphical interpretation. Three types of increasingly difficult questions are asked:

- **Factual recall** — these questions rely on recognizing specific facts, terms or concepts. Examples of these questions include definitions or identifying parts, recognizing members of a group and choosing the right statement about function.
- **Conceptual understanding** — you will explain how something works or how ideas interact. Questions are related to processes or facts presented in class, but they are arranged in a new way so you must analyze the relationships in a more advanced way.
- **Application** — you will have to use what you know to answer questions about related, but new scenarios. You will solve problems, analyze data and arrive at a conclusion for situations you may not have seen before, but are based on general concepts.

It is important to completely understand the meaning of the terms, concepts and processes to be successful on questions that use application and conceptual understanding.

You are expected to take exams on the days they are scheduled and during class time. Please *mark exams on your calendar*. An alternative date can be set that to accommodate individuals with an **acceptable academic** reason for not taking an exam on a scheduled day, but you must contact me at least one week in advance. The format of the make-up exam will be at my discretion. You also are permitted to make-up an exam for a *documented* emergency and illness. In these cases you must let me know as soon as these situations arise, but no later than noon on exam day. A rehearsal, athletics, a minor illness, or a job are not acceptable reasons for missing an exam. If you miss an exam without an unexcused absence, you will earn a zero for that exam.

Quizzes: Quizzes will primarily cover material from the reading assigned **for that class period**. Occasionally, quizzes might cover material from the prior class. You may use your notes taken on a separate paper/your class notebook during the quiz. You cannot use notes taken in the margins of any reading or on a computer. Quizzes may be at the beginning of lecture and no extra time will be allotted if you are late to class. If you are absent you will receive a 0 for that quiz. The lowest score for the quizzes will be dropped. For serious emergencies, such a medical emergency requiring hospitalization, make-up work will be assigned as appropriate.

Assignments: There will be 4 review/synthesis assignments due before each exam via Moodle. These assignments contain questions to help you practice applying course material. Assignment questions are generally in a similar format as exam questions. Additionally, you will be responsible for writing an informational article about an infectious disease or current topic in microbiology related to infectious diseases (ex. multi-drug resistant tuberculosis, HPV vaccination, *Clostridium difficile*, etc.). Each member of the class must choose a different topic. I will accept topic choices on a first-come-first-serve basis. All students must submit their topic by Wed. March 23rd by 5pm to lburrack@gustavus.edu. The audience for your article is a well-educated member of the general

public. This article will be posted on our class website and will be due on Wed. April 27th (more details on the mechanism of posting will be handed out closer to the due date).

Questions about your exams or assignments: I am happy to discuss your exams and assignments, but make sure you consult keys, your notes, the text, etc. as appropriate to make sure our discussions can focus on increasing your understanding of the material and improving performance in the future. If you have a concern about your grade, please wait 24 hours before submitting your re-assessment request. If you request a re-assessment of any question, write a rationale for why you believe I should re-consider your answer, and include your original exam, quiz or homework assignment with the request. Reassessment requests must be submitted within 1 week of receipt of the grade. I will respond to you within 48 hours. I reserve the right to re-grade your entire assignment.

Class Attendance:

There is a direct, positive relationship between attending class prepared and doing well. I will not take attendance, but I notice who attends. Lectures will be punctuated with discussion, activities or questions. I give quizzes, ask for or hand out assignments, and make announcements in class. If you are absent you will not earn points associated with these activities. For serious emergencies, such a medical emergency requiring hospitalization, make-up work will be assigned as appropriate.

Class time helps you build and test your knowledge. I will assume that you have read the text and understand the basics. Questions from are always welcome during a lecture. If you are unclear about something, ask it; other people are likely to have a similar question. I plan to post lecture PowerPoint files after every class period. Please note that these files usually consist primarily of figures and will not contain all of the information discussed in class. Reviewing these files DOES NOT substitute your attendance to the class. If you must miss class, make sure to get notes from a fellow classmate.

Late Policy:

Late assignments will be penalized 20% of the possible points per day. If an assignment is due at the beginning of class and you are late for class, your assignment will be considered late. Computer problems do not constitute a legitimate excuse for late work. Each student will be allowed one 48 hour extension per semester for any reason – use it wisely! To use this extension, you must contact me via email at least 12 hours before the assignment is due.

Technology:

I expect that cell phones will not be used in class. If you are texting or checking texts in class you will be given one warning for the semester, after that you may be asked to leave. If your phone is out during an exam or an evaluation, you will be asked to leave and won't be able to complete the exam, activity or quiz.

Research has shown that for many individuals the processing and synthesis necessary to take notes on paper improves recall of concepts on tests compared to typed notes (Mueller and Oppenheimer 2013 - <http://pss.sagepub.com/content/25/6/1159.full>). I would encourage you to try to take notes by hand. However, not all students have the same needs, so if you prefer to use a laptop - that is fine, but please speak with me first. If you use a laptop to take notes, do not surf the net; it is rude to me and even more importantly, distracting to your peers. I will ask you to put away your computer for the class period if you are doing other types of work or are playing on it. Otherwise, computers should not be used in class unless we are specifically using them for a course-related purpose.

Reference Desk Assistance:

The library's Reference Desk provides one-on-one guidance to help you with your research. The reference librarians will help you find information on a topic, develop search strategies for papers and projects, search library catalogs and databases, and provide assistance at every step. No appointment necessary. Visit www.gustavus.edu/library/reference_question.html for hours, location, and more information.

Group Work and Academic Honesty:

As science is a collaborative process, it is my hope that you will discuss your readings, assignments, and laboratory work with each other. However, it is expected that all group members will participate in laboratory work and that graded work should be the unique product of the individual turning it in unless otherwise specified. You have agreed to abide by the academic honesty policy and you will sign this honor code on all assignments: "On my honor, I pledge that I have not given, received, or tolerated others' use of unauthorized aid in completing this work." Cheating on exams, parasitizing group members and plagiarism never will be tolerated. Plagiarism is defined as using the ideas and/or words of another and representing them as your own *and includes pasting material from web sites*. If you are dishonest in your work, I will discuss it with you and the Dean, and you will earn a zero for the assignment. Students fail the course if they repeat it a second time. "It is plagiarism if you use an author's key phrase or sentence structure in a way that implies they are your own, even if you cite the source. Instead, enclose the original wording in quotations and cite the source. Better yet, put the whole passage in your own words."¹ Excessive quotations (>2) and reliance on websites are not acceptable. To cite a source, use a technique that you are comfortable with (footnotes, parenthetical citations, etc). I am not picky about your citation method, but ask that you are thorough, honest and consistent. Full descriptions of the Academic Honesty Policy and the Honor Code can be found in the Academic Catalog (online at www.gustavus.edu/general_catalog/current/acainfo).

1. McMillan, V.1998. *Writing Papers in the Biological Sciences*. Bedford Books, New York. Pgs. 44-46.

Title IX

Title IX is federal legislation that makes clear that violence and harassment based on sex or gender are civil rights violations. Gustavus Adolphus College takes incidents of sexual misconduct and sexual harassment seriously. For examples and more details, please see www.gustavus.edu/deanofstudents/policies/gustieguide/sexualassault.php#misconduct. Sexual Harassment is any behavior of a sexual nature that is unwelcome, offensive or fails to respect the rights and dignity of another person whether of the same or opposite sex. (Please see: www.gustavus.edu/facultybook/allcollegepolicies/#Anchor-Sexua-60443.) Not all college employees are mandatory reporters. However, all faculty are legally mandatory reporters and must make a formal report to the Dean of Students Office within twenty-four hours. The college will respect the confidentiality of the victim and alleged offender(s) as much as possible consistent with the College's legal obligations. Students also always have a choice as to whether to participate in an investigation or not. The only exception to this reporting responsibility for Gustavus employees is that conversations with SART/CADA, Chaplains, Counseling Center staff, and professional health care staff may be kept strictly confidential. SART/CADA can be reached 24 hours a day at 507-933-6868. If you have any questions, contact the Title IX Coordinator (Paula O'Loughlin, Associate Provost, at 507-933-7541) or Deputy Coordinators (Stephen Bennett, Associate Dean of Students, at 507-933- 7526 or Ken Westphal, Vice President for Finance, at 507-933-7499).

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Accessibility (Resources for Students with Disabilities and ELL):

I am committed to ensuring that all students fully participate. We will work together to ensure this class is as accessible and inclusive as possible. Gustavus Adolphus College is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or you think you may have a disability of any nature) and, as a result, need reasonable academic accommodation to participate in class, take tests or benefit from the College's services, then you should speak with the Disability Services staff, for a confidential discussion of your needs and appropriate plans. Course requirements cannot be waived, but reasonable accommodations may be provided based on disability documentation and course outcomes. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact Disability Services as early as possible. Disability Services (www.gustavus.edu/advising/disability/) is located in the Academic Support Center. Disability Services Coordinator, Kelly Karstad, (kkarstad@gustavus.edu or x7138), can provide further information.

Support for English learners and multilingual students is available through the Academic Support Center's Multilingual Learner Academic Specialist, Jody Bryant (jbryant2@gustavus.edu or x7197). The MLAS can meet individually with students for tutoring in writing, consulting about academic tasks, and helping students connect with the College's support systems. In addition, English learners and multilingual students can seek help from peer tutors in the Writing Center (www.gustavus.edu/writingcenter/). I am also happy to be a resource for you. Please stop by office hours or set up an appointment.

Tentative Class Schedule and Readings (Subject to change if necessary)

Date Discussion Topic Reading from textbook (or Moodle)

Unit 1: Introduction to microorganisms, microbial structure and growth

M Feb 8	Introduction to microorganisms	Bauman pg. 3-14
W Feb 10	Review of chemistry of life	Bauman pg. 36-50
F Feb 12	Bacterial cell structure	Bauman pg. 57-66
M Feb 15	Bacterial cell structure (cont.)	Bauman pg. 66-74
W Feb 17	Archaeal and eukaryotic microbial structure	Bauman pg. 74-87
F Feb 19	Microbial diversity and classification	Bauman pg. 113-119
M Feb 22	Microbial metabolism	Bauman pg. 134-148
W Feb 24	Microbial growth	Bauman pg. 166-174
F Feb 26	Microbial growth quantification/control	Bauman pg. 182-190, 262-267
M Feb 29	Synthesis and review	Assignment #1 due
W Mar 2	Exam I	

Unit 2: Molecular Biology of Microbes and Viruses

F Mar 4	Microbial genomes	Bauman pg. 197-204
M Mar 7	Microbial gene expression and regulation	Bauman pg. 206-219
W Mar 9	Mutations and their repair	Bauman pg. 219-227
F Mar 11	Genetic recombination and transfer	Bauman pg. 227-233
M Mar 14	Introduction to viruses	Bauman pg. 387-393
W Mar 16	Viral replication	Bauman pg. 394-403
F Mar 18	Molecular biology of viruses	Bauman pg. 403-406
M Mar 21	Synthesis and review	Assignment #2 due
W Mar 23	Exam II	Infectious disease topic due

F Mar 25 – F Apr 1 NO CLASS – Spring Break

Unit 3: Control of infections with immunity and pharmaceuticals

M Apr 4	Antimicrobial drugs	Bauman pg. 289-298
W Apr 6	Antimicrobial drugs (cont.)	Bauman pg. 298-302

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F Apr 8	Antimicrobial drug resistance	Bauman pg. 302-316
M Apr 11	Innate immunity	Bauman pg. 449-458
W Apr 13	Innate immunity (cont.)	Bauman pg. 458-467
F Apr 15	Adaptive immunity	Bauman pg. 473-482
M Apr 18	Adaptive immunity (cont.)	Bauman pg. 482-489
W Apr 20	Immunity and immunization	Bauman pg. 489-496, 505-511
F Apr 22	Synthesis and review	Assignment #3 due
M Apr 25	Exam III	

Unit 4: Microbial pathogenesis

W Apr 27	No class – MAYDAY!	Infectious disease assignment due
F Apr 29	Microbial interactions with humans	Bauman pg. 415-430
M May 2	Transmission of infectious disease	Bauman pg. 431-442
W May 4	Examples of skin pathogens	Bauman pg. 560-570, 586-591
F May 6	Examples of immune and nervous system pathogens	Bauman pg. 542-551, 604-609, 653-654
M May 9	Examples of systemic pathogens	Bauman pg. 646-651, 656-663
W May 11	Examples of respiratory pathogens	Bauman pg. 686-699
F May 13	Examples of intestinal pathogens	Bauman pg. 721-731, 742-746
M May 16	Examples of reproductive pathogens	Bauman pg. 762-771, 773-775
W May 18	Synthesis and review	Assignment #4 due
F May 20 (8:00-10:00am)	Final exam	