**BIO112 Principles of Microbiology**

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**Course Materials:**
Bauman, R.W. 2018. *Microbiology with Diseases by Body System*. 5th Edition. Pearson Education Inc.

**Course Description:**
An overview of microbiology, with particular emphasis on the role of microbes in human health and disease. Core concepts of evolution, cell structure and function, metabolism, genetics, microbial systems, and the impact of microorganisms on humans will be covered, and competencies in the application of the process of science, and use of quantitative reasoning will be developed. After students master sterile technique and safe laboratory practices, the laboratory portion of the course will focus on the development of microscopy, culture, and bacterial identification techniques.

**Course Objectives:**

1. The students will demonstrate an understanding of the following concepts as they relate to microbes and human health;
    a. Evolution
    b. Cell structure and function
    c. Metabolic pathways
    d. Information flow and genetics
    e. Microbial systems
    f. The impact of microorganisms on the environment
2. The students will demonstrate the following skills;
    a. The ability to practice safe microbiology
    b. The ability to formulate hypotheses and design an experiment
    c. The ability to use mathematical reasoning and graphing
    d. The ability to analyze the relationship between science and society
    e. The ability to prepare and view specimens using microscopy
    f. The ability to use sterile technique to isolate and selectively cultivate organisms
    g. The ability to use multiple methods to identify unknown organisms

**Domain Objectives**

1. The students will learn the basic terminology of a specific field of study
2. The students will collect scientific data
3. The students will critically analyze scientific data
4. The students will present results in an appropriate graphical representation

**Course Policies:**

***Grading:***

Grading will be based on total points accumulated during the semester. Points can be earned as follows:

| | | |
|---|---|---|
| Exams (4): | 125 pts each | (500 total) |
| Laboratory reports (15): | 30 pts each | (390 max) |
| Assignments (in-class or homework) (13+): | 10 pts each | (110 max) |

***Exams:*** Closed book; in class; final exam cumulative. Question formats typically include multiple choice and case studies. IFAT forms may be used on multiple choice exams; these may not be used if taking the exam early.

***Laboratory reports***: Format will vary with the individual lab exercise and may be a worksheet or a short write-up. Each week I will either grade everyone's lab report or give everyone a completion grade. It will not be announced beforehand whether a particular lab will be graded, so it is in your best interest to do a thorough job on all of them.

***Assignments***: On some class days you will complete research activities using the internet, debate the pros and cons of an ethical issue, read and analyze literature, or work problems from your textbook. Active learning has been shown to improve outcomes (grades!) in science courses. Expect this to happen for all or part of class once per week. Sometimes homework is necessary to prepare for these activities, so those assignments are part of this grade.

**Grade Scale:**

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|---|---|---|---|---|---|
| **970–1000** | **A+** | **940-969** | **A** | **900–939** | **A-** |
| **870-899** | **B+** | **840-869** | **B** | **800–839** | **B-** |
| **770-799** | **C+** | **740-769** | **C** | **700–739** | **C-** |
| **670-699** | **D+** | **640-669** | **D** | **600–639** | **D-** |
| **Below 600** | **F** | | | | |

**Final grades are non-negotiable**. I do not offer individual extra credit assignments. If you are struggling with the material please see me for help ASAP. I promise I am not an evil ogre, and I don't charbroil students and eat them with fries (I don't even like fries, so don't believe any rumors you hear). If my office hours don't work for you, just email me and we'll figure out a time.

***Attendance/Make ups:***

There are no make-up assignments or labs; only the first 13 laboratory reports completed and first 11 assignments completed will count toward your grade, allowing you to miss multiple sessions without penalty regardless of the reason. This is in accordance with the guidelines released by the Academic Dean on how to handle absences for athletes and others involved in school-sponsored activities. If you need to miss an exam due to participation in a school-sponsored activity you must see me at least 1 week prior to your anticipated absence so that arrangements can be made for you to take the exam with a certified proctor. The only other circumstances under which a make-up exam will be given are if (1) you are ill the day of the exam and provide a doctor's note indicating that you are excused from classes that day and contact me to let me know about this

circumstance the day of the exam or (2) the Academic Dean or Dean of Students contacts me to let me know that some extreme circumstance warrants a make-up exam. If you miss an exam for any other reason or do poorly on one of the first three exams, the cumulative final exam can be counted twice (dropping your lowest exam grade and replacing it with the final exam grade). **While this attendance policy is fairly lenient, you need to be aware that students that don't attend class regularly generally do poorly on exams. The fact that there is no direct grade penalty for every absence does not mean that absences won't hurt your grade!**

**Laboratory reports are due at the beginning of the next lab period.** Lab reports handed in after this time but less than 24 hours late will be docked 5 points (out of 30). Reports will be docked 10 points if they are 24-48 hours late, 15 points if they are 48-72 hours late, etc. **You will not receive credit for labs you did not attend!** Lateness penalties apply even if the lab is just being given a completion grade. If you will be absent on a lab day, you may turn your report in on time via email to avoid late penalties.

**Homework assignments, when given, are due at the beginning of class and will not be accepted once class has started.** We often go over the homework in class, or use it for an activity, so I can't give you credit if it is handed in after class has started. If you arrive late, bring your homework to me immediately upon your arrival. I will not accept homework at the end of class or after class. Homework can be turned in electronically (take a photo and attach to an email) if it is turned in on time.

**Be here on time!** FOR SAFETY REASONS, YOU WILL NOT BE ALLOWED TO ENTER THE LABORATORY ONCE WE HAVE STARTED PRE-LAB DISCUSSION, NOR WILL YOU BE ALLOWED TO ENTER THE LAB IF YOU ARE NOT DRESSED PROPERLY. You will not receive any credit for the lab session you miss.

***Cheating/Plagiarism*:**
I have no tolerance for cheating or plagiarism. Plagiarism is copying someone's words or ideas without giving him or her proper credit. **Working together on lab write-ups is cheating.** You may not possess cell phones or other electronic devices during exams; they must be turned off and left at the front of the room. If you are unsure if what you are about to do constitutes cheating or plagiarism, ask me. Ignorance will not excuse the offense. The first offense of cheating or plagiarism will result in a zero on the assignment, and a letter to the registrar. A second offense will result in a failing grade (F) in the course.

***Disabilities:***
Students with a disability requiring accommodations or any student who believes that he or she will require accommodations should contact Kim Ochsenbein in the Academic Support Center located in the lower level of Thaw Hall (865) 981-8124. Students are encouraged to make contact before or during the first week of classes.

***Safety:***
While most of the organisms we will work with in the laboratory pose little threat to a healthy adult, safety is taken very seriously in the microbiology laboratory. Safety rules will be described in a separate handout, and your failure to follow these rules may result in your expulsion from an individual laboratory session or from all remaining laboratory sessions. You will not be able to earn any points for laboratory reports if you are expulsed from the lab due to a violation of safety regulations. No emotional support animals are allowed in the lab at any time. Service Animals must be coordinated in advance with the Dean of the College and the Lab Instructor.
At the end of this syllabus is a list of all organisms that we will be working with in this laboratory. **If you are pregnant or immunocompromised or live with someone who is pregnant or immunocompromised you should bring this list to your (their) regular physician so they can determine if you can safely work with these organisms.**

**Organisms used in BIO112 (varies by semester):**
*Alcaligenes faecalis*
*Bacillus cereus*
*Bacillus licheniformis*
*Bacillus thuringiensis*
*Bacillus subtilis*
*Bacillus megaterium*
*Enterobacter aerogenes*
*Escherichia coli (obtained from Carolina as a "normal" strain)*
*Escherichia coli B*
*Kocuria rosea*
*Lactococcus lactis*
*Micrococcus luteus*
*Neisseria sicca*
*Rhodospirillum rubrum*
*Saphylococcus epidermidis*
Microbes from the campus environment and human skin will be cultured on solid media

**Tentative Class Schedule**

| Date | Topic | Text Chapter |
|---|---|---|
| W Aug 21 | Introduction | 1 |
| F Aug 23 | Chemical foundations of life | 2 |
| M Aug 26 | Cell structure and function | 3 |
| *T Aug 27* | *Safety, scientific method, and introduction to excel* | |
| W Aug 28 | Cell structure and function | 3 |
| F Aug 30 | Microscopy/staining | 4 |
| M Sep 2 | No class – labor day | |
| *T Sep 3* | *Microscopy and simple staining* | 4 |
| W Sep 4 | Metabolism | 5 |
| F Sep 6 | Nutrition and Growth | 6 |
| M Sep 9 | Nutrition and Growth | 6 |
| *T Sep 10* | *Gram stain* | |
| W Sep 11 | Wrap up & review | |
| F Sep 13 | Exam I | 1 - 6 |
| M Sep 16 | Genetics | 7 |
| *T Sep 17* | *Sterile technique and basic culture techniques* | |
| W Sep 18 | Genetics | 7 |
| F Sep 20 | Recombinant DNA | 8 |
| M Sep 23 | Recombinant DNA | 8 |
| *T Sep 24* | *Environmental sampling / selective media* | |
| W Sep 25 | Controlling growth – environment | 9 |
| F Sep 27 | Controlling growth – environment | 9 |
| M Sep 30 | Controlling growth – body | 10 |
| *T Oct 1* | *Antimicrobials and antibiotics* | |
| W Oct 2 | *Gather & analyze results from lab* | |
| F Oct 4 | No class – fall break | |
| M Oct 7 | Controlling growth – body | 10 |
| *T Oct 8* | *Water purification techniques* | |
| W Oct 9 | Characterizing and classifying microbes | 11-13 |
| F Oct 11 | Characterizing and classifying microbes | 11-13 |
| M Oct 14 | Infection | 14 |
| *T Oct 15* | *Identifying unknown bacteria: isolation on selective and non-selective media* | |
| W Oct 16 | Wrap up & review | |
| F Oct 18 | Exam 2 | 7-14 |
| M Oct 21 | Innate Immunity | 15 |
| *T Oct 22* | *Identifying unknown bacteria: isolation and culture characterization* | |
| W Oct 23 | Adaptive Immunity & Immunization | 16, 17 |
| F Oct 25 | Immune disorders | 18 |
| M Oct 28 | Infections of the skin and wounds | 19 |

| | | |
|---|---|---|
| | *Start cultures for lab tomorrow* | |
| *T Oct 29* | *Identifying unknown bacteria: staining and biochemical tests part 1* | |
| W Oct 30 | Infections of the skin and wounds | 19 |
| F Nov 1 | Infections of the nervous system and eyes | 20 |
| M Nov 4 | Infections of the nervous system and eyes<br>*Start cultures for lab tomorrow* | 20 |
| *T Nov 5* | *Identifying unknown bacteria: biochemical tests part 2* | |
| W Nov 6 | Cardiac and systemic infections | 21 |
| F Nov 8 | Cardiac and systemic infections | 21 |
| M Nov 11 | Infections of the respiratory system | 22 |
| *T Nov 12* | *Hand washing and hand sanitizers* | |
| W Nov 13 | Infections of the respiratory system | 22 |
| F Nov 15 | Wrap up & review | |
| M Nov 18 | Exam III | 15-22 |
| *T Nov 19* | *Molecular methods for identifying bacteria* | |
| W Nov 20 | Infections of the digestive system | 23 |
| F Nov 22 | Infections of the digestive system | 23 |
| M Nov 25 | Infections of the urinary and reproductive syst. | 24 |
| *T Nov 26* | *Molecular methods for identifying bacteria* | |
| Nov 27-29 | Thanksgiving break | |
| M Dec 2 | Infections of the urinary and reproductive syst. | 24 |
| *T Dec 3* | *Molecular methods for identifying bacteria* | |
| W Dec 4 | Wrap up & review | |
| W Dec 11 9 am | Cumulative Final Exam | |