

**MICROBIOLOGY (BIOL 304), Spring 2010, 1:30-2:50pm TTh MG 2001 (Herrera)**

Lab section **1 (Lockhart)**, 9:30-11:20pm, Wednesday, Recitation **1**, 9:30-10:20am Friday MG2061

Lab section **2 (Lockhart)**, 12:30-2:20pm, Wednesday, Recitation **2**, 1:30-2:20am Friday MG 2061

Lab section **3 (Herrera)**, 3:30-5:20pm, Wednesday, Recitation **3**, 3:30-4:20 pm Friday MG 2061

<u>INSTRUCTORS</u>	<u>Office</u>	<u>Lab</u>	<u>Phone(s)</u>
Jose Herrera	MG 3034	MG 2060	785-4616 (office) 665-0058 (home)
Michael Lockhart	MG 3030	MG3031	785-4614 (office)

**OFFICE HOURS:** Herrera: MWF 8:30-10:30; Lockhart: M10:30-11:30, T12:30-1:30, Th 9-10, F 8-9 (or by appointment). In general, we can usually be found in our offices or in our research labs. However, occasionally it pays off to take a gander in the microbiology laboratory (MG 2061). If we can not be found, you have several options:

- 1) Leave a note in our research labs
- 2) Slip a note under our office doors
- 3) Leave a message in our mailbox (MG2010 main floor of Magruder Hall)
- 4) Use e-mail: [jherrera@truman.edu](mailto:jherrera@truman.edu); [mlockhar@truman.edu](mailto:mlockhar@truman.edu)
- 5) Leave a message on our voice mail
- 6) Return or phone later

Feel free to use any of these options. Remember, we are here to help you learn microbiology.

### **GENERAL CONCERNS:**

**Course objectives--** This course is designed to introduce you to microbiological principles and methods. As such, we will only scratch the surface of SOME of the important microbiological concepts of current importance. Furthermore, this class is somewhat of a misnomer. Although the course title implies that we will examine all microbes, we will spend a disproportionate amount of time examining the biology and methodology of bacteria. Nevertheless, we hope that you will at the very least get an appreciation of the diversity of microbes present in our ecosystem.

Truman also offers a scaled-down version of the microbiology course (BIOL 204). If you have not taken 107, you can not take this course. Try taking the 204 course, instead. This course is more focused on allied health concepts and their relationship to microbiology. Furthermore, although cell biology and genetics are not required to take this course, if you already have taken these courses, you will be at a considerable advantage. If you have not taken these courses, fear not, just be prepared to spend a bit more time on these concepts when we get to them.

We suspect there will be some rough spots in this ever-evolving course. Please bear with me. In addition, there will be some elemental biological concepts not discussed in class, but their understanding expected. Most of you will have already encountered some of the principle concepts in earlier courses, but if you find yourself floundering and not understanding the topics addressed in class, **please come see us early**. It will not help you if you come to see us near the end of the course, when you do not have sufficient time to adapt your learning.

The objectives listed below are only a few of what we consider the most important objectives that this course will endeavor to meet.

1. After this course you should be proficient at executing and interpreting commonly-used microbiological techniques. These skills should be useful whether you plan to make science a career, an

interesting hobby or a painful memory. We will assume the first and treat you accordingly.

2. Understand microbiological phenomena and concepts, and be able to couch such topics in a larger biological frame of reference. This will include, but not be limited to, extrapolating microbiological events to macrobiological consequences.

3. All students will be required to understand how the design and execution of microbiological experiments influences the data obtained; however, because some of you are taking this course with the writing-enhanced option, you will be required to understand and design scientifically valid experiments and to use scientific writing to convey your results using accepted scientific writing methods.

4. In order to observe, understand and experiment using microbes, you need to at least have some cursory knowledge of microbiological concepts, principles and theories. Science is exponentially more efficient if you know how your observations may fit into well established concepts, principles and theories. Therefore, you will also be exposed and expected to understand some factual microbiological knowledge that should serve as the foundation for the first 3 objectives and any future biology courses that you may take.

#### **Required Books--**

1. **Text:** Prescott, Harley and Klein's Microbiology (7th ed.), by Joanne M. Willey et al.
2. **Lab Manual:** Microbiology: laboratory Theory and Application (2nd ed.), by Leboffe & Pierce

#### **Suggested Books--**

1. Bergey's manual of determinative bacteriology (9<sup>th</sup> ed.), by Holt et al. (eds.), Williams and Wilkins, Publishers

#### **Web pages--**

<http://highered.mcgraw-hill.com/classware/infoCenter.do?isbn=0072992913> -- This rather long web address has a variety of self quizzes and exploration of the topics discussed in class. We suspect that we will occasionally use the information on these and other web pages.

<http://www2.truman.edu/~jherrera/> -- This is my home page that has a microbiology subtab under "classes" tab. This page will occasionally have assignments, old tests, course information, and independent research projects.

**Supplies**-- It is recommended that you purchase your laboratory supplies through Tri-Beta (Truman's own Biological honor society). Tri-Beta will come to class or set up a table outside of MG2010 where you can purchase a laboratory kit for use in the microbiology laboratory. We should be able to provide you with most of the other required lab supplies. We will notify you in advance if you will be required to supply additional materials. However, we recommend 1 or 2 three ring binders and a set of color pencils or markers. Additionally, a good dose of patience may be necessary with some of the lectures and labs.

**Help**-- Although office hours usually are underused by students, you may nevertheless want to untangle your confusion about microbiology on your own. We would suggest a Tri-Beta tutor (please come see us for more information), reading over the study guide in your book, or following some of the exercises in the interactive website. Any one of these options should make microbiology more understandable, and at times, even fun!

**Absences** -- Attendance in not taken in lecture or lab. However, make-ups for labs or tests will only be given if prior arguments have been made on your behalf. We will NOT accept late assignments or give "make-up" tests if no prior arguments have been made. Acceptable arguments may be:

1. death in the family (must have appropriate proof)
2. officially approved university activity (must have a university form prior to absence)
3. illness (must have appropriate proof)
4. DISCRETIONARY and RARE exceptions which must be argued on paper.

**Lectures**-- I usually will write an outline skeleton and expect to you embellish your version with details that I may OR MAY NOT write down on the board. In other words, We expect you to show competency with concepts that may not be explained in writing. Concepts that may make sense when I talk about them, may be confusing if you do not **describe the concepts in your own words**. Consequently, it is of some importance to pay attention to the concepts being discussed and attempt to understand them as they are being talked about. If you do not understand, **We expect you to ask questions** during the lecture or during my office hours. We will assume you understand the concepts discussed if we do not hear from you.

**Labs--** We will expect that you read the laboratory manual prior to coming to your assigned laboratory period. We will let you know of assignments as they come up.

**COURSE RULES (THINK OF THEM AS MICRO COMMANDMENTS):**

1. ASK QUESTIONS AND WRITE CONCEPTS IN YOUR OWN WORDS
2. NOTIFY INSTRUCTOR OF BROKEN GLASS, INJURIES OR OTHER MAYHEM.
3. Please adhere to our academic integrity policy:

Students are expected to do their own academic work. Collaboration is encouraged on some class assignments but cheating or academic dishonesty will be severely punished. **ACADEMIC DISHONESTY** is more thoroughly described in the Truman State University Catalog: Any student involved in cheating on an examination or in any other form of academic dishonesty will be subject to disciplinary action, including suspension or expulsion from the class, the student's academic program, or the university. It is the responsibility of faculty members 1) to inspire in their students an appreciation of and a desire for honesty in academic work; 2) to take appropriate action in instance of dishonesty and to protect the honest student; and 3) to take appropriate action in instances of dishonesty. Such action may include the reduction or elimination of a dishonest student's score for an affected test or project, the lowering of a grade for the affected class (including the assignment of an F grade), or the expulsion of a student from the affected class. Serious cases of academic dishonesty are reported by the faculty member to his or her department chair, who may take additional disciplinary action against the dishonest student, including suspension or expulsion from classes in the academic division. The department chair also may report the dishonesty to the department in which the dishonest student is enrolled as a major and/or to the Dean of Student Affairs. The Dean of the college in which the dishonest student is enrolled as a major may suspend or expel the student from the academic program. The Dean of Students may also suspend or expel the student from the University as outlined in the Student Conduct Code for incidents of academic dishonesty. Disciplinary action by a faculty member for academic dishonesty may be appealed to the Dean of the faculty member's academic college. Disciplinary action decisions by a Dean may be appealed to the Vice President for Academic Affairs for review and final decision. Disciplinary action by the Dean of Student Affairs for academic dishonesty may be appealed through the same process as other disciplinary actions by the Dean of Student Affairs for student misconduct.

4. LAB BENCHES AND LECTURE SEATS SHOULD BE LEFT CLEAN AND UNCLUTTERED.
5. READ ASSIGNED MATERIAL BEFORE YOU COME TO CLASS.
6. REFRAIN FROM CONVERSING WITH OTHER STUDENTS WHILE SOMEONE ELSE IS TALKING TO THE CLASS.
7. DON'T BE AFRAID TO COME TO MY OFFICE
8. IT IS MY RESPONSIBILITY TO CLEARLY CONVEY CONCEPTS, BUT IT IS YOUR RESPONSIBILITY TO LEARN.
9. We WILL NOT DISCUSS INDIVIDUAL GRADES WITH STUDENTS DURING CLASS.
10. We USUALLY GIVE YOU THE BENEFIT OF THE DOUBT, SO . . . NO WHINING.

**LAB RULES**

1. NO GUM, SMOKES, FOOD, OR DRINK (BEING MERRY IS OPTIONAL).  
Try to avoid any type of oral fixation. Pathogenic microorganisms are, at times, used in this lab. Thumb sucking, or teeth picking could lead to an illness, so don't.
2. WASH YOUR HANDS BEFORE AND AFTER CLASS.
3. DISINFECT YOUR LAB BENCHES BEFORE AND AFTER CLASS
4. SHOES SHOULD BE WORN AT ALL TIMES
5. MAKE SURE THAT ALL GAS LINES ARE OFF BEFORE YOU LEAVE
6. KEEP YOUR DESK CLEAR OF UNNECESSARY PERSONAL ITEMS  
Unwittingly taking some pathogenic inoculum home is a sure way of making roommate relations worse.
7. NO MEDIA, CULTURE TUBES, LABWARE, OR SAMPLES ARE TO LEAVE LAB.  
See explanation under #6
8. REMOVE ALL LABELS FROM USED TUBES AFTER YOU ARE DONE WITH THEM
9. SCOPES WILL NOT BE DRAGGED ACROSS TABLES (tends to shake lenses out of alignment), BE CLEAN, FREE OF OIL & THE OBJECTIVE LENS WILL BE SET @ 10X AT THE END OF LAB.
10. TRY TO IMITATE THE 70s CLOTHING FASHIONS OF YOUR INSTRUCTOR  
We will be working with some powerful stains and reagents. Nice clothes are the first to get stained and are not recommended. You can't usually tell with seventies clothing.

**Grades--** You may earn a total of 1000 points. Please remember, however, that we have the right to add or delete any of the evaluated items. Their points will be distributed in the following provisional manner:

10 Preliminary exams	50 points each, 450 Points total <b>(you may drop ONE of these but keep in mind you may not make up ANY-whatever the reason).</b>
final exam . . . . .	100 pts (there is no make up for this <u>required</u> exam)
double unknown . . . . .	100 pts

If you have enrolled in this course with a writing-enhanced (WE) component, you will be required to conduct an independent research project that will be worth 100 points.

Miscellaneous . . . . .	100 pts	The final grading point scale is as follows:	
*quizzes		900-1000	A
*class participation		800-899	B
*ad-hoc assignments		700-799	C
		600-699	D
laboratory portion of course	250 pts	<600	F
*unknowns & practicals			
*quizzes and hand ins			

**Tests--** Tests will be multiple choice, true/false and embellished with short essay, fill-in-the-blank, short answer, and include material from **BOTH** lecture and laboratory. On most weeks, We will try to administer the exams on Tuesday to test material discussed the previous week. Some weeks we will not take an exam (e.g. the week before finals week begins). We will keep you informed as we develop the itinerary. The lowest of these exam scores will be dropped (if you do not take an exam at the scheduled time, this is the score that will be dropped). The final exam is comprehensive for the laboratory portion of the course.

**We usually give several exam questions that ask you to extrapolate from the information given during lecture and the laboratory (not memorized). Although, this often draws criticism from students not familiar with these types of questions (e.g., exam questions are too “picky”), We strongly feel that showing competence in extrapolative exam questions is a better predictor of concept mastery. Furthermore, practicing these types of questions will prepare you to be a professional (who is paid to extrapolate) not a technician (who is paid to repeat memorized tasks).**

**Lab note books--** Some laboratory sessions require that you keep a detailed notebook. This lab requires no FORMAL lab notebook, but you will be saved much grief and pain if you take notes on the labs. This INFORMAL notebook should include pictures, graphs, sketches, notes, results, and anything else that may allow you to formulate a clearer picture of the concepts being taught.

**Lab write-ups--** The 250 points allotted for the laboratory portion of the course will be distributed on an *ad-hoc* basis throughout the semester. The points may be awarded for lab write ups, quizzes or for essential practical microbiological tasks that require mastery. Late write-ups will only be accepted with a 5 point deduction for every day the write up is late. It would be a good idea to read and answer the questions in your laboratory manual in the back of the exercises scheduled to be completed that day prior to coming to lab. Doing so will give you a better idea of the concepts that you are required to master before you begin the laboratory procedure.

**PROVISIONAL LECTURE SCHEDULE, SPRING 2010**

<u>WEEK</u>	<u>TOPIC</u>	<u>READ CHPT</u>
1/11 (1)	Class Starts, course description, taxonomy, start on history of microbiology	1; pgs 489-494
1/18 (2)	No classes on Monday, Martin Luther King day Finish history of microbiology begin on microscopy	2
1/25 (3)	Start on Characteristics of microbial cells	3
2/1 (4)	Finish Characteristics, Start on microbial growth Last week to drop course without W showing up in transcript	6
2/8 (5)	Finish microbial growth-dilution schemes homework. Discussion of double unknowns; catch up; microbial nutrition	6
2/15 (6) 2/18	Introduction to viruses University conference day - no classes on Thursday	16
2/22 (7)	Viruses; discussion of virtual unknown.	17
3/1 (8)	Finish Viruses, including those that are pathogens on humans	18, 37
<b>3/8-3/12</b>	<b>Spring Break . . . we need one</b>	
3/15 (9)	Fungi	26; pgs 997-1001 pgs. 1008-1011
3/22 (10)	Microbial genetics-general principles We will not talk about most of this chapter but We expect for you to be familiar with the contents. Please see us if you never studied the principles of genetics Microbial genetics - Gene Transfer	11-12
3/29 (11)	Microbial genetics continued	13
4/5 (12)	Spring break, no classes on Monday Genetic Engineering	14-15
4/12 (13) 4/13	Associations: Commensals, mutualists, and pathogens Student Research Conference- Tuesday; No classes	29-30
4/19 (14)	Epidemiology of infectious diseases Morbidity and Mortality Weekly Report (MMWR)	36
4/26 (15)	For Writing enhanced folks . . .Independent research due sometime at the end of this week or early next Mop up	
5/3	Final exams begin	
5/5	Reading day	

**FINAL EXAM: Tuesday 5 MAY, 11:30a.m.?**

**PROVISIONAL LABORATORY SCHEDULE OF EVENTS, SPRING 2010**

<b>WEEK</b>	<b>EXERCISE</b>	<b>TOPIC</b>
1/11 (1)	Intro 1-2 2-1	Introduction/Orientation Aseptic transfer (learning how to play with microbes—read pgs. 345-347 in lab book) Ubiquity of microorganisms (expose spare plates)
1/15	2-2	Examine exposed plates cultural characteristics of plates and transfers from Wednesday
1/18 (2)	3-1 3-2 3-4	Light microscopy - video Calibration of scope (this may be done on Friday if we don't have time) Simple stain and preparation of stained smears
1/22		Finish looking at simple stains and calibration of scope
1/25 (3)	3-6 3-10	Gram Stain (may want to prepare heat-fixed smears only and finish examining Friday) Motility determination: Wet-mount and hanging drop
2/1 (4)	1-3 4-2 & 4-5	Streak plate method PEA & EMB plates Gram stain/calibration quiz
2/5		Read streak results- some students may need to conduct Gram stain quiz today
2/8 (5)	5-10 & 5-2 5-4 & 5-5 5-6 & 5-7 5-8 & 5-11 5-15 & 5-20	Unknown discussion in lecture. READ and understand tests in Chapter 5 Arginine decarboxylase test & Phenol red broth test MR-VP test & Catalase test Oxidase test & Nitrate reduction test Citrate test & Phenylalanine Deaminase test Urea test & SIM media for motility and H <sub>2</sub> S production
2/12		Streak plate practical and read results of tests as a table.
2/15 (6)	5-29 & 5-30	Obtain bacterial double unknown today (rapid identification tests: Entero & API strips); streak onto EMB, Mannitol Salts, NA & T-soy and Gram stain unknown broths; isolate on Friday;
2/22 (7)	6-1 2-6	Inoculate API broths and Entero strips Standard plate count (viable count; read pgs 353-356 in lab book: how to use a pipettor) Cultivation of anaerobes (using FTM) and demonstrating Anaerobic jar (Ex 2-9)
3/1 (8)		Double unknown due at end of week
3/8 - 3/12		Spring break
3/15 (9)	11-1 & handout	Common fungi: traditional and molecular identification
3/22 (10)	9-1 & handout	Isolation of DNA from fungi (students get their own or get one from collection) unknown—practice gel loading Run gel on Friday to confirm DNA present.
3/29 (11)	handout	Finish gel from last week and amplify DNA . . . run gel on Friday (graded on relative measure). Exo-sap and DNA send out for sequencing . . .we will do this for you.
4/5 (12)	handout	Demonstration of Finch to work on sequences. Students will be given practice sequences.
4/12 (13)		Clean unknown sequences in amplified DNA. Reserve computer lab?
4/19 (14)		Molecular unknowns due on Friday; otherwise free lab to work on projects
4/26 (15)	8-7	Microbiology of yogurt production; <b>Need to come in on Friday—Clean &amp; Check out</b>