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**Biology Department, College of Arts & Sciences, Valdosta State University**  
**SPRING 2011---COURSE SYLLABUS\***

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**BIOL 3100, Sections A & B. Microbiology (CRN 21202 & 21203) - 4 credit hours**

**BIOL 5100, Sections A & B. Microbiology (CRN 21231 & 21232) – 4 credit hours\*\***

<b>Class:</b>	<b>TR</b>		<b>8:00-9:15 am, 2022 Bailey Science Center</b>
<b>Laboratory:</b>	<b>TR</b>	<b>3100/5100 <u>Section A</u></b>	<b>10:00-11:25 am, 2068 Bailey Science Center</b>
	<b>TR</b>	<b>3100/5100 <u>Section B</u></b>	<b>2:00-3:25 pm, 2068 Bailey Science Center</b>

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<b>Instructor:</b>	<b>Dr. Jenifer Turco</b>	<b>Email:</b>	<b><a href="mailto:jturco@valdosta.edu">jturco@valdosta.edu</a></b>
<b>Telephone:</b>	<b>229-249-4845</b>	<b>Office:</b>	<b>2091 Bailey Science Center</b>
<b>Office Hours:</b>	<b>Tues. 4:30-5:30 pm &amp; Thurs. 12:30-1:30 pm; or by appointment.</b>		

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**Course Description:**

**BIOL 3100 Microbiology 3-3-4 (4 credit hours)**

**Prerequisites: BIOL 2010, BIOL 2230, BIOL 2270, CHEM 1212/1212L. Recommended: CHEM 3402.**

**BIOL 5100 Microbiology 3-3-4 (4 credit hours)**

**Prerequisite: Admission into the graduate program or permission of the instructor.** Survey of microbiology covering eubacteria, archaebacteria, protozoa, fungi, algae, and viruses. Includes fundamental techniques, microbial physiology and genetics, biotechnology, medical applications, and applied microbiology. Two 1.5 hour laboratory periods per week.

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**Required Textbook:** **BROCK BIOLOGY OF MICROORGANISMS, Twelfth Edition**  
by Michael T. Madigan, John M. Martinko, Paul V. Dunlap, and David P. Clark  
Prentice Hall 2009

**Required Lab Manual:** **BENSON'S MICROBIOLOGICAL APPLICATIONS, LABORATORY MANUAL  
IN GENERAL MICROBIOLOGY (Complete Version), Eleventh Edition**  
by Alfred E. Brown  
McGraw-Hill, Inc. 2009

**Other Required Items:** **A notebook for recording the results of laboratory work**  
**Calculator that is not integrated with a cell phone**  
**Permanent, fine-tip marking pen ("Sharpie") for labeling cultures in lab**  
**One CD (or jump drive) for oral presentation**  
**One thin, light-weight folder for handing in references & other assignments (Please do not use a 3-ring binder to hand in assignments.)**  
**Paper clips or stapler/staples for organizing references & assignments**

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**Special notes to students:**

1. In order to respect the privacy of each student, exam scores and grades will not be posted, given out by telephone, or sent to students by email.
  2. Students should consult the VSU Student Handbook, Catalog, Semester Calendar, Schedule of Classes, & Registration Guide for information about VSU policies and procedures regarding registration, drop/add, and withdrawal. March 3 is midterm. Students are not permitted to withdraw after midterm except in cases of hardship.
  3. Students requesting classroom accommodations or modifications because of a documented disability should discuss this need with the instructor at the beginning of the semester. These students must contact the Access Office for Students with Disabilities located in Farber Hall. The phone numbers are 245-2498 (V/VP) and 219-1348 (TTY).
  4. Cell phones may not be used during examinations or at any time in class or lab.
  5. Students must read and follow the Biology Department policy on plagiarism (available online through the departmental web site). The instructor may use a variety of methods for detecting plagiarism. Each student must be particularly careful to do his/her own writing on the oral presentations and on any assignments/reports that are to be completed individually. Plagiarism will result in a grade of "0" for the assignment. A student who plagiarizes on more than one assignment will receive a grade of "F" in the course.
  6. No disruptive behavior will be tolerated during class or lab. A student who engages in disruptive behavior will be asked to leave.
  7. Students who wish to use laptop computers as part of the class are required to sit in the first three rows of the classroom.
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**\*This is a tentative syllabus. Changes to this syllabus will be announced during class or laboratory periods; alternatively, changes may be posted on BlazeView.**

**\*\*Graduate students who are taking BIOL 5100 must meet with the instructor to discuss additional course requirements & grading.**

## **Course Objectives:**

(Page 3 shows how the objectives below are aligned with the VSU General Education Outcomes and the Biology Department Education Outcomes.)

### **After successful completion of this course, the student should be able to:**

- A. List and describe the three domains of living organisms.
- B. List and describe the three types of noncellular infectious agents.
- C. List several activities of microorganisms that are beneficial to humans and the environment.
- D. List and briefly explain several current challenges in medical microbiology and infectious diseases.
- E. Compare and contrast the structure and function of the microorganisms in the domains Bacteria, Archaea, and Eukarya.
- F. List and describe the various strategies used by microorganisms to obtain carbon, energy, and electrons.
- G. Describe the growth of a pure culture of bacteria in a closed system, and perform mathematical calculations related to the exponential growth phase. Explain several ways in which bacterial growth can be measured.
- H. Compare and contrast the following processes as they occur in Bacteria, Archaea, and Eukarya: DNA replication, transcription, and translation.
- I. Describe several mechanisms through which gene expression is regulated in bacteria.
- J. Explain how viruses replicate, and explain in detail how HIV enters and replicates within host cells.
- K. Describe the causes and consequences of mutations.
- L. Describe the three mechanisms of horizontal gene transfer in bacteria, and explain their significance.
- M. Describe specific examples of the use of microorganisms in genetic engineering and biotechnology.
- N. Briefly explain the role of microorganisms in the evolutionary history of life on earth.
- O. List and describe a variety of methods and approaches that are used to detect and identify various microorganisms and noncellular infectious agents.
- P. Explain how physical methods and chemical agents (antiseptics and disinfectants) are used for controlling microbes.
- Q. State the mechanisms of action of various antibacterial, antifungal, and antiviral medications.
- R. Discuss the problem of antimicrobial drug resistance, and explain several ways in which the emergence of drug resistant bacteria can be minimized.
- S. Give examples of beneficial interactions between: (i) microorganisms and plants, (ii) microorganisms and animals, and (iii) different types of microorganisms.
- T. Describe the role of microorganisms in the cycling of nutrients, using examples from the carbon cycle, the nitrogen cycle, and the sulfur cycle.
- U. Describe in detail: (i) the innate defenses of humans and (ii) the adaptive immune response of a human to a foreign antigen.
- V. Explain how infectious diseases are transmitted, giving specific examples.
- W. List the major types of virulence factors observed in pathogenic bacteria, giving specific, detailed examples.
- X. List and describe several human diseases that are due to specific bacteria, viruses, and fungi.
- Y. Describe the general course of the disease caused by human immunodeficiency virus (HIV).
- Z. Properly handle microorganisms in a biosafety level 2 laboratory.
- ZA. Use a compound light microscope to examine various types of microorganisms.
- ZB. Keep accurate records of microscopic observations, as well as other laboratory and field work.
- ZC. Use culture media to grow bacteria and fungi in the laboratory, and maintain stock cultures.
- ZD. Use staining techniques, physiological tests, and rRNA sequences as aids in bacterial identification.
- ZE. Use dilutions to determine the colony-forming units per milliliter in a bacterial suspension and the plaque-forming units per milliliter in a viral suspension.
- ZF. Work with others to formulate an answerable question, develop a hypothesis, design and conduct an experiment, collect and organize data, and write a formal report in the format used in a scientific journal.
- ZG. Use library and electronic resources to obtain formal scientific articles related to a particular topic in microbiology.
- ZH. Read the articles mentioned in objective ZG and give an oral presentation based on them.

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### **Alignment of Assignments with Course Objectives:**

The course objective(s) aligned with each assignment are given on page 11.

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### **Alignment of Course Objectives with VSU General Education Outcomes & Biology Department Educational Outcomes:**

The VSU General Education Outcomes (1-8) are available online at

<http://www.valdosta.edu/academic/VSUGeneralEducationOutcomes.shtml>

In this syllabus, the VSU General Educational Outcomes are designated as: VSU1-VSU8

The Biology Department Educational Outcomes (1-5) are in the Undergraduate Catalog on page 116. The catalog is available online through <http://www.valdosta.edu>. In this syllabus the Biology Department Educational Outcomes are designated as: B1-B5.

The course objectives that are aligned with the VSU General Education Outcomes and Biology Department Educational Outcomes are given below:

<u>VSU or Biology Objective</u>	<u>Course Objective(s)</u>
VSU1	D, R, V, X, Y
VSU2	D, R, V, X, Y
VSU3	ZF, ZG, ZH
VSU4	ZB, ZF, ZH
VSU5	all course objectives
VSU6	-----
VSU7	G, ZA, ZE, ZF, ZH
VSU8	-----
B1	Z, ZA, ZB, ZC, ZD, ZE, ZF, ZG, ZH
B2	A, B, D, H, J, K, L, N, O, R, X, Y
B3	A, D, E, F, G, H, I, O, P, Q, U, W, X, Y
B4	D, H, I, J, K, L, M, O, X, Y
B5	C, D, S, T, V

**BIOLOGY 3100/5100. Microbiology - Class and Lab Schedule**

<b>Date</b>	<b>Topics/Lab Exercises</b> (Additional notes for lab exercises)	<b>Related material in text</b>
Tues. Jan. 11	General course information Microorganisms and microbiology	<b>Chap. 1</b>
Tues. Jan. 11L	>Program #1, <i>The Microbial Universe</i> SUPPL. EX., HANDWASHING <b><u>Wash your hands before leaving lab!</u></b>	
Thurs. Jan. 13	Microorganisms and microbiology An overview of microbial life Cell structure/function	<b>Chap. 1</b> <b>Chap. 2</b> <b>Chap. 4</b>
	<b><u>Review the following topics on your own:</u></b> <b>Basics of chemistry and biochemistry; DNA structure &amp; replication; transcription; translation</b>	<b>Chap. 3</b> <b>Chap. 7</b>
Thurs. Jan. 13L	>EX. 19, CULTURE MEDIA PREPARATION (We will follow the directions in the course packet for preparing nutrient broth and nutrient agar.) After completing this lab, students should be able to explain how nutrient broth, nutrient agar plates, and nutrient agar slants are prepared. Complete questions, p. 139-140. <b><u>&gt;PLEASE READ THE FOLLOWING BEFORE NEXT WEEK:</u></b> LABORATORY SAFETY (Read handout & p. ix-xv in lab manual.) EX. 9, ASEPTIC TECHNIQUE SUPPL. EX., WINOGRADSKY COLUMN; EX. 54 WINOGRADSKY COLUMN (IN LAB MANUAL), AND PAGES 654-657 IN THE TEXTBOOK.	
Tues. Jan. 18	Cell structure/function	<b>Chap. 4</b>
Tues. Jan. 18L	>LAB ORIENTATION >LABORATORY SAFETY >EX. 9, ASEPTIC TECHNIQUE <b><u>Wash your hands before leaving lab!</u></b> PLEASE REMEMBER TO READ THE INFORMATION FOR EACH DAY'S LAB <b><u>BEFORE</u></b> COMING TO LAB.	
	<ul style="list-style-type: none"> <li>• <b><i>Discuss the Winogradsky Column Project with your lab group. Decide on a question, formulate a hypothesis, and decide how you will conduct the experiment. Decide on your assignments for the Winogradsky Column Project, and bring any required materials to lab on Thursday, Jan. 27. Each group of 4 students will build <u>at least two</u> columns.</i></b></li> </ul>	

CONTINUED ON PAGE 4.....

Date	Topics/Lab Exercises	Related material in text
Tues. Jan. 18L	.....CONTINUED FROM PAGE 3	
	<ul style="list-style-type: none"> <li>• <b>YOUR GROUP'S LAB REPORT ON THE WINOGRADSKY COLUMN PROJECT (DUE APRIL 7)</b> must be written in the style of a scientific paper and must contain the following sections: <u>Title, Authors, Abstract, Introduction, Materials and Methods, Results, Discussion, Literature Cited, and an Appendix</u>. The Results section must include your group's organized data and observations on the Winogradsky columns, charts and/or graphs, selected drawings (or photographs), and a written description of the results.</li> <li>• The Appendix must contain each lab group member's <u>original</u> written notes and drawings (or photographs) for the project. <b>Each group member's work must be labeled with his or her name.</b></li> <li>• The overall format for the report must follow the "Instructions for Authors" for the Journal of Bacteriology (available online at <a href="http://jb.asm.org/misc/ifora.shtml">http://jb.asm.org/misc/ifora.shtml</a>)</li> </ul>	
Thurs. Jan. 20	Cell structure/function	<b>Chap. 4</b>
Thurs. Jan. 20L	<p>&gt;EX. 1, MICROSCOPY            &gt;MICROSCOPE CARE &amp; USE ; MICROSCOPE CHECKLIST (course packet)            &gt;EX. 11, SMEAR PREPARATION &amp; EX. 12 , SIMPLE (POSITIVE) STAINING (On a single slide, prepare a smear of <i>Saccharomyces cerevisiae</i>, and a separate smear of <i>Escherichia coli</i>. Use the technique for preparing smears from solid media [see Ex. 11, p. 96], &amp; stain with crystal violet [see Ex. 12].) We will use paper towels instead of bibulous paper. Use this slide in the exercise below (SUPPL. EX.).            &gt;SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST <i>Saccharomyces cerevisiae</i> (A FUNGUS) AND THE BACTERIUM <i>ESCHERICHIA COLI</i> (<b>Hand in your drawings to the instructor at the end of lab, 10 points</b>)            &gt;FINISH EX. 9, ASEPTIC TECHNIQUE (Answer questions, p. 79-80.)</p>	
Tues. Jan. 25	Cell structure/function Eukaryotic microorganisms	<b>Chap. 4 &amp; 9 (pages 235-236) Chap. 18</b>
Tues. Jan. 25L	<p>&gt;<b>Additional simple stain:</b> Aseptically remove a sterile swab from wrapping paper &amp; swab your gums and teeth. Gently rub swab onto a DRY slide. Allow smear to air dry; then heat fix. Stain with <b>methylene blue</b>, rinse, and blot dry. Examine with oil immersion objective. Draw epithelial cells and bacteria on page 104 or 105.            &gt;EX. 13, NEGATIVE STAINING (We will use nigrosin &amp; the method in Fig. 13.1. On page 102, follow steps 1-7, but <b>omit step #4</b>. Draw a few representative <i>Staphylococcus aureus</i> cells and <i>Bacillus subtilis</i> cells on page 104 or 105. Answer questions 1-5, page 106; and answer questions on page 107. (You may need to consult Ex. 14 to answer the questions about the capsule stain.)            &gt;<b>If necessary, complete</b> SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST <i>Saccharomyces cerevisiae</i> (A FUNGUS) AND THE BACTERIUM <i>ESCHERICHIA COLI</i> (<b>Hand in your drawings to the instructor at the end of lab, 10 points</b>)</p>	
Thurs. Jan. 27	Eukaryotic microorganisms	<b>Chap. 18</b>
Thurs. Jan. 27L	<p>&gt;EX. 7, UBIQUITY OF BACTERIA Complete steps 1-7, but omit step 6.            &gt;EX. 8, THE FUNGI (Page 64, Fungi Study. You will prepare the plates we will use next week. Work in groups of 4 and expose 2 plates of Sabouraud dextrose agar to air for 45 minutes. Expose one plate inside the building and the other plate outside. Incubate the plates at room temperature until next week.)            &gt;SUPPL. EX., WINOGRADSKY COLUMN (WE WILL USE <b>TEXT, P. 654-657</b>            THE PROCEDURE IN THE SUPPL. EX., BUT PLEASE READ EX. 54            IN THE LAB MANUAL AS WELL.) <b>Discuss plans for the lab report with your group.</b>            &gt;<b>If necessary, complete</b> SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST <i>Saccharomyces cerevisiae</i> (A FUNGUS) AND THE BACTERIUM <i>ESCHERICHIA COLI</i> (<b>Hand in your drawings to the instructor at the end of lab, 10 points—last day</b>)</p>	

Date	Topics/Lab Exercises	Related material in text
Tues. Feb. 1	Eukaryotic microorganisms Nutrition, culture, & metabolism of microorganisms	<b>Chap. 18</b> <b>Chap. 5 &amp; 21</b>
Tues. Feb. 1L	<p>&gt;EX. 10, PURE CULTURE TECHNIQUES, STREAK-PLATE METHOD ONLY You will use a loopful of water from one of your Winogradsky columns as the mixed sample of microorganisms in this exercise. Use a prepared plate of MacConkey agar, desoxycholate agar, or Eosin methylene blue agar for doing the quadrant streak (<b>method B</b> on page 85). Each person will do his/her own streak plate.</p> <p>&gt;CHECK WINOGRADSKY COLUMNS (Make macroscopic observations of columns, and record this information. Observe biofilm slides. You may also prepare wet mounts, if desired. Make neat, detailed drawings of any microorganisms observed. Use the information in EX. 6, PROTOZOA, ALGAE, &amp; CYANOBACTERIA to aid you in recognizing different groups of organisms. At some point during the semester, be sure you see and draw examples of protozoa, algae, &amp; cyanobacteria. <b><u>Discuss issues related to data collection &amp; organization with your group members.</u></b>)</p>	
Thurs. Feb. 3	Nutrition, culture, & metabolism of microorganisms	<b>Chap. 5, 21, &amp; 20</b>
Thurs. Feb. 3L	<p>&gt;<b>FOR EX. 61, YOU WILL WORK IN GROUPS OF 4. PICK UP TWO STERILE, 50 ML TUBES FOR EACH GROUP. OBTAIN A FRESHWATER SAMPLE AND BRING IT TO LAB ON TUESDAY, FEB. 8 FOR EX. 61.</b></p> <p>&gt;EX. 10, PURE CULTURE TECHNIQUES, STREAK-PLATE METHOD ONLY Examine plate from Tuesday. Pick a well-isolated colony, and use it to do another streak plate (using method B on page 85) on the prepared plate of medium provided by the instructor. If you do not have a well-isolated colony, take a VERY TINY sample from your plate and perform another streak plate, using method B on page 85.</p> <p>&gt;FINISH EX. 7, THE BACTERIA (Complete table, p. 57. Answer short answer questions 1 &amp; 2 on page 58.) <u>Use plates with fungal colonies in Ex. 8.</u></p> <p>&gt;FINISH EX. 8, THE FUNGI (Fungi Study – Do NOT open fungal cultures in the lab. Open them only in the biological safety cabinet. You will use transparent tape to prepare slides of two or more different molds. The instructor will describe this procedure. Examine the slides using the low power (10x) objective and the high dry (40x) objective. Draw the specimens on p.67, part A2. Also record a description of the appearance of the fungal colonies. Answer the questions on p. 68.)</p>	
Tues. Feb. 8	Metabolic diversity of microorganisms	<b>Chap.15, 16, &amp; 17</b>
Tues. Feb. 8L	<p><b><u>REMEMBER TO BRING 2 TUBES WITH FRESH WATER SAMPLE FOR TODAY’S LAB.</u></b></p> <p>&gt;EX. 61, BACTERIOLOGICAL EXAMINATION OF WATER (You will work in groups of 4 and use the fresh water collected in 2 sterile, 50 ml tubes for this exercise.)</p> <p>&gt;EX. 10, PURE CULTURE TECHNIQUES, STREAK-PLATE METHOD ONLY Examine plates from Thursday. Hopefully, each group of 4 students will be able to decide today on an isolate to use for their general unknown. If you are looking at a streak plate prepared <b>from</b> a well-isolated colony, pick a well-isolated colony and transfer it to a nutrient agar slant. This can be your group’s general unknown culture; please label it clearly with “<b><u>UNKNOWN</u></b>”, <b><u>your lab section, and seat numbers</u></b>. If your group has no plates that were prepared <b>from</b> a well-isolated colony, then pick a well-isolated colony and use it to do another streak plate (using method B on page 85) on the prepared plate of medium provided by the instructor. During the next lab you will pick a well-isolated colony from the new plate to transfer to a nutrient agar slant for use as your group’s unknown.</p> <p>&gt;MONITOR WINOGRADSKY COLUMNS-- <b><u>Discuss plans for the Winogradsky lab report with your group.</u></b></p>	
Thurs. Feb. 10	<b>EXAM 1</b> (Material covered through Feb. 8)	
Thurs. Feb. 10L	<p>&gt;CONTINUE EX. 61, BACTERIOLOGICAL EXAMINATION OF WATER (MPN+EMB/MAC) We will use MacConkey agar instead of Endo agar. Record results on board.</p>	
CONTINUED ON PAGE 6.....		

Date	Topics/Lab Exercises	Related material in text
Thurs. Feb. 10L	.....CONTINUED FROM PAGE 5  FINISH EX. 10, PURE CULTURE TECHNIQUES, STREAK-PLATE METHOD ONLY Examine plates from Tuesday. If your group hasn't yet established a general unknown nutrient agar slant culture, please do this today. If you are looking at a streak plate prepared <b>from</b> a well-isolated colony, pick a well-isolated colony and transfer it to a nutrient agar slant. This can be your group's general unknown culture; please label it clearly with " <b>UNKNOWN</b> ", <b>your lab section, and seat numbers</b> . <b>If, for some reason, your group has no suitable colonies, please consult the instructor.</b>  > SUPPL. EX., ENUMERATION OF BACTERIA ASSOCIATED WITH FRESH PRODUCE (SPREAD-PLATE TECHNIQUE) <u>WORK IN GROUPS OF 2 FOR THIS EXERCISE. ALSO, PLEASE READ EX. 22 TO LEARN ABOUT THE POUR-PLATE TECHNIQUE, OMITTING P. 155-157. HOWEVER, PLEASE NOTE THAT WE WILL NOT ACTUALLY DO EX. 22.</u> >BEGIN TO WORK DILUTION PROBLEMS IN COURSE PACKET	
Tues. Feb. 15	Metabolic diversity of microorganisms	<b>Chap.15, 16, &amp; 17</b>
Tues. Feb. 15L	>FINISH EX. 61, BACTERIOLOGICAL EXAMINATION OF WATER (Read results of EMB/MAC. We will omit the "completed test procedure" and the IMViC tests.) Answer questions 4-9 on p. 398-399. >COMPLETE SUPPL. EX., ENUMERATION OF BACTERIA ASSOCIATED WITH FRESH PRODUCE Record your results on board. > <b>WORK DILUTION PROBLEMS IN COURSE PACKET</b> >MONITOR WINOGRADSKY COLUMNS. <b><u>Discuss plans for lab report with your group.</u></b>	
Thurs. Feb. 17	Microbial growth	<b>Chap. 6</b>
Thurs. Feb. 17L	<i>Program #3, Metabolism</i>  <b>WORK SESSION ON DILUTION PROBLEMS; ASK QUESTIONS ABOUT PROBLEMS</b> >> <b><u>Hand in 3 stapled articles in a folder</u></b> (formal articles from peer-reviewed, professional, scientific journals – 12 points). <u>These articles will be used to prepare your oral presentation. Please note that full credit will not be given if appropriate articles are not handed in initially.</u>	<b>Chap. 24 (p. 717-720); chap. 25 (p. 749-755), &amp; Chap. 36 (p. 1026-1032)</b>
Tues. Feb. 22	Microbial molecular biology DNA structure & replication; transcription, translation	<b>Chap. 3, 7, &amp; 8</b>
Tues. Feb. 22L	>EX. 15, GRAM STAINING, Prepare smears from nutrient agar slant cultures as described on p.96 of lab manual. Complete drawings/questions, p. 119-122; omit questions 1 & 2 on p. 122.) >GENERAL UNKNOWN CULTURES-----READ ABOUT STOCK CULTURES IN EX. 20. <b><u>Prepare subcultures (stock cultures) of the unknown and also gram stain it.</u></b> Record dates, work done, drawings, etc., on your own unknown record sheet. Also record your results on the descriptive chart on page 263. PREPARE A STREAK PLATE USING YOUR UNKNOWN CULTURE ON A NUTRIENT AGAR PLATE. > <b>YOUR LAB REPORT ON THIS GENERAL UNKNOWN (which is due on Apr. 19)</b> should be organized in a thin folder that contains the following: (i) a well-organized and complete copy of your unknown record sheets, including your drawings, (ii) a <b><u>neat and complete</u></b> copy of the descriptive sheet (p. 263 in lab manual) with the results of all of the tests performed (do not make your own table—use the one in the lab manual or a photocopy of it), (iii) a statement of your conclusion about the identity of the unknown bacterium (based on EX. 44 and <i>Bergey's Manual of Determinative Bacteriology</i> , and (iv) a paragraph explaining & discussing the following: how you arrived at your conclusion, any test results that are inconsistent with your conclusion, & any additional tests that would allow you to more specifically identify your unknown. <b><u>Do NOT describe the methods used for performing the various tests in your report.</u></b>  >MONITOR WINOGRADSKY COLUMNS – <b><u>Discuss plans for lab report with your group.</u></b>	

Date	Topics/Lab Exercises	Related material in text
Thurs. Feb. 24	Microbial molecular biology DNA structure & replication; transcription, translation Regulation of gene expression	<b>Chap. 7 &amp; 8</b> <b>Chap. 9</b>
Thurs. Feb. 24L	>CONTINUE WORK ON GRAM STAINING KNOWN AND UNKNOWN CULTURES. >EXAMINE STREAK PLATE OF UNKNOWN. Measure diameter of colonies and record a description of the colonies on your unknown record sheet and on the descriptive chart on p. 263. Consult p. 268 (Ex. 40).	
Tues. Mar. 1	Regulation of gene expression Viruses	<b>Chap. 9</b> <b>Chap. 10 &amp; 19</b>
Tues. Mar. 1L	>SUPPL. EX., VARIOUS MEDIA (CULTURES FOR DESOXYCHOLATE AGAR AND PHENYL ETHYL ALCOHOL AGAR: <i>Escherichia coli</i> , <i>Staphylococcus aureus</i> , <i>Pseudomonas aeruginosa</i> , & unknown) (CULTURES FOR BLOOD AGAR: <i>E. coli</i> , <i>S. aureus</i> , <i>Bacillus cereus</i> , & unknown) >A <b>THROAT CULTURE</b> WILL ALSO BE PERFORMED ON A BLOOD AGAR PLATE. >EX. 17, ACID-FAST STAINING (Ziehl-Neelsen method procedure) Use 0.1% albumin solution instead of water for preparing the smears. On one slide prepare a smear of a mixture of <i>Mycobacterium smegmatis</i> & <i>Staphylococcus aureus</i> , as well as a separate smear of your unknown. Allow the smears to air dry, and then heat fix them. Put on gloves, and try to be neat. (You are responsible for cleaning up any spills of carbol fuchsin.) Cover the smears with a cut piece of paper towel that does not extend over the edges of the slide. Hold the slide with a clothespin or slide holder and soak the towel with carbol fuchsin. Heat the slide <u>intermittently</u> over the flame of the bunsen burner so that it “steams” for 5 minutes. Do NOT let the paper towel dry out—add more carbol fuchsin as needed. Allow the slide to cool and then remove the paper towel. Proceed with steps 2 through 7 as described in the lab manual in Figure 17.1 on page 118. Complete drawings/questions, p. 119-122; omit questions 1 & 2 on p. 122. Record results for unknown culture on unknown record sheet, and on the descriptive chart on p. 263. >MONITOR WINOGRADSKY COLUMNS. <b><u>Work on lab report with your group.</u></b>	
Thurs. Mar. 3	Viruses	<b>Chap. 10 &amp; 19</b>
Thurs. Mar. 3L	>EX. 33, ULTRAVIOLET LIGHT: LETHAL EFFECTS  >FINISH SUPPL. EX., VARIOUS MEDIA -- Record results in the table provided with the exercise. <b><u>ALSO, record results for your unknown on your unknown record sheet, and on the descriptive chart on p. 263.</u></b> <b><u>Consider the following question: Is the pattern of growth of your unknown on the selective media consistent with the results you obtained in the Gram stain?</u></b>  >EX. 16, SPORE STAINING (Modified Schaeffer-Fulton Method) On one slide prepare a smear of the <i>Bacillus</i> species provided as well as a separate smear of your unknown. Allow smears to air dry, and then heat fix them. Put on gloves, and try to be neat. (You are responsible for cleaning up any spills of malachite green.) Complete drawings/questions, p. 119-122; omit questions 1 & 2 on p. 122. Record results for unknown culture on unknown record sheet, and on the descriptive chart on p. 263.	
Tues. Mar. 8	Viruses Microbial genetics	<b>Chap. 10 &amp; 19</b> <b>Chap. 11</b>
Tues. Mar. 8L	>FINISH EX. 33, ULTRAVIOLET LIGHT (Observe demonstration. Record results today or Thurs.; answer questions on p. 223-224.)  >PREPARE NEW STOCKS OF GENERAL UNKNOWNNS  CONTINUED ON PAGE 8.....	

Date	Topics/Lab Exercises	Related material in text
Tues. Mar. 8L	.....CONTINUED FROM PAGE 8	
	<p>&gt;EX. 40, CULTURAL CHARACTERISTICS (You will inoculate your unknown in/on the following: nutrient agar slant [use a straight inoculation line], nutrient broth, motility medium [deep], nutrient gelatin deep, &amp; fluid thioglycollate medium.)</p> <p>&gt;EX. 18, MOTILITY DETERMINATION (TUBE METHOD ONLY) You will inoculate tubes of motility medium with <i>Staphylococcus aureus</i>, <i>Proteus vulgaris</i>, (&amp; your unknown, as noted above).</p> <p>&gt;EX. 21, CULTIVATION OF ANAEROBES – We will not do this exercise, but you should read it with particular attention to the information about oxygen requirements and fluid thioglycollate medium, which you will use for your unknown, as noted above.</p> <p>&gt;SUPPL. EX., PLAQUE ASSAY OF A PHAGE SUSPENSION – WORK IN GROUPS OF 2  READ pages 173-175 in the lab manual. <b><u>Ask questions on dilution problems.</u></b></p> <p>&gt;MONITOR WINOGRADSKY COLUMNS (today &amp;/or Thurs.)</p>	
Thurs. Mar. 10	<b>EXAM 2</b> (material covered through Mar. 8)	
Thurs. Mar. 10L	<p>&gt;FINISH EX. 33, ULTRAVIOLET LIGHT (Observe demonstration. Record results if not done on Tues.; answer questions on p. 223-224.)</p> <p>&gt;FINISH EX. 40. (Record results on unknown record sheet and on descriptive chart on p. 263. Consult Ex. 21 for information about oxygen requirements and fluid thioglycollate medium.)</p> <p>.&gt;FINISH EX. 18, MOTILITY (TUBE METHOD &amp; WET MOUNT) (On pages 127-128, draw the motility tubes and answer questions 3 &amp; 5 in part B. Prepare a wet mount of the nutrient broth culture of your unknown and examine for motility using the microscope. Record the results of the motility tube test and wet mount for the unknown on the record sheet and in the descriptive chart on p. 263.)</p> <p>&gt;<b>FINISH</b> SUPPL. EX., PLAQUE ASSAY OF A PHAGE SUSPENSION – Record results on board.</p> <p>&gt;MONITOR WINOGRADSKY COLUMNS (if not done on Tues.)</p>	
SPRING BREAK		
Tues. Mar. 22	Microbial genetics Genetic engineering & Biotechnology	<b>Chap. 11</b> <b>Chap. 12 &amp; 26</b>
Tues. Mar. 22L	<p>&gt;PREPARE NEW STOCKS OF GENREAL UNKNOWNNS</p> <p>&gt;EX. 41, OXIDATION AND FERMENTATION TESTS</p> <p>&gt;EX. 43, MULTIPLE TEST MEDIA (We will do <u>ONLY</u> the test for hydrogen sulfide production using SIM medium.)</p> <p>&gt;EX. 42, HYDROLYTIC/DEGRADATIVE REACTIONS (Modification: we will use tributyrin agar rather than spirit blue agar for the lipid hydrolysis test. On tributyrin agar, a clear zone around the bacterial growth indicates a positive test for lipid hydrolysis.)</p> <p><b>INSTRUCTOR WILL MAKE BRIEF COMMENTS ABOUT BERGEY’S MANUAL</b></p> <p>&gt;READ EX. 44, USE OF BERGEY’S MANUAL, &amp; EXAMINE <b>APPENDIX 2 (TEXT)</b></p> <p>&gt;BERGEY’S MANUAL OF DETERMINATIVE BACTERIOLOGY is on reserve in the library.  You will need to consult it to find out which additional tests would allow you to more specifically identify your unknown. You will need this information for your lab report, which is due on April 7.</p> <p>&gt;MONITOR WINOGRADSKY COLUMNS (LAST TIME)</p>	
Thurs. Mar. 24	Microbial genomics Microbial evolution & systematics Microbial identification & clinical microbiology	<b>Chap. 13</b> <b>Chap. 14</b> <b>Chap. 32</b>
Thurs. Mar. 24L	<p>&gt;FINISH EX. 41(EXCEPT VP TEST, WHICH MUST BE INCUBATED LONGER)</p> <p>&gt;FINISH EX. 43 &amp; 42.</p> <p>Record results on unknown record sheet, and on descriptive chart on p. 263.  Answer questions 4-9 in part B, p. 291-292. In addition, answer questions in part C, p. 293-294.</p> <p>&gt;<b><u>Work on lab reports (unknown &amp; Winogradsky) with your group.</u></b></p>	



<b>Date</b>	<b>Topics/Lab Exercises</b>	<b>Related material in text</b>
Tues. Mar. 29	Microbial genomics Microbial evolution & systematics Microbial identification & clinical microbiology Microbial growth control	<b>Chap. 13</b> <b>Chap. 14</b> <b>Chap. 32</b> <b>Chap. 27</b>
Tues. Mar. 29L	> <i>Program #9, Microbial Control</i> >EX 41, READ RESULTS OF VP TEST (See procedure on board. Record information on unknown record sheet, and on descriptive chart on p. 263. <u>THIS IS THE LAST DAY FOR LAB WORK ON THE GENERAL UNKNOWN.</u> >EX. 36, KIRBY-BAUER METHOD >EX. 37, EVALUATION OF ANTISEPTICS (PAPER DISK METHOD- this exercise will be slightly modified) >EX. 35, EFFECTIVENESS OF ALCOHOL > <u>Do the following online exercise on your own:</u> >SUPPL. EX., USING RIBOSOMAL RNA GENE SEQUENCES TO LEARN ABOUT A MICROORGANISM	
Thurs. Mar. 31	>SUPPL. EX., <i>Staphylococcus aureus</i> EXPERIMENT (class work) Microbial growth control	<b>Chap. 27</b>
Thurs. Mar. 31L	>VIDEO SEGMENTS >SUPPL. EX., <i>Staphylococcus aureus</i> EXPERIMENT >FINISH EX. 36, 37, & 35. Record data & answer questions in lab manual. Brief class discussion. > <u>Work on lab reports with your group.</u>	
Tues. Apr. 5	Microbial ecology (selected topics)	<b>Chap. 22-24, &amp; 26</b>
Tues. Apr. 5L	>VIDEO SEGMENTS >CONTINUE SUPPL. EX., <i>Staphylococcus aureus</i> (Record results on board. We will omit Kirby-Bauer antibiotic sensitivity tests that are described in this exercise. Remember to streak presumptive <i>S. aureus</i> for isolation on a plate of tryptic soy agar. This plate will be used on Thurs. for EX. 73.) <b><u>STUDENT ORAL PRESENTATIONS</u></b>	
Thurs. Apr. 7	Innate immunity; adaptive immunity	<b>Chap. 29, 30, &amp; 31</b>
Thurs. Apr. 7L	>SUPPL. EX., BACTERIOLOGICAL ANALYSIS OF URINE (RECORD UNKNOWN #) >FINISH SUPPL. EX., <i>Staphylococcus aureus</i> >EX. 73, LATEX AGGLUTINATION TEST FOR <i>S. aureus</i> identification. <b><u>STUDENT ORAL PRESENTATIONS</u></b> <b><u>HAND IN WINOGRADSKY LAB REPORT</u></b>	
Tues. Apr. 12	Adaptive immunity Practical applications of immunology	<b>Chap. 29, 30, &amp; 31</b> <b>Chap. 29-32</b>
Tues. Apr. 12L	>HAND IN SUPPL. EX., RIBOSOMAL RNA SEQUENCES (12 POINTS) >CONTINUE SUPPL. EX., URINE (Inoculate Enterotube II)---See EX. 46, ENTEROTUBE II. We will omit the Kirby Bauer antibiotic sensitivity tests. >SUPPL. EX., BACTERIAL CONJUGATION	
Thurs. Apr. 14	<b>EXAM 3</b> (Material covered through Apr. 12)	
Thurs. Apr. 14L	>COMPLETE SUPPL. EX., BACTERIAL CONJUGATION – Answer the questions with this exercise & be sure you understand what happened and why it happened. >FINISH SUPPL. EX., URINE & EX. 46 ENTEROTUBE II--- HAND IN LAB REPORT Practical applications of immunology <b>Chap. 29-32</b> <u>WORK ELISA AND IMMUNOFUORESCENCE PROBLEMS (SEE COURSE PACKET)</u>	

<b>Date</b>	<b>Topics/Lab Exercises</b>	<b>Related material in text</b>
Tues. Apr. 19	Human-microbe interactions Epidemiology & public health	<b>Chap. 28</b> <b>Chap. 33</b>
Tues. Apr. 19L	<b><u>HAND IN LAB REPORT ON GENERAL UNKNOWN</u></b> <b><u>STUDENT ORAL PRESENTATIONS</u></b>	
Thurs. Apr. 21	Human-microbe interactions Epidemiology & public health	<b>Chap. 28</b> <b>Chap. 33</b>
Thurs. Apr. 21L	<b><u>STUDENT ORAL PRESENTATIONS</u></b>	
Tues. Apr. 26	Microbial diseases	<b>Chap. 34-37</b>
Tues. Apr. 26L	<b><u>STUDENT ORAL PRESENTATIONS</u></b>	
Thurs. Apr. 28	Microbial diseases	<b>Chap. 34-37</b>
Thurs. Apr. 28L	<b><u>STUDENT ORAL PRESENTATIONS</u></b>	
<b>Wed. May 4</b>	<b>COMPREHENSIVE FINAL EXAM (EXAM 4) – 10:15 am – 12:15 pm</b>	

### **ADDITIONAL INFORMATION**

**Course content:** We will not be covering all of the material in the textbook and lab manual. Please read the sections of the textbook and lab manual that pertain to the topics covered, and make use of the tables and illustrations. Study questions and online resources for the textbook may also be useful. **Specific assigned readings may be announced in class or lab.**

### **Laboratory:**

- Laboratory exercises are an integral part of microbiology. Students are expected to attend ALL laboratory sessions, to be on time at the beginning of the period, and to complete all assigned laboratory exercises. There will be no makeups for the laboratory exercises.
- Microscopes will be assigned and spot checks will be made to ensure that they are clean and properly stored. Misuse or mishandling of the microscopes will result in the loss of points (20 points per occurrence). After you have finished using your microscope, please consult the "microscope checklist" to be certain that you have followed the proper procedures.
- Each student must **read the laboratory exercises for the day, any additional required readings from the lab manual (noted in the syllabus), and any notes pertaining to the lab exercises (in the syllabus) before coming to the laboratory.** This will allow the student to complete the exercises in an efficient and informed manner.
- Each student must record the results of the lab exercises and answer the related questions, as noted in the syllabus. In some cases, **lab reports** are due as indicated in the course schedule. If a student misses a portion of the lab work relating to a required lab report, the student's report will be worth a maximum of 85% of the points allotted for the report. Each student must turn in his/her own drawings (due Jan. 20) and rRNA report (due April 12). However, the Winogradsky Column Project report must be prepared with your lab group (due April 7). **For this report, each group member will evaluate the percentage of the work contributed by each of the group members, and individual scores will reflect the average percents.** For the remaining reports [general unknown (due April 19) and urine unknown (due April 14)], students may prepare their lab reports individually, or they may work with their lab groups and turn in joint reports.
- Oral Presentations.** During the laboratory portion of the course, each student will give an 8- to 10-minute **oral report** on a primary scientific article or case study selected from a list provided by the instructor. Students will draw numbers to indicate the order in which they will select articles and give their presentations. **Once a topic is chosen it may not be changed.** Students should search databases in GALILEO to find related, formal scientific articles. Some peer-reviewed, scientific journals are available in the Odum library and/or online. At least three **formal** articles (including the original article chosen) from PEER-REVIEWED, PROFESSIONAL JOURNALS must be used to prepare the presentation. Only one of these articles may be a review article. **Complete, stapled (or paper-clipped) copies of these articles must be placed in a folder & handed in on Feb. 17. The folder with the articles must again be provided to the instructor on the day of the presentation.** Articles must list references at the end, and references must be cited within the text. Informal articles, Web sites, Internet articles or fact sheets, newspaper articles, magazine articles, book reviews, and letters to the editor are NOT acceptable. Students should make every effort to ensure the accuracy of the information in their reports. Should a report contain inaccurate information, the presenter should expect to be questioned about it as well as about the source of the information.

For their presentations, students are required to use PowerPoint software. **Students must use a PowerPoint version that is compatible with the one available in the microbiology lab. If you are in doubt, please bring your PowerPoint presentation to the**

lab at least one week before the day of your presentation to verify that it will run. If you do not check your presentation ahead of time, you are responsible for having a backup method for showing your illustrations. Full-size print-outs of your PowerPoint slides are useful as backups, since they may be shown using the ELMO projector. Students may use visual aids in addition to PowerPoint. A projector for transparencies is available; handouts may also be used. There will be no makeups for the oral presentations. **On the day of the presentation, the student must turn in: complete copies of the three references, a copy of the PowerPoint slides, and a copy of any other illustrations or notes used during the presentation.**

**ADDITIONAL EMPHASIS:** IF YOU WANT A GOOD SCORE ON YOUR PRESENTATION, YOU MUST FOLLOW THE GUIDELINES ON THE PROVIDED EVALUATION FORM. A STUDENT WHOSE REPORT DOES NOT FOCUS ON THE PRIMARY SCIENTIFIC ARTICLE OR CASE STUDY WILL RECEIVE A SCORE OF ZERO.

**Attendance, participation, and tardiness:** In accordance with VSU policy, attendance and participation will be checked in the laboratory and in class. The remainder of this paragraph outlines the lab/oral presentation attendance policy. Attendance is required during ALL labs and oral presentations periods. A student who has perfect attendance during laboratory/oral presentation periods will receive 25 bonus points. A student who misses (or fails to complete) only one laboratory/oral presentation period will receive 15 bonus points. Missing (or failing to complete) additional laboratory/oral presentation periods will result in the **loss of points** as follows. Ten points will be deducted for the fourth missed (or incomplete) period; 20 additional points will be deducted for the fifth missed (or incomplete) period; 40 additional points will be deducted for the sixth missed/incomplete period, and 50 additional points will be deducted for each subsequent missed/incomplete period. Students who are habitually late for lab or oral presentation periods will be marked late. Coming late to lab or oral presentation periods three times will be counted as one absence. A student with more than 6 absences (or a student who fails to complete more than 6 laboratory or oral presentation periods) will not pass the course. **There will be no makeups for the laboratory exercises or student presentations.**

**Examinations given during class periods:**

1. Examinations 1-4 will cover material presented during both the class and laboratory portions of the course. The first three exams will be worth 185 points each. The final exam will be worth 225 points. Examinations will begin promptly at the times and dates indicated on the class schedule. The final examination will be comprehensive in that it will include material covered throughout the course. Exams 2 and 3 will be comprehensive in that up to 25% of the points on the exam may cover material presented before any earlier examination. Exams may include questions of the multiple-choice, matching, true-false, short-answer, and essay formats. A student who misses an examination should notify the instructor promptly. Arrangements for a make-up exam must be made within one week after the exam date; otherwise, a make-up exam will not be given. Make-up examinations may consist entirely of questions of the short answer and essay formats. Make-up examinations for exams 1, 2, and 3 will be worth 165 points rather than 185 points each.

2. STUDENTS ARE REQUIRED TO BRING TWO #2 PENCILS AND ERASERS TO ALL EXAMINATIONS. THE INSTRUCTOR WILL NOT PROVIDE PENCILS.

**Late Assignments & Failure to Turn in Assignments:**

Please make a calendar noting when assignments and lab reports are due. Turning in an assignment/report 1-4 days late will result in a deduction of 20% of the points for that assignment. Turning in an assignment 5-9 days late will result in a deduction of 50% of the points for that assignment. **No points will be awarded for an assignment that is late by more than 9 days.** Students will not be notified by the instructor for failing to turn in course assignments. Late assignments must be given DIRECTLY to the instructor. They may NOT be placed in the instructor's mailbox. It is also NOT ACCEPTABLE to slide late assignments under the instructor's office door.

**Grading:** Points for the course are allocated as follows:

<u>EXAMS 1, 2, &amp; 3</u> (Feb. 10, Mar. 10, & April 14) (185 points each x 3=555)	555	POINTS
<u>EXAM 4</u> (FINAL EXAM –May 4)	225	POINTS
LAB REPORT (Drawings) (Course objective ZA) - (Jan. 20)	10	POINTS
REFERENCES FOR ORAL PRESENTATION (Course objective ZG) - (Feb. 17)	12	POINTS
rRNA LAB REPORT (Course objective ZD) - (April 12)	12	POINTS
LAB REPORT ON GENERAL UNKNOWN (Course objectives ZC, ZD) - (April 19)	33	POINTS
LAB REPORT ON URINE UNKNOWN (Course objective ZD) - (April 14)	13	POINTS
FORMAL (EXTENSIVE) LAB REPORT (Course objective ZF) - (April 7)	65	POINTS
ORAL PRESENTATION (Course objective ZH) - (April 5-28)	75	POINTS
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TOTAL FOR COURSE	1000	POINTS

**There are FOUR REQUIREMENTS TO PASS the course:**

1. Do not miss (or fail to complete) any more than 6 laboratories or oral report periods.
2. Complete and turn in all assignments and lab reports.
3. Obtain at least 40% of the points for **EACH** assignment and lab report.
4. Have a total of 600 or more points for the course.

**Students should read the entire syllabus carefully so they understand the course policies & procedures.**

The grade is "F" for a student who obtains less than 600 total points **or** fails to meet one of the other requirements for passing the course (see above list). **GRADING SCALE: 900-1000, A; 800-899, B; 700-799, C; 600-699, D; < 600, F**