Biology Department, College of Arts & Sciences, Valdosta State University
FALL 2014----COURSE SYLLABUS*

BIOL 3100, Sections A & B. Microbiology (CRN 81758 & 81759) - 4 credit hours
BIOL 5100, Sections A & B. Microbiology (CRN 81792 & 81793) – 4 credit hours

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

Instructor: **Dr. Jenifer Turco** **Email:** jturco@valdosta.edu
Telephone: **229-249-4845** **Office:** **2091 Bailey Science Center**

Office Hours: **Wed., 5:00-5:30 pm & Thurs. 12:30-1:30 pm; or by appointment.**

Course Description: BIOL 3100 Microbiology 3-3-**4 (4 credit hours)** Prerequisites: BIOL 1107K, BIOL 1108K, BIOL 3200, CHEM 1211/CHEM 1211L, 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.

Required Textbook: **BROCK BIOLOGY OF MICROORGANISMS, Fourteenth Edition**
by Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, and David A. Stahl
Benjamin Cummings, 2015. (ISBN 9780321897077)

Required Lab Manual: **LAB MANUAL FOR BIOL 3100 MICROBIOLOGY, Valdosta State University, Biology**
McGraw-Hill, 2014. (ISBN 9781308191034)

Other Required Items: (i) A calculator that is not integrated with a cell phone; (ii) a permanent, fine-tip marking pen ("Sharpie") for labeling cultures in lab; (iii) one CD or flash drive for the oral presentation (Email cannot be used to access your PowerPoint presentation); (iv) one thin, light-weight folder for handing in references & other assignments (Please do **not** use a 3-ring binder to hand in assignments); (v) paper clips or stapler/staples for organizing references & assignments; and (vi) a notebook for organizing and recording lab results (this may be a loose-leaf notebook).

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 (all available online) for information about VSU policies and procedures regarding registration, drop/add, and withdrawal. October 2 is midterm. Students are not permitted to withdraw after October 9 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. The phone numbers are 245-2498 (V/VP) and 219-1348 (TTY).
4. Cell phones, music players (iPod, mp3, etc.), and other electronic devices may not be used at any time in class or lab. Students are especially cautioned to be certain that cell phones are silenced and put away during examinations. Should a cell phone be heard during an exam, or should a cell phone be seen by the instructor during an examination, the student's exam will be terminated and the student will receive a score of "0" on the exam. Students may use cameras during lab to photograph their lab results.
5. Please use the rest room before you come to class to take an exam. Should a student need to leave the classroom during an exam, the student's exam will be terminated.
6. Students are expected to read and adhere to the following: (i) the VSU Student Code of Conduct as described in the VSU Student Handbook and (ii) the Biology Department policy on plagiarism (available online through the departmental Web site). The instructor may use a variety of methods for detecting cheating and plagiarism. Cheating or plagiarism will result in a grade of "0" for the exam or assignment. In addition, the instructor may complete a Report of Academic Dishonesty and submit it to the VSU Student Conduct Office. A student who cheats or plagiarizes on more than one exam or assignment will receive a grade of "F" in the course.
7. No disruptive behavior will be tolerated during class or lab. A student who engages in disruptive behavior will be asked to leave. If necessary, the campus police will be contacted.
8. Students who wish to use laptop computers as part of the class are required to sit in the first three rows of the classroom.

***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:
(Pages 2 and 3 show how the objectives below are aligned with the University System of Georgia, VSU and Biology Department Educational Outcomes/Objectives.

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 strageties 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. Describe in detail how viruses replicate.
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, protozoa, 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 and complete 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 solve problems such as determining 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, organize and analyze data; and prepare a report with emphasis on the results and discussion.
ZG. Use library and electronic resources to obtain formal scientific articles related to a particular topic in microbiology.
ZH. Read a scientific article and give a brief oral presentation based on it.

Alignment of Assignments with Course Objectives:
The course objective(s) aligned with each assignment are given on the last page of this syllabus.

Alignment of Course Objectives with Educational Outcomes:
The **Student Learning Goals for the Core Curriculum in the University System of Georgia (USG)** are available online at http://www.usg.edu/academic_affairs_handbook/section2/C738/. The application of these learning goals in VSU's Core Curriculum is explained at http://www.valdosta.edu/academics/academic-affairs/vp-office/vsu-core-curriculum.php .
Each Core Area (A1, A2, B, C, D, and E) has one or more learning goals. There are also three additional learning goals for the Core Curriculum as follows: Learning Goal I: US Perspectives (US Goal): Students will demonstrate an understanding of the United States and its cultural, economic, political, and social development; Learning Goal II: Global Perspectives (GL Goal): Students will demonstrate an understanding of the cultural, religious, or social dimensions of societies around the world; and Learning Goal III: Critical Thinking (CT Goal): Students will identify, evaluate, and apply appropriate models, concepts, or

principles to issues, and they will produce viable solutions or make relevant inferences. The **VSU General Education Outcomes** (numbered 1-8) are available online at http://ww2.valdosta.edu/gec/documents/matrixGenEdoutcomestocorecourses.pdf ; in this syllabus they are referred to as VSU1-VSU8. The **Biology Undergraduate Educational Outcomes** (numbered 1-5) are available in the VSU Undergraduate Catalog, and the **Biology Graduate Educational Outcomes** are available in the VSU Graduate Catalog and are numbered 1 through 4. Both catalogs are available online through http://www.valdosta.edu. In this syllabus the Biology Undergraduate and Graduate Educational Outcomes are designated as B1-B5 and GB1-GB4, respectively.

The course objectives that are aligned with the USG, VSU and Biology Department Educational Outcomes/Objectives are below.

USG, VSU or Biology Objective	**Course Objective(s)**
Core Area A1Learning Goal	ZF, ZG, ZH
Core Area A2 Learning Goal	G, ZE, ZF
Core Area B Learning Goal	C, D, M, R, U, V, X, Y
Core Area D Learning Goal	all course objectives
Core US Goal	C, D, M, R, U, V, X, Y
Core GL Goal	C, D, M, R, U, V, X, Y
Core CT Goal	E, G, H, R, ZB, ZD, ZE, ZF, ZG, ZH
VSU1	C, D, M, R, U, V, X, Y
VSU2	C, D, M, R, U, V, X, Y
VSU3	ZF, ZG, ZH
VSU4	ZB, ZF, ZH
VSU5	all course objectives
VSU7	C, D, G, H, M, O, R, ZA, ZB, ZD, ZE, ZF, ZH
VSU8	D, M, P, R, U, V, W, X, Y, Z, ZB, ZF, ZG
B1	Z, ZA, ZB, ZC, ZD, ZE, ZF, ZG, ZH
B2	A, B, D, E, H, J, K, L, N, O, R, U, X, Y
B3	A, B, D, E, F, G, H, I, J, K, L, O, P, Q, U, W, X, Y
B4	B, D, H, I, J, K, L, M, O, R, X, Y
B5	C, D, F, R, S, T, V
GB1	all course objectives
GB2	G, ZB, ZE, ZF, ZG, ZH

BIOLOGY 3100/5100. Microbiology - Class and Lab Schedule

Date	**Topics/Lab Exercises** (Additional notes for lab exercises)	**Related material in text**
Tues. Aug. 19	General course information Microorganisms and microbiology	 **Chap. 1**
Tues. Aug. 19L	HANDWASHING (see information in course pack)	
Thurs. Aug. 21	Microorganisms and microbiology An overview of microbial life Cell structure/function	**Chap. 1** **Chap. 1** **Chap. 2**
	Review the following topics that you covered in introductory biology: **Basics of chemistry and biochemistry** **DNA structure & replication** **Transcription & translation**	
Thurs. Aug. 21L	**Begin keeping records in your lab notebook today.** >LAB MANUAL EX., CULTURE MEDIA PREPARATION, green box p. 121 (Please read over this exercise. However, please note that we will follow the directions in the course pack 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, green box p. 129-130, except question 3 on p. 130. **Continued on the next page……**	

Date		Topics/Lab Exercises	Related material in text
Thurs.	Aug. 21L	**.....continued from the preceding page** **>PLEASE READ THE FOLLOWING BEFORE NEXT WEEK:** LABORATORY SAFETY (Read course pack handout & lab manual, green box p. 1-4.) LAB MANUAL EX., ASEPTIC TECHNIQUE, green box p. 61. SUPPL. EX., WINOGRADSKY COLUMN (Course pack--We will use these procedures.) LAB MANUAL EX., WINOGRADSKY COLUMN, green box p. 203 PAGES 567-572 IN THE TEXTBOOK **Wash your hands before leaving lab!**	
Tues.	Aug. 26	Cell structure/function	**Chap. 2**
Tues.	Aug. 26L	**Please note that missing this particular lab period will result in a deduction of 25 points, except in the event of a documented, serious emergency.** >LAB ORIENTATION & LABORATORY SAFETY >SUPPL. EX., HANDWASHING (course pack) >LAB MANUAL EX., ASEPTIC TECHNIQUE, green box p. 61. **Wash your hands before leaving lab!** PLEASE REMEMBER TO READ THE INFORMATION FOR EACH DAY'S LAB **BEFORE** COMING TO LAB.	

- ***Discuss the Winogradsky Column Project with your lab group. Decide on a question, formulate a hypothesis, and decide how you will conduct the experiment. Discuss your experimental design, plans for data collection, and plans for your lab report. Decide on your assignments for the Winogradsky Column Project, and bring any required materials to lab next Thursday, Sept. 4. Each group of 4 students will build 4 columns. Two columns will serve as duplicate controls, and the other two will be duplicate experimental columns.***
- During this semester, you will use these Winogradsky columns to allow you to observe, recognize, and keep records on a variety of microorganisms that might otherwise be difficult to maintain in the lab. Each student must record his/her own original, macroscopic and microscopic observations of the columns in an organized manner. These records must include at least some drawings of the columns and the microorganisms observed. Photographs are optional. **Each student's individual report on this project must consist of these original observations, drawings, and optional photographs.**
- **The group members must also work together to prepare an oral report on this project** consisting of the following: **(1)** a statement of the question that was addressed and a statement of the hypothesis; **(2)** a brief description of how the experiment was done; **(3)** at least two graphs, figures, or tables summarizing/organizing the major findings of the group; **(4)** brief comments and discussion about the major findings; and **(5)** a statement about whether or not the results supported the original hypothesis. **The group members must use PowerPoint software to give this oral presentation, which should be approximately 13-15 minutes long. Students must bring their PowerPoint presentations to the lab on a jump drive or compact disk. Students will NOT be permitted to access their presentations online or via email.** Oral presentations will be given during lab on the scheduled days. Please practice your presentation, and note that a group will not be permitted to speak for more than 18 minutes. **Immediately after the presentation, each group must submit to the instructor a readable paper copy of the PowerPoint presentation, readable copies of the graphs, figures, and tables used, as well as a copy of any notes used during the presentation.**
- For the group report, each group member will confidentially evalulate the percentage of the work contributed by each of the group members (including himself or herself). The instructor will consider the average percents in calculating individual scores for the group oral report.

Thurs.	Aug. 28	Cell structure/function	**Chap. 2**
Thurs.	Aug. 28L	>LAB MANUAL EX., MICROSCOPY (green box p. 9); answer questions on green box p. 15-17. >MICROSCOPE CARE & USE ; MICROSCOPE CHECKLIST (course pack) >LAB MANUAL EX., SMEAR PREPARATION (green box p. 85) & SIMPLE (POSITIVE) STAINING (green box p. 91). Specific directions: On a single slide, prepare one smear of *Saccharomyces cerevisiae*, and a separate, second smear of *Escherichia coli.* Use the technique for preparing smears from solid media [see LAB MANUAL EX.], & stain with crystal violet for 30 seconds [See LAB MANUAL EX. for basic guidelines].) We will use paper towels instead of bibulous paper. Use this slide in the next exercise. >SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST *Saccharomyces cerevisiae* (A FUNGUS) AND THE BACTERIUM *ESCHERICHIA COLI* **continued on the next page……..**	

Date		Topics/Lab Exercises	Related material in text
Thurs.	Aug. 28L	**.....continued from the preceding page** (Sometime during the next 4-5 labs, you must ask the instructor to look at: (1) a stained *E. coli* smear that you have prepared and brought into clear focus using the oil immersion objective of your assigned microscope, plus a drawing of it, & (2) a wet mount of a mixture of *S. cerevisiae* and *E. coli* that you have prepared and brought into clear focus using the oil immersion objective of your assigned microscope, plus a drawing of it. **These observations are required; upon their completion you will receive points.)** >FINISH LAB MANUAL EX., ASEPTIC TECHNIQUE (Answer questions, green box p. 69-70.)	
Tues.	Sept. 2	Cell structure/function Eukaryotic microorganisms	**Chap. 2 & 7 (pages 226-228)** **Chap. 17 & Chap. 32**
Tues.	Sept. 2L	>**Additional simple stain:** Aseptically remove a sterile swab from wrapping paper & swab your gums and teeth. Gently rub swab onto a DRY slide. Allow smear to air dry; then heat fix. Stain with **methylene blue**, rinse, and blot dry. Examine with oil immersion objective. Draw epithelial cells and bacteria in your notebook. >LAB MANUAL EX., NEGATIVE STAINING, green box p. 95 (We will use nigrosin & the method in Fig. 13.2. On green box page 96, follow steps 1-7, but **omit steps 2 & 4**. Draw a few representative *Staphylococcus aureus* cells and *Bacillus subtilis* cells in your lab notebook. Answer questions 1-4 in part B (green box p. 104). >**If necessary, complete** SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST *Saccharomyces cerevisiae* (A FUNGUS) AND THE BACTERIUM *Escherichia coli*	
Thurs.	Sept. 4	Eukaryotic microorganisms	**Chap. 17 & Chap. 32**
Thurs.	Sept. 4L	>LAB MANUAL EX., UBIQUITY OF BACTERIA, green box p. 43. Complete steps 1-7, but omit step 6. >LAB MANUAL EX., THE FUNGI (green box p. 59). You will prepare the plates we will use for the "Mold Study" section 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 outdoors. Incubate the plates at room temperature until next week.) >SUPPL. EX., WINOGRADSKY COLUMN (WE WILL USE THE PROCEDURE IN THE SUPPL. EX., BUT PLEASE ALSO READ LAB MANUAL EX. (green box p. 203) & ASSIGNED PAGES IN TEXT. **Discuss your experimental design, plans for data collection, and plans for the oral lab report with your group.** >**If necessary, complete** SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST *Saccharomyces cerevisiae* (A FUNGUS) AND THE BACTERIUM *Escherichia coli*	**TEXT, P. 567-572**
Tues.	Sept. 9	Eukaryotic microorganisms Nutrition, culture, & metabolism of microorganisms	**Chap. 17 & Chap. 32** **Chap. 3, 13, 14, 15, & 16** **(selected topics)**
Tues.	Sept. 9L	>LAB MANUAL EX., PURE CULTURE TECHNIQUES (green box p. 71), 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 (**method B** on green box p. 72). Each person will do his/her own streak plate. **Begin keeping records for your general unknown today (in your lab notebook).** **continued on the next page……**	

Date		Topics/Lab Exercises	Related material in text
Tues.	Sept. 9L	**…….continued from preceding page** >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 in your lab notebook. Use the information in LAB MANUAL EX., PROTOZOA, ALGAE, & CYANOBACTERIA (green box p. 29) 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, & cyanobacteria. Keep in mind that you may also see some microscopic invertebrate organisms in your samples. **Discuss issues related to data collection & organization with your group members.**) **>If necessary, complete** SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST *Saccharomyces cerevisiae* (A FUNGUS) AND THE BACTERIUM *Escherichia coli* OPTIONAL: EXAMINE PREPARED SLIDES OF *Plasmodium falciparum* in blood smear; *Trichomonas vaginalis, Trypanosoma cruzi, & Entamoeba histolytica*	
Thurs.	Sept. 11	Nutrition, culture, & metabolism of microorganisms	**Chap. 3, 13, 14, 15, & 16 (selected topics)**
Thurs.	Sept. 11L	**>LAB MANUAL EX., BACTERIOLOGICAL EXAMINATION OF WATER** (green box p. 209)**.** **YOU WILL WORK IN GROUPS OF 4. PICK UP 2 STERILE, 50 ML TUBES FOR EACH GROUP.** **OBTAIN A FRESHWATER SAMPLE AND BRING IT TO LAB THIS COMING TUESDAY FOR THIS EX.** >LAB MANUAL EX., PURE CULTURE TECHNIQUES (green box p. 71), 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 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. >FINISH LAB MANUAL EX., UBIQUITY OF BACTERIA (Complete table, green box p. 45, as well as items 2, 3, & 4 on the top of the next page. Answer short answer questions 1-4**.)** **Use plates with fungal colonies in next exercise.** >FINISH LAB MANUAL EX., THE FUNGI (green box p. 47) (Mold Study – Do NOT open fungal cultures in the lab. Open them only in the biological safety cabinet. You will use clear cellophane tape to prepare slides of two or more different molds. The instructor will demonstrate this procedure, which is described in the lab manual. Examine the slides using the low power (10x) objective and the high dry (40x) objective. Draw the specimens in your lab manual or lab notebook. Also record a description of the appearance of the fungal colonies. Answer the questions in the lab manual (green box p. 56.). **>If necessary, complete** SUPPL. EX., EXAMINATION OF STAINED SLIDES AND WET MOUNTS OF THE YEAST *Saccharomyces cerevisiae* (A FUNGUS) AND THE BACTERIUM *Escherichia coli*	
Tues.	Sept. 16	Nutrition, culture, & metabolism of microorganisms	**Chap. 3, 13, 14, 15, & 16 (selected topics)**
Tues.	Sept. 16L	**REMEMBER TO BRING 2 TUBES WITH FRESH WATER SAMPLE FOR TODAY'S LAB.** **>LAB MANUAL E**X., BACTERIOLOGICAL EXAMINATION OF WATER (Green box, p. 209. You will work in groups of 4 and use the fresh water collected in 2 sterile, 50 ml tubes for this exercise.) > CONTINUE LAB MANUAL EX., PURE CULTURE TECHNIQUES (green box p. 71), STREAK-PLATE METHOD 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 **from** 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 "**UNKNOWN", your lab section, and seat numbers**. If your group has no plates that were prepared **from** a well-isolated coloony, then pick a well-isolated colony and use it to do another streak plate (using method B) 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. >MONITOR WINOGRADSKY COLUMNS-- **Discuss plans for the Winogradsky report with your group.** OPTIONAL: EXAMINE PREPARED SLIDES OF *Plasmodium falciparum* in blood smear; *Trichomonas vaginalis, Trypanosoma cruzi, & Entamoeba histolytica* (if not done last week)	

Date		Topics/Lab Exercises	Related material in text
Thurs.	Sept. 18	**EXAM 1** (will include both class and lab material)	
Thurs.	Sept. 18L	>CONTINUE LAB MANUAL EX., BACTERIOLOGICAL EXAMINATION OF WATER (MPN+EMB/MAC) We will use MacConkey agar instead of Endo agar. Record results on board. FINISH LAB MANUAL EX., PURE CULTURE TECHNIQUES (green box p. 71), STREAK-PLATE METHOD 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 **from** 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 "**UNKNOWN", your lab section, and seat numbers. If, for some reason, your group has no suitable colonies, please consult the instructor.** > SUPPL. EX., ENUMERATION OF BACTERIA ASSOCIATED WITH FRESH PRODUCE (SPREAD-PLATE TECHNIQUE) WORK IN GROUPS OF 2 FOR THIS EXERCISE. **>BEGIN TO WORK DILUTION PROBLEMS IN COURSE PACK**	
Tues.	Sept. 23	Metabolism of microorganisms	**Chap. 13, 14, 15, & 16 (selected topics)**
Tues.	Sept. 23L	>FINISH LAB MANUAL EX., BACTERIOLOGICAL EXAMINATION OF WATER (Read results of EMB/MAC. We will omit the "completed test procedure" and the IMViC tests.) Answer questions 4-9 in lab manual. >COMPLETE SUPPL. EX., ENUMERATION OF BACTERIA ASSOCIATED WITH FRESH PRODUCE Record your results on board. **>WORK DILUTION PROBLEMS IN COURSE PACKET** >MONITOR WINOGRADSKY COLUMNS. **Discuss plans for lab report with your group.**	
Thurs.	Sept. 25	Microbial growth	**Chap. 5**
Thurs.	Sept. 25L	*Program #3, Metabolism* **>SUPPL. EX., USING RIBOSOMAL RNA GENE SEQUENCES TO LEARN ABOUT A MICROORGANISM WORK SESSION ON DILUTION PROBLEMS; ASK QUESTIONS ABOUT PROBLEMS** >>**OPTIONAL: Hand in your stapled primary source concerning the pathogen you selected.** The instructor will provide feedback if you hand in the article today; however, points will not be awarded until you submit the article immediately after your brief report during lab.	**Chap. 21 (p. 657-661); Chap. 13 (p. 395-396), Chap. 14 (p. 447-452), Chap. 3 (p. 88-89) & Chap. 31 (p. 910-911)**
Tues.	Sept. 30	Molecular microbiology	**Chap. 4**
Tues.	Sept. 30L	>LAB MANUAL EX., GRAM STAINING (green box p. 99), Prepare smears from nutrient agar slant cultures as described in the earlier lab manual ex. on smear preparation. Complete drawings/questions in lab manual. >GENERAL UNKNOWN CULTURES-----**Prepare subcultures (stock cultures) of the unknown and also gram stain it.** Record dates, work done, drawings, etc., in your lab notebook. Also record your results on the descriptive chart in lab manual, green box p. 161. WITH THE NUTRIENT AGAR PLATE PROVIDED, PREPARE A STREAK PLATE USING YOUR UNKNOWN CULTURE . **>THE LAB REPORT ON THIS GENERAL UNKNOWN MAY BE DONE INDIVIDUALLY OR WITH OTHER GROUP MEMBER(S).** It must be organized in a thin folder that contains the following items: **(i-individually graded and worth 15% of grade)** each person's individual unknown records and drawings from his/her lab notebook (labeled with the person's name); **(ii-worth 20% of grade)** one **neat and complete** copy of the descriptive chart (green box p. 161 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-worth 15% of grade)** a statement of your conclusion about the group to which the unknown bacterium belongs (based on *Bergey's Manual of Determinative Bacteriology*, which is on reserve in the library; and **(iv)** an explanation and discussion of the following points: how you arrived at your conclusion **(worth 10% of grade)**; any test results that are inconsistent with your conclusion **(worth 10% of grade)**; & what you have learned about the properties and metabolism of your unknown organism from the work you did **(worth 30% of grade)**. Part (iv) must be typed (double-spaced) and approximately 2 to 3 pages long. **Do NOT describe the methods used for performing the tests.** >MONITOR WINOGRADSKY COLUMNS – **Discuss plans for oral report with your group.**	

Date		Topics/Lab Exercises	Related material in text
Thurs.	Oct. 2	Molecular microbiology	**Chap. 4**
Thurs.	Oct. 2L	>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 in your notebook and on the descriptive chart (lab manual, green box p. 161). Consult green box p. 166 in lab manual for aids in describing colonies.	
Tues.	Oct. 7	Regulation	**Chap. 7**
Tues.	Oct. 7L	>SUPPL. EX., VARIOUS MEDIA [CULTURES FOR NUTRIENT AGAR, DESOXYCHOLATE AGAR (AND/OR MACCONKEY AGAR) AND PHENYL ETHYL ALCOHOL AGAR: *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa,* & unknown] (CULTURES FOR BLOOD AGAR: *E. coli, S. aureus, Bacillus cereus,* & unknown) >A **THROAT CULTURE** WILL ALSO BE DONE ON A SEPARATE BLOOD AGAR PLATE. >**LAB MANUAL E**X., ACID-FAST STAINING (We will use the Ziehl-Neelsen method procedure; please see the directions that follow this sentence, as well as the exercise in the lab manual.) Use 0.1% albumin solution instead of water for preparing the smears. On one slide prepare a smear of a mixture of *Mycobacterium smegmatis* & *Staphylococcus aureus,* 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 intermittently 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 version of this exercise (see the figure on green box p. 112). Complete drawings/questions in lab manual. Record results for unknown culture in lab notebook and on the descriptive chart >**HAND IN SUPPL. EX., RIBOSOMAL RNA SEQUENCES (16 POINTS)** >MONITOR WINOGRADSKY COLUMNS. **Work on reports.**	
Thurs.	Oct. 9	Viruses	**Chap. 8 & 9**
Thurs.	Oct. 9L	>FINISH SUPPL. EX., VARIOUS MEDIA -- Record results in the table provided with the exercise. **ALSO, record results for your unknown in your notebook, and on the descriptive chart.** **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?** >LAB MANUAL EX., SPORE STAINING (Modified Schaeffer-Fulton Method) On one slide prepare a smear of the *Bacillus* 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. Record results for unknown culture in lab notebook and on the descriptive chart.	
Tues.	Oct. 14	Viruses	**Chap. 8 & 9**
Tues.	Oct. 14L	>PREPARE NEW STOCKS OF GENERAL UNKNOWNS >LAB MANUAL EX., CULTURAL CHARACTERISTICS, green box p. 163. (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, & fluid thioglycollate medium.) Fluid thioglycollate medium is being used to determine the oxygen requirements of the unknown culture. See the textbook for more information about oxygen requirements and this medium (text, p. 168-170). >LAB MANUAL EX., MOTILITY DETERMINATION (TUBE METHOD ONLY, green box p. 115) You will inoculate tubes of motility medium with *Staphylococcus aureus, Proteus vulgaris,* (& your unknown, as noted above). >SUPPL. EX., PLAQUE ASSAY OF A PHAGE SUSPENSION – WORK IN GROUPS OF 2 **Ask questions on dilution problems.** >MONITOR WINOGRADSKY COLUMNS (today &/or Thurs.)	

Date		Topics/Lab Exercises	Related material in text
Thurs.	Oct. 16	**EXAM 2** (will include both class and lab material)	
Thurs.	Oct. 16L	>FINISH LAB MANUAL EX., CULTURAL CHARACTERISTICS. (Record results in notebook and on descriptive chart.) >FINISH LAB MANUAL EX., MOTILITY (TUBE METHOD & WET MOUNT) (Draw the motility tubes. In the lab manual, answer questions 3 & 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 in your notebook and in the descriptive chart. >FINISH SUPPL. EX., PLAQUE ASSAY OF A PHAGE SUSPENSION – Record results on board. >MONITOR WINOGRADSKY COLUMNS (if not done on Tues.)	
Tues.	Oct. 21	Microbial genomics Genetics of *Bacteria & Archaea*	**Chap. 6 & Chap. 18 (p. 584-587)** **Chap. 10**
Tues.	Oct. 21L	>LAB MANUAL EX., OXIDATION AND FERMENTATION TESTS (green box p. 167) >LAB MANUAL EX., MULTIPLE TEST MEDIA (green box P. 185) (We will do ONLY the test for hydrogen sulfide production using SIM medium.) >LAB MANUAL EX., HYDROLYTIC/DEGRADATIVE REACTIONS (green box p. 179) (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.) >DISCUSSION ON THE USE OF BERGEY'S MANUALOF DETERMINATIVE BACTERIOLOGY BERGEY'S MANUAL OF DETERMINATIVE BACTERIOLOGY is on reserve in the library for your use. >MONITOR WINOGRADSKY COLUMNS	
Thurs.	Oct. 23	Genetics of *Bacteria & Archaea* Genetic engineering & biotechnology (selected topics)	**Chap. 10** **Chap. 11**
Thurs.	Oct. 23L	>Finish LAB MANUAL EX., OXIDATION/FERMENTATION TESTS (except Voges-Proskauer test) >Finish LAB MANUAL EX., MULTIPLE TEST MEDIA (test for hydrogen sulfide production only) >Finish LAB MANUAL EX., HYDROLYTIC/DEGRADATIVE REACTIONS (Recall that on tributyrin agar, a clear zone around the bacterial growth indicates a positive test for lipid hydrolysis.) Record results in lab notebook, and on descriptive chart. Answer: questions 4-9 and 13 in part B on p. 291-293; matching sets 1-4 on p. 293-294. >DISCUSSION ON THE USE OF BERGEY'S MANUAL OF DETERMINATIVE BACTERIOLOGY BERGEY'S MANUAL OF DETERMINATIVE BACTERIOLOGY is on reserve in the library for your use. **Work on lab report on general unknown.**	
Tues.	Oct. 28	Microbial evolution & systematics Microbial identification & clinical microbiology	**Chap. 12** **Chap. 27 (Fig. 27.3)**
Tues.	Oct. 28L	>*Program #9, Microbial Control* THIS IS THE LAST DAY FOR LAB WORK ON THE GENERAL UNKNOWN. >LAB MANUAL EX., OXIDATION & FERMENTATION TESTS, finish Voges Proskauer (VP) test >LAB MANUAL EX., KIRBY-BAUER METHOD (ANTIMICROBIAL AGENTS) (green box p. 139) >LAB MANUAL EX., EVALUATION OF ANTISEPTICS (PAPER DISK METHOD- this exercise will be slightly modified) (green box p. 151) >MONITOR WINOGRADSKY COLUMNS >**Work on lab reports.**	
Thurs.	Oct. 30	>SUPPL. EX., *Staphylococcus aureus* (class work) Microbial identification & clinical microbiology Microbial growth control	 **Chap. 27 (Fig. 27.3)** **Chap. 5 & 27**

Date		Topics/Lab Exercises	Related material in text
Thurs.	Oct. 30L	>SUPPL. EX., *Staphylococcus aureus* >FINISH LAB MANUAL EX., KIRBY-BAUER & ANTISEPTICS Record data & answer questions in lab manual. >**Work on lab reports.**	
Tues.	Nov. 4	Microbial growth control Microbial ecology (selected topics)	**Chap. 5 & 27** **To be announced**
Tues.	Nov. 4L	>CONTINUE SUPPL. EX., *Staphylococcus aureus* (Record results on board. We will omit Kirby-Bauer antibiotic sensitivity tests that are described in this exercise. Remember to streak presumptive *S. aureus* for isolation on a plate of tryptic soy agar. This plate will be used for an agglutination test on Thursday.) > MONITOR WINOGRADSKY COLUMNS, **LAST TIME**	
Thurs.	Nov. 6	Innate immunity; adaptive immunity	**Chap. 23-26**
Thurs.	Nov. 6L	>**HAND IN LAB REPORT ON GENERAL UNKNOWN** >FINISH SUPPL. EX., *S. aureus* >LATEX AGGLUTINATION TEST FOR *S. aureus* IDENTIFICATION – There is no writeup for this test. The instructor will summarize the principle of the test and will give directions at the beginning of the lab. RECORD RESULTS from *S. aureus* EX. & latex test on board & in chart. **WORK ON WINOGRADSKY COLUMN PROJECT REPORTS**	
Tues.	Nov. 11	Adaptive immunity	**Chap. 23-26**
Tues.	Nov. 11L	Practical applications of immunology >WORK ELISA AND IMMUNOFLUORESCENCE PROBLEMS (SEE COURSE PACKET) **WORK ON WINOGRADSKY COLUMN PROJECT REPORTS**	**Chap. 23-26**
Thurs.	Nov. 13	**EXAM 3 (will include both class and lab material)**	
Thurs.	Nov. 13L	Practical applications of immunology >WORK ELISA AND IMMUNOFLUORESCENCE PROBLEMS (SEE COURSE PACK) **WORK ON WINOGRADSKY COLUMN PROJECT REPORTS**	**Chap. 23-26**
Tues.	Nov. 18	Adaptive immunity Human-microbe interactions Epidemiology & public health	**Chap. 23-26** **Chap. 27** **Chap. 32**
Tues.	Nov. 18L	**GROUP ORAL PRESENTATIONS (WINOGRADSKY)** **HAND IN INDIVIDUAL WINOGRADSKY COLUMN PROJECT REPORTS**	
Thurs.	Nov. 20	Human-microbe interactions Epidemiology & public health	**Chap. 23** **Chap. 28**
Thurs.	Nov. 20L	**GROUP ORAL PRESENTATIONS (WINOGRADSKY)** **HAND IN INDIVIDUAL WINOGRADSKY COLUMN PROJECT REPORTS**	
		THANKSGIVING HOLIDAY	
Tues.	Dec. 2	Microbial diseases (selected topics)	**Chap. 29-32**
Tues.	Dec. 2L	**INDIVIDUAL REPORTS ON PATHOGENS**	

Date		Topics/Lab Exercises	Related material in text
Thurs.	Dec. 4	Microbial diseases (selected topics)	**Chap. 29-32**
Thurs.	Dec. 4L	**INDIVIDUAL REPORTS ON PATHOGENS**	
Wed.	**Dec. 10**	**COMPREHENSIVE FINAL EXAM** (EXAM 4) – **10:15 am – 12:15 pm**	

ADDITIONAL INFORMATION

Course Content: We will not be covering all of the material in the textbook and lab manual. Please read the pertinent sections of the textbook and lab manual, 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, or they may be posted on BlazeView.**

Laboratory:

1. 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.

2. Each student must **read the laboratory exercises for the day, any additional required readings (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. Exercises indicated as "SUPPL. EX." can generally be found in the course pack. Alternatively, the instructor may provide a separate handout.

3. Each student is required to wear proper attire in the lab (as noted in the lab safety guidelines), and to bring his/her lab manual and course pack to the lab. A student who comes to the lab without these essentials will not be permitted to complete the lab.

4. 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.

5. 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 **rRNA report**, as well as an **individual Winogradsky Column Project report**, which must consist of his/her own original, weekly records, drawings, pictures, and other notes about the project. **Please note that you must keep records relating to different lab projects in different sections of your lab notebook, in order to facilitate submission of original records for different projects, as needed.** For the Winogradsky column project, the members of each group (generally 4 students) will also work together to prepare and present a **group oral report** that will be given during lab, as outlined in the course schedule. For details, see page 4. For this report, each group member will confidentially evalulate the percentage of the work contributed by each of the group members (including himself or herself), and the instructor will consider the average percents in calculating individual scores for the group oral report. For the **general unknown lab report**, students may prepare their lab reports individually, or they may work with their lab groups and turn in joint reports. If a joint unknown report is submitted, each student **must** include his/her own individual records, drawings, and pictures; and these must be labeled with his/her name. Please see page 7 for details on this report. Please note that there will be no makeups for the oral reports, except in the event of a documented serious emergency.

6. A separate lab exam will not be given. However, please note that the exams given during class periods (as well as the final exam) will include material covered during lab, including dilution problems.

7. **Oral Presentations on Scientific Articles.** During the laboratory portion of the course, each student will give a **brief**, **3-to 4-minute oral report** about a particular microbial pathogen selected (by lottery) from a list provided by the instructor. Once a topic is chosen it may not be changed. Students should use the textbook as a starting point to obtain background information. Then they must locate **one formal, peer-reviewed, scientific article** about the pathogen. **This article must be a primary source that was published between 2005 and 2014; it must also list references at the end, and the listed references must be cited**

within the article. The primary source must be two or more pages long. The instructor suggests that students first try to locate a suitable primary source in "Morbidity and Mortality Weekly Reports" (MMWR), which is available free online at www.cdc.gov . Additional peer-reviewed, scientific and medical journals are available in the Odum library and/or online. The article may be obtained through interlibrary loan; however, this process is not recommended because it takes additional time. **Above all, please select a primary source that you will be able to read and understand. Approximately 2/3 of the presentation should focus on the primary source; the remaining 1/3 should consist of background information on the pathogen.** Practice your talk and aim for 3 minutes; you will not be permitted to speak for more than 4 minutes. Due to the short nature of these presentations, PowerPoint may NOT be used. You may, however, write on the board, show a poster, or use a handout. Informal articles, Web sites, Internet articles or fact sheets, newspaper articles, magazine articles, book reviews, and letters to the editor are NOT acceptable sources. 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. **Immediately after giving the presentation, the student must turn in a complete, readable, paper copy of the primary source (including readable figures and tables).**

Please note that there will be no makeups for any of the oral presentations, except in the event of a documented, serious emergency.

Attendance, Participation, and Tardiness: In accordance with VSU policy, attendance and participation will be checked both in class and in the laboratory. The VSU Undergraduate Catalog states, "A student who misses more than 20% of the scheduled classes of a course will be subject to receiving a failing grade in the course." The remainder of this paragraph outlines the laboratory/student oral presentation period attendance policy, except that there is a special policy for the lab period on Aug. 26 (see note in schedule). Attendance is required during ALL labs and student presentation periods. A student who has perfect lab attendance or who misses only one laboratory/student presentation period will receive 20 bonus points. A student who misses (or fails to complete) two to three laboratories/student presentation periods will receive 10 bonus points. Missing (or failing to complete) additional laboratories/student presentation periods will result in the **loss of points** as follows. Ten points will be deducted from the student's total points for the fourth missed (or incomplete) laboratory/student presentation period; 20 additional points will be deducted for the fifth missed (or incomplete) laboratory/student presentation period; 40 additional points will be deducted for the sixth missed/incomplete laboratory/student presentation period, and 50 additional points will be deducted for each subsequent missed/incomplete laboratory/student presentation period. Students who are habitually late for lab or student oral presentation periods will be marked late. Coming late to lab or student presentation periods two times will be counted as one absence. A student with more than 6 missed or incomplete laboratories/student presentation periods will not pass the course. **There will be no makeups for the laboratory exercises.**

Examinations Given During Class Periods:

1. Examinations 1-4 will cover material presented during both the class and laboratory portions of the course. 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 and will be worth fewer points than the regularly-scheduled exams.
2. Students must bring TWO #2 PENCILS AND ERASERS to all examinations. The instructor will not provide pencils. **Unless otherwise noted, students may NOT use calculators during examinations.**
3. Exams will not be returned to students. After grading has been completed, the instructor will bring the exams to one of the lab periods for students to view.

Late Assignments & Failure to Turn in Assignments:

Please make a calendar noting when assignments and lab reports are due. Turning in an assignment/report 1-3 days late will result in a deduction of 20% of the points for that assignment. Turning in an assignment 4-7 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 7 days.** Students should note that completion of all assignments and reports is required in order to pass the course. 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:

EXAMS 1, 2, & 3 (Sept. 18, Oct. 16, & Nov. 13) (165 points each x 3=495)…….	495	POINTS
EXAM 4 (FINAL EXAM –Dec. 10)…….	200	POINTS
SLIDE/MICROSCOPE/DRAWING FOCUSING CHECKS (Course objective ZA) (Aug. 28-Sept. 11)…..…….	20	POINTS
rRNA LAB REPORT (Course objective ZD) – (Oct. 7)…….……	20	POINTS
LAB REPORT ON GENERAL UNKNOWN (Course objectives ZC, ZD) - (Nov. 6).....	65	POINTS
INDIVIDUAL LAB REPORT ON WINOGRADSKY COLUMN PROJECT (Course objective ZF) - (Nov. 18 & 20)……	65	POINTS
GROUP ORAL REPORT ON WINOGRADSKY COLUMN PROJECT (Nov. 18 & 20)..	70	POINTS
INDIVIDUAL ORAL REPORT ON PATHOGEN (Course objective ZH) - (Dec. 2 & 4)……..……..	50	POINTS
PRIMARY SOURCE FOR ORAL REPORT ON PATHOGEN (Course objective ZG) – (Dec. 2 & 4).....	15	POINTS
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