-- -------------

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**

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.

Date	Topics/Lab Exercises	Related material in text
Thurs. Aug. 21L	**.........continued from the preceding page** **>PLEASE READ THE FOLLOWING BEFORE NEXT WE**	

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*	

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	

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	

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. >**<u>Work on lab reports.</u>**	
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.* Lf o *aureus* for isolation on a plate of tryptic soy agar. This plate	

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**	

<u>ADDITIONAL INFORMATION</u>

<u>Course Content:</u> 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.**

<u>Laboratory:</u>

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) <u>before</u> 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, **<u>lab reports</u>** 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 **<u>rRNA report</u>**, as well as an **<u>individual Winogradsky Column Project report</u>**, which must consist of his/her own original, weekly records, drawings, pictures, and other notes about the project. **<u>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</u> records for different projects, as needed.** F

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)		
(		