BIOL231-01 ***MICROBIOLOGY*** **SPRING 2010**

Instructor: Gilles Bolduc, Ph.D.

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Office Hours: Monday and Wednesday: 9:00 – 10:00 AM
Tuesday: 9:30 – 10:30 AM
Thursday 1:00 – 2:00 PM

Lecture and Laboratory Schedule:
Lecture: 2 hours/week MWF 10:00 AM – 11:50 AM (S-325)
Laboratory: 4 hours/week

Course Material:

- **Course textbook:** Tortora, Funke, Case, *Microbiology An Introduction*, Pearson/Benjamin Cummings, 10th edition, 2009, ISBN 13: 9780321646880

- **Laboratory Photographic Atlas:** Leboffe, Pierce, *A Photographic Atlas for the Microbiology Laboratory*, 3rd edition, Morton Publishing, 2005, ISBN:0-89582-656-9
- **Laboratory notebook** (Composition book)

- **Laboratory Exercises** will be provided in the form of handouts and must be kept together in a **three-ring binder**.

Course Prerequisites:
Grade of **'C-'** or better in Biological Principles I (BIOL121) or successful performance on departmental challenge exam, and Preparing for College Reading II (ENGL092), Introductory Writing (ENGL099), and Fundamentals of Mathematics (MATH010), or waiver by placement testing results, or Departmental Approval Chemistry is recommended but not required.

Course Description:
This is a course in general microbiology with emphasis placed on the practical applications for medical, food, dairy, water, and environmental microbiology. Part of the laboratory experience includes an introduction to techniques in molecular biology and the identification of one or more bacterial 'unknowns' to demonstrate adequate knowledge of the proper laboratory technique. Organisms of discussion include bacteria, viruses, fungi, and some of the primitive algae and protozoa. Topics covered include classification, prokaryotic cell structure, microbial genetics, biotechnology, microbial metabolism, microbial growth and control of microbial growth.

Course Grade:

Lecture	
3 Exams (10% each)	30%
Quizzes, Homeworks & In-class activities	15%
Cumulative Final	15%
Laboratory	
Laboratory Journal	
Staining	8%
Unknowns	12%
Laboratory Report	
Transformation Report	5%
2 Lab practicals (7.5% each)	15%

Grading System:

A 92.5 and above	A- 89.5 to 92.4	
B+ 86.5 to 89.4	B 82.5 to 86.4	B- 79.5 to 82.4
C+ 76.5 to 79.4	C 72.5 to 76.4	C- 69.5 to 72.4
D+ 66.5 to 69.4	D 62.5 to 66.4	D- 59.5 to 62.4
F Below 59.5		

Exams and Quizzes:

Three scheduled lecture exams will be given throughout the semester (see course outline) and a cumulative final exam will be scheduled by the registrar's office during the week of finals (see syllabus for date). Exams will consist of multiple choice, matching, fill-in, short answer and data interpretation questions. **There are no make-up lecture tests.** If you miss an exam, the grade you earn on the final will replace your one missed exam grade. Fifteen percent of your grade will be based on your performance on multiple short quizzes, homework assignments and in-class activities or presentations. Quizzes may be given as take home assignments or in class assessments. Quiz times will be announced at least one class in advance and your lowest quiz grade will be dropped. **There are no make-up quizzes.** One missed quiz will be considered your lowest grade and will be dropped.

Laboratory Notebook and Practical Exams:

Students are expected to keep a thorough account of their laboratory work in a laboratory notebook. The notebook will include an explanation of the technique used, a description of the microorganism being studied and detailed labeled diagrams. The notebook will be collected and graded two times during the semester. The staining journal entry will be worth 8% of your laboratory grade and the bacterial unknown journal entry will be worth 12% of your grade for a total of 20% of your overall grade. In addition, there will be two scheduled laboratory practical exams during the semester. During the exams you will be required to identify certain microorganisms based upon

staining and growth characteristics and demonstrate your knowledge and interpretation of various stains and physiological tests commonly used in the microbiology laboratory.

Attendance:

The student is expected to attend all lecture and laboratory sessions. Attendance will be taken daily by passing around an attendance sheet. If you arrive late to class make sure that you see the instructor at the end of class. If you are not going to be able to attend class or lab, please leave a message on my voice mail or send me an email message. It is the student's responsibility to get copies of lecture notes, handouts, and assignments for days missed. **Please remember that missed exams and quizzes may not be made up. In addition, missed laboratory experiments may not be made up.**

Teaching Methods:

Students are expected to actively participate in the discussion of the topics assigned in both lecture and lab. The student should spend a minimum of two hours preparing for each class by pre-reading the assigned pages from the text and laboratory exercises. Class discussion will be augmented by use of Powerpoint, handouts, animations and in-class activities.

During laboratory sessions students will work individually and occasionally in small groups to complete the assigned tasks. The student should carefully read over each procedure before coming to lab. The instructor will demonstrate all new procedures. **In the microbiology lab students are learning new techniques and work on projects independently. Often students must spend extra time in the lab to acquire the new skills.**

Students are encouraged to meet frequently with the instructor for additional help with understanding lecture or laboratory information, study skills, test taking skills, and writing skills. My office hours will be posted outside my office door. If these hours are not convenient, please see me about scheduling an appointment. Students are also strongly encouraged to use the ARC for individual and small group tutoring. The ARC also has a wide variety of review materials that many students have found very useful. .

Teaching Objectives:

At the successful completion of this course each student will have an understanding of the principles of microbiology with an emphasis on understanding microbial diversity, classification of microorganisms, prokaryotic cell structure, microbial metabolism, microbial growth and regulation, microbial genetics (see attached Outcomes Objectives). Each student will also develop the following laboratory skills: lab safety procedure as outlined in the biology department guidelines, aseptic techniques, use of oil immersion lens, microbiological staining techniques, identification of bacterial unknowns and selected molecular biology techniques.

Students with Disabilities:

Students with disabilities who believe that they may need accommodations in the classroom are encouraged to contact a disability counselor as soon as possible. Students at the Brockton Campus with learning disabilities should contact Andrea Henry, at extension 1805. Students with physical disabilities at the Brockton Campus should contact Mary Berg, at extension 1425. All students at the Canton Campus should contact Mary Berg at extension 2132.

BIOL231-01/02 Tentative Course Outline:

Date	Lecture	Tortora	Laboratory	Photographic Atlas
Week 1				
01/25/10	Introduction to Microbes (Ch.1)	pp. 1-22	Laboratory Safety	
01/27/10	Prokaryotes/Eukaryotes (Ch.4)	pp. 77-106	**Exercise 1:** Diversity and ubiquity of microbes Colony morphology	pp. 1-9
01/29/10	Introduction to the light Microscope (Ch.3)	pp. 55-59	**Exercise 2:** Introduction to the light Microscope	pp. 23-26
01/30/10	**Last Day To Drop/Add Without A Grade**			
Week 2				
02/01/10	Prokaryotes/Eukaryotes (Ch.4) continued	pp. 77-106	Staining pp. 68-72	pp. 27-34
02/03/10	Microbial Growth (Ch.6)	pp. 156-169	**Exercise 3:** Bacterial Smear	
02/05/10	**Convocation Day 12:00-4:00pm**		**Home assignment for BIOL231-02**	
Week 3				
02/08/10	Microbial Metabolism (Ch.5)	pp. 124 -140	**Exercise 4:** Simple Stain	p. 27
02/10/10	Metabolic Diversity (Ch.5)	pp. 142-150	**Exercise 5:** Gram Stain	p. 35
02/12/10	**Exam I**		**Exercise 6:** Endospore Stain	p.41
Week 4				
02/15/10	**President's Day-No Classes**		**No Lab today**	
02/17/10	Classification of Microbes (Ch.10)	pp.273-294	**Exercise 7:** Acid-Fast Stain	p. 38
02/19/10	"	"	**Exercise 8:** Negative Stain	p. 28
Week 5				
02/22/10	Prokaryotes – Bacteria/Archaea (Ch.11)	pp. 300-325	**Lab Practical I**	
02/24/10 and 02/26/10	Eukaryotes – Fungi,Algae, Protoza, and Helminths (Ch.12)	pp. 330-363	**Fungi:** ***Rhizopus*** ***Peziza*** ***Psilocybe*** ***Penicillium*** ***Saccaromyces***	pp. 159-173
	"	"	**Parasitic Protozoa:** ***Balantidiuim coli*** ***Entamoeba histolytica*** ***Trypanosoma*** ***Plasmodium*** ***Trichomonas*** ***Giardia***	pp. 175-186

Week 6 **03/01/10**	"	"	**Free-living protozoa:** ***Paramecium bursaria*** ***Euglena gracilis*** ***Amoeba proteus***	
03/03/10	"	"	**Algae:** ***Spirogyra*, *Pandorina*,** **Desmids and Diatoms**	
03/05/10	"	"	**Exercise 9:** Serial Dilutions (day 1) **Exercise 10:** Streak-plating (day 1)	
Week 7 **03/08/10**	"	"	**Exercises 9 and 10**: (day 2)	
03/10/10	Viruses, Viroids, and Prions (Ch.13)	pp. 368-395	**Exercise 10**: (day 3) Dichotomous Keys	
03/12/10			**Lab Practical II**	
03/15/10 through 03/19/10	**Spring Recess (No Classes)**			
Week 8 **03/22/10**	"	"	**Exercise 11**: Phenol-Red Fermentation	pp. 57-79
03/24/10	"	"	**Exercise 12:** Oxidation – Fermentation	pp. 73-74
03/26/10	Dichotomous Keys		**Bacterial Unknowns**	
Week 9 **03/29/10**	Principles of Disease and Epidemiology (Ch.14)	pp. 399-420	Independent Research	pp. 45-82
03/31/10	"	"		
04/02/10	**Exam II**			
Week 10 **04/05/10**	Microbial Mechanisms and Pathogenicity (Ch.15)	pp. 428-445	Independent Research	pp. 45-82
04/07/10	"	"		
04/09/10	"	"		
04/10/10	**Last Day To Withdraw From A Class**			
Week 11 **04/12/10**	Microbial Genetics (Ch.8)	pp. 210-241	Independent Research	pp. 45-82
04/14/10	"	"		
04/16/10	"	"		

Week 12 **04/19/10** **04/20/10** **04/21/10** **04/23/10**	**Patriot's Day (No Classes)** **Scheduling For Fall 2010 Brockton (No Day Classes)** Antimicrobial drugs (Ch.20) "	 pp. 553-579 "	 **API Test Strips** 	 p.45
Week 13 **04/26/10** **04/28/10** **04/30/10**	Environmental Microbiology (Ch.27) " **Exam III**	pp. 766-789 "	**Exercise 13**: Bacterial Transformation (day 1) **Exercise 13**: Bacterial Transformation (day 2)	
Week 14 **05/03/10** **05/05/10** **05/07/10**	Biotechnology and Recombinant DNA (Ch.9) **"** "	pp.246-268 " "	**Exercise 13**: Bacterial Transformation (day 3S)	
Week 15 **05/10/10** **05/12/10** **05/12/10**	Applied and Industrial Microbiology (Ch.28) " **Last Day Of Classes**	pp. 793-808 "	**Transformation lab report and unknowns are due today** **Lab Clean up**	
05/14/10 **05/19/10**	**Final Examinations week**			

Course Goals and Objectives:
After having completed Microbiology, you should be able to…

1. Discuss selected historic figures in microbiology and important milestones accomplished to appreciate the history of the field.

2. Classify microorganisms, focusing on their diversity in form and function; include methods of classification in order to distinguish among microorganisms in the laboratory and in the natural environment

3. Discuss beneficial uses of microorganisms and the implication of microorganisms in disease in order to counter common misconceptions about microorganisms.
Describe the role of microorganisms in the environment.

4. Demonstrate knowledge of basic chemistry including the properties of atoms, ions, chemical bonding and chemical reactions to understand biologically important molecules and processes.

5. Describe the role of biologically important molecules in order to understand the correlation between cell structure and function.

6. Explain the role of enzymes, glycolysis, the Krebs cycle, and the electron transport chain in microbial metabolism, and discuss the metabolic diversity of microorganisms, in order to understand how microorganisms extract nutrients and utilize energy.

7. Discuss and demonstrate requirements for bacterial division, and measure microbial growth in order to construct a growth curve and relate microbial growth to available nutrients and other conditions.

8. Discuss and demonstrate methods of microbial control including antibiotics and physical and chemical methods of control in order to make informed decisions about the use of antibiotics and other control methods.

9. Describe the structure and replication of DNA and its role in protein synthesis in order to understand the chemical basis of genetics and the use of DNA in genetic engineering and biotechnology; include gene regulation, mutation, recombination, transformation and transduction.

10. Discuss viral structure, cultivation and identification methodologies, reproduction and disease implications in order to distinguish between viruses and bacteria, and dispel common misconceptions about viruses.

11. Discuss principles of infectious disease and microbiological causes of select diseases in order to better understand and communicate information about sources of infection.

12. Follow safety procedures in microbiology lab in order to work safely in the laboratory environment.

13. Properly utilize a bright field light microscope including correct set-up, focusing, care and storage in order to use the microscope correctly to view microorganisms.

14. Prepare specimen for microscopic examination and utilize proper staining technique including gram stains, spore stains and acid fast stains; demonstrate understanding of each step of the stains; clean and dispose of slides, in order to distinguish among microorganisms and work in a safe environment.

15. Use standard microbiology equipment correctly including Meker burner, loops, picks, measurement equipment; utilize aseptic technique, in order to work safely in the laboratory.

16. Prepare media to be utilized in the microbiology lab in order to have media upon which to grow cultures.

17. Recognize microbial growth patterns in liquid and on solid media, and quantitate microbe numbers in serial dilutions in order to identify microorganisms and quantitate the size of the culture.

18. Perform and understand biochemical testing to identify microbiological organisms; integrate knowledge of the purpose of the test, procedure, basic biochemistry, reagents precautions and positive and negative results in order to correctly distinguish among microorganisms

19. Identify microorganisms using microscopic, macroscopic and biochemical information, design a flow chart using the dichotomous key technique, and use reference material including Bergey's Manual in order to correctly distinguish among microorganisms.