SCB 260
Fall I 2018

LAGUARDIA COMMUNITY COLLEGE
CITY UNIVERSITY OF NEW YORK
NATURAL SCIENCES

SCB 260: GENERAL MICROBIOLOGY (4 credits – 3 hours lecture, 3 hours Lab)

Course coordinator: Olga Calderón, PhD. ocalderon@lagcc.cuny.edu or 718-482-5749-Office M-220A

CATALOGUE DESCRIPTION

This course introduces students to microorganisms found in nature, industry and disease. Topics covered include virology, bacteriology, immunology, epidemiology, pathology and other related areas of microbial physiology. The laboratory will deal with the isolation and identification of common pathogenic and non-pathogenic organisms utilizing techniques of staining, culturing, fermentation reactions and microscopic inspection. The lab sessions will reinforce and emphasize lecture material.

PREREQUISITES

SCB202 or SCB204 or SCB209

REQUIRED TEXTS

LECTURE TEXTBOOK

Title: **Microbiology: An Introduction, Books a la Carte Plus MasteringMicrobiology, 13/E**
Authors: Gerard J. Tortora, Berdell R. Funke, Christine L. Case
Publisher: Benjamin Cummings Copyright: 2019
ISBNs: 0134605187 or 9780134605180

LABORATORY MANUAL – PAPER COPY – NO ELECTRONIC COPY PERMITTED

Title: Microbiology Laboratory Theory & Application, **3rd Edition**
Authors: Michael J. Leboffe, Burton E. Pierce
Publisher: Morton Publishing Company Copyright: 2008, 2012, 2016

GRADING CRITERIA

Lecture	60%	**Laboratory**	40%
Case studies quizzes homework	10%	Pre-lab Quizzes	4%
Exams	40%	Morph. Unk. Ind. Unk.	4% 20%
Term Paper Project	10%	4 Lab Exams lowest dropped	12%

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COURSE GRADE

A	=	93 – 100	C-	=	70 – 72.9
A-	=	90 – 92.9	D+	=	67 – 69.9
B+	=	87 – 89.9	D	=	63 – 66.9
B	=	83 – 86.9	D-	=	60 – 62.9
B-	=	80 – 82.9	F	=	<59.9
C+	=	77 – 79.9			
C	=	73 – 76.9			

ATTENDANCE is mandatory based on the College's policy. Both lecture and laboratory! Attendance will be taken at each session. You must e-mail your instructor the day you are absent and let him/her know the reason you are not attending class, and especially on a day that there is an exam scheduled.

EXAMINATION MAKE-UP POLICIES

LECTURE EXAMS There are four (4) major exams. If you are absent for any exam, a make-up will be permitted on your own time. Make-ups for exams will be administered only after documented absence (doctor's note, etc.). The make-up exams tend to be considerably more difficult than the scheduled exam. **Please bring a No. 2 pencil and eraser to all exams.**

WRITING ASSIGNMENTS

This class will be depositing student work for this semester in the e-digication platform. The assignment meets the global learning competency and writing ability.

- **Global aspects of the disease**. How health departments and/or governments may manage the diseases or conditions. Include aspects such as healthcare and prevention of disease spreading (quarantines in the case of epidemics or pandemics etc.).

-**Understanding Global Systems**. What sorts of global issues are driving this problem? – E.g. Factory farming, climate change etc. What possible social issues can arise from the disease or condition, e.g. social stigmatism, changes in health care laws?

-**Your perspective/understanding about the social impacts of the disease.**

Other details of the writing assignments will be given by your instructor.
For information about how to deposit student work, go to:

https://support.digication.com/hc/en-us/articles/115000074591-New-Digication-Submitting-your-ePortfolio-to-an-Assignment [support.digication.com]. **You must deposit your term paper on the assessment section for this course.**

LABORATORY EXAMS – 4 exams = 3 written and 1 practical

If you are absent or late, there will be no make-ups permitted. However, the **lowest exam grade**

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LABORATORY SAFETY (Dress code/ Personal Protective Equipment)

- Students participating in microbiology labs must have their own lab coat for every lab. No exceptions.
- No open-toed shoes are allowed in the lab.
- Gloves are required for standard lab procedures *if proper hand hygiene is performed*; however students should wear gloves if their hands have fresh cuts or abrasions. Proper hand hygiene involves thorough hand washing prior to and immediately after finishing handling microorganisms.
- Safety glasses/ goggles are not required for standard lab procedures but they are permitted. It is recommended that students do not wear contact lenses to lab to prevent the risk of contamination; instead corrective lenses should be worn underneath a pair of splash-resistant safety goggles.
- **Students not following the laboratory dress code and safety guidelines will not be permitted to attend the lab.**

POLICY ON CHEATING

Instructors of this course are required to implement College policy regarding cheating on examinations and quizzes. A complete statement is available through student counseling services.

A synopsis is as follows:

If an instructor suspects a student of cheating, or any of the violations listed below, the instructor will inform the student of his or her suspicion, and a student/teacher conference will be held. At that conference the suspected violation and the instructor's intended penalty for the violation will be discussed.

1. Give the student a copy of the STUDENT HANDOUT ON LAGUARDIA ACADEMIC INTEGRITY POLICY (this document) and answer any questions the student may have.
2. Inform the student of the reasons for his or her suspicions and the intended penalties. These penalties may include, but are not limited to, the following:
    a. An "F" on the paper, quiz, assignment or examination involved
    b. And an "F" for the course.
3. If the student admits guilt, and agrees on the penalty, he/she should indicate so on the formal complaint. The instructor will then send the complaint to the Office of Academic Standing and impose the penalty.
4. If the student does not admit guilt or agrees to the penalty, the student/teacher conference will end and a hearing on the issue must be held. The instructor will then submit the complaint to the Office of Academic Standing, which will send a copy to the Dean of Students who will then begin disciplinary proceedings.

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INCOMPLETE POLICY

The following is the policy on incomplete grades. There will be no exceptions to the rule.

An incomplete grade is assigned **ONLY if ALL** of the following conditions have been met:

- The student is missing only one assignment or exam.
- The student has complied with the attendance policy.
- The student presents the instructor with documentation explaining the reason he/she is unable to complete the assignment before the end of the semester.
- The student has maintained a grade of C or higher at the time the incomplete is given
- A student will not be given an incomplete if the student does not attend class or contact the instructor at the end of the semester.
- Both student and instructor must complete an Incomplete Contract.

Additional Information

Office hours

- Will be announced by instructor.

Quiz dates/Assignment due dates

- The days and times of the quizzes and exams will be announced well in advance.

College Calendar

- In order to allow for school holidays, it is often necessary to hold classes on days of the week other than those originally scheduled. Consult the College Catalog for changes.

Official Withdrawal Date

- Consult the College Catalog for Official Withdrawal Date.

Student Rights and Responsibilities

- Consult the Student Handbook and College Catalog.

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INSTRUCTIONAL OBJECTIVES

1. Introduce students to the field of microbiology, including its history and medical, economic and scientific importance.

2. Familiarize students with the diversity and classification of microorganisms, including Viruses, Bacteria, Archaea, Fungi, Protists, parasitic Helminths and Prions.

3. Reinforce students' knowledge of the functional anatomy of viruses, prions and unicellular organisms (prokaryotic and eukaryotic).

4. Familiarize students with techniques for the safe collection, handling and processing of potentially pathogenic microbial samples.

5. Familiarize students with microbiological techniques for the identification of microorganisms, including enrichment culture, differential staining, fermentation, other metabolic tests and microbial control methods

6. Introduce students to the principles of epidemiology and public health, and their importance in monitoring and controlling the spread of diseases.

7. Reinforce students' knowledge of emerging infectious diseases and immunity.

8. Familiarize students with the diverse methods by which the human immune system protects individuals from pathogens.

9. Reinforce students' skills of literature research and writing through a written term paper based on emergent infectious diseases and their global impacts.

10. Reinforce students' knowledge of laboratory and library research methods in microbiology, including the use of online databases and electronic resources.

11. Familiarize students with the preparation of written reports and oral presentations based on the results of scientific investigations.

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PERFORMANCE OBJECTIVES

1. Describe the field of microbiology, including its history and medical, economic and scientific importance.

2. Explain the diversity and classification of microorganisms, including Viruses, Bacteria, Archaea, Fungi, Protists, parasitic Helminths and Prions.

3. Describe the functional anatomy of viruses, prions and unicellular organisms (prokaryotic and eukaryotic).

4. Illustrate techniques for the safe collection, handling and processing of potentially pathogenic microbial samples.

5. Explain microbiological techniques for the identification of microorganisms, including enrichment culture, differential staining, fermentation, other metabolic tests and microbial control methods.

6. Explain the principles of epidemiology and public health, and their importance in monitoring and controlling the spread of diseases.

7. Define emerging infectious diseases and immunity.

8. Compare and contrast the diverse methods by which the human immune system protects individuals from pathogens.

9. Write a term paper based on an emerging infectious disease and address its global impacts.

10. Use laboratory and library research methods in microbiology, including online databases and electronic resources.

11. Prepare and deliver written reports and oral presentations based on the results of scientific investigations.

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LECTURE OUTLINE

Timeline	Lecture Topics for the Week	Readings from Tortora
Week 1	A History of Microbial Life, Chemical Principles A Survey of Microbial Life ***… Listen to Podcast - The Microbes Inside...** **http://www.wnyc.org/story/249498-please-explain-microbes-inside/**	Ch. 1; 2 (36-46); Appendix D & F
Week 2	Functional Anatomy of Prokaryotic & Eukaryotic cells **Quiz # 1**	Ch. 4
Week 3	Microbial Metabolism Microbial Growth	Ch. 5; Ch. 6; Appendix A
Week 4	**Exam 1 (Ch.1,2,4,5,6)** Classification of Microorganisms ***…Listen to podcast – How Urban Living Changes the Commensals….** **http://www.wnyc.org/story/149150-please-explain-urban-evolution/** The Prokaryotes	Ch. 10; 11.
Week 5	The Eukaryotes	Ch. 12;
Week 6	Viruses, Viroids & Prions **Homework**	Ch. 13;
Week 7	**Exam 2 (Ch.10,11,12,13)** Control of Microbial Growth Antimicrobial Drugs	Ch. 7; Ch. 20
Week 8	Principles of Disease & Epidemiology **Term Paper Due on: TBA**	Ch. 14; Ch. 15
Week 9	Microbial Mechanisms of Pathogenicity Innate Immunity	Ch. 16
Week 10	**Exam 3 (Ch.7,20,14,15)** Adaptive Immunity **Case study**	Ch. 17
Week 11	Practical Applications of Immunology	Ch. 18;
Week 12	Disorders of the Immune System	Ch. 19;
Finals Week	**Exam 4 (Ch. 16,17,18,19)**	

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LABORATORY OUTLINE

Lab #	Leboffe Ex #	TOPICS & Exercises
Wk 1 Lab 1	Lab Safety ppt Introduction(p.1-9) 3.1 3.2 3.3	**Lab Safety** • Lab Safety ppt **Microscopy** • Introduction to the Light Microscope (3.1) • Calibration of the Ocular Micrometer (3.2) • Examination of Eukaryotic Microbes (3.3)
Wk 2 Lab 2	1.3 (theory only) 1.4 1.5 1.5 6.2	**Aseptic Technique** • Nutrient broth and Agar preparation • Aseptic Transfer & Inoculation (1.4) • Streak Plate Methods of Isolation (1.5) • Spread Plate Method (1.6) • Standard Plate Count (6.2)
Wk 3 Lab 3	2.2 2.3 2.4 3.4 3.5 3.6 3.10	**Record results (1.4,1.5,6.2 and refer to 2.2,2.3 & 2.4)** • Colony Morphology (2.2) • Growth Patterns on Slants (2.3) • Growth patterns in broth (2.4) **Staining Techniques:** • Preparation of smears and simple staining (3.4) • Negative staining (3.5) • Gram staining (3.6) • Wet Mount & Hanging Drop Preparations/Flagella movement (3.10)
Wk 4 Lab 4	3.7 3.8 3.9	**Staining Techniques (cont.)** • Acid Fast Staining (3.7) **Structural Staining Techniques:** • Capsule Staining (3.8) • Endospore Staining (3.9)
Wk 5 Lab 5	2.1 3.12	**Microbes in the Environment (handout)** • Ubiquity of Microorganism (2.1) (theory only) • **Start Morphological Unknown (3.12) - Determine the morphology, Gram reaction and any special structures present or produced by microbe (endospore, acid fast, capsule)** • **Submit a hypothesis by lab # 6 of the organisms you think you will identify based on the staining techniques performed in this lab. Your instructor will guide you on this task.**
Wk 6 Lab 6	Handout (2.1) 2.6 2.7 2.8 2.9 4.3 4.4 4.5	**Gram Stain for Microbes in the Environment (handout lab # 5)** **Oxygen and the growth of bacteria** • Fluid Thioglycollate Medium (2.6) • Anaerobic Jar (2.7) • Temperature response (2.8) • Effect of pH (2.9) **Selective media for isolating bacteria** • Mannitol Salt Agar (4.3) • MacConkey Agar (4.4) • Eosin Methylene Blue (4.5)

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Wk 7 Lab 7	5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8	**Record (2.6, 2.7, 2.8,2.9, 4.3, 4.4, 4.5)** **Subculture unknown in broth in TS slants and TS broth** **Selective Tests – Biochemical Tests** **Carbohydrate Catabolism Fermentation** • Glucose Oxidation-Fermentation Test (5.1) • Phenol Red Broth (5.2) • Methyl Red & Voges Proskauer Test (5.3) **Respiration** • Catalase Test (5.4) • Oxidase Test (5.5) • Nitrate Reduction Test (5.6) • Citrate Test (5.7) • Decarboxylation Test (5.8)
Wk 8 Lab 8	5.9 5.10 5.11 5.12 5.13 5.14 5.15 5.16 5.18 5.21	**Record (5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7 & 5.8)** **Biochemical tests continue** • Phenylalanine Deamination Test (5.9) **Hydrolytic Enzymes** • Bile Esculin (5.10) • Starch Hydrolysis (5.11) • Urea Hydrolysis (5.12) • Casein Hydrolysis (5.13) • Gelatin Hydrolysis (5.14) • DNA Hydrolysis (5.15) • Lipid Hydrolysis (5.16) **Combination Differential Media** • SIM Medium (5.18) (H_2S, Indole, Motility) • Blood Agar (5.21)
Wk 9 Lab 9	9.1 9.2 9.3	**Record (5.9-5.16, 5.18 & 5.21)** **Continue Individual Unknown Project – From lab 5** **Perform: Temperature, Aerotolerance & pH determination** Identification of Enterobacteriacea (9.1) Identification of Gram-positive cocci (9.2) Identification of Gram-positive rods (9.3)
Wk 10 Lab 10	2.12 8.3 2.13 7.2	**Record Preliminary Unknown experiment results** **Physical Methods of Control: UV Radiation** • Lethal Effect of UV Radiation (2.12) **(theory only)** • UV radiation – damage and repair (8.3) **Demo by Instructor** **Chemical Methods of Control (theory only-no experiment performed)** • Chemical Germicides: Disinfectants & Antiseptics (2.13) (theory only) **Chemical Methods of Control** • Antimicrobial Susceptibility Test (Kirby-Bauer Method) (7.2) • **Continue with Individual Unknown**
Wk 11 Lab 11	2.12 - theory only 8.3- instruct demo 2.13- theory only 7.2 – in groups	**Record results (7.2 & 8.3)** **Final lab for determination of Individual Unknowns – refer to exercises:** Identification of Enterobacteriacea (9.1) Identification of Gram-positive cocci (9.2) Identification of Gram-positive rods (9.3) **Bergey's Manual of Determinative Bacteriology**

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Final Unknown identification report will be graded based on the following criteria:

a) **Organizational and technical skills**, which will be reflected on the ability to isolate, identify, characterize, and keep your organism free from contaminants.
b) **Hypothesis** – **What** do you intend to find out with this project? **Why** do you think you will have the type of organism you have isolated and are hypothesizing about? **How** are you planning to narrow down the genus and species of the microbe you are identifying?
c) **Coherent organization of scientific research project** – development and rationale about whether your proposed hypothesis was proven or not based on your data collected (experimentation), results (outcomes of experiments) observations, and discussion/conclusion.
d) **Your perspective on the project** and the broader impacts in the field of microbiology or how this changes your view about microbes in your live and/or the application in your career.

The final paper should include the following

1. **An introduction with stated hypothesis** - A short introduction stating the goal of the project
2. **Methods** (Gram reaction, and other type of staining if applicable, temperatures, biochemical tests, etc)
3. **Results** – provide evidence of experiments done - pictures may be included, but not required- tables, etc
4. **Discussion/conclusion** - the concluded results of genus and species. The claim must be backed up by results outcomes (positive, negative, and why they think they have that organism) - in other words, results and identification have to make sense. Did you disprove the hypothesis proposed after you performed your morphological unknown during lab 5?

Identifying the wrong organism does not mean failing the project. You worked hard trying to achieve your goal, it means points are taking off from the original 20 points the assignment is worth.

After considering the points above, final Unknown reports are graded in the following way:

- Correct genus and species = 20 points
- Correct genus and wrong species = 18 points
- Incorrect genus, incorrect species, correct Gram reaction, Same taxonomic group (ex. Enterobacteriacea or Bacillales and 90% of tests accurate = 17 points
- Incorrect genus, incorrect species, correct Gram reaction, 80% of tests accurate = 16 points
- Incorrect genus, incorrect species, correct Gram reaction, 70% of tests accurate = 15 points
- Incorrect genus, incorrect species, incorrect Gram reaction 50% of tests accurate = 14 points
- Incorrect genus, incorrect species, incorrect Gram reaction, less than 50% of tests accurate = 1-13 points

Scoring:

Excellent 90-100% - The student performs all the skills thoroughly and fully understands exceptional understanding of the key features of the skills and project. **Contains no errors**
Good – 80-89% - The student performs almost all the skills and parts fully and demonstrates understanding of the key features of the skills and project **with minimal errors.**
Fair – 70-79% - The student minimally fulfills the major component of the skills and project and parts **with multiple errors.**
Poor – 0-69% - The student performs **multiple significant errors** in fulfilling the major components of the project and skills.