



Course Syllabus

Microbiology

BIOL 2420

**Semester with Course
Reference Number (CRN)**

Summer II 2013 (July 08 – August 11)
44753

**Instructor contact
information (phone number
and email address)**

Dr. Olumide Ogunmosin
(713) 718-2432
olumide.ogunmosin@hccs.edu

Office Location and Hours

By appointment only

Course Location/Times

Northeast College - Northline Campus
MW Lecture 12:45pm – 05:30pm Rm 309
TuTh Laboratory 12:45pm – 05:30pm Rm 309

**Course Semester Credit
Hours (SCH) (lecture, lab) If
applicable**

Credit Hours	4.00
Lecture Hours	3.00
Laboratory Hours	3.00

Total Course Contact Hours

96.00

**Course Length (number of
weeks)**

5

Instructional Method:

In-Class Lecture (web enhanced)

Course Description:

Study of microorganisms including morphology, metabolism, taxonomy, culture techniques, microbial genetics, immunology, bacteriology, virology, mycology, parasitology, and diseases. Core Curriculum course

Course Prerequisite(s)**PREREQUISITE(S):**

- BIOL 1406
- College-level reading (or take GUST 0342)
- College-level writing (or take ENGL 0310/0349)

**Academic Discipline/CTE
Program Learning Outcomes****Course Student Learning
Outcomes (SLO): 4 to 7**

1. Explain microbial evolution, microbial diversity on earth, and environmental impact of microbes.
2. Understand microbial cell biology and genetics including, cellular structure and function, cell division and growth, metabolism, mutations, and inheritance.
3. Recognize Microbe-Human Interactions including, host non-specific defenses, adaptive immunity, chemotherapy (antibiotics), pathogenesis, and disease transmission.
4. Apply basics of biotechnology and genetic engineering, to provide an understanding of the importance of molecular methods in the construction of microbial products for scientific, medical, and industrial uses.
5. Apply microbiology laboratory safety rules and maintain lab equipment and lab environment in accordance with those rules.
6. Perform standard microbiological lab techniques including, use of the bright field microscope, aseptic technique, smear preparation and staining, inoculation/streaking techniques, media preparation, serial dilutions, and incubation protocols.

**Learning Objectives
(Numbering system should
be linked to SLO - e.g., 1.1,
1.2, 1.3, etc.)**

Explain microbial evolution, microbial diversity on earth, and environmental impact of microbes.
Understand microbial cell biology and genetics including, cellular structure and function, cell division and growth, metabolism, mutations, and inheritance.
Recognize Microbe-Human Interactions including, host non-specific defenses, adaptive immunity, chemotherapy (antibiotics), pathogenesis, and disease transmission.

Apply basics of biotechnology and genetic engineering, to provide an understanding of the importance of molecular methods in the construction of microbial products for scientific, medical, and industrial uses.

Apply microbiology laboratory safety rules and maintain lab equipment and lab environment in accordance with those rules.

Perform standard microbiological lab techniques including, use of the bright field microscope, aseptic technique, smear preparation and staining, inoculation/streaking techniques, media preparation, serial dilutions, and incubation protocols.

Student Assignments

Explain microbial evolution, microbial diversity on earth, and environmental impact of microbes.

Chapter assessment

Understand microbial cell biology and genetics including, cellular structure and function, cell division and growth, metabolism, mutations, and inheritance.

Chapter assessment

Recognize Microbe-Human Interactions including, host non-specific defenses, adaptive immunity, chemotherapy (antibiotics), pathogenesis, and disease transmission.

Chapter assessment

Apply basics of biotechnology and genetic engineering, to provide an understanding of the importance of molecular methods in the construction of microbial products for scientific, medical, and industrial uses.

Chapter assessment

Apply microbiology laboratory safety rules and maintain lab equipment and lab environment in accordance with those rules.

Chapter assessment

Perform standard microbiological lab techniques including, use of the bright field microscope, aseptic technique, smear preparation and staining, inoculation/streaking techniques, media preparation, serial dilutions, and incubation protocols.

	Chapter assessment
Student Assessment(s)	<p>Explain microbial evolution, microbial diversity on earth, and environmental impact of microbes.</p> <p>Chapter assessment</p> <p>Understand microbial cell biology and genetics including, cellular structure and function, cell division and growth, metabolism, mutations, and inheritance.</p> <p>Chapter assessment</p> <p>Recognize Microbe-Human Interactions including, host non-specific defenses, adaptive immunity, chemotherapy (antibiotics), pathogenesis, and disease transmission.</p> <p>Chapter assessment</p> <p>Apply basics of biotechnology and genetic engineering, to provide an understanding of the importance of molecular methods in the construction of microbial products for scientific, medical, and industrial uses.</p> <p>Chapter assessment</p> <p>Apply microbiology laboratory safety rules and maintain lab equipment and lab environment in accordance with those rules.</p> <p>Chapter assessment</p> <p>Perform standard microbiological lab techniques including, use of the bright field microscope, aseptic technique, smear preparation and staining, inoculation/streaking techniques, media preparation, serial dilutions, and incubation protocols.</p> <p>Chapter assessment</p>

Instructor's Requirements

There will be an **assessment on each chapter, two 2-hour examinations (on campus), one 2-hour final examination (on campus) and one laboratory examination.** Computer literacy is necessary as students will be required to obtain course materials from the HCC "Eagle Online" website.

Students are expected to attend all class and laboratory sessions. It is the student's responsibility to always sign his/her name on the attendance sheet. Any student that is more than 1 hour late to class or laboratory is considered to be absent and will not be allowed to sign his/her name on the attendance sheet.

2 points shall be deducted from the final laboratory report grade for each laboratory session missed. There will be no make-up examination unless there is a genuine excuse supported by an acceptable documentation in which case the student must make up the missed examination within one week of the time of the exam. Any student with more than a total of **3 absences** in class and laboratory sessions combined will be administratively withdrawn from the class. Chapter assessments must be submitted on due dates. There will be no time extension on any chapter assessment due date under any circumstance. Laboratory reports not submitted on the due date will attract a penalty of **2 points if submitted on the next day after the due date and an additional 1 point for each day thereafter**. The penalty points shall be deducted from the laboratory reports grade. To minimize distractions in class and laboratory, students must turn off their cell phones or put them in the vibrate mode. Eating and drinking are not allowed in the classroom and laboratory. Any form of foul language is strictly prohibited.

Please allow at least 48 hours for responses to your phone calls and emails.

Students must adhere to the rules and policies in the Houston Community College student handbook.

Last day for students to administratively withdraw from course is 4:30pm on Monday, July 29, 2013.

HCC Grading Scale

A = 100- 90	4 points per semester hour
B = 89 - 80:	3 points per semester hour
C = 79 - 70:	2 points per semester hour
D = 69 - 60:	1 point per semester hour
59 and below = F	0 points per semester hour
IP (In Progress)	0 points per semester hour
W(Withdrawn)	0 points per semester hour
I (Incomplete)	0 points per semester hour
AUD (Audit)	0 points per semester hour

IP (In Progress) is given only in certain developmental courses. The student must re-enroll to receive credit. COM (Completed) is given in non-credit and continuing education courses. To compute grade point average (GPA), divide the total grade points by the total number of semester hours attempted. The grades "IP," "COM" and "I" do not affect GPA.

For Health Science programs, see the Program/Discipline Requirements section for specific grading requirements.

Instructor Grading Criteria	Chapter assessments	25%
	Examination 1 (chapters 1 – 5)	15%
	Examination 2 (chapters 6 – 12)	15%
	Final examination (chapters 13 – 17)	15%
	Laboratory examination	10%
	Laboratory reports	20%

Instructional Materials
Textbook: Foundations In Microbiology, 8th Edition, Kathleen Park Talaro McGraw Hill
LAB Manual: Lab Manual For Microbiology 2420, 5th Edition. Edited by: Donna Wiersema & Permila Sen, 2007

HCC Student Policy <http://hccs.edu/student-rights>

HCC ADA Statement: Any student with a documented disability (e.g. physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the Disability Services Office at the northeast college at the beginning of each semester. Faculty is authorized to provide only the accommodations requested by the Disability Support Services Office.

ADA counselor contact information:

Kim Ingram
(713)718 - 8420
Room 122.2 Northline campus
8001 Fulton Street, Houston, TX. 77022

LECTURE TOPICS

Chapter 1	The Main Theme of Microbiology
Chapter 2	The Chemistry of Biology
Chapter 3	Tools of the Laboratory: The methods for Studying Microorganisms
Chapter 4	A Survey of Prokaryotic Cells and Microorganisms
Chapter 5	A Survey of Eukaryotic Cells and Microorganisms
Chapter 6	An Introduction to Viruses
Chapter 7	Elements of Microbial Nutrition, Ecology, and Growth
Chapter 8	An Introduction to Microbial Metabolism: The Chemical Crossroads of Life
Chapter 9	Microbial Genetics
Chapter 10	Genetic Engineering: A Revolution in Molecular Biology
Chapter 11	Physical and Chemical Agents for Microbial Control
Chapter 12	Drugs, Microbes, Host – The Elements of Chemotherapy
Chapter 13	Microbe – Human Interactions: Infection and Disease
Chapter 14	Host defenses: Overview and Nonspecific Defenses
Chapter 15	Adaptive, Specific Immunity and Immunization
Chapter 16	Disorders in Immunity
Chapter 17	Diagnosing Infections

LABORATORY EXERCISES

- | | |
|-------------|---|
| Exercise 1 | Care and Use of the microscope |
| Exercise 2 | Smear Preparation, Simple Staining and Bacterial Morphology |
| Exercise 3 | Negative Staining |
| Exercise 4 | Isolation of Bacteria Using the Streak Plate Method |
| Exercise 5 | Gram Staining |
| Exercise 6 | Acid-Fast Staining |
| Exercise 7 | Bacterial Endospores |
| Exercise 8 | Bacterial Capsules |
| Exercise 9 | Bacterial Flagella and Motility Testing |
| Exercise 10 | Selective, Differential, and Enriched Media |
| Exercise 11 | Gas Requirements for the Growth of Bacteria |
| Exercise 12 | Counting Bacteria in Milk Using the Pour-Plate Method |
| Exercise 13 | Control of Microbial Populations: Effects of Heat |
| Exercise 14 | Control of Microbial Populations: Effects of Chemicals |
| Exercise 15 | Carbohydrate Fermentation by Bacteria |
| Exercise 16 | Triple Sugar Iron (TSI) Fermentation Test |
| Exercise 17 | The IMViC Biochemical Tests |
| Exercise 18 | Rapid and Miniaturized Methods for Identification of Bacteria |
| Exercise 19 | Bacteriophages |
| Exercise 20 | Immune System: White Blood Cells |
| Exercise 21 | Antibiotic Sensitivity Testing: Kirby-Bauer Method |

EXAMINATIONS

EXAMINATIONS

Chapters covered

Each chapter has a 30-question assessment (Deadline Wednesday 8/7/2013)

EXAM 1 (100 questions) **1, 3, 4, 5** **in class (Monday 7/22/2013)**

EXAM 2 (100 questions) **6, 7, 8, 11** **in class (Thursday 8/1/2013)**

EXAM 3 (100 questions) **12, 13, 14, 15** **in class (Thursday 8/8/2013)**

SESSION 1

TOPIC TO BE COVERED

Chapter 1

The Main Themes of Microbiology

Chapter 2

The Chemistry of Biology

Chapter 3

Tools of the Laboratory

SUGGESTED ACTIVITY

Distribute course syllabus and materials

INSTRUCTIONAL OBJECTIVES

1. To discuss the benefits and risks of microorganisms in everyday life.
2. To understand the scope and significance of studying microbiology, including the kinds of microorganisms.
3. To learn the general characteristics of the different types of microbes.
4. To glimpse the historical foundations of microbiology.
5. To discover the basis for and significance of organizing, classifying and naming microorganisms.
6. To discuss strategies for studying microbes.
7. To study various methods for identification and classification of microbes including macroscopic colony observation, staining techniques, and biochemical reactions.
8. To learn basic principles of light and electron microscopy.
9. To Describe the types of media used for cultivation of microbes.

SESSION 2

TOPIC TO BE COVERED

**Laboratory Exercise 1
Care and Use of the Microscope**

Departmental Laboratory Safety Rules and Regulations

INSTRUCTIONAL
OBJECTIVES

Each laboratory exercise has specific objectives to be discussed with the students.

SESSION 3

TOPIC TO BE COVERED

**Chapter 4
A Survey of Prokaryotic Cells and Microorganisms**

INSTRUCTIONAL
OBJECTIVES

1. To describe the general external and internal cellular structures of a prokaryotic cell.
2. To describe the various shapes, arrangements, and dimensions of bacterial cells.
3. To introduce more sophisticated bacterial classification and identification methods including: serological analysis, genetic and molecular analysis, DNA sequence analysis, and rRNA analysis.
4. To survey groups of bacteria bearing unusual characteristics.

SESSION 4

TOPIC TO BE COVERED

**Laboratory Exercise 2
Simple Staining and Bacterial Morphology
Laboratory Exercise 3
Negative Staining**

SESSION 5

TOPIC TO BE COVERED

**Chapter 5
A Survey of Eukaryotic Cells and Microorganisms**

INSTRUCTIONAL
OBJECTIVES

1. To theorize as to the evolution of the eucaryotic cell.
2. To review eukaryotic cell structure and organelle function.
3. To discuss Kingdom Mycetae(Fungi) and fungal diseases that affect man.
4. To discuss important protozoal diseases of man.
5. To survey the multitude and diversity among the eucaryotic

microbial world, with a focus on the different styles of nutrition and habitat, locomotion, life cycles, and human disease.

SESSION 6

TOPIC TO BE COVERED

**Laboratory Exercise 4
Isolation of Bacteria Using the Streak Plate Method
Laboratory Exercise 5
Gram Staining**

EXAMINATION 1-Chapters 1, 3, 4, 5 (Monday July 22nd, 2013)

SESSION 7

TOPIC TO BE COVERED

**Chapter 6
An Introduction to the Viruses**

INSTRUCTIONAL
OBJECTIVES

1. To understand the virus as an obligate intracellular parasite.
2. To study the general structures and components of viruses.
3. To classify viruses into groups.
4. To learn different modes and host ranges of viral replication.
5. To describe cultivation of animal viruses.
6. To discuss the impact of viruses human health and potential treatments.

SESSION 8

TOPIC TO BE COVERED

**Laboratory Exercise 6
Acid-Fast Staining
Laboratory Exercise 7
Bacterial Spores**

SESSION 9

TOPIC TO BE COVERED

**Laboratory Exercise 8
Bacterial Capsules
Laboratory Exercise 9
Bacterial Flagella and Motility Testing**

SESSION 10

TOPIC TO BE COVERED

INSTRUCTIONAL
OBJECTIVES

Chapter 7

Elements of Microbial Nutrition, Ecology and Growth

1. To learn the many organic and inorganic nutritional requirements of microbes.
2. To understand various strategies that different microbes use to obtain nutrients.
3. To discuss the environmental factors that influence growth and survival of microorganisms.
4. To describe the bacterial growth curve.
5. To discuss methods for analyzing microbial growth.

SESSION 11

TOPIC TO BE COVERED

Chapter 8

An Introduction to Metabolism: The Chemical Crossroads of Life

Laboratory Exercise 11

Laboratory Exercise 10

Selective, Differential, and Enriched Media

Gas Requirements for the Growth of Bacteria

SESSION 12

TOPIC TO BE COVERED

INSTRUCTIONAL
OBJECTIVES

Chapter 9

Microbial Genetics

1. To study the basics of heredity, genetics and genes.
2. To learn how DNA is transcribed into RNA and RNA is translated into protein.
3. To discuss how protein synthesis and metabolism are controlled in microorganisms.
4. To understand how various changes and exchanges in microbial DNA can arise.

SESSION 13

TOPIC TO BE COVERED

Laboratory Exercise 12

Counting Bacterial in Milk Using Pour-Plate Method

SESSION 14

TOPIC TO BE COVERED

Chapter 10

Genetic Engineering: A Revolution in Molecular Biology

INSTRUCTIONAL
OBJECTIVES

1. To survey the basic elements and applications of Genetic Engineering.
2. To learn the tools and techniques of Genetic Engineering.
3. To describe the methods for gene cloning and recombination.
4. To discuss the benefits of the products of Genetic Engineering.
5. To learn how scientists create recombinant plants and animals and how these organisms can benefit us.
6. To introduce ways in which DNA can be exploited as medicine.
7. To survey methods for analyzing the makeup and mechanisms of the human body.

SESSION 15

TOPIC TO BE COVERED

Chapter 11

Physical and Chemical Control of Microbes

EXAMINATION 2 – Chapters 6, 7, 8, 11 (Thursday, August 1st 2013)

SESSION 16

TOPIC TO BE COVERED

Chapter 12

Drugs, Microbes, Host -- The Elements of Chemotherapy

INSTRUCTIONAL
OBJECTIVES

1. To understand how the growth of microorganisms is controlled, including what is microbial death and the modes of action of antimicrobial agents.
2. To survey physical methods of controlling microbes.
3. To discuss chemical methods of controlling microbes.
4. To study the principles of antimicrobial therapy.
5. To describe the interactions between drug and microbe.
6. To survey the various groups of antimicrobial drugs.
7. To understand the characteristics of host/drug interactions.
8. To learn the considerations in the selection of an antimicrobial agent.

SESSION 17

TOPIC TO BE COVERED

**Laboratory Exercise 13
Control of Microbial Populations:
Effect of Heat**

SESSION 18

TOPIC TO BE COVERED

**Laboratory Exercise 14
Control of Microbial Populations:
Effects of Chemicals
Laboratory Exercise 21
Antibiotic Sensitivity Testing: Kirby-Bauer Method**

SESSION 19

TOPIC TO BE COVERED

**Chapter 13
Microbe-Human Interactions: Infection and Disease**

INSTRUCTIONAL
OBJECTIVES

1. To survey the human as host to resident flora.
2. To understand the progression of an infection from route of entry, to mechanisms of invasion and establishment, to microbial resistance factors, to signs and symptoms of human disease, to route of exit.
3. To introduce principles of epidemiology.
4. To review Koch's Postulates.

SESSION 20

TOPIC TO BE COVERED

**Laboratory Exercise 15
Carbohydrate Fermentation by Bacteria
Laboratory Exercise 16
Triple Sugar Iron (TSI) Fermentation Test**

SESSION 21

TOPIC TO BE COVERED

**Chapter 14
The Nature of Host Defenses**

INSTRUCTIONAL
OBJECTIVES

1. To realize the first line of host defense against microbial infection.
2. To understand the molecular basis of the immune response

- including surveillance, recognition, and destruction.
3. To survey the body systems involved in the immune response.
 4. To discover the non-specific immune reactions of the body in response to microbial invasion.
 5. To introduce the specific immune system.

SESSION 22

TOPIC TO BE COVERED

Laboratory Exercise 17
The IMViC Biochemical Tests

SESSION 23

TOPIC TO BE COVERED

Chapter 15
Adaptive, Specific Immunity and Immunization

INSTRUCTIONAL
OBJECTIVES

1. To realize the dual nature of specific immunity: humoral and cell-mediated.
2. To understand underlying concepts of specific immunity, including the recognition of self and non-self, and the source of diversity and specificity.
3. To learn the complex involvement and responsibilities of lymphocytes in humoral and cell-mediated immunity.

SESSION 24

TOPIC TO BE COVERED

Laboratory Exercise 18
Rapid and Miniaturized Methods for Identification of Bacteria
Laboratory Exercise 19
Bacteriophages

SESSION 25

TOPIC TO BE COVERED

Chapter 16
Disorders in Immunity

INSTRUCTIONAL
OBJECTIVES

1. To survey the practical applications of immunological function. These include
 - Methods and principles of immunization
 - Principles of vaccine preparation
 - Strategies for new vaccines
 - Exploitation of immunological responses for

- obtaining clinical and research data
2. To introduce microbial diseases.
 3. To describe how an infectious agent is isolated from the patient, cultivated, and identified as the causative agent.

SESSION 26

TOPIC TO BE COVERED

Chapter 17
Disorders in Immunity

Laboratory Exercise 20
Immune System: White Blood Cells

SESSION 27

FINAL EXAMINATION - Chapters 12, 13, 14, 15 (Thursday August 8th, 2013)

LABORATORY EXAMINATION (Thursday August 8th, 2013)