Degree Applicable

Glendale Community College
October, 2013

COURSE OUTLINE

Biology 112
Microbiology

I. Catalog Statement

Biology 112 is a study of microorganisms (algae, bacteria, fungi, protozoa, and viruses). The course includes microbial biochemistry, genetics, cellular activities, applied uses, and the pathogenicity of these microorganisms. In the laboratory, students utilize various staining procedures and biochemical tests to identify at least one unknown microorganism.

Total Lecture Units: 3.0
Total Laboratory Units: 2.0
Total Course Units: 5.0

Total Lecture Hours: 48.0
Total Laboratory Hours: 96.0
Total Faculty Contact Hours: 144.0

Prerequisite: Chemistry 101, or Chemistry 110, or Chemistry 120

II. Course Entry Expectations

Skill Level Ranges: Reading 5; Writing 5; Listening/Speaking 5; Math 4.

Prior to enrolling in the course, the student should be able to:
1. describe chemical processes in terms of chemical equations and be able to use the equations to answer quantitative questions concerning the process described;
2. analyze modern theories of atomic motion, especially as they apply to gases;
3. utilize bonding theories to describe the chemical nature of ions and molecules;
4. know the chemical structures and function of the organic compounds found in living organisms;
5. demonstrate the proper use of laboratory equipment and the ability to handle chemicals safely.

III. Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:
1. demonstrate a general understanding of the taxonomy and major characteristics of the various microorganisms;
2. demonstrate general knowledge of the physical and chemical structure of prokaryotes

and eukaryotes;

3. demonstrate an understanding of the biochemical processes of the cell, including cell respiration, DNA replication, genetic recombination, transcription, translation, and cellular transport;
4. demonstrate an understanding of the physical and chemical methods and mechanisms used to control microbial growth;
5. demonstrate an understanding of the disease process of various microorganisms;
6. demonstrate proper aseptic techniques and proficiency in performing various staining procedures and biochemical tests on microorganisms.

IV. <u>Course Content</u> **Total Faculty Contact Hours = 144 Hrs**

A. Introduction and History of Microbiology — 1.5 lecture hrs
   1. The golden age of microbiology
   2. 20th and 21st century microbiology
   3. Diversity of microorganisms
   4. Beneficial applications of microbiology

B. Important Biological Molecules — 1.5 lecture hrs
   1. Inorganic compounds
   2. Organic compounds

C. Microscopic Techniques — 5.5 lecture hrs, 34.5 laboratory hrs
   1. Microscope types and functions
   2. Staining methods

D. Comparison of Prokaryotic and Eukaryotic Cells — 3 lecture hrs, 6 laboratory hrs
   1. Structures of prokaryotic cell
   2. Structures of eukaryotic cell

E. Microbial Metabolism — 3 lecture hrs, 12 laboratory hrs
   1. Enzymes
   2. Biochemical pathways of energy production
   3. Fermentation end products
   4. Photosynthesis

F. Microbial Growth — 6 lecture hrs, 6 laboratory hrs
   1. Requirements for growth
   2. Culture media
   3. Phases of growth
   4. Direct and indirect measurements of growth

G.	Control of Microbial Growth	3 lecture hrs
	1. Physical methods of microbial control	9 laboratory hrs
	2. Chemical methods of microbial control	
	3. Actions of microbial control agents	
H.	Microbial Genetics	6 lecture hrs
	1. DNA replication	6 laboratory hrs
	2. Transcription and translation	
	3. Regulation of gene expression	
	4. Gene mutations	
	5. Transformation	
	6. Transduction	
	7. Conjugation	
	8. Genetic recombination	
I.	Recombinant DNA and Biotechnology	2 lecture hrs
	1. Restriction enzymes	
	2. Vectors and sources of DNA	
	3. Applications of genetic engineering	
	4. Genetically engineered products for medical therapy	
J.	Microbial Classification and Identification	1.5 lecture hrs
	1. Criteria for classifying and identifying microorganisms	7.5 laboratory hrs
	2. Bergey's manual	
	3. Identification of unknown microorganisms	
K.	Bacteria	3 lecture hrs
	1. Classification of bacterial groups	6 laboratory hrs
	2. Pathogenic bacteria and the diseases they cause	
L.	Fungal Diseases	1 lecture hr
M.	Protozoa	1 lecture hr
		3 laboratory hrs
N.	Viruses	3 lecture hrs
	1. Classification	
	2. Viral structure	
	3. Isolation, cultivation, and identification of virus	
	4. Viral multiplication	
	5. Viruses and cancer	
	6. Latent and slow viral infections	

O.	Prions	0.5	lecture hr
P.	Epidemiology and Principles of Disease	3	lecture hrs
	1. Normal microbiota		
	2. Etiology of infectious diseases		
	3. Classifying infectious diseases		
	4. Transmission of diseases		
	5. Nosocomial infections		
Q.	Mechanisms of Pathogenicity	2	lecture hrs
	1. Portals of entry		
	2. Pathogens penetrate host defenses		
	3. Pathogens damage host cells		
R.	Antimicrobial Drugs	1.5	lecture hrs
	1. Action of antimicrobial drugs	6	laboratory hrs
	2. Survey of commonly used antimicrobial drugs		
	3. Antimicrobial sensitivity		

V. Methods of Instruction

The following methods of instruction may be used in the course:
1. lecture;
2. multimedia;
3. laboratory demonstrations.

VI. Out of Class Assignments

The following out of class assignments may be used in the course:
1. laboratory protocols (e.g. a written protocol that includes the title, purpose, materials needed, procedures, and expected results for each laboratory exercise);
2. unknown organism report (e.g. a written report of the data acquired from performing various tests on an organism and the identification of the organism).

VII. Methods of Evaluation

The following methods of evaluation may be used in the course:
1. written exams;
2. laboratory practicum exams;
3. unknown organism report.

VIII. Textbook(s)

Tortora, Gerard J., Berdell R. Funke, and Christine L. Case. *Microbiology An Introduction*. Boston: Pearson, 2013. Print.
14th Grade Textbook Reading Level. ISBN**:** 9780321767387

Black, Jacquelyn G. *Microbiology Principles and Explorations*. Hoboken: John Wiley and Sons, 2012. Print.
14th Grade Textbook Reading Level. ISBN: 9781118129234

IX. Student Learning Outcomes

Upon successful completion of the required coursework, the student will be able to:

1. explain the biochemical processes of cellular activities and/or explain the disease process as it relates to microbial infections;
2. demonstrate proficiency in various staining methods and/or biochemical tests used in identifying microorganisms.