GROSSMONT COLLEGE

COURSE OUTLINE OF RECORD

Curriculum Committee Approval: 05/18/2021

GCCCD Governing Board Approval: 06/15/2021

BIOLOGY 152 – PARAMEDICAL MICROBIOLOGY

1. Course Number Course Title Semester Units

BIO 152 Paramedical Microbiology 5

Semester Hours

3 hours lecture: 48-54 hours 96-108 outside of class hours 6 hours laboratory: 96-108

240-270 total hours

2. Course Prerequisites

A “C” grade or higher or Pass in Biology 120 or equivalent. Only Nursing majors may fulfill the BIO 120 prerequisite with one year of high school biology with a lab.

Corequisite

None

Recommended Preparation

A “C” grade or higher or Pass in Chemistry 115 or equivalent.

3. Catalog Description

An introduction to the major groups of microorganisms and the diseases they cause. Emphasis in the lecture and laboratory is on concepts and techniques relevant to students entering paramedical professions; identifying and handling bacteria, basic principles of immunology, medical microbiology, and epidemiology. Principles of microbial physiology, genetics, growth and control are also discussed. Biology 152 will also satisfy the introductory microbiology requirement needed by students who major in nursing and other paramedical fields leading to a B.S. or B.A. degree.

4. Course Objectives

The student will:

a. Recognize the importance of microorganisms to humans and the role of microbes in nature.

b. Examine the basic facts and principles of microbial structure, physiology, genetics and growth.

c. Describe the principles involved in host-parasite relationships, and the role of microbiology in public health and medicine.

d. Examine the basic facts about how microorganisms cause human diseases and the symptoms of those diseases.

e. Appraise the epidemiological and immunological aspects of infectious diseases.

f. Use and apply manual and technical skills necessary for the study of bacteriology and immunology in the laboratory.

g. Solve problems related to medical microbiology when they are encountered in the chosen medical field of the student. Consequently, the student will be a more effective medical worker by applying the knowledge gained in this course

5. Instructional Facilities

a. Standard Classroom

b. Special aids:

1) Standard microbiology laboratory with preparation support facilities.

2) Incubators: refrigerated, high temperature and water bath types.

3) Bacterial stock culture transfer and storage facilities.

4) Microbiological safety hood for work with pathogenic microorganisms.

6. Special Materials Required of Student

a. Lab coat, hip or knee length or long-sleeved smock.

b. Box of microscope slides.

d. Glass-marking pencils and pens--wax waterproof, and permanent, respectively.

e. Lens paper.

7. Course Content

a. Lecture

1) History of microbiology.

2) Microscopy and staining.

3) General characteristics of microbes.

a) Classification and survey of microbial world. Classification relationships between organisms are based on evolutionary history.

b) Cell structure: eukaryotic and prokaryotic, with emphasis on evolution of the cell.

c) Nature of viruses.

d) Nutrition and cultivation.

e) Physiology. The role of natural selection in determining the strategies and limits of

microbes is an inherent part of the discussion of these topics.

i) Energy generation--respiration, fermentation, photosynthesis.

ii) Energy consumption--biosynthesis.

f) Growth. The role of natural selection in determining the strategies and limits of

microbes is an inherent part of the discussion of these topics.

i) Measurement.

ii) Factors influencing growth.

4) Control of microbes.

a) Physical methods.

b) Chemical methods: disinfectant and antiseptics, including the evolution of resistance to control methods.

c) Biochemical methods: antibiotics and chemotherapeutic drugs, including the importance of artificial selection processes resulting from use of chemotherapeutic approaches to control.

5) Introduction to microbial genetics and drug resistance, including the evolution of resistance to control methods.

6) Principles of epidemiology.

7) Host-Parasite relationships. This relationship is investigated from an evolutionary perspective in terms of examining the interactions amongst humans and microbes, and microbes and microbes.

a) Factors of infection and virulence: invasiveness and toxigenicity.

b) Body defense mechanisms.

i) innate immunity: mechanical, chemical, phagocytosis, and inflammation.

ii) adaptive immunity, the Immunological response: antigens, antibodies,

immunological-serological reactions, the immune response, hypersensitivity and immune diseases.

b. Laboratory

Microscopy and Staining

1. General Characteristics of Microbes
2. Live specimens survey of major groups
3. General Nutrition and cultivation concepts
4. Hands-on aseptic transfer techniques

ii. Hands-on mixed culture isolation techniques

1. Physiology/Biochemical pathways
2. Bacterial identification methodologies
3. Growth
4. Control of Microbes
5. Physical methods
6. Chemical methods
7. Biochemical methods
8. Clinical laboratory methodologies

a) Special media and cultivation techniques, including multi-test systems

b) Gathering, processing/cultivation and testing of clinical specimens

c) Bacterial Identification techniques

4) Normal flora andInfectious disease of humans

a) Bacterial: of the skin, eye, ear, mouth, respiratory, gastrointestinal, urogenital, circulatory, nervous system

b) Fungal: superficial and systemic

c) Parasitic: protozoan, flatworm, round worm

d) Viral

8. Method of Instruction

a. Lectures, supplemented with overhead transparencies, and the usual A/V and computer-generated materials.

b. Laboratory demonstrations and explanations of procedures.

c. Performing various laboratory exercises and techniques following directions from a lab manual and instructor's explanations.

9. Methods of Evaluating Student Performance

a. Several combination format objective/written examinations, including a final examination. This requires students to use basic math skills, written and oral communication skills.

b. Six lab quizzes will be given to test students' knowledge of laboratory techniques and principles. Some quizzes require math skills up through basic algebra and including ratios and dilutions calculations. Others require students to use and organize data, form it into a table or graph, and draw conclusions based on that data.

c. Technique demonstrations will be done in which each student will be required to (1) satisfactorily prepare gram-stained, endospore-stained and acid fast-stained slides;(2) satisfactorily obtain pure culture isolations from a mixed population; and (3) satisfactorily identify several unknown cultures (this exercise requires the student to apply, independently, the skills and techniques learned during the entire laboratory portion of the course). These require students to use a combination of basic written and oral English communication skills.

10. Outside Class Assignments

a. Study assigned text chapters and lab manual exercises. This requires students to read college-level science textbooks.

b. Complete written lab reports identifying unknown cultures handed out to students in lab. Students demonstrate use of proper grammar, sentence structure and organization. Students demonstrate critical thinking skills as they show how they conclude their sample culture identity.

c. Answer questions in the study guides for the course material, as part of preparation for written lecture exams and lab quizzes. Students use a variety of resources, including textbook, lecture note packets and online resources.

d. Research an infectious disease topic, with a poster or oral presentation to the class. Students use primary and secondary literature sources from print or online materials.

e. Written homework assignments (as deemed necessary by the individual instructor) to keep students engaged in the material. Students use primary and secondary literature sources from print or online materials.

11. Representative Texts

a. Representative Text(s):

1) Cowan, M.K. *Microbiology: A Systems Approach*. Fifth Edition, or equivalent. New York, NY: McGraw-Hill Publishing. 2018

2)M.J. Leboffe and B.E. Pierce. 2018. *Microbiology Laboratory Theory and Application Brief, 3rd edition, Customized for Grossmont College*. ISBN: 978-1-64043-041-9

3) Perchez, Michele. *Paramedical Microbiology Biology 152 Lecture Note Packet*. El Cajon, CA: Grossmont College.

b. Supplementary texts and workbooks:

Alcamo, I. E. and L. M. Elson. *The Microbiology Coloring Book*. New York: Harper Collins, 1996.

Addendum: Student Learning Outcomes

Upon completion of this course, our students will be able to do the following:

* 1. create a pure culture from a mixed bacterial sample
  2. perform a successful Gram stain
  3. identify cell shape and arrangement of a bacterial sample
  4. perform aseptic transfers to maintain pure cultures
  5. calculate and create dilutions properly