



**MERCER**  
COUNTY COMMUNITY COLLEGE

## COURSE OUTLINE

Course Number	Course Title	Credits
<b>BIO 215</b>	<b>Principles of Microbiology</b>	<b>3</b>
Hours:	Co- or Pre-requisite	Implementation Semester & Year
Lecture/Lab/Other		
<b>3 lecture/0 laboratory</b>	CHE 100 and BIO 104 or BIO 106	<b>Fall 2022</b>

**Catalog description:** The study of the morphology, taxonomy, physiology, transmission, and control of microbes, especially those causing disease in humans. The process of infectious disease and defense mechanisms of disease covered as well as an introduction to the basic fundamental principles of organic chemistry and biochemistry. Designed for funeral education students and based on the most recent information in the American Board of Funeral Service Education Curriculum Guidelines.

**General Education Category:**

Goal 3: Science

**Course coordinator:**

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**Required texts & Other materials:**

Pathology and Microbiology for Mortuary Science, David Mullins and Bob Brennan, Funeral Service Education Resource Center, 2<sup>nd</sup> edition; ISBN 978-0-9979261-7-0

BIO215 Principles of Microbiology Course Manual, D.N. Hilker, MCCC Publisher, 3<sup>rd</sup> edition.

Information resources: MCCC library website for database of holdings:

[http://www.mccc.edu/student\\_library.shtml](http://www.mccc.edu/student_library.shtml) There are numerous MCCC library holdings for Funeral Service. The call designations are: RA622-Funeral Service science and practice, HD9999-Funeral Service business and profession and GT3202-Funeral customs, sociology, and history

**Course Student Learning Outcomes (SLO):**

**Upon successful completion of this course the student will be able to:**

1. Highlight the historical events associated with the field of microbiology and immunology. [Supports ILGs #1, 4, 7, 10]
2. Appraise the historical influence of scientists on the evolution of microbiology. [Supports ILGs #1, 4, 7, 10]
3. Differentiate the classification of microorganisms, categories of cells and divisions of microbiology. [Supports ILGs #1, 3, 4, 10, 11; PLOs# 4]
4. Distinguish the anatomy and physiology of bacteria. [Supports ILGs #1, 3, 4, 10, 11; PLOs# 4]
5. Evaluate physical and chemical methods used to control microorganisms and their implications for the embalmer. [Supports ILGs #1, 3, 4, 9, 10, 11; PLOs# 4, 7]
6. Analyze the relationship between microorganisms and disease and the factors that influence the occurrence of disease. [Supports ILGs #1, 3, 4, 10, 11; PLOs# 4, 5, 7]
7. Synthesize the etiology of disease of specific pathogenic microorganisms with the appropriate embalming and restorative art treatments. [Supports ILGs #1, 3, 4, 9, 10, 11; PLOs# 4, 5, 7]

### **Course-specific Institutional Learning Goals (ILG):**

**Institutional Learning Goal 1. Written and Oral Communication in English.** Students will communicate effectively in both speech and writing.

**Institutional Learning Goal 3. Science.** Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

**Institutional Learning Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

**Institutional Learning Goal 7. History.** Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.

**Institutional Learning Goal 9. Ethical Reasoning and Action.** Students will understand ethical frameworks, issues, and situations.

**Institutional Learning Goal 10. Information Literacy:** Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

**Institutional Learning Goal 11. Critical Thinking:** Students will use critical thinking skills understand, analyze, or apply information or solve problems.

### **Program Learning Outcomes for Funeral Service A.A.S. Program (PLO)**

1. Evaluate the service needs for the pre-need, at-need, and aftercare time frames
2. Create and plan activities and ceremonies designed to meet the needs of those who mourn
3. Educate the consumer regarding funeral and cremation memorialization and merchandise options
4. Evaluate and describe solutions to current embalming and restorative art situations
5. Assemble and formulate appropriate information for death certificates, obituaries, and other necessary forms and documents
6. Evaluate legal, professional, and ethical issues facing funeral service
7. Demonstrate effective verbal and written communication skills in face to face meetings, in front of small groups, and via electronic means

### **Units of study in detail – Unit Student Learning Outcomes:**

**Unit #1** – Topics: Introduction to Microbiology, Spontaneous Generation, Germ Theory, Classification of Microorganisms, Categories of Cells and Divisions of Microbiology [**Supports SLOs # 1, 2, 3**]

*The student will be able to...*

- Distinguish the influence of van Leeuwenhoek on the evolution of microbiology
- Correlate the concept of “spontaneous generation” with the work of Redi, Needham and Pasteur
- Differentiate the Germ Theory of Disease with the research of Bassi, Semmelweis, Pasteur and Lister
- Evaluate the influence of Koch on modern bacteriology and explain “Koch’s Postulates”
- Explain the order of classification used for all biological forms
- Compare and contrast eukaryotic and prokaryotic cells
- Explain the five divisions of microbiology.

**Unit #2** – Topics: Anatomy of Bacteria, Binary Fission and Morphology of Bacteria, Structure and Function of Bacteria, Endospores, Flagella and Pili, and Gram-staining [**Supports SLOs # 3,4**]

*The student will be able to...*

- Explain the process of binary fission
- Evaluate the morphology and differentiate basic shapes and arrangements of bacteria

- Synthesize the nucleoid, ribosomes, cell membrane, cell wall and capsule with their contribution to cell structure and function
- Distinguish the characteristics of endospores and their implications for embalmers
- Differentiate the various structures used for bacterial motility
- Compare and contrast Gram-positive and Gram-negative bacteria

**Unit #3** – Topics: Physiology of Bacteria, Chemical and Physical Requirements for Bacterial Growth and Microbial Associations [Supports SLOs # 3,4]

*The student will be able to...*

- Differentiate the physical and chemical requirements for bacterial growth
- Compare and contrast psychrophiles, mesophiles and thermophiles
- Describe the pH scale and its implication on bacterial growth
- Examine osmotic pressure and its influence on the cell
- Differentiate autotrophic and heterotrophic bacteria
- Compare and contrast obligate aerobes and obligate anaerobes
- Differentiate microaerophilic, facultative and aerotolerant organisms
- Synthesize the microbial associations of mutualism, commensalism, parasitism, synergism and antagonism

**Unit #4** – Topics: Control of Microorganisms, Actions of Antimicrobial Agents and Physical and Chemical Methods of Controlling Microorganisms [Supports SLOs # 5, 7]

*The student will be able to...*

- Demonstrate the appropriate applications of antimicrobial agents for the embalmer
- Differentiate sterilization, disinfection and antisepsis
- Examine the influence of membrane permeability and enzymes on the efficacy of antimicrobial agents
- Critique physical and chemical methods of controlling microorganisms and their appropriate applications for the embalmer
- Identify factors that influence the properties of chemical agents
- Compare and contrast halogens, alcohols, aldehydes, phenols and quaternary ammonium compounds

**Unit #5** – Topics: Microorganisms and Disease, Defense Mechanisms, Factors Influencing the Occurrence of Disease, MRSA (Methicillin-resistant *Staphylococcus aureus*, Infection vs. Disease, Endemic/Epidemic/Pandemic/Sporadic Disease, Universal Precautions and Immunology [Supports SLOs # 5, 6, 7]

*The student will be able to...*

- Distinguish defense mechanisms and their relationship to pathogens
- Describe the “chain of infection”
- Examine the factors that influence the occurrence of disease
- Evaluate methicillin-resistant *Staphylococcus aureus* and its implications for the embalmer
- Compare and contrast exogenous, endogenous, local, focal, general, primary and secondary infections
- Distinguish endemic, epidemic, pandemic and sporadic diseases
- Examine direct and indirect methods of transmission and their implications for the public and the embalmer
- Synthesize mechanical, physiological and chemical defenses

- Correlate the concept of “universal precautions” with implications for the embalmer

**Unit #6** - Topics: *Staphylococcus*, *Streptococcus*, *Neisseria*, *Clostridium*, *Corneybacterium*, *Francisella tularensis* and *Salmonella typhi* [Supports SLOs # 5, 6, 7]

*The student will be able to...*

- Synthesize the characteristics of *Staphylococcus* and *Streptococcus* with their specific pathogenicity's
- Evaluate the embalming and restorative art implications for *Staphylococcal* and *Streptococcal* diseases
- Analyze the characteristics of *Neisseria* and *Corneybacterium* in relation to pathogenicity
- Determine embalming and restorative art implications for *Neisseria* and *Corneybacterium* pathogenicity's
- Analyze the genus *Clostridium* with respect to its unique characteristics and determine embalming and restorative art implications
- Examine the characteristics of *Francisella tularensis* and *Salmonella typhi* bacterium and their pathogenic qualities
- Explain the embalming and restorative art implications for *Francisella tularensis* and *Salmonella typhi*

**Unit #7** – Topics: *Mycobacterium*, Spirochetes, *Leptospira interrogans*, *Borrelia burgdorferi* and *Treponema pallidum* [Supports SLOs # 5, 6, 7]

*The student will be able to...*

- Synthesize the characteristics of *Mycobacterium avium* and *Mycobacterium tuberculosis* with their specific pathogenicity's
- Explain diagnosis, treatment and vaccines for tuberculosis
- Analyze embalming and restorative art implications for *Mycobacterium avium* and *Mycobacterium tuberculosis* infections
- Examine the characteristics of Spirochetes and their pathogenicity.
- Distinguish *Leptospira interrogans*, *Borrelia burgdorferi* and *Treponema pallidum* with respect to their specific pathogenicity's
- Analyze the restorative art and embalming implications for *Leptospira interrogans*, *Borrelia burgdorferi* and *Treponema pallidum*

**Unit #8:** - Topics: *Vibrio cholera*, *Bacillus anthracis*, *Bordetella pertussis*, *Enterobacteriaceae*, *Klebsiella pneumonia*, *Proteus*, *Salmonella*, *Shigella*, *Yersinia pestis* [Supports SLOs # 5, 6, 7]

*The student will be able to...*

- Synthesize the characteristics of *Vibrio cholera* with its specific pathogenicity's and embalming and restorative art implications
- Examine the characteristics of *Bacillus anthracis* and the three forms that affect humans with consideration for embalming implications
- Analyze the characteristics of *Bordetella pertussis* and its toxins with diagnosis and treatment options
- Explore the embalming and restorative art implications inherent with *Bordetella pertussis*
- Synthesize the pathogenic characteristics of *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis* and *Proteus vulgaris* with appropriate embalming and restorative art techniques

- Compare and contrast Salmonellosis and Shigellosis with respect to source, mode of transmission, treatment and prevention
- Evaluate *Yersinia pestis* with respect to virulence, mode of transmission and diagnosis

**Unit #9** – Topics: *Haemophilus*, *Campylobacter jejuni*, *Legionella*, *Listeria monocytogenes*, *Pseudomonas*, *Mycoplasma*, *Rickettsia*, *Coxiella*, *Chlamydia* and Prions [Supports SLOs # 5, 6, 7]

*The student will be able to...*

- Analyze the virulence of the genus *Haemophilus* and its associated diseases
- Compare and contrast *Campylobacter jejuni* and *Listeria monocytogenes* with respect to source, mode of transmission and symptoms
- Synthesize the characteristics of *Legionella* with its pathogenicity and mode of transmission
- Examine the genus *Pseudomonas* and its responsibility for nosocomial infections
- Differentiate the characteristics of the genus *Mycoplasma* with respect to its virulence
- Compare and contrast *Rickettsia rickettsii*, *Rickettsia prowazekii* and *Rickettsia typhi* with respect to mode of transmission, signs and symptoms, treatment and embalming implications
- Examine the characteristics of the bacterium *Coxiella burnetti* and appropriate preventive measures for the disease “Q Fever”
- Compare and contrast *Chlamydia trachomatis*, *Chlamydia psittaci* and *Chlamydia pneumonia* with respect to mode of transmission, signs and symptoms, treatment and embalming implications
- Synthesize the virulence of prions with pathologies of the human central nervous system and removal/transfer/embalming implications.

**Unit #10** – Topics: Viruses-Dermatropic, Pneumotropic, Neurotropic and Viscerotropic Diseases and Immunological Diseases [Supports SLOs # 5, 6, 7]

*The student will be able to...*

- Explain how viruses replicate and methods for their deactivation
- Compare and contrast smallpox and monkeypox with respect to clinical presentation, mode of transmission and prevention.
- Evaluate embalming and restorative art implications for smallpox and monkeypox
- Compare and contrast rubeola and rubella with respect to clinical presentation, mode of transmission, treatment and prevention
- Evaluate embalming and restorative art implications for rubeola and rubella
- Examine the correlation between chickenpox and shingles and determine appropriate embalming and restorative art techniques
- Compare and contrast Herpes Simplex 1 and 2 with respect to clinical presentation, mode of transmission, treatment, embalming and restorative art implications
- Compare and contrast Influenza, Hantavirus Pulmonary Syndrome, Severe Acute Respiratory Syndrome and the common cold with respect to clinical presentation, mode of transmission and treatment
- Distinguish the viruses responsible for rabies, poliomyelitis and viral encephalitis with their specific pathogenicity’s
- Explain the vaccines that are available for rabies and polio
- Examine the history and characteristics of the West Nile Virus

- Compare and contrast Hepatitis A, B & C with respect to mode of transmission, virulence, treatment and prevention
- Describe the OSHA regulation regarding the HBV vaccine and its implication for funeral home employees
- Synthesize embalming implications for Hepatitis A, B & C
- Analyze the viruses responsible for infectious mononucleosis, inclusion disease and epidemic parotiditis with appropriate actions to limit transfer of these microorganisms
- Evaluate the characteristics of the Human Immunodeficiency Virus and correlate appropriate embalming and restorative art techniques

**Unit #11** – Topics: Fungi-Dermatomycosis, Coccidioidomycosis, Histoplasmosis, Candidiasis, Cryptococcosis, Aspergillosis and Pneumocystis Pneumonia (PCP) [Supports SLOs # 5, 6, 7]

*The student will be able to...*

- Differentiate the three fundamental categories of fungi
- Compare and contrast Dermatomycosis, Coccidioidomycosis, Histoplasmosis, Candidiasis, Cryptococcosis and Aspergillosis with respect to etiology, mode of transmission, characteristics, diagnosis and treatment as well as formulating embalming and restorative art implications for each.
- Evaluate *Trichophyton*, *Microsporum* and *Epidermophyton* infections with their corresponding infections
- Evaluate the microorganism *Pneumocystis carinii*/*Pneumocystis jiroveci* with respect to its characteristics, pathogenicity, diagnosis and treatment
- Examine embalming and restorative art implications for PCP

**Unit #12** – Topics: Protozoa- Amoebiasis, Malaria and Toxoplasmosis [Supports SLOs # 5, 6, 7]

*The student will be able to...*

- Explain the characteristics of protozoa
- Differentiate the etiology, symptoms, diagnosis and treatment of Amoebiasis with the characteristics of *Entamoeba histolytica*
- Synthesize the disease malaria with the genus *Plasmodium*, its mode of transmission, signs and symptoms, virulence, diagnosis and treatment
- Explain the life cycle of Malaria and associated embalming and restorative art treatments
- Analyze Toxoplasmosis with respect to its etiology, mode of transmission, symptoms and appropriate preventive measures

### **Evaluation of student learning:**

Student learning will be assessed using examinations, tests, quizzes, research papers and case studies. Multiple-choice, matching, case studies, short essays, and fill-in-the-blank questions will be given. The final examination will be multiple-choice and will be inclusive. Case studies will be completed in groups as well as individually on tests.

The students will complete a research paper OR give an oral presentation on a specific pathogen based on an assigned microorganism. The paper or presentation will include mode of transmission, incubation period, portal of entry and exit, pathogenicity, factors influencing virulence, embalming and restorative art implications.

The final grade will be determined as follows:

Quizzes:	5% (The lowest quiz grade will be dropped.)
Tests:	25%
Research Paper/Presentation:	5%
Midterm Exam:	30%
Final Exam:	35%

Note: A minimum “C” grade is required to pass this course.

Grading: 100-94 A; 93-90 A-; 89-87 B+; 86-83 B; 82-80 B-; 79-78 C+; 77-75 C; 74-60 D and <60 F

Attendance: It is the students’ responsibility to attend all classes. If classes are missed for any reason, students are still responsible for all content that is covered, for announcements made in their absence, and for acquiring any materials that may have been distributed in class. **Students that miss 2 or more classes may have their final course grade reduced by 5%.** Students are expected to be on time for classes. If students walk into a class after it has begun they should select a seat close to the entrance in order to minimize the disruption.

Make-up tests and exams will not be given. In the event of an emergency it is the student’s responsibility to notify the instructor of the situation **prior** to the administration of the test or exam. Should the instructor decide that a make-up test or exam is warranted because of the circumstances resulting in the absence, it will be administered at a **scheduled time**. The student must take the test or exam at the scheduled time or they will receive a grade of “0”. This “exception” will only be considered **once** for the entire semester. Any additional tests or exams that are not taken with the rest of the class will receive a grade of “0”.