MICR 5 Course Outline as of Summer 2025

CATALOG INFORMATION

Dept and Nbr: MICR 5 Title: GENERAL MICROBIOLOGY
Full Title: General Microbiology
Last Reviewed: 8/14/2023

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	5.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	5.00	Lab Scheduled	6.00	6	Lab Scheduled	105.00
		Contact DHR	0		Contact DHR	0
		Contact Total	9.00		Contact Total	157.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 262.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	MICRO 5

Catalog Description:
Students will study the following topics: morphology, growth, metabolism, genetics, and control of microorganisms, with emphasis on bacteria and viruses. Includes principles of microbial pathogenicity, and the human immune response. Emphasis on laboratory techniques. Intended for allied health majors considering transfer to CSU or UC.

Prerequisites/Corequisites:
Course completion of ENGL 1A OR EMLS 10 (formerly ESL 10); AND
Completion of BIO 10 or higher (V7); AND
Completion of CHEM 60, CHEM 3A (OR CHEM 1A), or higher (V6)

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
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Completion of BIO 10 or higher (V7); AND
Completion of CHEM 60, CHEM 3A (OR CHEM 1A), or higher (V6)
Recommended:
Limits on Enrollment:
Transfer Credit: CSU;UC.
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**		Effective:	Inactive:
	C	Natural Sciences	Fall 1981	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B2	Life Science	Fall 1981	
	B3	Laboratory Activity		
IGETC:	**Transfer Area**		Effective:	Inactive:
	5B	Biological Sciences	Fall 1981	
	5C	Fulfills Lab Requirement		

CSU Transfer:	Transferable	Effective:	Fall 1981	Inactive:
UC Transfer:	Transferable	Effective:	Fall 1981	Inactive:

CID:

Certificate/Major Applicable:
Both Certificate and Major Applicable

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Integrate basic principles of microbial cell structures and processes with evolutionary and ecological concepts.
2. Explain the impact of microbiology on medical, public health, and environmental concerns.
3. Demonstrate proficiency in a variety of standard laboratory techniques used for the routine culture, analysis, and identification of microorganisms.

Objectives:
At the conclusion of this course, the student should be able to:
1. Outline the history of major microbiological discoveries and describe their contributions to world civilization.
2. State Koch's postulates and apply them to different types of pathogens and to new diseases.
3. Relate basic principles of chemistry and cell biology to structure and function of microbes.
4. Explain how the unity of basic cell processes contributes to difficulties in treating infectious disease.
5. Describe the principles and mechanisms of microbial genetics and coevolution and apply them to the problem of increasing drug resistance in microorganisms.
6. Describe viruses and their relation to cells.

7. Compare and evaluate the various mechanisms of control and prevention of microbial disease.
8. Discuss the mechanisms of pathogenicity in microbes.
9. Compare and contrast the epidemiology of community-acquired and hospital-acquired infections.
10. Describe the functions of the human immune system, its relations to disease, and how vaccination contributes to immunity.
11. Describe the etiology, epidemiology, treatment, and prevention of a variety of important infectious diseases.
12. Safely and aseptically perform a variety of microbiological laboratory techniques.
13. Collect and analyze data.

Topics and Scope:

I. Historical Development
- A. Discovery of the microbial world and development of the microscope
- B. Spontaneous generation vs. biogenesis
- C. Koch's postulates
- D. Contribution of microbiology to biochemistry and molecular biology
- E. Contribution of microbiology to world civilization

II. Cell Biology
- A. Chemistry and biochemistry review
- B. Lipids, membranes, and transport
- C. Nucleic acids and protein: structure, function, and flow of information
- D. Adenosine triphosphate (ATP) synthesis and cell work
- E. The eukaryotic cell: structure and function; endosymbiotic theory
- F. The prokaryotic cell: structure and function
- G. Comparison of bacteria and archaea

III. Antimicrobial Agents
- A. Sterilization, disinfectants, and antiseptics
- B. Antibiotics
  1. Mode of action
  2. Resistance mechanisms

IV. Microbial Genetics
- A. Genome and phenotype
- B. Mutation, selection, and adaptation
- C. Horizontal gene transfer
  1. Transformation
  2. Conjugation
  3. Transduction
- D. Relation to virulence and antibiotic resistance

V. Viruses
- A. Definitions and historical background
- B. Interactions with cells
- C. Viral diseases of importance

VI. Ecological Principles
- A. The human as ecosystem
- B. Symbiosis
- C. Impact on model of infectious disease

VII. Infectious Disease
- A. Role of microbiome
- B. Mechanisms of pathogenicity
- C. Epidemiology

D. Role of the host in disease
1. Innate resistance
2. Acquired resistance
E. Vaccination, prevention, and treatment
F. Specific diseases of the human population

VIII. Applied Microbiology
A. Modern biotechnology
B. Environmental microbiology
1. Wastewater treatment
2. Antibiotic isolation
3. Environmental sampling and analysis
C. The role of hospital and public health laboratories
D. Fermentation applications

IX. Laboratory Exercises
A. Laboratory safety and sanitation
B. Laboratory techniques
1. Aseptic technique
2. Bacterial cultures (liquid and solid medium)
3. Microscopy and staining techniques
4. Preparation and sterilization of media
5. Analyses of bacteria in water, soil, and the community at large
6. Antibiotic sensitivity
7. Metabolic tests and bacterial identification
8. Bacterial mutagenesis
9. Transformation
10. Polymerase chain reaction and gel electrophoresis
11. Enzyme-linked immunosorbent assay (ELISA)

Assignment:

Lecture-Related Assignments:
1. Reading assignments from text (1 chapter/week average); additional reading assignments (1-5 page(s)/week)
2. Research paper(s) (1-2 at 2-4 pages each)
3. Quiz(zes) (0-15)
4. Lecture exams (3-4)
5. Oral presentation

Lab-Related Assignments:
1. Laboratory experiments, that may involve:
A. Data collection
B. Data analysis
C Demonstration of laboratory techniques
2. Lab exams (2-3)

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Research paper(s)	Writing 4 - 15%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Data analysis (optional)	Problem solving 0 - 2%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Laboratory experiments	Skill Demonstrations 1 - 15%

Exams: All forms of formal testing, other than skill performance exams.

Quiz(zes); lecture exams; lab exams	Exams 70 - 90%

Other: Includes any assessment tools that do not logically fit into the above categories.

Oral presentation; attendance and participation	Other Category 5 - 15%

Representative Textbooks and Materials:
Microbiology: An Introduction. 13th ed. Tortora, Gerard, Funke, Berdell and Case, Christine. Pearson. 2019.
Microbiology: A Systems Approach. 6th ed. Cowan, Marjorie. McGraw-Hill. 2021.
Microbiology: A Photographic Atlas for the Laboratory. Alexander, Steven and Strete, Dennis. Pearson. 2001 (classic).
Instructor prepared lab manual