Cerro Coso College

# Course Outline of Record Report

**02/23/2022**

# BIOLC262 : General Microbiology

## General Information

| | |
|---|---|
| **Author:** | • Claudia Sellers<br>• Ooi, Guck<br>• Burch, Andrew |
| **Course Code (CB01) :** | BIOLC262 |
| **Course Title (CB02) :** | General Microbiology |
| **Department:** | Science |
| **Proposal Start:** | Spring 2022 |
| **TOP Code (CB03) :** | (0403.00) Microbiology |
| **SAM Code (CB09) :** | Non-occupational |
| **Distance Education Approved:** | No |
| **Course Control Number (CB00) :** | CCC000547071 |
| **Curriculum Committee Approval Date:** | 05/07/2021 |
| **Board of Trustees Approval Date:** | 07/08/2021 |
| **External Review Approval Date:** | 07/08/2021 |
| **Course Description:** | This course offers an introduction to major topics and sub-disciplines in microbiology including microbial diversity and classification, microbial anatomy and physiology, microbial genetics, microbial ecology, medical microbiology and immunology, epidemiology and public health, and biotechnology. The course is designed for students interested in health careers. |
| **Submission Type:** | Mandatory Revision |
| | Cyclical review. Added co-contributors. Changed ENGL C070 prerequisite to ENGL C101. Make BIOL C255 as prerequisite. Update textbooks. Added rationale for Methods of Instructions & Methods of Evaluation. Last assessed in Spring 2020, SLOs met, and no actions necessary. |
| **Author:** | No value |

## Faculty Minimum Qualifications

| | |
|---|---|
| **Master Discipline Preferred:** | • Biological Sciences |
| **Alternate Master Discipline Preferred:** | • Biological Sciences |
| **Bachelors or Associates Discipline Preferred:** | No value |
| **Additional Bachelors or Associates Discipline Preferred:** | No value |

## Course Development Options

| Basic Skills Status (CB08) | Course Special Class Status (CB13) | Grade Options |
|---|---|---|

Course is not a basic skills course.

Course is not a special class.

- Pass/No Pass
- Letter Grade Methods

☐ Allow Students to Gain Credit by Exam/Challenge

**Allowed Number of Retakes**

0

**Course Prior To College Level (CB21)**

Not applicable.

**Rationale For Credit By Exam/Challenge**

No value

**Retake Policy Description**

Type:|Non-Repeatable Credit

☑ Allow Students To Audit Course

**Course Support Course Status (CB26)**

Course is not a support course

## Associated Programs

☑ Course is part of a program (CB24)

| Associated Program | Award Type | Active |
|---|---|---|
| CC Liberal Arts: Mathematics & Science | A.A. Degree Major | Summer 2018 to Fall 2020 |
| Nutrition and Dietetics Associate in Science Degree for Transfer (AS-T) | A.S. Degree for Transfer | Fall 2019 to Spring 2020 |
| CSU General Education (CSU GE Breadth) | Certificate of Achievement | Fall 2020 |
| Intersegmental General Education Transfer Curriculum Certificate of Achievement | Certificate of Achievement | Fall 2020 |
| Nutrition and Dietetics Associate in Science Degree for Transfer (AS-T) | A.S. Degree for Transfer | Spring 2020 to Spring 2022 |
| Liberal Arts: Mathematics & Science Associate in Arts Degree | A.A. Degree Major | Fall 2020 |
| CSU General Education (CSU GE Breadth) (In Development) | Certificate of Achievement | Fall 2021 |
| Intersegmental General Education Transfer Curriculum Certificate of Achievement (In Development) | Certificate of Achievement | Fall 2021 |

| | | |
|---|---|---|
| Nutrition and Dietetics Associate in Science Degree for Transfer (AS-T) | A.S. Degree for Transfer | Spring 2022 |

## Transferability & Gen. Ed. Options

**Course General Education Status (CB25)**

Y

**Transferability**

Transferable to both UC and CSU

**Transferability Status**

Approved

| Cerro Coso General Education Requirements | Categories | Status | Approval Date | Comparable Course |
|---|---|---|---|---|
| Area 1.1 | Natural Science Life Sciences | Approved | No value | No Comparable Course defined. |

| CSU General Education Certification | Categories | Status | Approval Date | Comparable Course |
|---|---|---|---|---|
| Area B.2 | Scientific Inquiry & Quantitative Reasoning Life Science | Approved | No value | No Comparable Course defined. |
| Area B.3 | Scientific Inquiry & Quantitative Reasoning Laboratory | Approved | No value | |

| Intersegmental General Education Transfer Curriculum | Categories | Status | Approval Date | Comparable Course |
|---|---|---|---|---|
| Area 5.B | Physical & Biological Sciences Biological Science | Approved | No value | No Comparable Course defined. |
| Area 5.C | Physical & Biological Sciences Laboratory/Activity | Approved | No value | |

## Units and Hours

### Summary

| | |
|---|---|
| **Minimum Credit Units (CB07)** | 5 |
| **Maximum Credit Units (CB06)** | 5 |
| **Total Course In-Class (Contact) Hours** | 162 |
| **Total Course Out-of-Class Hours** | 108 |

| | |
|---|---|
| **Total Student Learning Hours** | 270 |
| **Faculty Load** | 0 |

## Credit / Non-Credit Options

**Course Credit Status (CB04)**

Credit - Degree Applicable

**Course Non Credit Category (CB22)**

Credit Course.

**Non-Credit Characteristic**

No Value

**Course Classification Status (CB11)**

Credit Course.

**Funding Agency Category (CB23)**

Not Applicable.

☐ Cooperative Work Experience Education Status (CB10)

☐ Variable Credit Course

## Weekly Student Hours

| | In Class | Out of Class |
|---|---|---|
| Lecture Hours | 3 | 6 |
| Laboratory Hours | 6 | 0 |
| Activity Hours | 0 | 0 |

## Course Student Hours

| | |
|---|---|
| **Course Duration (Weeks)** | 18 |
| **Hours per unit divisor** | 54 |
| **Course In-Class (Contact) Hours** | |
| Lecture | 54 |
| Laboratory | 108 |
| Activity | 0 |
| **Total** | 162 |
| **Course Out-of-Class Hours** | |
| Lecture | 108 |
| Laboratory | 0 |
| Activity | 0 |
| **Total** | 108 |

## Time Commitment Notes for Students

No value

## Faculty Load

**Extra Duties:** 0

**Faculty Load:** 0

## Units and Hours - Weekly Specialty Hours

| Activity Name | Type | In Class | Out of Class |
|---|---|---|---|
| No Value | No Value | No Value | No Value |

## Pre-requisites, Co-requisites, Anti-requisites and Advisories

### Prerequisite

BIOLC255 - Human Physiology (in-development)

A fundamental understanding of how the human body functions facilitates an understanding of mechanisms employed by microorganisms to invade and grow within the body. BIOL C255 provides the necessary foundational knowledge for students to understand microbial metabolism, enzyme kinetics, and how dysregulation of homeostasis by microbes lead to diseases. Relevant outcomes from BIOL C255 are:

- Apply the fundamentals of chemistry and cell biology in understanding physiological mechanisms.
- Analyze body functions in maintaining homeostasis at the cellular, tissue, organ, organ system and organism level.
- Apply physiological concepts in understanding how physiological dysregulation leads to diseases.
- Perform lab skills correctly and display a habit of accurate and safe lab practices.

**AND**

### Advisory

CHEMC101 - Introduction to Chemistry

Students should be able to apply chemical concepts (e.g., pH, acids, bases, buffers, diffusion, osmosis, law of mass action, Boyle's law, bond formation and thermodynamics) to cell structure and function at the molecular level. CHEM C101 provides students with the necessary knowledge to understand microbial physiology and genetics. Relevant outcomes from CHEM C101 are:

- Analyze the fundamental features of chemistry including measurement and dimensional analysis of physical properties such as mass, volume, density, solution concentrations, dilutions.
- Perform an analysis of physical and chemical processes using the laws of conservation of mass and energy and information of reactivity and solubility.
- Evaluate the chemical and physical properties of solids, liquids, solutions and gasses.
- Use the periodic chart to assess the properties of materials and to determine realistic bonding stoichiometries.
- Analyze the features of chemistry including physical and chemical properties, naming and writing chemical formulas of compounds along with balancing and classifying chemical reactions.
- Perform calculations from balanced chemical equations including but not limited to composition, yield and limiting reactant calculations.
- Draw and interpret Lewis dot, line bond and short hand structures of inorganic compounds and ions as well as organic compounds and organic functional groups.
- Perform experiments adhering to safety regulations in the laboratory.
- Explain in detail and apply the Scientific Method.

**AND**

### Prerequisite

ENGLC101 - Freshman Composition

Students in BIOL C262 must be able to read and comprehend a college-level Biology textbook which are usually written at a Gunning Fog Index of 13 to 14. They are expected to identify central points, both explicit and implied, outline and summarize complex and technical scientific readings, and interpret difficult and figurative language in academic discourse and scientific terminology. Students must also be able to write summaries of assigned readings from the course textbook, answer homework questions using paragraph-length responses, and answer essay questions in clear and error-free prose based on readings from various scientific texts. ENGL C101 provides the student with the requisite skills to meet these expectations. Relevant outcomes from ENGL C101 are:

- Read, analyze, and evaluate a variety of university-level texts for content, context, and rhetorical merit with consideration of tone, audience, and purpose.
- Develop varied and flexible strategies for generating, drafting, and revising essays.
- Evaluate the style of one's own writing and the writing of others and self-correct for greater clarity and directness.
- Write timed essays in class exhibiting acceptable college-level control of mechanics, organization, development, and coherence.
- Integrate the ideas of others through paraphrasing, summarizing, and quoting without plagiarism.
- Proofread and edit essays for presentation so they exhibit no disruptive errors in English grammar, usage, or punctuation.

## Entrance Skills

| Entrance Skills | Description |
| --- | --- |
| No value | No value |

## Limitations on Enrollment

| Limitations on Enrollment | Description |
| --- | --- |
| No value | No value |

## Specifications

### Methods of Instruction

| | |
| --- | --- |
| **Methods of Instruction** | Lecture |
| **Rationale** | Classroom lecture using board-work and Powerpoint to explain material from the assigned textbook.<br>Example: List the structural similarities and differences between eukaryotic and prokaryotic cells. |
| **Methods of Instruction** | Demonstration |
| **Rationale** | Proper laboratory techniques are demonstrated to ensure safe and correct lab procedures are followed.<br>Example: Students are asked to complete the exercises in the handout " Microbiology - Lab Safety Worksheet" |
| **Methods of Instruction** | Laboratory |
| **Rationale** | Group work to further explore important ideas. Individual reading of material in preparation to review and conduct laboratory experiments.<br>Example: Students are asked to perform the Kirby-Bauer test for antibiotic susceptibility. |

### Assignments

A. Homework assignments from the relevant textbook chapters.
Example: The student is expected to answer instructor assigned questions from the relevant textbook chapters.
B. Readings from the assigned textbook and laboratory notes.
Example: The student is expected to read the textbook chapter and laboratory notes covered in each week's lecture and lab.
C. Written laboratory summaries.
Example: The student is required to write a lab report that summarizes the laboratory methods performed, data collected, and data analysis for each week's lab activity.
D. Data analysis.
Example: The student is required to analyze the data collected in a lab activity in order to reach conclusions regarding the lab's hypothesis.

E. A ten page research paper.
Example: The student is required to write a ten page research paper about an infectious agent.

| Methods of Evaluation | Rationale |
|---|---|
| Final Exam | Summative cumulative exam to evaluate student learning, knowledge application, and academic achievement at the end of the course.<br>Example: Final cumulative exam at the end of semester on various microscopic organisms such as bacteria, viruses, fungi, and protozoa. |
| Tests | Quizzes: Quizzes covering topics from lecture material and reading assignments are given.<br>Example: A quiz covering the specific and non-specific components of the immune system. |
| Tests | Three to four Exams on assigned material. Exams are typically a combination of short answer and multiple choice.<br>Example: Exam one covers the chemical composition of cells & eukaryotic and prokaryotic cell structures. |

**Equipment**

No Value

**Textbooks**

| Author | Title | Publisher | Date | ISBN |
|---|---|---|---|---|
| Gerard J. Tortora, Berdell R. Funk, Christine L. Case, Derek Weber, Warner B. Bair | Microbiology: An Introduction. 13th edition | Pearson | 2019 | 9780135789377 |

**Other Instructional Materials**

| | |
|---|---|
| **Description** | Laboratory notes created by instructor. |
| **Author** | No value |
| **Citation** | No value |

| | |
|---|---|
| **Description** | Microbiology by OpenStax (Open educational resource) |
| **Author** | No value |
| **Citation** | No value |

| | |
|---|---|
| **Description** | Microbiology: Laboratory Theory & Application 4e Michael J. Leboffe, Burton E. Pierce 2015 |
| **Author** | No value |
| **Citation** | No value |

**Materials Fee**

No

## Learning Outcomes and Objectives

**Course Objectives**

Compare and contrast cell metabolism and the chemical characteristics of prokaryotic and eukaryotic cells.

Apply the fundamentals of chemistry and cell biology towards an understanding of prokaryotic and eukaryotic cell communication, structure, growth and division.

Describe basic microbial genetics concepts and the evolutionary forces which act on the genome.

Examine the interaction of microorganisms and humans and their impact on the environment.

Relate current molecular and biochemical technologies to their uses in medical research.

Compare and contrast different mechanisms used by various pathogens to invade host organ systems and cause disease.

**CSLOs**

**Compare and contrast cell metabolism and the chemical characteristics of prokaryotic and eukaryotic cells.** Expected SLO Performance: 70.0

**Apply the fundamentals of chemistry and cell biology towards an understanding of prokaryotic and eukaryotic cell communication, structure, growth, and division.** Expected SLO Performance: 70.0

**Describe basic microbial genetics concepts and the evolutionary forces which act on the genome.** Expected SLO Performance: 70.0

**Examine the interactions between environmental and human microbial communities.** Expected SLO Performance: 70.0

**Relate current molecular and biochemical technologies to their uses in medical research.** Expected SLO Performance: 70.0

**Compare and contrast different mechanisms used by various pathogens to invade host organ systems and cause disease.** Expected SLO Performance: 70.0

## Outline

**Course Outline**

A. Chemical Composition of the cell.

1. Atoms; Ions; and Chemical Bonds
2. Carbohydrates and Lipids
3. Proteins
4. Nucleic Acids

B. Prokaryote and Eukaryote Cell Structure
1. Microscopes how they function and how they are utilized.
2. Plasma Membrane and Associated Structures
3. Cytoplasm and the Organelles

C. Cell Division
1. Binary fission;
2. Mitosis; Meiosis

D. Enzymology and Energetics.
1. Enzymes as Catalysts
2. Controlling enzymatic activity
3. Bioenergetics

E. Cell Respiration and Metabolism
1.Glycolysis and Fermentation
2.Aerobic Respiration
3.Anaerobic Respiration
4. Metabolism of Proteins and Lipids

F. Cells and the Extracellular Environment
1. Diffusion and Osmosis
2. Carrier Mediated Transport
3. Membrane potential
4. Cell Signaling

G. Microbial Genetics
1. Molecular dogma
2. Regulation of gene expression
3. Mutants
4. Genetic transfer (prokaryotic/eukaryotic)

H. Recombinant DNA Technology
1. Gene Cloning
2. Genetic engineering (bioremediation)
3. Methods for detecting gene expression patterns

I. Growth of Microorganisms
1. Growth parameters and characteristics
2. Nutritional needs
3. Methods for counting microorganisms

J. Controlling growth
1. Characteristics of death curve
2. Physical controls on microbial growth
3. Chemical controls on microbial growth
4. Preserving food

K. Classification
1. Principles of biological classification
2. Microorganisms and higher levels of classification
3. Methods of microbial classification
4. Prokaryotic classification

L. Eukaryotic microorganisms
1. Fungi and Algae
2. Helminthes
3. Arthropod vectors

M. Viruses
1. Classification
2. Bacteriophages
3. Animal viruses
4. Infectious agents that are simpler that viruses

N. Microorganisms and human health and disease
1. Normal biota
2. Symbiosis
3. Sites of normal biota
4. Maintaining a reservoir
5. Entering the host
6. Evading the body's immune defenses

7. Multiplying in the body
8. Diseases of the human body systems

O. Immunology: nonspecific defenses
1. Inflammation
2. Leukocytes
3. Complement system

P. Immunology: specific defenses
1.Cells and organs of the immune system
2.Overview of how specific and nonspecific branches of the immune system function together
3. B Cells
4. T Cells
5. Roles of the immune system

Q. Immunological disorders
1. Immune system malfunctions
2. Hypersensitivity
3. Immunodeficiencies
4. Cancer and the immune system

R. Diagnostic immunity
1. Diagnostic immunity
2. Detecting antibody reactions
3. Immunoassays and fluorescent antibodies

S. Preventing disease
1. Epidemiology
2. Public health
3. Immunization

**Lab Outline**

1. Safety
2. Microscopy
3. Aseptic techniques
4. Staining of Microorganisms
5. Cultivation of Microorganisms
6. Biochemical Properties of Cells
7. Physical and Chemical Agents for the Control of Microbial Growth
8. Microbes and Food
9. Microbes and Water
10.Epidemiology
11.Bacterial genetics
12.Biotechnology
13. Medical Microbiology

## Delivery Methods

**Delivery Method: Please list all that apply -Face to face -Online (purely online no face-to-face contact) -Online with some required face-to-face meetings ("Hybrid") -Online course with on ground testing -iTV – Interactive video = Face to face course with significant required activities in a distance modality -Other**

- Face to face

**Rigor Statement: Assignments and evaluations should be of the same rigor as those used in the on-ground course. If they are not the same as those noted in the COR on the Methods of Evaluation and out-of-class assignments pages, indicate what the differences are and why they are being used. For instance, if labs, field trips, or site visits are required in the face to face section of this course, how**

**will these requirements be met with the same rigor in the Distance Education section? Describe the ways in which instructor-student contact and student-student contact will be facilitated in the distance ed environments.**

No Value

**Good practice requires both asynchronous and synchronous contact for effective contact. List the methods expected of all instructors teaching the course. -Learning Management System -Discussion Forums -Message -Other Contact -Chat/Instant Messaging -E-mail -Face-to-face meeting(s) -Newsgroup/Discussion Board -Proctored Exam -Telephone -iTV - Interactive Video -Other**

- Discussion Forums
- E-mail
- Face-to-face meeting(s)
- Telephone

**Software and Equipment: What additional software or hardware, if any, is required for this course purely because of its delivery mode? How is technical support to be provided?**

No Value

**Accessibility: Section 508 of the Rehabilitation Act requires access to the Federal government's electronic and information technology. The law covers all types of electronic and information technology in the Federal sector and is not limited to assistive technologies used by people with disabilities. It applies to all Federal agencies when they develop, procure, maintain, or use such technology. Federal agencies must ensure that this technology is accessible to employees and the public to the extent it does not pose an "undue burden". I am using -iTV—Interactive Video only -Learning management system -Publisher course with learning management system interface.**

- Learning management system

**Class Size: Good practice is that section size should be no greater in distance ed modes than in regular face-to-face versions of the course. Will the recommended section size be lower than in on-ground sections? If so, explain why.**

No Value

**Emergency Distance Education Options The course will operate in remote delivery mode when all or part of the college service area is under an officially declared city, county, state, or federal state of emergency, including (check all that apply) - Online including all labs/activity hours - Hybrid with online lecture and onsite lab/activity hours - Correspondence education in high school and prison facilities - None. This course will be cancelled or paused if it cannot be held fully onsite.**

- Online including all labs/activity hours
- Hybrid with online lecture and onsite lab/activity hours