



## MASTER COURSE OUTLINE

A. BIOL 2040 General Microbiology

B. COURSE DESCRIPTION:

This introductory course is designed to provide an overview of major concepts in microbiology. Thematic areas to be studied include prokaryotic and eukaryotic cell structure and function, prokaryotic metabolism (including growth and nutrition), microbial genetics, microbial classification, isolation, and identification, and microbial roles in the disease process, environment and industry. Laboratory exercises will stress the microscopic study of microorganisms and the application of culturing and identification techniques. An emphasis will be placed on safe laboratory practice. Prerequisites: BIOL 1091 or BIOL 2021 and CHEM 1121 or CHEM 1202

**MnTC (Goal 3/NS and Goal 2/CT); (4 Cr – 2 lect, 2 lab)**

C. \*MnTC Discipline: Natural Sciences \*\*Core Theme: Critical Thinking

D. RIVERLAND INSTITUTIONAL LEARNING OUTCOMES:

This course addresses the following Riverland Institutional Learning Outcome(s):

- ILO 1: critical thinking (*Core Theme Goal 2*)
- ILO 2: awareness of the larger global community (*Core Theme Goal 7 or 8*)
- ILO 3: ethical, engaged citizenship (*Core Theme Goal 9 or Goal 10*)
- ILO 4: communication and collaboration (*Discipline Goal 1 and by any learning outcome(s) involving communication or collaboration*)

E. MAJOR CONTENT AREAS:

### Lecture Content

- Introduction and History of Microbiology
- Review of Chemical Principles
- Prokaryotic and Eukaryotic Cell Structure and Function
- Microbial Metabolism
- Microbial Growth and Control in the Environment
- Antimicrobial Chemotherapy
- Microbial Genetics: Nucleic acid structure, gene function, operons, mutations
- Recombinant DNA technology
- Characterization and Taxonomy of Bacteria, Fungi, Viruses, and Protozoa
- Principles of Disease and Pathogenicity of Microbes
- Innate Immunity and Nonspecific Defenses
- Adaptive Immunity and Specific Defenses

- Immunizations
- Immune Disorders
- Survey of Microbial Diseases
- Food, Industrial and Environmental Microbiology and Bioterrorism

#### Laboratory Content

- Microscopy and Observation Techniques
- Isolation of microbes from the environment, food and water
- Growth and Transfer of Microbial Culture
- Smear Preparation and Staining Microorganisms
- Selective and Differential Media
- Biochemical Characteristics of Microorganisms
- Control of microbial growth and antibiotic resistance
- Recombinant DNA techniques
- Medical Microbiology and Epidemiology
- Applied Microbiology: Soil, Water, Food, and Medical Microbiology

#### F. GOAL TYPE, OBJECTIVES, AND OUTCOMES:

<u>GOAL TYPE</u>	<u>OBJECTIVES</u> Students will be able to:	<u>OUTCOMES</u> The student will successfully:
<u>MnTC Goal 3a</u>	demonstrate understanding of scientific theories.	<ol style="list-style-type: none"> <li>1. define and explain the principles of experimentally-verifiable biological theories related to microbiology.</li> <li>2. define and explain the pertinent vocabulary terms related to outcomes.</li> </ol>
<u>MnTC Goal 3b</u>	formulate and test hypotheses by performing laboratory simulations or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.	<ol style="list-style-type: none"> <li>1. submit laboratory report(s) on open-ended experiment(s) that will include the identification of the independent, dependent, and control variables as well as data presentation in the form of a table or graph.</li> <li>2. explain the sources of possible bias, error and uncertainty in the experimental analysis above.</li> </ol>
<u>MnTC Goal 3c</u>	communicate their experimental findings, analyses, and interpretations both orally and in writing.	<ol style="list-style-type: none"> <li>1. critically evaluate lab experimental results and analyses in a collaborative manner and submit this data in oral and written formats.</li> </ol>
<u>MnTC Goal 3d</u>	evaluate societal issues from a natural science perspective, ask questions about the evidence presented and make informed judgments about science-related topics and policies.	<ol style="list-style-type: none"> <li>1. demonstrate an understanding of human diseases caused by microbes.</li> <li>2. analyze these diseases from a societal, public health, and scientific standpoint.</li> <li>3. evaluate public health policies regarding these diseases.</li> </ol>
<u>MnTC Goal 2a</u>	gather factual information and apply it to a given problem in a manner that is relevant,	<ol style="list-style-type: none"> <li>1. apply techniques and information generated by laboratory experiments to seek</li> </ol>

	clear, comprehensive, and conscious of possible bias in the information selected.	<p>out the presumptive identification of an unknown organism.</p> <ol style="list-style-type: none"> <li>2. explain the significance of this organism in health and disease or the environment.</li> </ol>
<u>MnTC Goal 2b</u>	imagine and seek out a variety of possible goals, assumptions, interpretations or perspectives which can give alternative meanings or solutions to a given situation or problem.	<ol style="list-style-type: none"> <li>1. arrive at “working” assumptions and seek alternative explanations for the results obtained in the activity report as defined in MnTC Goal 3d and in the activities as defined in MnTC Goal 2a.</li> </ol>
<u>MnTC Goal 2c</u>	analyze the logical connections among the facts, goals and implicit assumptions relevant to a problem or claim; generate and evaluate implications that follow from them.	<ol style="list-style-type: none"> <li>1. research, interpret, incorporate, and cite information in a report on strategies to combat a problem relevant to medical, environmental, and/or industrial microbiology.</li> </ol>
<u>CS</u>	use critical thinking skills to understand, evaluate, and analyze processes related to microbial pathogenesis, the response of the mammalian immune system to microbial infection, microbial metabolic diversity, and microbial biotechnology.	<ol style="list-style-type: none"> <li>1. investigate scientific writings that discuss one or more of the following topics: microbial pathogenesis, the mammalian immune system response to microbial infection, the metabolic diversity of microbes and the use of microbes in biotechnology.</li> </ol>
<u>CS</u>	use critical thinking skills to understand, evaluate, and analyze processes related to microbial growth such as examining a bacterial growth curve, classifying and applying bacterial growth mediums, and studying the effect of environmental variables such as temperature, pH, salinity, osmolarity and nutrient deprivation on microbial growth.	<ol style="list-style-type: none"> <li>1. demonstrate an understanding of microbial growth through experimentation and analysis of results.</li> </ol>
<u>CS</u>	compare and contrast the cell wall differences between Gram positive and Gram negative bacteria.	<ol style="list-style-type: none"> <li>1. perform staining techniques that identify cell wall differences in bacteria.</li> </ol>
<u>CS</u>	apply molecular methods used in microbial research.	<ol style="list-style-type: none"> <li>1. perform experiments that utilize one or more of the following molecular biology techniques: DNA extraction, electrophoresis, PCR.</li> </ol>
<u>CS</u>	apply bioinformatics databases and methods used to analyze bacterial DNA.	<ol style="list-style-type: none"> <li>1. through simulation and/or experimentation, utilize DNA sequencing methods and bioinformatics databases to identify bacteria.</li> </ol>

#### G. SPECIAL INFORMATION:

This course may require use of the Internet, the submission of electronically prepared documents and the use of a course management software program. Students who have a disability and need accommodations should contact Accessibility Services at the beginning of the semester. This information will be made available in alternative format, such as

Braille, large print, or current media, upon request. This course will cover the characteristics of hazardous wastes and its safe handling, storage, and disposal.

H. COURSE CODING INFORMATION:

Course Code C/Class Maximum 48; Letter Grade

Revision date: 03/03/17; 09/06/22; 10/03/23

AASC Approval date: 04/18/17; 09/20/22; 11/21/23

<b>*Riverland Community College Disciplines</b>	<b>MnTC Goal Number</b>
Communication (CM)	<b>1</b>
Natural Sciences (NS)	<b>3</b>
Mathematics/Logical Reasoning (MA)	<b>4</b>
History and the Social & Behavioral Sciences (SS)	<b>5</b>
Humanities and Fine Arts (HU)	<b>6</b>

<b>**Riverland Community College Core Themes</b>	<b>MnTC Goal Number</b>
Critical Thinking (CT)	<b>2</b>
Human Diversity (HD)	<b>7</b>
Global Perspective (GP)	<b>8</b>
Ethical and Civic Responsibility (EC)	<b>9</b>
People and the Environment (PE)	<b>10</b>

\*These five MnTC Goals have been identified as Riverland Community College Disciplines.

\*\* These five MnTC Goals have been identified as Riverland Community College Core Themes.

NOTE: The Minnesota Transfer Curriculum “10 Goal Areas of Emphasis” are reflected in the five required discipline areas and five core themes noted in the Riverland Community College program of study guide and/or college catalog.