



## MASTER COURSE OUTLINE

A. SCIE 1100 Integrated Biology and Chemistry for Elementary Education Majors

B. COURSE DESCRIPTION:

This one semester course is designed to introduce students to key concepts in biology and chemistry using an integrated approach. Students will learn basic biological and chemical terminology and the connection between biology and chemistry in areas such as the characteristics of life, cell structure and function, metabolism, biotechnology, and genetics. Enrollment in this course is limited to elementary education majors only.

**MnTC (Goal 2/CT and 3/NS); (4 Cr – 3 lect, 1 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:

- Scientific Method
- Properties and Classification of Matter
  - a. Particle Nature of Matter
  - b. Atomic Structure
  - c. Chemical Bonding
  - d. Molecular Shape
  - e. Electrolytes
- Physical Changes
  - a. Solutions & Solubility
  - b. Intermolecular Forces
  - c. Hydrophobic and Hydrophilic Interactions
- Chemical Changes
  - a. Law of Conservation of Matter

- b. Chemical Reactions
  - c. Balanced Chemical Equations
  - d. Oxidation Reduction Reactions
  - e. Kinetics
- Density
- Heat & Temperature
  - a. Law of Conservation of Energy
  - b. Thermodynamics
- Classifying Living Things
- Cell Structure & Function
  - a. Organelles
  - b. Cell Membrane
  - c. Transport Across Membranes and Equilibrium
- Metabolism
  - a. Photosynthesis
  - b. Cellular Respiration
    - i. Aerobic Respiration
    - ii. Anaerobic Respiration
  - c. Fermentation
- Mendelian & Molecular Genetics
  - a. Patterns of Inheritance
  - b. Cellular Division
    - i. Cell Cycle
    - ii. DNA Structure & Replication
  - c. Protein Synthesis
    - i. Transcription
    - ii. Translation
    - iii. Mutations
  - d. Biotechnology
    - i. Polymerase Chain Reaction
    - ii. Genetic Engineering
- Animals and Plants
  - a. Animal Life Cycles
  - b. Plant Life Cycles
  - c. Variation, Adaptation, & Natural Selection
  - d. Evolution
  - e. Energy Flow in Communities
  - f. Material Cycles in Ecosystems

E. GOAL TYPE, OBJECTIVES, AND OUTCOMES:

<b><u>GOAL TYPE</u></b>	<b><u>OBJECTIVES</u></b> <b>Students will be able to</b>	<b><u>OUTCOMES</u></b> <b>The student will successfully</b>
MnTC Goal 2a	gather factual information and apply it to a given problem in a manner that is relevant, clear, comprehensive, and conscious of possible bias in the information selected.	<ol style="list-style-type: none"> <li>1. demonstrate the ability to gather and appropriately analyze factual information, especially experimental results obtained during laboratory exercises.</li> </ol>
MnTC Goal 2b	imagine and seek out a variety of possible goals, assumptions, interpretations, or perspectives which can give alternative meanings or solutions to given situations or problems.	<ol style="list-style-type: none"> <li>1. explore other interpretations, possibilities, perspectives, etc. that could be derived from the experimental results of the lab exercises.</li> <li>2. display an understanding of the assumptions underlying the interpretation of data.</li> </ol>
MnTC Goal 2c	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. analyze the logical connections between the didactic learning in the course, the results of laboratory exercises and other practical applications.</li> <li>2. state goals and hypotheses related to the laboratory exercises.</li> <li>3. analyze the assumptions relevant to the experimental process.</li> </ol>
MnTC Goal 2d	recognize and articulate the value assumptions which underlie and affect decisions, interpretations, analyses, and evaluations made by ourselves and others.	<ol style="list-style-type: none"> <li>1. research and report on a controversial issue in ecology.</li> <li>2. provide a summary and analysis of the issue that includes evaluating the issue from a scientific and societal perspectives.</li> </ol>
MnTC Goal 3a	demonstrate understanding of scientific theories.	<ol style="list-style-type: none"> <li>1. explain the scientific method.</li> <li>2. develop a hypothesis.</li> <li>3. Identify independent, dependent, and control variables.</li> <li>4. differentiate between a theory and a law.</li> <li>5. apply knowledge of scientific theories to problem-solving applications.</li> <li>6. complete a critical analysis of laboratory experimental findings.</li> </ol>

MnTC Goal 3b	formulate and test hypotheses by performing laboratory, simulation, 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. use the scientific method to formulate and test hypotheses in lab experimentation.</li> <li>2. perform an in-depth analysis of a laboratory experiment, including statistical and graphical analysis.</li> <li>3. explain the sources of bias, error (% error) and uncertainty in the analysis above.</li> </ol>
MnTC Goal 3c	communicate their experimental findings, analyses, and interpretations both orally and in writing.	<ol style="list-style-type: none"> <li>1. discuss experimental findings in oral and written formats.</li> </ol>
MnTC Goal 3d	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. articulate the logical connections among the facts, goals and implicit assumptions related to the issue chosen for the report specified in the outcomes for MnTC Goals 2d.</li> <li>2. articulate how this issue relates to experimental and controversial work in ecology, and generate and evaluate the implications/conclusions that could be drawn from their analysis.</li> </ol>
<u>CS</u>	demonstrate mastery of the Law of Conservation of Mass and the Law of Conservation of Energy.	<ol style="list-style-type: none"> <li>1. explain how the Law of Conservation of Mass and the Law of Conservation of Energy can be tested and verified.</li> </ol>
<u>CS</u>	demonstrate an understanding of chemical formulas, drawing chemical structures, and molecular shape and polarity.	<ol style="list-style-type: none"> <li>1. write formulas for named compounds and name compounds from written formulas.</li> <li>2. draw chemical structures.</li> <li>3. identify the shape and polarity of a molecule.</li> </ol>
<u>CS</u>	identify acids and bases and their relationship to the pH scale.	<ol style="list-style-type: none"> <li>1. identify an acid and a base.</li> </ol>
<u>CS</u>	demonstrate an understanding of the structures of organic compounds and functional groups.	<ol style="list-style-type: none"> <li>1. identify and draw organic structures based on their functional groups.</li> </ol>
<u>CS</u>	demonstrate an understanding of nucleic acids.	<ol style="list-style-type: none"> <li>1. explain the structure of DNA and RNA.</li> <li>2. explain DNA replication.</li> </ol>
<u>CS</u>	demonstrate an understanding of protein synthesis.	<ol style="list-style-type: none"> <li>1. explain transcription and translation.</li> </ol>
<u>CS</u>	demonstrate an understanding of ecosystems.	<ol style="list-style-type: none"> <li>1. explain how organisms with an ecosystem interact.</li> </ol>
<u>CS</u>	demonstrate an understanding of the Theory of Evolution.	<ol style="list-style-type: none"> <li>1. explain the theory of evolution.</li> </ol>

<u>CS</u>	demonstrate an understanding of reproduction in plants and animals.	<ol style="list-style-type: none"> <li>1. identify the parts of a plant. explain how reproduction occurs in plants.</li> <li>2. compare and contrast reproduction in cold-blooded and warm-blooded animals.</li> </ol>
<u>CS</u>	demonstrate an understanding of the food web.	<ol style="list-style-type: none"> <li>1. explain key terms, such as omnivore, herbivore, and carnivore.</li> <li>2. explain how the food web operates.</li> <li>3. explain impacts to the food web caused by extinction.</li> </ol>
<u>CS</u>	demonstrate an understanding of the polymerase chain reaction (PCR).	<ol style="list-style-type: none"> <li>1. define the purpose and explain the steps involved in performing the polymerase chain reaction.</li> <li>2. describe conditions where it would be applied.</li> </ol>
<u>CS</u>	demonstrate an understanding of the various topics encompassing genetic engineering. These topics may include gene therapy, genetic analysis, transgenic organisms, cloning and stem cell therapy.	<ol style="list-style-type: none"> <li>1. investigate a topic related to genetic engineering and report findings either in written or oral form.</li> </ol>

F. 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.

G. COURSE CODING INFORMATION: Course Code B/Class Maximum 24; Letter Grade

Revision date: 04/06/18; 09/01/22

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

<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.

Riverland