MASTER COURSE OUTLINE

A. MATH 1210 Calculus I

B. COURSE DESCRIPTION:

This course covers the basics of calculus emphasizing understanding of the basic principles through investigation. The course begins with a review of functions and continues with limits, rates of change, derivatives, differentiation rules, applications of derivatives, and antiderivatives and integration. Concepts are presented graphically and numerically as well as algebraically. Prerequisites: Math 1115 or Math 1120 with a grade of C or better or appropriate placement in course based on Multiple Measures for Course Placement – Math Decision Band Chart.
MnTC (Goals 4/MA and 2/CT); (5 Cr – 5 lect, 0 lab)

C. *MnTC Discipline: Mathematical/Logical Reasoning **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:

- Review and examine functions and models
  - Four ways to represent functions
  - Mathematical models
  - Exponential and logarithmic functions
  - Trigonometric Functions
- Limits and Continuity
  - Limits
  - Rates of change
  - Using limit laws
  - One sided limits and limits at infinity
  - Infinite Limits
  - Continuity
  - Tangents
- Derivatives
  - Rules of differentiation

- Product and quotient rule
- Derivative of trigonometric functions
- Derivatives of exponential and logarithmic functions.
- Chain rule
- Implicit Differentiation
- Related Rates

- Applications of derivatives
  - Maximum and minimum
  - Concavity
  - Shapes of curves
  - Graphing
  - Optimization problems
  - Mean Value Theorem
  - Indeterminate forms and L'Hôpital's Rule
  - Newton's Method
  - Antiderivatives

- Integration
  - Approximating area under Curves
  - Definite Integrals
  - The Fundamental Theorem of Calculus
  - Integrating using substitution
  - Integrating transcendental functions

F. GOAL TYPES, OBJECTIVES, AND OUTCOMES:

GOAL	**OBJECTIVES** **Students will be able to**	**OUTCOMES** **The student will successfully**
MnTC Goal 4b	clearly express mathematical ideas in writing.	1. describe what it means for a function to be continuous. 2. state the various types of discontinuities.
MnTC Goal 4c	explain what constitutes a valid mathematical/logical argument (proof).	1. use applicable definitions and theorems to prove other theorems or results. 2. compute a derivative using the definition. 3. recognizing the derivative as a rate of change and a slope.
MnTC Goal 4d	apply higher-order problem-solving and/or modeling strategies.	1. use derivatives to solve application problems such as optimization and related rates.
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.	1. use the first derivative, second derivative test, and limits to study the characteristics of functions. 2. discuss examples to show where the tests work and where other methods are necessary to evaluate a function.
MnTC Goal 2b	imagine and seek out a variety of possible goals, assumptions, interpretations, of perspectives which can give alternative	1. use alternate methods of solving for the derivative of a function and discuss the variation of the results. Ex: use the definition of the

	meanings or solutions to given situations or problems.	derivative and rules of differentiation.
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.	1. use implicit differentiation to generate methods for evaluating and interpreting problems.
CS	demonstrate mastery of four different ways to represent a function.	1. recognize, solve and graph functions in all forms: formulas, graphs, tables and words.
CS	demonstrate mastery of finding limits.	1. explain the concept of a limit from a graphical, numerical, and algebraical point of view. 2. illustrate and calculate a variety of algebraic and transcendental functions, and limits involving infinity. 3. recognize limits in indeterminate forms (quotient, product, difference, power) and apply L'Hospital's Rule appropriately to evaluate them.
CS	demonstrate mastery of finding derivatives.	1. find derivatives using differentiation rules.
CS	demonstrate mastery of finding antiderivatives and integrating using basic integration rules and substitution.	1. define the definite integral as a limit of Riemann sums. 2. describe the relationship between derivative and definite integral as expressed in both parts of the Fundamental Theorem of Calculus. 3. apply the Fundamental Theorem of Calculus to evaluate definite integrals using antiderivatives. 4. Use basic integration rules and substitution to find antiderivatives, including antiderivatives of transcendental functions.

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. A graphing calculator is required.

H. COURSE CODING INFORMATION:

Course Code A/ Class Maximum 48; Letter Grade

Revision date: 04/29/13; 09/01/16; 09/29/17; 03/14/23
AASC Approval date: 11/21/17; 01/25/22; 03/28/23

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

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

*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.