MASTER COURSE OUTLINE

A. MATH 2210 Calculus III

B. COURSE DESCRIPTION:

This multivariable calculus course includes and expands upon the concepts from Calculus I. Topics covered include vectors and geometry in two- and three-dimensional space, vector functions, partial derivatives, multiple integrals, and vector calculus including Gauss', Green's and Stokes' Theorems. Prerequisites: MATH 1220 with a grade of C or better or equivalent courses.
MnTC (Goals 4/MA and 2/CT); (5 Cr – 5 lect, 0 lab)

C. *MnTC Discipline: Mathematical/Logical Reasoning **Core Theme: Critical Thinking

D. MAJOR CONTENT AREAS:

- Vectors and the geometry of space
  - Three dimensional coordinate system
  - Dot and cross product
  - Equations of lines and planes
  - Functions and surfaces
  - Cylindrical and spherical coordinates

- Vector functions
  - Vector functions and space curves
  - Derivatives and integrals of vector functions
  - Arc length and curvature
  - Motion in space
  - Parametric surfaces

- Partial derivatives
  - Functions of several variables
  - Limits and continuity
  - Tangent planes and linear approximations
  - Chain rule
  - Directional derivatives and the gradient vector
  - Maximum and minimum values
  - Lagrange multipliers

- Multiple integrals
  - Double integrals over rectangles
  - Iterated integrals

- Double integrals over general regions and in polar coordinates with applications
- Surface area
- Triple integrals in cylindrical and spherical coordinates
- Change of variables in multiple integrals

- Vector calculus
  - Vector fields
  - Line integrals
  - Fundamental Theorem for Line Integrals
  - Theorems – Green's, Stokes', divergence (Gauss')
  - Curl and divergence

E. GOAL TYPES, OBJECTIVES, AND OUTCOMES:

GOAL	**OBJECTIVES** **Students will be able to**	**OUTCOMES** **The student will successfully**
MnTC Goal 4a	illustrate historical and contemporary applications of mathematical/logical systems.	1. discuss the mathematicians who developed the systems and algorithms of differential and integral calculus, and the situations to which they were applied like the Fundamental Theorem of Line Integrals, Green's Theorem, Stokes' Theorem, and the divergence theorem. 2. apply these algorithms to contemporary problems and compare these to historical problems to which they were applied.
MnTC Goal 4c	explain what constitutes a valid mathematical/logical argument (proof).	1. explain the concepts of limits and continuity for real-values functions of two or more variables.
MnTC Goal 4d	apply higher-order problem-solving and/or modeling strategies.	1. use modeling strategies to solve problems of integral calculus. 2. use triple integrals to solve problems such as calculating volume, center of mass, moments of inertia, and the expected value of a continuous random variable.
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. find derivatives of vector-valued functions and use those derivatives to describe an object's motion. 2. compute gradients and directional derivatives and apply them to finding tangent spaces and normal lines.
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.	1. evaluate iterated integrals using rectangular, cylindrical, and spherical coordinate systems. 2. analyze each situation to determine which method leads to the most efficient solution.
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. compare and contrast the Fundamental Theorem of Line integrals, Green's Theorem, Stokes' Theorem, and the Divergence Theorem.
CS	demonstrate mastery of using vectors and the geometry of space.	1. recognize vector fields. Compute and interpret curl, divergence, and flux.

		2. use line integrals to calculate work done by a force field in moving an object along a curve.
CS	demonstrate mastery of partial derivatives.	1. use partial derivatives and/or Lagrange multipliers to locate any extreme values and saddle points of a function of several variables.

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 the instructor or the Student Success Center 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, TI-83 or TI-84 Series are recommended and supported.

G. COURSE CODING INFORMATION: Course Code A/Class Maximum 48; Letter Grade.

Revision date: 09/22/10; 9/1/16; 9/29/17
AASC Approval date: 11/21/17

***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.