MINNESOTA WEST COMMUNITY & TECHNICAL COLLEGE
COURSE OUTLINE

DEPT. MATH **COURSE NUMBER: 2201**

NUMBER OF CREDITS: 4 **Lecture: 4 Lab: 0 OJT 0**

Course Title:
Calculus III

Catalog Description:
Calculus III extends applications of derivatives and integrals to three-dimensions and continues Calculus II. Topics include vectors, vector-valued functions with applications, functions of two or more variables, partial derivatives, multiple integrals, and vector analysis topics including line and surface integrals, Green's Theorem, the Divergence Theorem, and Stoke's Theorem**.**

Prerequisites or Necessary Entry Skills/Knowledge:
MATH 1122

FULFILLS MN TRANSFER CURRICULUM AREA(S) ***(Leave blank if not applicable)***

☒Goal 4: Mathematics/Logical Reasoning: By meeting the following competencies:
*Goal Area 4 has been met by the pre-requisite course MATH 1121

Topics to be Covered (General)
Three Dimensional Coordinate systems and vector definitions
Vector Dot and Cross Products
Equations of lines, plane and surfaces (function approach).
Cylindrical and Spherical coordinates.
Vector Functions and space curves
Derivatives and Integrals of Vector Functions.
Arc Length, Curvature and Motion in Space.
Parametric Surfaces
Functions of several variables
Limits, Continuity, and Partial derivatives
Tangent Planes and Linear Approximations
Chain Rule for many variables
Directional Derivatives and the Gradient vector
Maxima, Minima, and Saddle Points
Lagrange Multipliers
Double Integrals over Rectangles and over General regions
Maxima, Minima, and Saddle Points
Lagrange Multipliers
Double Integrals over Rectangles and over General regions

Iterated integrals
Double Integrals in Polar Coordinates
Surface Area and other applications of double integrals
Triple Integrals and their applications
Changing Variables in Multiple Integrals
Vector Fields and Line Integrals
Green's Theorem
Curl and Divergence and Surface Integrals
Stoke's Theorem
Divergence Theorem

Student Learning Outcomes
Explain the concepts of limits and continuity for real-valued functions of two or more variables.
Find derivatives of vector-valued functions and use those derivatives to describe an object's motion.
Use partial derivatives and/or Lagrange multipliers to locate any extreme values and saddle points of a function of several variables.
Evaluate iterated integrals using rectangular, cylindrical, and spherical coordinate systems.
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.
Recognize vector fields. Compute and interpret curl, divergence, and flux.
Use line integrals to calculate work done by a force field in moving an object along a curve.
State and apply the Fundamental Theorem of Line Integrals, Green's Theorem, Stokes' Theorem, and the Divergence Theorem.
Compare and contrast the generalizations of the Fundamental Theorem of Calculus listed above.
Compute gradients and directional derivatives and apply them to finding tangent spaces and normal lines.

Is this course part of a transfer pathway: Yes ☒ No ☐

***If yes, please list the competencies below**

Calculus III	*MATH 2201: Calculus III*
1. Explain the concepts of limits and continuity for real-valued functions of two or more variables.	*1*
2. Find derivatives of vector-valued functions and use those derivatives to describe an object's motion.	*2*
3. Use partial derivatives and/or Lagrange multipliers to locate any extreme values and saddle points of a function of several variables.	*3*
4. Evaluate iterated integrals using rectangular, cylindrical, and spherical coordinate systems.	*4*
5. 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.	*5*
6. Recognize vector fields. Compute and interpret curl, divergence, and flux.	*6*
7. Use line integrals to calculate work done by a force field in moving an object along a curve.	*7*
8. State and apply the Fundamental Theorem of Line Integrals, Green's Theorem, Stokes' Theorem, and the Divergence Theorem.	*8*
9. Compare and contrast the generalizations of the Fundamental Theorem of Calculus listed above.	*9*
10. Compute gradients and directional derivatives and apply them to finding tangent spaces and normal lines.	*10*

Revised Date: 1/11/2024