Faculty are required to have the outline submitted to the Academic Affairs Office. The course outline is the form used for approval of new courses by the Collegewide Curriculum Committee.

DEPT. MATH COURSE NO. 2201

NUMBER OF CREDITS: 4

COURSE TITLE CALCULUS III

CATALOG DESCRIPTION: 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.

AUDIENCE Primarily for students majoring in the science and mathematics disciplines

FULFILLS MN TRANSFER CURRICULUM AREA(S) (Leave blank if not applicable)
Area 4 will have already been satisfied by the prerequisite for this class.

PREREQUISITES OR NECESSARY ENTRY SKILLS/KNOWLEDGE: MATH 1122 with a grade of C or better

LENGTH OF COURSE One semester

THIS COURSE IS USUALLY OFFERED:
Every other year ☐ fall ☒ spring ☐ summer ☐ undetermined ☐

Four goals are emphasized in course at Minnesota West Community & Technical College:

1) ACADEMIC CONTENT:

   The academic objectives of this course are:
   (a) To develop detailed knowledge and understanding of vector analysis.
   (b) To introduce multivariable calculus of three dimensions.
   (c) To study some applications of physics, engineering, and other areas where calculus is used.

2) THINKING SKILLS:

   This course will help students to improve the effectiveness of their thinking skills through:
   (a) Using mathematical models to understand patterns.
   (b) Exploring problems from real-world situations.
   (c) Developing problem solving strategies.
   (d) Focusing on logical, observational, insightful, and evaluative thinking.
3) COMMUNICATIONS SKILLS:

This course will help students to improve their oral and written communication skills through:
(a) Oral interpretation of problems.
(b) Writing concise solution papers to mathematical problems.
(c) Promoting visualization of mathematical concepts using graphing technology.
(d) Group problem solving and interaction.

4) HUMAN DIVERSITY:

This course will help students recognize, understand, and appreciate human diversity through:
(a) Working in groups to solve problems to experience ways those different persons interpret and solve problems.
(b) Comparing basic assumptions before tackling a complex problem.

TOPICS TO BE COVERED:

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.
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.

LIST OF EXPECTED COURSE OUTCOMES:

(a) To develop detailed knowledge and understanding of vector analysis.
(b) To introduce multivariable calculus of three dimensions using computer software.
(c) To study some applications of physics, engineering, and other areas where calculus is used.
(d) To study functions of two or more variables from four points of view: verbal, numerical, visual, and algebraic.
To decrease the time spent of pencil and paper techniques so as to increase the time spent on conceptual understanding, problem solving, and applications.

LEARNING/TEACHING TECHNIQUES used in the course are:

- Collaborative Learning
- Student Presentations
- Creative Projects
- Lecture
- Demonstrations
- Lab (Computer)
- Problem Solving
- Interactive Lectures
- Individual Coaching
- Films/Videos/Slides
- Other (describe below)

ASSIGNMENTS AND ASSESSMENTS FOR THIS CLASS INCLUDE:

- Reading
- Oral Presentations
- Textbook Problems
- Group Problems
- Other (describe below)
- Tests
- Worksheets
- Papers
- Term Paper
- Individual Projects
- Collaborative Projects
- Portfolio

EXPECTED STUDENT LEARNING OUTCOMES:

1. The student will be able to define multivariable functions in terms of vectors from graphical and analytic points of view.
2. The student will acquire skills to solve problems using partial derivatives and multiple integrals.
3. The student will learn how to apply the analytic skills to solve problems of a practical nature from several points of view: verbal, visual, numerical, and analytic.
4. The student will learn to use multivariable functions and relations to model real-world physical situations; they will also learn how to make predictions involving these physical situations.
5. The student will learn how to use computer programs to enhance the visual characteristics of multivariable functions.

The information in this course outline is subject to revision

To receive reasonable accommodations for a documented disability, please contact the campus Student Services Advisor or campus Disability Coordinator as arrangements must be made in advance. In addition, students are encouraged to notify their instructor.

Veteran Services: Minnesota West is dedicated to assisting veterans and eligible family members in achieving their educational goals efficiently. Active duty and reserve/guard military members should advise their instructor of all regularly scheduled military appointments and duties that conflict with scheduled course requirements. Instructors will make every effort to work with the student to identify adjusted timelines. If you are a veteran, please contact the Minnesota West Veterans Service Office.

This document is available in alternative formats to individuals with disabilities by contacting the Student Services Advisor or by calling 800-658-2330 or Minnesota Relay Service at 800-627-3529 or by using your preferred relay service.