Virginia Western Community College
MTH 265
Calculus III

Prerequisites
Completion of MTH 264 or equivalent with a grade of C or better.

Course Description
Focuses on extending the concepts of function, limit, continuity, derivative, integral and vector from the plane to the three dimensional space. Covers topics including vector functions, multivariate functions, partial derivatives, multiple integrals and an introduction to vector calculus. Features instruction for mathematical, physical and engineering science programs.

Semester Credits: 4 **Lecture Hours: 4**

Required Materials
Textbook:
University Calculus. Hass, Weir & Thomas. 3rd edition. Pearson/Addison-Wesley. ISBN: 9780321999580.

Other Required Materials:
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Course Outcomes
At the completion of this course, the student should be able to:

- Calculate the dot and cross products.
- Graph quadric surfaces and conic sections.
- Use the rectangular, polar, cylindrical, and spherical coordinate systems.
- Analyze and apply vector-valued and parametrized functions, employing their related theorems to describe motion in space, based upon tangent and normal vectors and the principles of curvature.
- Find and interpret the rate of change of a function of several variables.
- Find and interpret gradients and directional derivatives of functions of several variables.
- Express and evaluate area using double integrals in either rectangular or polar coordinate systems.
- Express and evaluate the volume, mass, etc. of a surface using triple integrals.
- Convert and integrate in either the rectangular, spherical, or the cylindrical systems.
- Compute line integrals for both scalar and vector valued functions.
- Apply Green's Theorem and Stoke's Theorem
- Evaluate Surface Integrals and interpret flux of a vector field.
- Find and interpret the divergence and curl of a vector-valued function.

Topical Description

Sections	Topics
11	Vectors and the Geometry of Space
11.1	Three-Dimensional Coordinate Systems
11.2	Vectors
11.3	The Dot Product
11.4	The Cross Product
11.5	Lines and Planes in Space
11.6	Cylinders and Quadric Surfaces
12	Vector-Valued Functions and Motion in Space
12.1	Curves in Space and Their Tangents
12.2	Integrals of Vector Functions; Projectile Motion
12.3	Arc Length in Space
12.4	Curvature and Normal Vectors of a Curve
12.5	Tangential and Normal Components of Acceleration
13	Partial Derivatives
13.1	Functions of Several Variables
13.2	Limits and Continuity in Higher Dimensions
13.3	Partial Derivatives
13.4	The Chain Rule
13.5	Directional Derivatives and Gradient Vectors
13.6	Tangent Planes and Differentials
13.7	Extreme Values and Saddle Points
13.8	Lagrange Multipliers
14	Multiple Integrals
14.1	Double and Iterated Integrals over Rectangles
14.2	Double Integrals over General Regions
14.3	Area by Double Integration
14.4	Double Integrals in Polar Form
14.5	Triple Integrals in Rectangular Coordinates
14.6	Moments and Centers of Mass
14.7	Triple Integrals in Cylindrical and Spherical Coordinates
14.8	Substitutions in Multiple Integrals
15	Integrals and Vector Fields
15.1	Line Integrals
15.2	Vector Fields and Line Integrals: Work, Circulation, and Flux
15. 3	Path Independence, Conservative Fields, and Potential Functions
15.4	Green's Theorem in the Plane
15.5	Surfaces and Area
15.6	Surface Integrals
15.7	Stoke's Theorem
15.8	The Divergence Theorem and a Unified Theory

Notes to Instructors

1. A comprehensive final exam will be given.