MAT 273 Calculus III

COURSE DESCRIPTION:

Prerequisite(s): MAT 272; minimum grade of "C"
Corequisite(s): None

This course is designed to develop the topics of multivariate calculus. Emphasis is placed on multivariate functions, partial derivatives, multiple integration, solid analytical geometry, vector valued functions, and line and surface integrals. Upon completion, students should be able to select and use appropriate models and techniques for finding the solution to multivariate-related problems with and without technology.
This course has been approved to satisfy the Comprehensive Articulation Agreement for the general education core requirement in natural sciences/mathematics.
Course Hours Per Week: Class, 3. Lab, 2. Semester Hours Credit, 4.

LEARNING OUTCOMES:

Upon completing requirements for this course, the student will be able to:

1. Perform operations with vectors in two- and three-dimensional space and apply to analytic geometry
2. Differentiate and integrate vector-valued functions and apply calculus to motion problems in two- and three-dimensional space
3. Determine the limits, derivatives, gradients, and integrals of multivariate functions
4. Solve problems in multiple integration using rectangular, cylindrical, and spherical coordinate systems
5. Select and apply appropriate models and techniques to define and evaluate line and surface integrals; these techniques will include but are not limited to Green's, Divergence, and Stokes' theorems
6. Demonstrate proficiency in using CAS technology to analyze, solve and interpret the various applications

OUTLINE OF INSTRUCTION:

I. Vectors and the Geometry of Space
   A. Three-Dimensional Coordinate Systems
   B. Vectors
   C. The Dot Product
   D. The Cross Product
   E. Equations of Lines and Planes
   F. Cylinders and Quadric Surfaces

II. Vector Functions
   A. Vector Functions and Space Curves
   B. Derivatives and Integrals of Vector Functions
   C. Arc Lengths and Curvature
   D. Motion in Space: Velocity and Acceleration

III. Partial Derivatives
   A. Functions of Several Variables
   B. Limits and Continuity
   C. Partial Derivatives
   D. Tangent Planes and Linear Approximations
   E. The Chain Rule
   F. Directional Derivatives and the Gradient Vector
   G. Maximum and Minimum Values
   H. Lagrange Multipliers

IV. Multiple Integrals
   A. Double Integrals Over Rectangles
   B. Iterated Integrals
   C. Double Integrals Over General Regions
   D. Double Integrals in Polar Coordinates
   E. Applications of Double Integrals
   F. Triple Integrals
   G. Triple Integrals in Cylindrical Coordinates
   H. Triple Integrals in Spherical Coordinates
   I. Change of Variables in Multiple Integrals

V. Vector Calculus
   A. Vector Fields
   B. Line Integrals
   C. The Fundamental Theorem of Line Integrals
   D. Green's Theorem
   E. Curl and Divergence
   F. Parametric Surfaces and Their Areas
   G. Surface Integrals
   H. Stokes Theorem
   I. The Divergence Theorem

REQUIRED TEXTBOOK AND MATERIAL:

The textbook and other instructional material will be determined by the chair/instructor.