

MTH 254 : VECTOR CALCULUS I

Transcript title

Vector Calculus I

Credits

4

Grading mode

Standard letter grades

Total contact hours

60

Lecture hours

30

Lab hours

30

Recommended preparation

MTH 253.

Course Description

Introduces concepts of vector calculus to science and engineering students. Includes vectors and vector functions, parametric curves, functions of several variables, partial derivatives, gradients, directional derivatives and optimization problems. Uses graphing technology.

Course learning outcomes

1. Analyze vectors and combinations of vectors in two- and three-dimensions, geometrically, and algebraically with vector operations.
2. Categorize lines, planes, cylinders, and quadric surfaces graphically and analytically.
3. Analyze vector valued functions with calculus techniques.
4. Categorize functions of several variables.
5. Analyze multivariable functions with partial derivatives.

Content outline

1. Vectors, and vector operations of addition, subtraction, scalar multiplication, dot-and-cross products, algebraically, and geometrically in two- and three-dimensional space
2. Equations and graphs of lines, planes, cylinders, and quadric surfaces in three-dimensional space
3. Vector-valued functions in one variable and space curves
4. Derivatives and integrals of vector-valued functions to find, with respect to the space curve:
 - a. Tangent and normal vectors
 - b. Arc-length
 - c. Curvature
 - d. Motion in space: position, velocity and acceleration
5. Differentiate functions of several variables by partial differentiation
6. Find and apply directional derivatives and the gradient of a function of two or three variables

7. Use partial derivatives to find tangent planes, normal lines, and extrema of functions of two variables
8. Use Lagrange multipliers to solve optimization problems

Required materials

This class requires a textbook and access to graphing technology.

General education/Related instruction lists

- Mathematics