

## MthSc 206 – Multivariable Calculus

2011 Catalog Data: MTHSC 206, H206 Calculus of Several Variables 4(4,0) Topics include real valued functions of several variables, multiple integration, differential calculus of functions of several variables, vector field theory. *Preq:* MTHSC 108.

Textbook: Multivariable Calculus by James Stewart, Brooks/Cole, Cengage Learning, 2012

Supplemental Material: On-line homework software: WebAssign (required)

Technology: Students may use calculators with graphing and symbolic capabilities (e.g., the TI-89) as learning aides for homework and classroom exercises. The Maple software package is also useful in this course.

Coordinator: Dr. Shari Prevost, Senior Lecturer

Pre/Co-requisites by Topic:

1. Integration
2. Applications of definite integrals
3. Techniques of integration
4. Infinite sequences and series, and
5. Calculus with parametric equations and polar coordinates.

Topical Outline:

### Chapter 12

Three-Dimensional Coordinate Systems, Vectors, Dot Product, Cross Product, Equations of Lines and Planes, Cylinders and Quadric Surfaces

### Chapter 13

Vector Functions and Space Curves, Derivatives and Integrals of Vector Functions, Arc Length and Curvature, Motion in Space: Velocity and Acceleration

### Chapter 14

Functions of Several Variables, Limits and Continuity, Partial Derivatives, Tangent Planes and Linear Approximations, The Chain Rule, Directional Derivatives and the Gradient Vector, Maximum and Minimum Values, Lagrange Multipliers

### Chapter 15

Double Integrals over Rectangles, Iterated Integrals, Double Integrals over General Regions, Double Integrals in Polar Coordinates, Applications of Double Integrals, Triple Integrals, Triple Integrals in Cylindrical Coordinates, Triple Integrals in Spherical Coordinates

## Chapter 16

Vector Fields, Line Integrals, The Fundamental Theorem for Line Integrals, Green's Theorem, Curl and Divergence, Parametric Surfaces and Their areas, Surface Integrals, Stokes' Theorem, The Divergence Theorem

### Evaluation Methods:

1. Online Homework = 10%
2. In class Quizzes = 10%
3. 4 Tests = 60% (15% each)
4. Final Exam = 20%

Student Learning Outcomes: A student who successfully completes MthSc 206 will be able to:

1. Perform basic vector operations such as the dot product and cross product and utilize these operations in applications.
2. Find equations of lines and planes in 3-space, and identify basic quadric surfaces and cylinders.
3. Evaluate limits, derivatives, and integrals of vector-valued functions of one variable and for the associated curves find arc length, curvature, tangent lines, unit tangent vectors, principle unit normal vectors, and bi-normal vectors.
4. Compute limits, partial derivatives, directional derivatives, and gradients for functions of several variables, and use differentiation to determine tangent planes, relative extrema, and absolute extrema of continuous functions on closed and bounded regions for functions of several variables.
5. Use Lagrange multipliers to find extrema of a function subject to one constraint.
6. Evaluate multiple integrals in 2 and 3 dimensions, in various coordinate systems, and apply these integrals to calculate areas, volumes, surface areas, mass, and centers of mass.
7. Evaluate line integrals, surface integrals and flux integrals directly, and be able to apply the Fundamental Theorem of Calculus for Line Integrals, and Green's Theorem, Stokes' Theorem, and the Divergence Theorem appropriately.
8. Identify conservative vector fields and find potential functions for conservative vector fields.

Prepared by: Kevin James

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