

CALCULUS III

MATH 1970

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1.0 Course Objectives

- 1.1 **Overview of Content and Purpose:** (4 hours) Plane vectors, polar coordinates, parametric equations, solid analytic geometry, partial differentiation, multiple integration, and introduction to vector calculus.
- 1.2 **For Whom Intended:** Science, mathematics, and engineering students, and anyone needing multivariable calculus.
- 1.3 **Prerequisites:** MATH 1960
- 1.3 **Unusual Circumstances:** None

2.0 Objectives

- 2.1 **Performance Objectives for the students:** The last semester of a three-semester sequence in calculus and analytic geometry. This semester emphasizes 3-dimensional space, vectors, multivariable calculus, line and surface integrals.

3.0 Content and Organization

- 3.1 **Topics:**
1. Vectors
 - a. Vectors in space
 - b. Dot and cross product of vectors
 - c. Lines in space
 - d. Planes in space
 2. Vector-valued functions
 - a. Calculus of vector-valued functions
 - b. Space curves and their lengths
 - c. Unit tangent and unit normal vectors
 - d. Velocity and acceleration of objects in space
 - e. Curvature
 - f. Newton's and Kepler's laws of motion
 3. Multivariable functions
 - a. Functions of several variables
 - b. Functions of two and three variables
 - c. Quadric surfaces
 - d. Cylindrical and spherical coordinates
 4. Differential calculus of multivariable functions
 - a. Limits and continuity
 - b. Partial derivatives
 - c. Differentiability
 - d. Chain Rule
 - e. Directional derivatives and gradients
 - f. Tangent planes and normals
 - g. Extrema of multivariable functions
 - h. Lagrange multipliers

5. Integral calculus of multivariable functions
 - a. Double integrals
 - b. Surface area
 - c. Triple integrals
 - d. Center of mass and moments of inertia
 - e. Change of variables in multiple integrals.
6. Calculus of vector fields
 - a. Vector fields
 - b. Line integrals
 - c. Green's Theorem
 - d. Surface integrals
 - e. Divergence theorem and applications
 - f. Stokes' Theorem and applications

4.0 Teaching Methodology

- 4.1 **Methods To be Used:** Traditional lecture-discussion methods in sections not exceeding fifty students.

5.0 Evaluation

- 5.1 **Basis for Evaluating Student Performance:** The grade for this course will be based on Five exams (100 points each) Quizzes, announced and unannounced, consisting of one or two problems from assigned homework (100 points) Final examination (200 points)

6.0 Resource Material

Textbook(s): Anton, Bivens, Davis' Calculus Early Transcendentals, 8th Edition, Wiley & Sons, Inc, 2005. ***NOTICE** - 1970 will cover chapter 12-16, omitting 13.7, including 2 MAPLE assignments.

OtherRequiredReadings: Harris, Discovering Calc with MAPLE, ISBN 0-471-00973-3 Addison Wesley publishers