Cape Cod Community College

Departmental Syllabus

Prepared by the Department of Mathematics
Date of Departmental Approval: November 6, 2017
Date approved by Curriculum and Programs: January 18, 2018 Effective: Fall 2018

1. **Course Number: MAT260**
   Course Title: Calculus III

2. **Description:** The sequel to MAT250 Calculus II. Topics include parametric equations and polar coordinates, vector-valued functions, partial differentiation, multiple integrals, and topics from vector calculus and from differential equations. 4 class hours.

3. **Student Learning Outcomes (instructional objectives: intellectual skills):**
   Upon successful completion of the course, students are able to do the following:
   - Define and evaluate limits, directional derivatives, and integrals of both vector and scalar fields.
   - State and prove basic properties of continuity, derivatives and integrals.
   - Use vector analysis to find the parametric equation of a line in multi-dimensional setting.
   - Determine the equation of a plane in R^3 as well as the plane tangent to a surface at a given point.
   - Use the gradient vector of a differentiable function to find directional derivatives and the tangent line to a level curve.
   - Solve extreme value problems by using Lagrange multiplier and other techniques.
   - Evaluate double, triple, and line integrals.
   - Recite and demonstrate intuitive understanding of the main theorems in vector calculus.
   - Solve related application problems in physical sciences.

4. **Credits(s):** 4 credits

5. **Satisfies General Education Core *or* Distribution Requirement:** No

6. **Prerequisite(s):** A grade C- or higher in MAT250 (Calculus II) or its equivalence

7. **Suggested General Statement of Evaluation:** Comprehensive final examination, hour tests, problems, and quiz papers.

8. **General Topical Outline (Optional):** Please see the attached course outline.

MAT260 Calculus III

I. Plane Curves and Polar Coordinates
   A. Plane Curves, Tangent Lines, Arc Length
   B. Polar Coordinates
   C. Integrals in Polar Coordinates
   D. Polar Equations of Conics

II. Vectors and Surfaces
   A. Vectors in Two and Three Dimensions
   B. Scalar Product
   C. Vector Product
   D. Lines and Planes
   E. Surfaces
   F. Cylindrical and Spherical Coordinates

III. Vector Valued Functions
   A. Definitions and Space Curves
   B. Limits, Derivatives, and Integrals
   C. Motion, Tangential and Normal Components of Acceleration
   D. Curvature
   E. Kepler's Laws

IV. Partial Differentiation
   A. Functions of Several Variables
   B. Limits and Continuity
   C. Partial Derivatives
   D. Increments and Differentials
   E. Chain Rules
   F. Directional Derivatives
   G. Tangent Planes and Normals to Surfaces
   H. Extrema of Functions of Several Variables
   I. Lagrange Multipliers

V. Multiple Integrals
   A. Double Integrals and Their Evaluation
   B. Area and Volume Applications
   C. Double Integrals in Polar Coordinates
   D. Surface Area
   E. Triple Integrals
   F. Moments and Centers of Mass
   G. Triple Integrals in Cylindrical and Spherical Coordinates
   H. Change of Variable in Multiple Integrals

VI. Vector Calculus
   A. Vector Fields
   B. Line Integrals
   C. Independence of Path
   D. Green's Theorem
   E. Surface Integrals
   F. Divergence Theorem
   G. Stokes Theorem