Common Course Outline

MATH 253

Calculus III

4 Credits

Community College of Baltimore County

Description

MATH 253 – Calculus III Covers the major topics of third semester Calculus, including functions of several variables, differentiation and integration, vectors, vector fields, parameterization, Green's Theorem, and applications.

4 Credits: 5 lecture hours

Prerequisite: MATH 252 with a grade of "C" or better

Overall Course Objectives

Upon completion of this course students will be able to:

1. define and apply differentiation and integration rules to various multi-variable functions;
2. express concepts of differentiable and integral multi-variable calculus using appropriate terminology;
3. define vectors and vector fields and compare their definitions to lower dimension analogs;
4. define the parameterization of surfaces and solids;
5. express mathematical information in table, graphical, formulaic, and written formats;
6. apply a working knowledge of mathematical applications relevant to such fields as mathematics, engineering, science, and computer science;
7. apply course-related mathematical theories in order to make informed decisions in real life situations;
8. analyze data and determine an appropriate mathematical function that describes the data;
9. apply appropriate technology, such as graphing calculators and computer algebra system software, to solve mathematical problems;
10. identify efficient and inefficient methods for problem solving;
11. utilize the Internet and other resources to research course-related topics;
12. examine the mathematical contributions made by people from diverse cultures throughout history; and
13. articulate a solution to mathematical problems.

Major Topics

I. Functions of several variables

A. Graphs of functions of several variables
B. Contour diagrams
C. Linear functions
D. Limits and continuity

II. Vectors
A. Displacement vectors and vectors in general
B. Dot product and cross product

III. Differentiating functions of several variables
A. Partial derivative: estimate from graph and table; compute algebraically
B. Local linearity and the differential
C. Gradients and directional derivatives in the plane and space
D. Chain Rule
E. Second-order partial derivatives
F. Taylor Approximations for functions of several variables

IV. Optimization
A. Local extrema
B. Global extrema: unconstrained optimization
C. Constrained optimization: Lagrange multipliers

V. Integrating functions of several variables
A. Iterated integrals and triple integrals
B. Double integrals in polar coordinates
C. Change of variables in a multiple integral

VI. Parameterized curves and surfaces
A. Vector-valued functions
B. Parameterized curves and surfaces
C. Motion, velocity, and acceleration
D. Implicit function theorem

VII. Vector fields
A. Definition of a vector field
B. Flow of a vector field
C. Divergence of a vector field
D. Divergence Theorem
E. Curl of a vector field
F. Stokes Theorem

VIII. Other Integrals
A. The idea of a line integral
B. Computing line integrals over parameterized curves
C. Gradient fields and path-independent fields
D. Path-dependent vector fields and Green's Theorem
E. The idea of a flux integral
F. Flux integrals over parameterized surfaces

Course Requirements

Grading procedures will be determined by the individual faculty member but will at least include the following:

Grading/exams

- At least two tests will be given
- A comprehensive final exam

Date revised: 01/30/2019