

Common Course Outline

MATH 253

Calculus III

4 Semester Hours

The Community College of Baltimore County

Description

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.

Prerequisite: MATH 252

Overall Course Objectives

Upon successful completion of this course, students will be able to:

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

Major Topics

1. Functions of several variables
 - A. Graphs of functions of several variables
 - B. Contour diagrams
 - C. Linear functions
 - D. Limits and continuity
2. Vectors
 - A. Displacement vectors and vectors in general
 - B. Dot product and cross product
3. 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
4. Optimization
 - A. Local extrema
 - B. Global extrema: unconstrained optimization
 - C. Constrained optimization: Lagrange multipliers
5. 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
6. Parameterized curves and surfaces
 - A. Vector-valued functions
 - B. Parameterized curves and surfaces
 - C. Motion, velocity, and acceleration
 - D. Implicit function theorem
7. 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
8. 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 (General Education Goal #VII)

Students will be given opportunity to collaborate via group work and/or oral presentation of problem solutions. There will be multiple opportunities for the instructor to assess student progress in the course through classwork and/or homework.

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

1. Tests, Exams, and/or Quizzes: At least two written examinations will be given. Individual faculty will notify students of testing procedures to be used.
2. Comprehensive Final Exam: The course will include a comprehensive final exam, which may include a final project.
3. Other projects: Individual faculty will notify students of other projects that are assigned.

Final Grades: Grades will be determined by faculty members.

Individual faculty members may include additional course objectives, major topics, and other course requirements to the minimum expectations stated in the Common Course Outline.

The Community College of Baltimore County is committed to providing a high-quality learning experience that results in growth in knowledge, attitudes, and skills necessary to function successfully as a transfer student, in a career and as a citizen. To accomplish this goal, we maintain high academic standards and expect students to accept responsibility for their individual growth by attending classes, completing all homework and other assignments, participating in class activities and preparing for tests.

We take seriously our responsibility to maintain high-quality programs and will periodically ask you to participate in assessment activities to determine whether our students are attaining the knowledge, attitudes and skills appropriate to various courses and programs. The assessment activities may take many different forms such as surveys, standardized or faculty-developed tests, discussion groups or portfolio evaluations. We ask that you take these activities seriously so that we can obtain valid data to use for the continuous improvement of CCBC's courses and programs.