# 4/8/2021

# brcc keystone logo

Baton Rouge Community College

*Academic Affairs Master Syllabus*

Date Approved: 27 April 2021

Term and Year of Implementation: Fall 2020

**Course Title:** Multidimensional Calculus

**BRCC Course Rubric:** MATH 2134

**Previous Course Rubric**: MATH 212

**Lecture Hours per week-Lab Hours per week-Credit Hours**: 4-0-4

**Per semester: Lecture Hours-Lab Hours-Instructional Contact Hours**: 60-0-60

**Louisiana Common Course Number:** CMAT 2133

**CIP Code:** 27.0101

**Course Description:** Covers three-dimensional analytic geometry, partial derivatives, multiple integrals, and vector calculus. This is the third calculus course of a three-course sequence.

**Prerequisites:** Appropriate placement test score or MATH 2125 (or MATH 211) with a grade of C or better

**Co-requisites:** None

**Suggested Enrollment Cap:** 40

**Learning Outcomes.** *Upon successful completion of this course, the students will be able to:*

1. Graph lines, planes, and three-dimensional figures such as cylinders, paraboloids, ellipsoids, and hyperboloids on a three-dimensional coordinate system.

2. Apply calculus techniques to multi-variable functions to find limits, intervals of continuity, partial derivatives, directional derivatives, gradients, parametric equations for a line in space, and an equation of a tangent plane to a surface in space.

3. Apply the second derivative test to find extrema and to optimize multi-variable functions.

4. Setup and evaluate multiple integrals to calculate areas and volumes for regions and solids.

5. Examine vector fields, evaluate line integrals, find potential functions and path-independence, and apply Green’s Theorem, Stoke’s Theorem, and/or Divergence Theorem to vector calculus problems.

**General Education Learning Outcome(s):** This course supports the development of competency in the following area(s). Students will:

Use processes and models to solve quantitative problems. (General Education Competency: Quantitative and Symbolic Reasoning)

**Assessment Measures.** Assessment of all learning outcomes will be measured using the following methods:

1. Instructor created exams, quizzes, and/or homework

2. Comprehensive final exam

**Information to be included on the Instructor’s Course Syllabi:**

* ***Disability Statement*:** Baton Rouge Community College seeks to meet the needs of its students in many ways. See the Office of Disability Services to receive suggestions for disability statements that should be included in each syllabus.
* ***Grading:*** The College grading policy should be included in the course syllabus. Any special practices should also go here. This should include the instructor’s and/or the department’s policy for make-up work. For example in a speech course, “Speeches not given on due date will receive no grade higher than a sixty” or “Make-up work will not be accepted after the last day of class”.
* ***Attendance Policy*:** Include the overall attendance policy of the college. Instructors may want to add additional information in individual syllabi to meet the needs of their courses.
* ***General Policies*:** Instructors’ policy on the use of things such as beepers and cell phones and/or hand held programmable calculators should be covered in this section.
* ***Cheating and Plagiarism*:** This must be included in all syllabi and should include the penalties for incidents in a given class. Students should have a clear idea of what constitutes cheating in a given course.
* ***Safety Concerns:*** In some courses, this may be a major issue. For example, “No student will be allowed in the lab without safety glasses”. General statements such as, “Items that may be harmful to one’s self or others should not be brought to class”.
* ***Library/ Learning Resources:*** Since the development of the total person is part of our mission, assignments in the library and/or the Learning Resources Center should be included to assist students in enhancing skills and in using resources. Students should be encouraged to use the library for reading enjoyment as part of lifelong learning.

**Expanded Course Outline:**

I. Vectors and the Geometry of Space

A. Lines and Planes in Space

B. Surfaces in Space

C. Cylindrical and Spherical Coordinates

II. Vector-Valued Functions

A. Tangent Vectors and Normal Vectors

B. Arc Length and Curvature

III. Functions of Several Variables

A. Functions of Several Variables

B. Limits and Continuity

C. Partial Derivatives

D. Differentials and Chain Rules for Functions of Several Variables

E. Directional Derivatives and Gradients

F. Tangent Planes and Normal Lines

G. Extrema of Functions and Application of Extrema of Functions of Two Variables

H. Lagrange Multipliers (optional)

IV. Multiple Integration

A. Iterated Integrals and Area in the Plane

B. Double Integrals and Volume

C. Change of Variables: Polar Coordinates

D. Center of Mass and Moments of Inertia

E. Surface Area

F. Triple Integrals and Applications

G. Triple Integrals in Cylindrical and Spherical Coordinates

H. Change of Variables: Jacobians (optional)

V. Vector Analysis

A. Vector Fields

B. Line Integrals

C. Conservative Vector Fields and Independence of Path

D. Green’s Theorem

E. Parametric Surfaces

F. Surface Integrals

G. Divergence Theorem

H. Stokes’ Theorem