Capital Community College
Course Outline
Calculus III;Multivariable *Calculus*

SECTION I

SUBJECT AREA & COURSE NUMBER: MAT* G268
COURSE TITLE: Calculus III: Multivariable Calculus
COURSE CATALOG DESCRIPTION: The topics studied in this course include vectors, analytic geometry in 3-space, partial derivatives, gradients, directional derivatives, multiple integrals, line and surface integrals, Green's and Stoke's Theorems, and continued introduction to differential equations. This course will incorporate calculus reform elements such as the use of the graphing calculator or the computer and writing assignments.
LECTURE HOURS PER WEEK: 4 **CREDIT HOURS:** 4
PREREQUISITE(S): MAT* G256

SECTION II

A. SCOPE:
Objectives of Calculus III are to enable the student to: (1) Extend the central concepts of calculus - limit, continuity, derivative, integral - to functions of several variables. (2) Develop the concept of vector, represent vectors, and perform algebraic operations on vectors. (3) Apply vectors and vector-valued functions to geometry, motion, velocity fields, and force fields. (4) Develop concept of scalar-valued and vector-valued multivariable functions. (5) Represent and visualize multivariable functions. (6) Evaluate and interpret partial derivatives. (7) Use partial derivatives to obtain information about functions. (8) Optimize functions of two variables. (9) Set up, evaluate, and interpret double and triple integrals. (10) Evaluate and interpret line and surface integrals – use Green's Theorem and Stoke's Theorem. (11) Develop and introductory understanding of ordinary and partial differential equations.

B. REQUIRED WORK: Determined by the instructor as described in the course syllabus

C. ATTENDANCE AND PARTICIPATION: Students are expected to attend each class, arrive on time, take exams at the scheduled times, and participate in the in-class learning process. (Specific instructor policies are included on the course syllabus)

D. METHODS OF INSTRUCTION: The methods of instruction are determined by each instructor and may include but are not limited to lecture, lecture/discussion, small group collaborative learning, experiment/exploration, distance learning, student presentations, use of technologies such as audio-visual materials, computer, language laboratory, and calculator.

NOTE: This draft (9/26/04) is based on the pre-common numbering system course, Calculus III- Math251; This common numbering system draft has yet to be acted on by the Science and Mathematics Dept.

E. OBJECTIVE, OUTCOMES, ASSESSMENT

The following objectives and outcomes represent the department's core requirements for student achievement.

LEARNING OBJECTIVES	LEARNING OUTCOMES	ASSESSMENT METHODS
To demonstrate an understanding of:	**Student will:**	**As measured by:**
Functions of several variables	a) Evaluate multivariable functions. b) Graph multivariable functions.	Written in-class quizzes, tests, and examinations; out-of-class projects, written reports; portfolios; homework assignments
Vectors	a) Represent and apply vectors. b) Perform algebraic operations on vectors. c) Calculate and interpret dot product. d) Calculate and interpret cross product.	
Lines, planes, curves, and surfaces in 3-space.	a) Represent lines, planes, curves, and surfaces in terms of vectors and in terms of x, y, z coordinates. b) Parametrize curves and surfaces.	
Vector-valued functions	a) Differentiate vector-valued functions. b) Define and compute arc length c) Parametrize a curve by arc length. d) Determine velocity and acceleration of a particle moving along a curve. e) Define and calculate curvature.	
Differentiation of functions of several variables	a) Evaluate limits, explore continuity, and find partial derivatives. b) Find and interpret the directional derivative and gradient of a function. c) Use the Chain Rule. d) Solve selected partial differential equations.	
Optimization of functions of several variables	a) Find local and global extremes – constrained and unconstrained optimization.	
Multiple Integrals	a) Evaluate definite integrals of functions of 2 or 3 variables. b) Evaluate integrals using polar, cylindrical, and spherical coordinates c) Apply integrals to find volume and mass.	
Vector fields	a) Evaluate line integrals. b) Evaluate and apply divergence and curl of a vector field. c) Distinguish conservative from non-conservative fields. d) Apply Green's Theorem. e)Evaluate and apply surface integrals. f) Apply Divergence Theorem and Stoke's Theorem.	

Note 1: The foregoing table of learning outcomes should not be considered exhaustive; other learning outcomes may also support the objectives. The list is not intended to limit the learning outcomes that can be used to support the objectives.
Note 2: The order in which the learning outcomes are addressed and the relative emphasis given to each will vary from instructor to instructor.
Note 3: There is no expectation that an instructor will employ all the assessment methods or any particular subset of them. Also, the particular list of assessment methods is not exhaustive. Other methods that measure the learning outcomes may be used.
Note 4: It is important to recognize that courses are not delivered in a social vacuum. Any bona fide assessment of a course must take account of out-of-class life demands on students that adversely impact academic success.

F. TEXTS AND MATERIALS: A text selected by the Mathematics Section of the Science and Mathematics Department with content and presentation that support the Learning Objectives and Outcomes given in Part E above.

G. INFORMATION TECHNOLOGY: Graphing calculator and DERIVE™ (a computer algebra system)