Capital Community College
Course Outline
Calculus I

SECTION I

SUBJECT AREA & COURSE NUMBER: MAT* G254
COURSE TITLE: Calculus I

COURSE CATALOG DESCRIPTION: Course includes a study of limits and continuity, derivatives and their applications, definite integrals, applications of definite integrals to area and motion, and an introduction to differential equations. The concepts of calculus are applied to polynomial, rational, exponential, logarithmic, and trigonometric functions. This course requires a graphing calculator and may include use of a computer software package.

LECTURE HOURS PER WEEK: 4 **CREDIT HOURS:** 4
PREREQUISITE(S): MAT* G186

SECTION II

A. SCOPE:
The objectives of Calculus I are to enable the student to: (1) develop a deeper understanding of functions as both processes and entities. (2) develop a working understanding of the central calculus concepts (CCCs) -- Limit, Derivative, Integral. (3) interrelate the CCCs. (4) work with calculus topics from a graphical, numerical, and algebraic point of view. (5) establish connections among calculus topics. (6) establish connections among calculus topics and "real world" applications. (7) achieve the level of mathematical understanding required for further study of calculus.

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 in 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.

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:**
The Limit	a) Evaluate limits (including left/right) graphically, algebraically, and numerically b) Apply epsilon-delta definition c) Apply limit theorems to evaluate limits	Written in- class quizzes, tests, and examinations; presentations to the class; out-of-class projects, written reports; portfolios; homework assignments
Continuity	a) Determine continuity from a graph b) Apply definition of continuity c) Distinguish removable and non-removable discontinuities	
The Derivative	a) Evaluate derivatives from the definition b) Interpret the derivative c) Apply differentiation theorems to evaluate derivatives c) Evaluate derivatives graphically, numerically, and algebraically d) Use implicit differentiation	
Theorems involving continuity and differentiability	Prove and apply: a) Intermediate Val. T. b) Extreme Val. T. c) Differentiability implies Continuity T. d) Local Extrema and Critical points T. e) Mean Value T. f) Increasing function T. g) Constant function T.	
Applications of the Derivative	Use the derivative to: (a) analyze functions (increasing/ decreasing, max/min, concave up/down) b) find the local linearization of a function at a point c) calculate velocity and acceleration c) solve optimization problems	
The Definite Integral Part 1	a) Estimate value of Def. Integrals from lower/upper sums b) Place bounds on estimation errors c) Interpret the Def. Integral of a rate as a total change d) Evaluate Def. Integral using basic Integral theorems and the Fundamental Theorem	
The Definite Integral Part 2	Apply the Definite Integral to calculate change in position, distance traveled, area, and the average value of a function	
Indefinite integration	Evaluate the indefinite integral of elementary functions	
A Mathematical Model	a) Represent a "real world" situation by a function b) Explore the situation by applying calculus to the mathematical model c) Support this activity with appropriate technology d) Describe findings in a written report	

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)