Alabama Community College System

MTH 125
Calculus I

I. MTH 125 Calculus I– 4 Semester Hours

II. Course Description

This is the first of three courses in the basic calculus sequence taken primarily by students in science, engineering, and mathematics. Topics include the limit of a function; the derivative of algebraic, trigonometric, exponential, and logarithmic functions; and the definite integral and its basic applications to area problems. Applications of the derivative are covered in detail, including approximations of error using differentials, maximum and minimum problems, and curve sketching using calculus.

III. Prerequisite

Grade of C or higher in MTH 113 or 115 or appropriate placement score.

IV. Textbook

Due to the varied selection of quality college-level textbooks, each college will select the textbook needed to meet the requirements of this course.

V. Course Objectives

By the end of the course, students will be able to:

1. find limits graphically, numerically, and analytically;
2. differentiate and integrate functions;
3. apply the first and second derivatives of a function to describe its graph; and
4. solve application problems by using concepts of derivatives and antiderivatives.

VI. Course Outline of Topics

Required Topics

1. Limits
    a. An introduction to limits
    b. Properties of limits
    c. Techniques for evaluating limits
    d. Continuity and one-sided limits
    e. Infinite limits
    f. Limits at infinity
2. Differentiation
    a. The derivative and tangent line problem
    b. Basic differentiation rules and rates of change
    c. Product and quotient rules and higher order derivatives
    d. The chain rule
    e. Implicit differentiation
3. Applications of Differentiation
    a. Related rates
    b. Extrema on an interval
    c. Rolle's Theorem and the Mean Value Theorem
    d. Increasing and decreasing functions and the first derivative test
    e. Concavity and the second derivative test
    f. A summary of curve sketching
    g. Optimization problems
    h. Differentials
4. Integration
    a. Antiderivatives and indefinite integration
    b. Basic area problems
    c. Riemann sums and definite integrals
    d. The Fundamental Theorem of calculus
    e. Integration by substitution
5. Logarithmic, Exponential, and Inverse Trigonometric Functions
    a. The natural logarithmic function: differentiation and integration
    b. Inverse functions
    c. Exponential functions: differentiation and integration
    d. Inverse trigonometric functions: differentiation, integration, and completing the square

Optional Topics

1. Homogeneous differential equations
2. Newton's Method
3. Separable differential equations and their applications
4. Hyperbolic functions
5. Numerical integration using rectangles

II. Evaluation and Assessment

Grades will be given based upon A = 90 – 100%, B = 80 – 89%, C = 70 – 79%, D = 60 – 69%, and F = below 60%.

III. Attendance

Students are expected to attend all classes for which they are registered. Students who are unable to attend class regularly, regardless of the reason or circumstance, should withdraw from that class before poor attendance interferes with the student's ability to achieve the objectives required in the course. Withdrawal from class can affect eligibility for federal financial aid.

IV. Statement on Discrimination/Harassment

It is the official policy of the Alabama Community College System and entities under its control, including all Colleges, that no person shall be discriminated against on the basis of any impermissible criterion or characteristic, including, without limitation, race, color, national origin, religion, marital status, disability, sex, age, or any other protected class as defined by federal and state law. (ACCS Policies 601.02 and 800.00)

V. Americans with Disabilities

The Rehabilitation Act of 1973 (Section 504) and the *Americans with Disabilities Act* of 1990 state that qualified students with disabilities who meet the essential functions and academic requirements are entitled to reasonable accommodations. It is the student's responsibility to provide appropriate disability documentation to the College.