**ALLEN COMMUNITY COLLEGE**
**COMMON COURSE OUTLINE**
**MAT 123 CALCULUS WITH ANALYTIC GEOMETRY I**

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## I. COURSE INFORMATION

A. Mathematics 123 Calculus with Analytic Geometry I
B. 5 credit hours
C. Briggs, Cochran, Gillett and Schulz. *Calculus for Scientists and Engineers: Early Transcendentals*. 3rd ed. New Jersey: Pearson, 2018
D. Prerequisites: MAT105 or MAT106, or MAT120, or high school equivalents with grade of C or above, or ACT Math score 24 or above, or with Instructor's consent
E. KRSN: MAT 2010 Calculus I

The learning outcomes and competencies detailed in this course outline or syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups project for this course as approved by the Kansas Board of Regents.

## II. COURSE DESCRIPTION

This course introduces analytic geometry, functions, limits and continuity, derivatives, and applications.

## III. LEARNING OUTCOMES

A. Using limits
   1. Evaluation of Limits
      - Evaluate the limit of a function at a point both algebraically and graphically
      - Evaluate the limit of a function at infinity both algebraically and graphically
      - Use the definition of a limit to verify a value for the limit of a function
   2. Use of Limits
      - Use the limit to determine the continuity of a function
      - Apply the Intermediate-Value Theorem
      - Use the limit to determine differentiability of a function
   3. Limiting Process
      - o Use the limiting process to find the derivative of a function

B. Finding derivatives
   1. Find derivatives involving powers, exponents, and sums
   2. Find derivatives involving products and quotients
   3. Find derivatives involving the chain rule
   4. Find derivatives involving exponential, logarithmic, and trigonometric functions
   5. Find derivatives involving implicit differentiation

C. Using derivatives
   1. Curve Sketching
      - Use the first derivative to find critical points
      - Apply the Mean-Value Theorem for derivatives
      - Determine the behavior of a function using the first derivative
      - Use the second derivative to find inflection points
      - Determine the concavity of a function using the second derivative
      - Sketch the graph of the function using information gathered from the first and second derivatives
      - Interpret graphs of functions
   2. Applications of Derivatives
      - Use the derivative to find velocity, acceleration, and other rates of change
      - Use the derivative to find the equation of a line tangent to a curve at a given point
      - Use optimization techniques in areas such as economics, the life sciences, the physical sciences, and geometry
      - Solve related rates problems
      - Use Newton's Method

- Use differentials to estimate change

D. Finding integrals
   1. Find area using Riemann sums and integrals
   2. Express the limit of a Riemann sum as a definite integral
   3. Evaluate the definite integral using geometry
   4. Integrate algebraic, exponential, and trigonometric functions
   5. Evaluate definite integrals using the Fundamental Theorem of Calculus
   6. Apply the Mean-Value Theorem for integrals
   7. Integrate indefinite integrals
   8. Integrate using substitution
   9. Approximate integrals using Simpson's Rule and the Trapezoidal Rule

**IV. MAJOR CONTENT AREAS**

A. Functions, graphs and models
B. Limits
C. Derivatives and applications of derivatives
D. Integrals and applications

**V. ASSIGNMENTS** (may include but are not limited to)

A. Reading assignments
B. Homework
C. Writing assignments
D. Quizzes and exams

**VI. EVALUATION METHODS** (may include but are not limited to)

A. Attendance and participation
B. Assignments
C. Quizzes and exams
D. Comprehensive fina**l**