J. Sargeant Reynolds Community College
Course Content Summary

Course Prefix and Number: MTH 261 **Credits:** 3

Course Title: Applied Calculus I

Course Description: Introduces limits, continuity, differentiation, and integration of algebraic, exponential and logarithmic functions, and techniques of integration with an emphasis on applications in business, social sciences, and life sciences. Replaces MTH 270 or MTH 271. Prerequisite: Placement into MTH 261 or completion of MTH 161 or equivalent with a grade of C or better. Lecture 3 hours per week.

General Course Purpose: To prepare students in business, social sciences, and life sciences to apply concepts of differentiation and integration of algebraic, exponential, and logarithmic functions in future coursework. Designed for students in business, social sciences, and life sciences who have completed college-level Precalculus I with a C or better. All students entering Applied Calculus are expected to be able to perform operations with linear, polynomial, rational, exponential, and logarithmic functions, to simplify expressions and solve equations involving these functions, and to graph them.

Course Prerequisites and Co-requisites:
Prerequisite: Placement into MTH 261 or completion of MTH 161 or equivalent with a grade of C or better

Course Objectives:
Upon completing the course, the student will be able to

1. (Limits and Continuity)
   - Calculate and interpret limits at particular x-values and as x approaches infinity;
   - Determine whether a function is continuous at a given point and over open/closed intervals;

2. (Derivatives)
   - Find the derivative of a function applying the limit definition of the derivative;
   - Interpret the derivative as both the instantaneous rate of change of a function and the slope of the tangent line to the graph of a function;
   - Use the power, product, quotient, and chain rules to find the derivatives of algebraic, exponential, and logarithmic functions;

3. (Applications of the Derivative)
   - Find the relative extreme values for a continuous function using the First and Second Derivative Tests;
   - Apply derivatives to solve problems in life sciences, social sciences, and business;
   - Find higher order derivatives and interpret their meaning;
   - Use derivatives to model position, velocity, and acceleration;
   - Apply First and Second Derivative Tests to determine relative extrema, intervals of increase and decrease, points of inflection, and intervals of concavity;
   - Graph functions, without the use of a calculator, using limits, derivatives and asymptotes;

- Use derivatives to find absolute extrema and to solve optimization problems in life sciences, social sciences, and business;
- Perform implicit differentiation and apply the concept to related rate problems (AND/OR);
- Evaluate partial derivatives and interpret their meaning;

4. (Integration and Its Applications)
    - Use basic integration formulas to find indefinite integrals of algebraic, exponential, and logarithmic functions;
    - Develop the concept of definite integral using Riemann Sums;
    - Evaluate definite integrals using Fundamental Theorem of Calculus;
    - Use the method of integration by substitution to determine indefinite integrals;
    - Evaluate definite integrals using substitution with original and new limits of integration;
    - Calculate the area under a curve over a closed interval [a, b];
    - Calculate the area bounded by the graph of two or more functions by using points of intersections;
    - Use integration to solve applications in life sciences such as exponential growth and decay; and
    - Use integration to solve applications in business and economics, such as future value and consumer and producer's surplus.

Major Topics to Be Included

1. Limits and Continuity
2. Derivatives
3. Applications of the Derivative
4. Integration and Its Applications

Effective Date of Course Content Summary: August 8, 2017