Course Prefix and Number: <u>MTH 263</u>   **Credits:** <u>3</u>

Course Title: <u>Calculus I</u>

Course Description

Presents concepts of limits, derivatives, differentiation of various types of functions and use of differentiation rules, application of differentiation, antiderivatives, integrals and applications of integration. This is a Passport and UCGS transfer course. Prerequisite: Placement into MTH 263 or completion of MTH 167 or MTH 161/162 or equivalent with a grade of C or better. Lecture 4 hours. Total 4 hours per week. 4 credits

General Course Purpose

The general purpose of this first course in a three course sequence is to prepare students for further study in calculus with analytic geometry by providing them with the necessary competencies in finding limits, differentiation and integration.

Course Prerequisites/Corequisites

Prerequisite: Completion of MTH 167 or MTH 161/162 or equivalent with a grade of C or better.

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

Limits
- Differentiate between the limit and the value of a function at a point
- Find the limit of a function by numerical, graphical and analytic methods
- Apply Limit Laws
- Calculate one-sided limit of a function
- Prove the existence of a limit using precise definition of the limit
- Determine the continuity of a function
- Calculate Vertical and Horizontal asymptotes using limits

Derivatives and Differentiation Rules
- Define Derivatives and Rates of Change
- Compute derivatives of basic functions using the definition of the derivative
- Differentiate polynomial, rational, radical, exponential and logarithmic functions
- Find equation of a tangent line using derivative
- Differentiate trigonometric functions
- Apply product, quotient, chain rules
- Apply implicit differentiation and find derivatives of inverse trigonometric functions
- Apply concept of rates of change to natural and social sciences
- Apply the concept of related rates
- Find linear approximation of a function at a given point

Applications of Differentiation
- Calculate local and absolute maximum and minimum values of a function
- Apply Rolle's Theorem and Mean Value Theorem to study properties of a function
- Find critical points, and intervals of increasing and decreasing values of a function
- Find points of inflection and intervals of different concavities

- Sketch a curve for a given function
- Apply rules of differentiation to solve optimization problems
- Find antiderivatives for basic functions using knowledge of derivatives

Integrals
- Relate areas to definite integrals using sigma notation, Riemann Sums, and limits. [Note: L'Hopital's Rule is in Calc II but may be used for instructional purposes here.]
- Apply Fundamental Theorem of Calculus to find definite integrals and derivatives
- Find indefinite integrals of polynomials and basic trigonometric and exponential function
- Apply Net Change Theorem
- Perform integration using substitution rule
- Find areas between curves
- Find average value of a function

Major Topics to be Included

- Limits
- Derivatives and Differentiation Rules
- Applications of Differentiation
- Integrals

Effective Date/Updated: August 1, 2022