NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
MTH 263 – CALCULUS I (4 CR.)

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. Credit will not be awarded for both MTH 261: Applied Calculus I and MTH 263 - Calculus I. **This is a Passport and UCGS transfer course.** Lecture 4 hours. Total 4 hours per week.

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

- 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
    - Define hyperbolic functions and their derivatives
    - 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
- Find areas between curves
- Find average value of a function

Major Topics to be Included

a) Limits
b) Derivatives and Differentiation Rules
c) Applications of Differentiation
d) Integrals