Revised 12/12

NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
MTH 174 - CALCULUS WITH ANALYTICAL GEOMETRY II (5 CR.)

Course Description

Continues the study of analytic geometry and the calculus of algebraic and transcendental functions including rectangular, polar, and parametric graphing, indefinite and definite integrals, methods of integration, and power series along with applications. Lecture 5 hours per week.

General Course Purpose

The above course is primarily for students in mathematics, engineering, sciences, and in other areas requiring strong mathematical backgrounds. The general purpose is to give students a basic understanding of the concepts of integral calculus, power series, and vectors, and to prepare students for multivariable calculus.

Course Prerequisites/Co–requisites

Prerequisite is satisfactory completion of MTH 173 - "Calculus with Analytic Geometry I" or equivalent.
Credit will not be awarded for both MTH 174 and MTH 272.

Course Objectives

As a result of the learning experiences provided in this course, the student should be able to:

- Solve problems involving volume, arclength work and centroids of plane areas
- Differentiates and integrates expressions involving transcendental functions
- Define conics, vectors, sequence, limit of a sequence, infinite series, convergence and divergence of a series
- Solve problems involving conics, rotation and translation of coordinate axes and polar coordinates
- Find areas bounded by curves in polar form
- Solve problems involving parametric equations, vectors
- Solve problems involving improper integrals and infinite limits of integration
- Find series representations of functions and use taylor's theorem with remainder
- Differentiates and integrates power series, solve problems in indeterminate form, and obtain competency in the use of a graphing utility and cas in the topics below

Major Topics To Be Included

A. Applications of Integrals
   1. Volume
   2. Arclength
   3. Work
   4. Centroids of plane areas
B. Transcendental Functions (inverse trigonometric, hyperbolic, and inverse hyperbolic)
   1. Definition
   2. Properties
   3. Differentiation and integration
C. Techniques of Integration
   1. Substitution
   2. Integration by parts
   3. Trigonometric substitution
   4. Quadratic irrationalities
   5. Partial fractions
   6. Change of limits
D. Conics
   1. Definition

2. Rotation and translation transformations
3. Forms and graphs of second degree equations in x and y

E. Polar Coordinates
1. Polar coordinate systems
2. Transformation from polar to Cartesian coordinates and vice versa
3. Polar functions
4. Graphing
5. Intersection of curves in polar coordinates
6. Plane areas in polar coordinate

F. Parametric Equations and Vectors
1. Transformations between parametric and Cartesian coordinates
2. Parametric functions
3. Differentiation and integration of parametric functions
4. Length of an arc
5. Vectors in 2 dimensions
6. Dot product

G. Indeterminate Forms
1. Definition
2. L'Hopital's Rule (for 0/0 and ∞/∞)
3. Other indeterminate forms ($0\times\infty$, ∞/∞, 0^0, 0^∞, 1^∞)

H. Improper Integrals
1. Infinite limits of integration
2. Comparison test for convergence
3. Infinite integrands

I. Infinite Series
1. Definition of sequence and limit of a sequence
2. Definition of infinite series
3. Convergence tests for positive series
4. Alternating series (conditional and absolute convergence)
5. Power series (definition, radius of convergence, convergence tests, Maclaurin and Taylor series)
6. Taylor's Theorem and forms of the remainder

J. Technology

<u>Extra Topics</u> (optional)

A. Surface Area
B. Liquid pressure
C. Centroids of solids of revolution
D. Complex functions