

Revised: Fall 2016

# **MTH 174**

## **Calculus with Analytic Geometry II**

### **COURSE OUTLINE**

#### **Prerequisites:**

MTH 173 or equivalent.

#### **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. Designed for mathematical, physical, and engineering science programs. Prerequisite: MTH 173 or equivalent. (Credit will not be awarded for more than one of MTH 174, MTH 176 or MTH 274.)

Lecture 4 hours per week. The computer algebra system Maple will be used.

**Semester Credits: 4 Lecture Hours:4 Lab/Recitation Hours: 0**

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# MTH 174 Calculus with Analytic Geometry II

## Course Outcomes

At the completion of this course, the student should be able to:

1. Solve appropriate applied problems from the area of science and engineering.
2. Evaluate improper integrals.
3. Integrate transcendental functions.
4. Find area and volume of solids of revolution.
5. Use the rectangular and polar coordinate systems including finding area, lengths, and graphing.
6. Graph, evaluate, differentiate, integrate, and define parametrized functions and applications.
7. Determine whether an infinite series is convergent or divergent.
8. Find the radius of convergence of a Taylor Series.
9. Use Maple to solve integral calculus problems and applications.

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Required Materials:

Textbook

Textbook:

University Calculus, Hass, Weir, & Thomas, 3rd edition, Pearson/Addison-Wesley, ISBN # 9780321999580

The following supplementary materials are available:

1. Student Solutions Manual
2. Software: Maple 15, Waterloo Maple Inc.

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Topical Description: (Outline chapters and sections to be covered in the book – may include timeline)

<u>Topics</u>	<u>Chapter</u>	<u>Sections</u>
1. Application of Integrals a. Disk, Washer, Shell b. Applications to Physics	6	6.1, 6.2, 6.5, 6.6
2. Techniques of Integration a. Integration of Parts b. Partial Fractions c. Trig Integrals d. Trig Substitution	8	8.1-8.4
3. Numerical Integration and Improper Integrals	8	8.5- 8.7
4. Sequences and Series, tests for convergence. a. Infinite Series b. Tests for Convergence/Divergence c. Power, Taylor, MacLaurin, and Binomial series	9	9.1-9.10
5. Parametric Equations and Polar Coordinates a. Polar Coordinates and Graphing b. Parametric Equations c. Calculus with Parametric Equations	10	10.1-10.5

## Maple Labs (To be determined)

1. Introduction Lab
2. Project 1 : Solids of Revolution
3. Project 2 : Numerical Integration
4. Project 3 : Centroids

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Notes to Instructors

## 1. Listing of all topics.

- 6 Applications of Definite Integrals
- 6.1 Volumes Using Cross-Sections
- 6.2 Volumes Using Cylindrical Shells
- 6.3 Arc Length
- 6.4 Areas of Surfaces of Revolution
- 6.5 Work
- 6.6 Moments and Centers of Mass
- 7 Integrals and Transcendental Functions
- 7.1 The Logarithm Defined as an Integral
- 7.2 Exponential Change and Separable Differential Equations
- 7.3 Hyperbolic Functions
- 8 Techniques of Integration
- 8.1 Integration by Parts
- 8.2 Trigonometric Integrals
- 8.3 Trigonometric Substitutions
- 8.4 Integration of Rational Functions by Partial Fractions
- 8.5 Integral Tables and Computer Algebra Systems
- 8.6 Numerical Integration
- 8.7 Improper Integrals
- 9 Infinite Sequences and Series
- 9.1 Sequences
- 9.2 Infinite Series
- 9.3 The Integral Test
- 9.4 Comparison Tests
- 9.5 The Ratio and Root Tests
- 9.6 Alternating Series, Absolute and Conditional Convergence
- 9.7 Power Series
- 9.8 Taylor and Maclaurin Series

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- 9.9 Convergence of Taylor Series
- 9.10 The Binomial Series and Applications of Taylor Series
  - 10 Parametric Equations and Polar Coordinates
- 10.1 Parametrizations of Plane Curves
- 10.2 Calculus with Parametric Curves
- 10.3 Polar Coordinates
- 10.4 Graphing in Polar Coordinates
- 10.5 Areas and Lengths in Polar Coordinates

2. Maple labs are optional. However, there should be some kind of “project” given.

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