

# Syllabus - Math 211 - Calculus II

Department of Mathematics  
Millersville University

## Description

Continuation of Math 161. Techniques of integration, applications of definite integrals, improper integrals, parametric equations, polar coordinates, and infinite sequences and series including Taylor series. (4 credits)

This course may be taken for general education credit (G2).

## Prerequisites

A C- or better in Math 161 or Math Placement.

## Objectives

Students will learn the theory and techniques of integral calculus, infinite series, parametric equations, and polar coordinates. They will be able to:

- Apply the definite integral to the computation plane areas, volumes and surface areas of solids, and lengths of curves, and to selected problems in physics.
- Compute antiderivatives using integration by parts, techniques for dealing with powers of trigonometric functions, trigonometric substitution, partial fractions, and selected special substitutions.
- Set up and determine the convergence or divergence of improper integrals of both kinds.
- Explain the ideas of sequences and infinite series, and apply the standard tests for convergence of series as applied to numerical series, and to power series.
- Compute Taylor and Maclaurin series for functions, and apply power series (for example, to approximating limits and integrals).
- Construct and graph parametric curves, and do computations in the differential calculus of parametric curves.
- Construct and graph functions in polar coordinates, perform algebraic operations with polar coordinate functions, and do computation in the differential calculus of polar curves.

## Assessment

Students will demonstrate their understanding through work in class, homework, and examinations.

## Use of Technology

Students are required to have access to a graphing calculator for this course. The department currently supports the TI 83, 84, and 86.

Calculators (and technology in general) should enhance learning, and students should learn to use them appropriately. Instructors may at times prohibit the use of calculators with symbolic math capabilities, such as the TI-89 or TI-92. Instructors may prohibit the use of calculators on exams, as they deem appropriate.

- Graphical and numerical evidence should be presented as an aid to conjecture and comprehension. They should not substitute for rigorous proof, nor should they replace the acquisition of appropriate symbolic manipulation skills.
- Students should understand the limitations of technology (for example, by seeing situations in which graphical or numerical evidence is unreliable or inconclusive).

In MATH 211, students will:

- Graph functions in polar coordinates, and curves given parametrically.
- Explore functional relationships through the use of numerical tables (e.g. using the Table function on the TI calculators).
- Approximate finite and infinite sums (e.g. using the Sum Seq function on the TI calculators).
- Approximate integrals numerically (e.g. using the fnint function on the TI calculators).

## **Topics**

### **1. Applications of the Definite Integral**

Area Between Curves  
Volume: Slicing, Disks and Washers  
Volumes by Cylindrical Shells  
Arc Length and Surface Area  
Work

### **2. Integration Techniques**

Integration by Parts  
Trigonometric Techniques of Integration  
Integration of Rational Functions Using Partial Fractions  
Improper Integrals

### **3. Sequences and Series**

Sequences of Real Numbers

Infinite Series  
The Integral and Comparison Tests  
Alternating Series  
Absolute Convergence and the Ratio Test  
Power Series  
Taylor Series  
Applications of Taylor Series

#### **4. Parametric Equations and Polar Coordinates**

Calculus and Parametric Equations  
Arc Length and Surface Area in Parametric Equations  
Polar Coordinates  
Calculus and Polar Coordinates  
Area in Polar Coordinates

### **Textbooks**

Robert Smith and Roland Minton, *Calculus* (4th edition, early transcendentals). New York: McGraw-Hill, 2012.

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