



## Math 231: Calculus II (3 credit hours)

### Course Description

This is a standard second course in the Calculus sequence. Topics for this course include techniques and applications of integration, infinite sequences, power series, parametric equations, and an introduction to differential equations.

Prerequisite: Calculus I

### Course Objectives

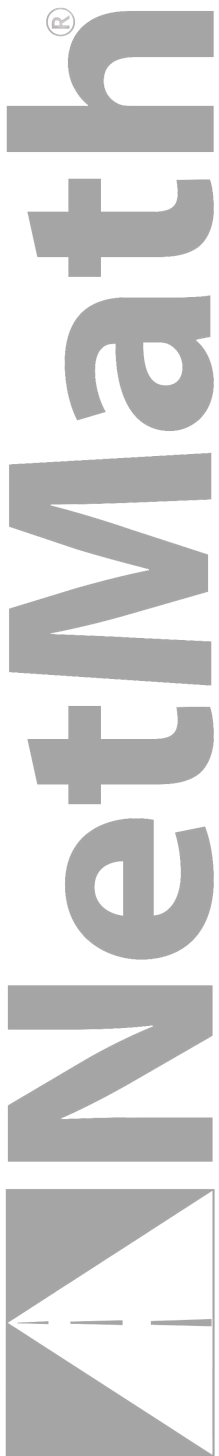
After completing this course a successful student will be able to understand and apply the concepts of Calculus listed above. He/she will also be able to apply numerical, computational, and estimation techniques as well as the process of measurement. Through exploration, a successful student will be able to use geometric concepts and relationships to describe and model mathematical ideas. He/she will also have the necessary tools to formulate and solve problems in both mathematical and everyday situations, and connect mathematics to other disciplines. Most importantly, a student completing this course will be able to communicate mathematical ideas through descriptive language as well as mathematical symbols.

### Course Content and Format

#### *Content*

A brief outline of topics for this course appears below:

- Growth
  - Linear, exponential, and trigonometric functions
  - Dominance in the global scale
  - Data modeling and analysis
- Expansions in Powers of  $x$ 
  - Approximating various functions
  - Differentiating and Integrating to find new expansions
- Applications of Expansions
  - Newton's Method
  - Calculating limits
  - Generating trigonometric identities
- Taylor's Formula



- Estimating integrals
- Applying Taylor's Formula to calculate limits
- Approximating solutions to differential equations
- Barriers to Convergence
  - Examining convergence of various expansions
  - Convergence intervals and infinite sums
- Power Series
  - Functions defined by power series and their plots
  - Convergence intervals for power series
  - The Ratio Test
- Parametric Plotting
  - Plotting ellipses, curves, and surfaces
  - Applications including projectile motion
- Integrals for Area and Volume Measurement
  - Properties of integrals
  - Approximation using trapezoidal rule
  - Measuring by slicing and accumulating
- The Fundamental Formula of Calculus
  - Finding distance and velocity
  - Integrating the area between two curves
  - Applying the formula to differential equations
- Techniques for Calculating Integrals
  - Integration by parts
  - Applying a complex exponential to integrate
  - Partial Fractions and u-substitution

*Format*

Course content is drawn from *Calculus II and Calculus III* written by Bill Davis, Horacio Porta and Jerry Uhl ©2006-2010.

Math 231 utilizes the CAS-ILE system. See <https://cas-ile.illinois.edu/> for more information. This online system helps students learn math topics through dynamic exploration and visualization.

Exams for Math 231 are taken with online.

