

**Course Objectives/Course Outline**  
**Spokane Community College**

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**Course Title:** Calculus IV

**Prefix and Course Number:** MATH& 254

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**Course Learning Outcomes:**

**By the end of this course, a student should be able to:**

- Communicate mathematical ideas in both everyday and mathematical language, using appropriate vocabulary and notation.
- Find the partial derivatives of functions of several variables.
- Interpret derivatives and gradients of functions of two or three variables.
- Identify/Find the extrema and saddle points of functions of two variables.
- Solve optimization problems using the method of Lagrange Multipliers.
- Integrate functions of two or three variables over rectangular and nonrectangular regions using polar, cylindrical and spherical coordinates when appropriate.
- Perform line and surface integrals.
- Describe and use the fundamental theorem for line integrals and comprehend how it relates to path independence in conservative fields.
- Paraphrase and apply Green's Theorem, Stokes' Theorem, and the Divergence Theorem.

**Course Outline:**

- I. Functions of Several Variables
  - A. Partial Derivatives
  - B. Gradient Vectors
  - C. Tangent Planes
  - D. Extreme Values and Saddle Points
  - E. Lagrange Multipliers
- II. Multiple Integrals
  - A. Double Integrals
    - i. Over Rectangular Regions
    - ii. Over Non-Rectangular Regions
    - iii. In Polar Coordinates
  - B. Triple Integrals
    - i. In Rectangular Coordinates
    - ii. In Cylindrical and Spherical Coordinates
- III. Vector Calculus
  - A. Review of Vector Functions
  - B. Vector Fields
  - C. Line Integrals
  - D. Independence of Path
  - E. Green's Theorem
  - F. Surface Integrals
  - G. Stokes' Theorem
  - H. The Divergence Theorem