

# MATH 104 : VECTOR ANALYSIS

California State University, Sacramento · Department of Mathematics & Statistics

This is a one-semester upper division course that is taught only in the spring. It is a continuation of the topics in Math 32 and is highly recommended for all math majors whose concentration is in Applied Math. It is also recommended for Physics and Engineering majors.

## CATALOG DESCRIPTION

---

Vector and scalar fields, integral theorems, orthogonal curvilinear coordinates, vector spaces and linear transformations, applications to physical fields and operators. **Graded:** Graded Student. **Units:** 3.0.

## PREREQUISITES

---

Math 32

## ASSIGNMENTS

---

A variety of reading and problem solving assignments will be part of the course.

## EXAMINATIONS

---

There will be regular midterm examinations and a comprehensive final examination for this course.

## COURSE OUTLINE

### I. Vector Algebra (3-4 Weeks)

- A. Definitions
- B. Addition and subtraction
- C. Scalar multiplication
- D. Applications in geometry
- E. Equations of a line
- F. Dot product
- G. Equation of a plane
- H. Cross product
- I. Triple scalar product

### II. Vector Functions of a Single Variable (2-3 Weeks)

- A. Differentiation
- B. Curves, velocities, and tangents
- C. Acceleration and curvature
- D. Planar motion in polar coordinates

### III. Scalar and Vector Fields (3 Weeks)

- A. Level surfaces
- B. Gradient
- C. Vector fields and flow lines
- D. Divergence
- E. Curl
- F. Laplacian

IV. Integration (5 Weeks)

- A. Line integrals
- B. Domains
- C. Conservative fields
- D. Oriented surfaces
- E. Surface integrals
- F. Volume integrals
- G. Divergence Theorem
- H. Green's Theorem
- I. Stoke's Theorem

V. Additional topics (time permitting, 1-2 weeks)

- A. Cylindrical and spherical coordinates
- B. Orthogonal curvilinear coordinates