

# MATH 210: CALCULUS WITH ANALYTIC GEOMETRY LLL

## Citrus College Course Outline of Record

Heading	Value
Effective Term:	Fall 2021
Credits:	5
Total Contact Hours:	90
Lecture Hours :	90
Lab Hours:	0
Hours Arranged:	0
Outside of Class Hours:	180
Prerequisite:	MATH 191.
District General Education:	A3. Mathematics
Transferable to CSU:	Yes
Transferable to UC:	Yes - Approved
Grading Method:	Standard Letter, Pass/No Pass

## Catalog Course Description

Vectors, calculus of functions of more than one variable, partial derivatives, multiple integration, vector calculus, Green's Theorem, Stokes' Theorem, and divergence theorem. 90 lecture hours.

## Course Objectives

- Perform vector operations
- Evaluate derivatives.
- Write the equation of a tangent plane at a point.
- Find local extrema and test for saddle points.
- Solve constraint problems using Lagrange multipliers.
- Compute arc length.
- Find the divergence and curl of a vector field.
- Determine differentiability.
- Determine equations of lines and planes.
- Find the limit of a function at a point.
- Illustrate calculus operations on vector valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion.
- Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals.
- Find extrema and tangent planes.
- Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, the Divergence Theorem, and Stokes' Theorem.
- Apply the computational and conceptual principles of calculus to the solutions of real-world problems.
- Evaluate two and three dimensional integrals.

## Major Course Content

1. Vectors and the Geometry of Space
  - a. Vectors in the plane
  - b. Performing vector operations
  - c. Space coordinates and vectors in space
  - d. The dot product of two vectors
  - e. The cross product of two vectors in space
  - f. Lines and planes in space
  - g. Surfaces in space
  - h. Rectangular equations of a plane.
    - i. Cylindrical and spherical coordinates
2. Vector-Valued Functions
  - a. Vector-valued functions
  - b. Differentiation and integration of vector-valued functions
  - c. Velocity and acceleration
  - d. Tangent vectors and normal vectors
  - e. Arc length and curvature
  - f. Vector and parametric equations of lines and planes.
3. Functions of Several Variables
  - a. Introduction to functions of several variables
  - b. Limits and continuity
  - c. Properties of limits and continuity
  - d. Partial derivatives
  - e. Differentials
  - f. Chain rules for functions of several variables
  - g. Differentiability and higher order derivatives.
  - h. Directional derivatives and gradients
    - i. Tangent planes and normal lines
    - j. Extrema of functions of two variables
    - k. Local and global maxima and minima
    - l. Saddle points
  - m. Applications of extrema of functions of two variables
4. Multiple Integration
  - a. Iterated integrals and area in the plane
  - b. Double integrals and volume
  - c. Change of variable: polar coordinates
  - d. Center of mass and moments of inertia
  - e. Surface area
  - f. Triple integrals and applications
  - g. Triple integrals in cylindrical and spherical coordinates
  - h. Triple products and projections.
    - i. Change of variables: Jacobians
5. Vector Analysis
  - a. Vector fields
  - b. Line integrals
  - c. Binormal Vectors
  - d. Level curves and surfaces
  - e. Lagrange Multipliers
  - f. Gradient Vector Field
  - g. Conservative vector fields and independence of path
  - h. Green's Theorem
    - i. Parametric surfaces
    - j. Surface integrals
    - k. Integrals of real-valued functions over surfaces
      - l. Divergence theorem
    - m. Divergence and curl
    - n. Stokes' Theorem

## Examples of Outside Assignments

1. A student will analyze higher dimensional coordinate systems by differentiation and integration on functions of several variables.
2. Students will apply the techniques of Gauss-Jordan elimination to transform matrices to reduced row echelon form.

## Instruction Type(s)

Lecture, Online Education Lecture

## IGETC Area 2: Mathematical Concepts and Quantitative Reasoning

Yes