Miami Dade College

Course Description

MAC 2313 | Calculus & Analytical Geometry 3 | 4.00 credits

The student will examine topics in analytic geometry in three dimensions, vectors and vector functions, curves and surfaces in three-space, partial differentiation and applications to optimization, multiple integrals and their applications, vector fields, line integrals and surface integrals, green's theorem, and the divergence and Stokes' theorems. Computational course.

Course Competencies:

Competency 1: The student will demonstrate knowledge of three-dimensional vectors and surfaces by:

1. Computing sums, differences, scalar multiples, and magnitudes of three-dimensional vectors
2. Computing dot products and cross products of three-dimensional vectors
3. Solving applied problems using dot and cross products
4. Determining equations of lines and planes in three dimensions
5. Determining equations of quadric surfaces
6. Representing points and surfaces in cylindrical and spherical coordinates

Competency 2: The student will demonstrate knowledge of curves in space by:

1. Representing curves as vector-valued functions
2. Representing curves parametrically
3. Representing curves as intersections of two surfaces
4. Computing limits, derivatives, and integrals of vector-valued functions
5. Computing the velocity and acceleration of a particle moving along a curve in three-space

Competency 3: The student will demonstrate knowledge of partial differentiation by:

1. Computing partial derivatives of any order of functions of two or more variables
2. Applying appropriate chain rules to compute partial derivatives and total derivatives
3. Computing gradients of functions of two or more variables
4. Computing directional derivatives of functions of two or more variables
5. Determining the direction in which the directional derivative of a function at a point is maximized or minimized
6. Determining equations of tangent planes and regular lines to a surface at a given surface point
7. Finding extremes of functions of two or more variables

Course Competency 4: The student will demonstrate knowledge of multiple integration by:

1. Evaluating double and iterated integrals in rectangular and polar coordinates
2. Solving applied problems involving double integrals
3. Evaluating triple and iterated integrals in rectangular, cylindrical, and spherical coordinates
4. Solving applied problems involving triple integrals

Course Competency 5: The student will demonstrate knowledge of vector calculus by:

1. Computing the divergence and curl of a vector field
2. Determining the potential function of a conservative vector field
3. Computing line integrals over oriented curves
4. Solving applied problems involving line integrals
5. Determining whether a line integral is independent of path
6. Evaluating line integrals using Green's Theorem
7. Evaluating surface integrals

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information