BROWARD COLLEGE
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Course Outline

Course Title: Calculus And Analytical Geometry III
Common Course Title: MAC2313
Effective Term: Fall 2020 (Aug 1, 2020)
Credit Hours: 5 Units

Next Review : Aug 6, 2025
Contact Hour Breakdown: *(Per 16 week Term)*
Total: 80
Lecture: Lab:
Clinic: Other:

Requirements

Pre-requisite(s) with minimum grade required
MAC2312 (C)

Course Description:

This is the third of a three-course sequence in calculus. Topics include vectors in 3-space, three-dimensional surfaces, multivariate functions, cylindrical and spherical coordinates, multiple integrals, partial derivatives, and vector fields. A graphing calculator may be required in certain sections of this course. Recommendation of the Mathematics Department or at least a grade of "C" in the prerequisite course is required.

Course Outline

UNITS

Unit 1 : Vectors in Two and Three Space and Solid Analytic Geometry

General Outcome
1.0 Compute and construct the algebra of 3-tuples, and the dot and cross products of vectors; and graph curves, and surfaces.

Specific Learning Outcomes
1.1 Define a vector in algebraic terms.
1.2 Define and find the magnitude of a vector.
1.3 Identify the properties of vectors under addition and multiplication by a scalar.
1.4 Apply the dot product to find projections and angles between vectors.
1.5 Find dot and cross products in R3 and apply them to the geometric constructs.
1.6 Find the equation of a plane and the equations of a line in R3, and graph them.
1.7 Graph cylinders, surfaces of revolution, quadric surfaces, and curves in R3.
1.8 Convert among rectangular, cylindrical and spherical coordinates.

Unit 2 : Differential Calculus of Multivariate Functions

General Outcome
2.0 Extend the concepts of domain, range, continuity, limits, derivative and differential from functions of one variable to functions of two or more variables.

Specific Learning Outcomes
2.1 Demonstrate knowledge of the definition of a function of two or more variables by finding its domain and range.
2.2 Graph the domain and specified level curves of a function of two variables.
2.3 Find the partial derivatives for functions of two or three variables, including using the chain rule and finding higher order partial derivatives.

2.4 Apply knowledge of the geometric interpretation of partial derivatives.
2.5 Find points of continuity of functions of two variables.
2.6 Demonstrate knowledge of the definition of limit of a function of two or more variables.
2.7 Determine whether or not the limit exists at a specified point for a function of two variables.
2.8 Find differentials of functions of two or more variables and solve problems involving differentials.

Unit 3 : Directional Derivatives, Gradients and Applications

General Outcome
3.0 Find directional derivatives and gradients, and apply partial derivatives to find extrema of functions of two variables.

Specific Learning Outcomes
3.1 Find the directional derivative of a function in the direction v (t).
3.2 Find the gradient of a function, , and use it to find a directional derivative.
3.3 Find the equation of the tangent plane to a surface at a point.
3.4 Determine the relative extrema and saddle points of a function of two variables.
3.5 Find the critical points of a function of two variables.
3.6 Use the method of Lagrange Multipliers to find the extrema in a constrained extrema problem.

Unit 4 : Multiple Integrals

General Outcome
4.0 Extend the concept of integration to double and triple integrals with application.

Specific Learning Outcomes
4.1 Evaluate double integrals by using iterated integrals.
4.2 Find volumes, plane areas, and the areas of surfaces using double integrals.
4.3 Evaluate double integrals in polar coordinates and use these integrals to find areas in polar coordinates.
4.4 Evaluate triple integrals by using iterated integrals.
4.5 Use triple integrals to find the volume of a three-dimensional region.
4.6 Change coordinates of points and the equations of surfaces from Cartesian to cylindrical coordinates and vice versa.
4.7 Change the coordinates of points and the equations of surfaces from Cartesian to spherical coordinates and vice versa.

Unit 5 : Calculus of Vector Fields

General Outcome
5.0 Apply the ideas and theorems of the calculus to vector fields, divergence and curl of a vector field, and use line integrals to find the work done by a force field in moving a particle along a curve.

Specific Learning Outcomes
5.1 Prove that a selected vector field F is conservative and find a potential function for F.
5.2 Find the curl and divergence of a vector field.
5.3 Find the total work done if the motion is caused by a force field.
5.4 Evaluate the line integral over a smooth curve C.
5.5 Show that a particular line integral is independent of the path, and evaluate the integral if C is any piecewise smooth curve from (x1, y1, z1) to (x2, y2, z2).