Minnesota State University Moorhead

MATH 323: Multi-Variable and Vector Calculus

A. COURSE DESCRIPTION

Credits: 4

Lecture Hours/Week: 4

Lab Hours/Week: 0

OJT Hours/Week: *.*

Prerequisites:
This course requires both of these prerequisites
MATH 260 - Computer Calculus
MATH 262 - Calculus II

Corequisites: PHYS 312

MnTC Goals: None

Calculus of several variables-- partial differentiation, multiple integration, vector calculus, line and surface integrals, Green's Theorem, and Stoke's Theorem. Students must have taken, or be currently enrolled in, Math 260.

B. COURSE EFFECTIVE DATES: 01/29/1999 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. Parameterized curves, tangent lines, and arc length of a parameterized curve
2. Iterated double integrals in polar coordinates; iterated triple integrals in rectangular, spherical and cylindrical coordinate
3. Evaluate area of a plane region and volumes of space regions using iterated integrals
4. Function of several variables, limits, continuity level curves, contours, and surfaces
5. Partial derivatives functions of more than one variable, multivariable chain rule, differentials, and approximation
6. Optimization of multi-variable functions. Apply Lagrange multipliers to optimization problems
7. Vectors, dot product, and cross product, directional derivatives and the gradient of a function of several variables. Relationship between the gradient and the directional derivative
8. Parametric and symmetric equations of a line; equation of a tangent plane to a surface
9. Line and surface integrals
10. Vector fields. Gradient, curl and, divergence of a vector field
11. Fundamental theorem for line integrals, Green's Theorem, Stoke's Theorem, and the Divergence Theorem

D. LEARNING OUTCOMES (General)

1. Understanding parameterization of curves and computing their arc lengths.
2. Understanding limits and continuity of functions of several variables.
3. Computing partial derivatives, gradients, and directional derivatives.
4. Learning optimization techniques of multi-variable functions and apply them to solve real life problems. This include using second partial derivatives test and Lagrange Multipliers.
5. Understanding iterated double and triple integrals.
6. Using multiple integrals to calculate areas, volumes, masses, and centers of mass of regions and solids.
7. Learning line integrals, independence of path, potential functions, and surface integrals.
8. Understanding and applying Green's Theorem, the Divergence Theorem, and Stoke's Theorem.

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted