COURSE #: 21300 **COURSE TITLE: Calculus III with Vector Analysis** CAREER: undergraduate CATEGORY: regular TERM OFFERED: Fall, Spring, Summer PRE-REQUISITES: A grade of C or higher in Math 21200 or placement by the Department. (Part of sequence MATH 20100, MATH 21200, MATH 21300.) PRE/CO-REQUISITES: HOURS/CREDITS: 4HR/WK; 4 CR DATE EFFECTIVE: 01/01/20 COURSE SUPERVISOR: Sergiy Merenkov	**CATALOG DESCRIPTION:** Applications of partial differentiation, vector-valued functions, multiple integrals, vector fields, line integrals, and theorems of Green, Stokes, and Gauss. Text: Thomas' Calculus: Early Transcendentals (14th ed.), Haas, Heil, and Weir (Pearson).

Topics and Allotted Times

Suggested Periods	Section	Topics
2.5	13.1	Curves in Space and Their Tangents
1.5	13.3	Arc Length in Space
2	14.4	The Chain Rule
2	14.5	Directional Derivatives and Gradient Vectors
2	14.6	Tangent Planes and Differentials
2	14.7	Extreme Values and Saddle Points
2	15.1	Double and Iterated Integrals over Rectangle
2	15.2	Double Integrals over General Regions
1	15.3	Area by Double Integration
2	15.4	Double Integrals in Polar Form
2	15.5	Triple Integrals in Rectangular Coordinates
1	15.6	Moments and Centers of Mass
2	15.7	Triple Integrals in Cylindrical and Spherical Coordinates
3	16.1	Line Integrals
3	16.2	Vector Fields and Line Integrals: Work, Circulation, and Flux
3	16.3	Path Independence, Conservative Fields, and Potential Functions
3	16.4	Green's Theorem in the Plane
3	16.5	Surfaces and Area
3	16.6	Surface Integrals
3	16.7	Stokes' Theorem
3	16.8	The Divergence Theorem and a Unified Theory

COURSE LEARNING OUTCOMES

After taking this course, the student should be able to:	Contributes to Departmental Learning Outcome(s):
1. Use differentiation of vector-valued functions to compute tangent lines.	a, b, c
2. Use differentiation of multivariate functions to find extrema and rates of change.	a, b, c
3. Set-up and evaluate multiple integrals for regions in the plane and in space.	a, b
4. Use iterated integrals to measure areas, compute volumes, and find centers of mass.	a, b, c
5. Compute work, flux, and mass integrals on curves, surfaces, and solids, respectively.	a, b, c
6. State and apply the theorems of Green, Stokes, and Gauss.	a, b, e1, e2
7. Find and use potential functions to compute work integrals along curves.	a, b, c

COURSE ASSESSMENT TOOLS

1. Term average, based mostly on in-class examinations: 60% of grade
2. Comprehensive written final exam: 40% of grade.

DEPARTMENTAL LEARNING OUTCOMES

The mathematics department, in its varied courses, aims to teach students to

a. perform numeric and symbolic computations
b. construct and apply symbolic and graphical representations of functions
c. model real-life problems mathematically
d. use technology appropriately to analyze mathematical problems
e. state (e1) and apply (e2) mathematical definitions and theorems
f. prove fundamental theorems
g. construct and present (generally in writing, but, occasionally, orally) a rigorous mathematical argument