COURSE #: 21300 **COURSE TITLE: Calculus III with Planar Vector Analysis** CAREER: undergraduate CATEGORY: regular TERM OFFERED: Fall, Spring, Summer PRE-REQUISITES: C or better in Math 21200 or placement. PRE/CO-REQUISITES: HOURS/CREDITS: 4 HR/WK; 4 CR DATE EFFECTIVE: Spring 2023 COURSE SUPERVISOR: Sergiy Merenkov	**CATALOG DESCRIPTION:** Vectors, multivariate functions, partial differentiation, multiple integrals, vector fields, line integrals, and Green's theorem. Text: Thomas' Calculus: Early Transcendentals (14th ed.), Hass, Heil, Weir, and Bogacki (Pearson).

Topics and Allotted Times

Suggested Periods	Section	Topics
1.5	12.2	Vectors (omit applications)
1.5	12.3	The Dot Product (omit work)
1.5	12.4	The Cross Product (omit torque)
2.5	12.5	Lines and Planes in Space
0,5	12.6	Quadric Surfaces Review
1	14.1	Functions of Several Variables
2	14.2	Limits and Continuity in Higher Dimensions (omit computing ε-δ, only cover ε-δ definition)
1.5	14.3	Partial Derivatives
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
1.5	15.1	Double and Iterated Integrals over Rectangle
2.5	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
2	11.1	Parametrizations of Plane Curves
2.5	13.1	Curves in Space and Their Tangents
1.5	13.3	Arc Length in Space
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
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COURSE LEARNING OUTCOMES

After taking this course, the student should be able to:	Contributes to Departmental Learning Outcome(s):
1. Model spatial problems with vectors, lines, planes, curves and surfaces in space.	a, b, c
2. Differentiate multivariate functions.	a, b
3. Use differentiation of vector-valued functions to compute tangent lines.	a, b, c
4. Use differentiation of multivariate functions to find extrema and rates of change.	a, b, c
5. Set-up and evaluate multiple integrals for regions in the plane and in space.	a, b
6. Use iterated integrals to measure areas, compute volumes, and find centers of mass.	a, b, c
7. Compute work and mass integrals on curves and solids, respectively.	a, b, c
8. State and apply Green's theorem.	a, b, e1, e2
9. 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