

10/22/15 DATE

Math/Science DIVISION

REQUIRED COURSE
ELECTIVE COURSE

NEW COURSE
X REVISION

LAKE LAND COLLEGE
Course Information Form

COURSE NUMBER MAT243 TITLE Analytic Geometry and Calculus III
SEM CR HRS 4 LT HRS 4 LAB HRS SOE HRS ECH 4
COURSE PCS # (Assigned by Administration)

PREREQUISITES: MAT242

Catalog Description (40 Word Limit): A continuation of Analytic Geometry and
Calculus II. The focus is on solid analytic geometry, vectors, partial derivatives, line,
volume and surface integrals in various coordinate systems, and vector fields. A
graphing calculator is required. Ask instructor for calculator recommendations.

CONTENT OUTLINE	LECTURE HOURS
Vectors and Applications in Geometric Space	12
Vector-Valued Functions	8
Functions of Several Variables and their Derivatives	15
Multiple Integrals	15
Vector Fields, Line & Surface Integrals & Related Theorems	10
Total Hours	60

EVALUATION: Quizzes X Exams X Oral Pres. Papers
Lab Work Projects Comp. Final X Other

Textbook: Title Calculus: Early Transcendental Functions

Author Roland Larson, Robert Hostetler, Bruce Edwards

Publisher Houghton, Mifflin and Company

Volume/Edition 6th Edition Copyright Date 2015

SEE REVERSE FOR CONTENT DETAIL

Major Course Segment	Hours	Learning Outcome
Vectors and the Geometry of Space		
Conic Sections Review	1	Each student will under-
Vectors in a Plane and in Space	2	stand vectors and use
Dot and Cross Products	3	vectors and vector products
Lines and Planes in Space	2	to solve problems, and
Surfaces in Space	2	represent geometric
Cylindrical and Spherical Coordinates	2	surfaces in space.
Vector-Valued Functions		
Vector-Valued Functions	1	Each student will be able
Differentiation and Integration of Vector Functions	2	understand vector-valued
Velocity and Acceleration	1	functions and their useful-
Tangent and Normal Vectors	2	ness in representing curves
Arc Length and Curvature	2	and motion along a curve.
Functions of Several Variables and Their Derivatives		
Limits and Continuity	1	Each student will be able to
Derivatives (Partial, Differentials, Chain Rule)	5	graph and differentiate
Gradient	2	functions of several vari -
Tangent Planes and Normal Lines	2	ables and use these skills
Extrema of Functions of Two Variables	5	to solve optimization and
		gradient problems.
Multiple Integrals		
Double Integrals	3	Each student will be able to
Double Integrals in Polar Coordinates	2	integrate functions of
Surface Area	2	several variables in order to
Triple Integrals	4	determine areas (plane
Change of Variables; Jacobians	2	and surface) and volumes
		of objects in
		rectangular, polar, cylindri-
		cal & spherical coordinates.

ATTACH ADDITIONAL PAGES IF NEEDED

Major Course Segment	Hours	Learning Outcome
Vector Analysis		Each student will be able to
Vector Fields	2	understand vector fields
Line Integrals	2	and their usefulness in
Green's Theorem	2	representing various types
Surface Integrals	2	of force fields and velocity
Divergence Theorem	1	fields, and mathematically
Stokes Theorem	1	manipulate these fields
		through several theorems
		to solve real life problems.

Course Outcomes: At the successful completion of this course, students will be able to:

- Evaluate slopes and areas of curves expressed in parametric and polar form.
- Perform basic operations with vectors and understand the uses of the operations in mathematical areas.
- Evaluate and understand partial derivatives and their uses in optimization problems.
- Set up and evaluate double and triple integrals in different coordinate systems.
- Calculate key properties of vector fields and integrate over a path.

General Education Goals:

Critical Thinking, Objective d.: Students will apply critical thinking skills through interpreting initial results. *Students will learn how to interpret results obtained by calculating vector products, partial derivatives, and line and surface integrals. Students will analyze how their results relate to curves and surfaces and applied problems.*

Critical Thinking, Objective e.: Students will apply critical thinking skills through transferring insights to new contexts. *Students will obtain a fundamental understanding of two and three dimensional vectors and their properties, which will allow them to explore curves and surfaces in space. Furthermore, students will apply the techniques of partial differentiation and iterated integrals in order to solve problems involving optimization, volume and area.*

Problem Solving, Objective b.: Students will demonstrate scientific and quantitative problem-solving skills through performing mathematical operations. *Students will perform mathematical operations while calculating and solving problems involving vectors, partial derivatives, multiple integrals and vector integrals.*

Problem Solving, Objective c.: Students will demonstrate scientific and quantitative problem-solving skills through interpreting tables and graphs. *Students will learn how to interpret and analyze graphs in two and three dimensions while exploring the concepts of vector valued functions, directional derivatives and various area and volume calculation methods.*