EFFECTIVE: JANUARY 2003
CURRICULUM GUIDELINES

Douglas College

A.	Division:	Instructional	Effective Date: January 2003	
B.	Department / Program Area:	Mathematics	Revision [X]	New Course [ ]
			If Revision, Section(s) Revised:	G,J,L,M, N,O,P,Q
			Date of Previous Revision:	May 1993
			Date of Current Revision:	

C: Math 321	**D:** Calculus III	**E:** 3
Subject & Course No.	Descriptive Title	Semester Credits

F: Calendar Description: This course extends the theory of differential and integral calculus to functions of many variables. Topics include the study of vectors, quadric surfaces, vector functions, cylindrical and spherical coordinates, partial derivatives, multiple integrals, vector fields line integrals; all with applications.

G: Allocation of Contact Hours to Type of Instruction / Learning Settings

Lecture	3 – 4 hours/week
Tutorial/Lab	0 – 1 hours/week

Primary Methods of Instructional Delivery and/or Learning Settings:

Number of Contact Hours: (per week / semester for each descriptor)

4 hours/week

Number of Weeks per Semester:

15

H: Course Prerequisites: Math 220

I: Course Corequisites: Math 232 (recommended)

J: Course for which this Course is a Prerequisite

Math 440

K: Maximum Class Size: 35

L: PLEASE INDICATE**:**

[ ]	Non-Credit	SFU 251(3)	UVic 200(1.5)
[ ]	College Credit Non-Transfer	UBC 200(3)	UNBC 200(3)
[X]	College Credit Transfer:		

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bccat.bc.ca)

M: Course Objectives / Learning Outcomes

At the completion of the course a student will be expected to:

- use vector notation and the properties of vectors
- use vectors to describe various physical quantities (position, velocity, acceleration...)
- compute dot and cross-products and verify and use properties of these products
- determine angle/orientation between two vectors or one vector and standard basis vectors
- find scalar and vector projection of one vector onto another
- use vector operations to find area and volume defined by sets of vectors
- find vector, parametric or symmetric representations for an equation of a line in R^3
- determine whether two lines are parallel, perpendicular or skew
- determine whether or not two lines intersect
- find vector or scalar equations for a plane
- determine and describe the orientation of two planes (angle between their normal vectors)
- determine the points (if any) of intersection between any two lines or planes
- determine the distance between a point and a line or plane
- identify and sketch the surface for a degree-two equation in three variables
- sketch regions bounded by two quadric surfaces
- find limits involving vector functions
- find the domain of a vector function and subsets of the domain where a vector function is continuous
- sketch graphs of vector functions
- differentiate and integrate vector functions
- find unit tangent, principal normal vectors and tangent lines to space curves
- verify differentiation rules for vector functions
- find the length of a space curve over an interval and its curvature at a point
- work with cylindrical or spherical coordinate systems to describe points in R^3
- use cylindrical or spherical coordinates to express curves or surfaces in R^3
- sketch level curves for functions of two variables and level surfaces for functions of three variables
- calculate limits (or prove the non-existence) for functions of two or three variables
- find subsets of a function’s domain for which the function is continuous
- calculate partial derivatives of a function
- find the equation of the tangent plane to a surface at a point
- use differentials to approximate values and errors for a function of two or three variables
- establish and apply the chain rules
- find and interpret implicit partial derivatives
- find directional derivatives and gradients of functions
- find the maximum value of a directional derivative and interpret with respect to the gradient
- find and classify critical points of a function of two variables. Solve associated optimization problems
- use Method of Lagrange Multipliers to solve constrained optimization problems
- set up double and triple Riemann sums over rectangular regions and convert notation to multiple integrals. Evaluate
- identify different classes of domains of integration to set up and evaluate general multiple integrals. Change the order of integration variables
- set up Riemann sums in polar coordinates and convert to multiple integrals and evaluate
- change the representation of an integral from one set of coordinates to another and evaluate
- calculate the Jacobian of a transformation of coordinates to re-express integrals
- solve geometric and applied problems involving integration
- sketch vector fields on R^2
- find the gradient vector field of a multi-variable function
- set up and evaluate line integrals with respect to arclength, or any of the independent variables. Identify applications for line integrals and solve
- evaluate line integrals for vector fields
- determine whether or not a vector field is conservative
- find conditions for and use the fundamental theorem of line integrals
- verify physical principles with the fundamental theorem of line integrals (conservation of energy...)

N: Course Content:

1. Properties and applications of points, curves and surfaces for various coordinates in R^3.
2. Operations, properties and applications of vectors and vector functions.
3. Partial Derivatives: Limits, partial derivative rules and properties, gradients and optimization principles. Applications.
4. Multiple Integrals: Double and triple integrals over general domains in appropriate coordinate systems (rectangular, polar, cylindrical, spherical or other defined coordinates). Applications.
5. Vector Calculus: Vector fields, line integrals, Fundamental Theorem of Line Integrals. Applications.

O: Methods of Instruction

Lecture, problems sessions/assignments and computer laboratory exercises.

P: Textbooks and Materials to be Purchased by Students

Stewart, James. Multivariable Calculus, Brooks/Cole, 1999.

Q: Means of Assessment

Quizzes	0 – 40 %
Term Tests	20 – 70 %
Assignments	0 – 20 %
Attendance	0 – 5 %
Participation	0 – 5 %
Technology Lab	0 – 20 %
Final Examination	30 – 40 %

R: Prior Learning Assessment and Recognition: specify whether course is open for PLAR

None

Course Designer(s)

Education Council / Curriculum Committee Representative

Dean / Director

Registrar