UNIVERSITY OF THE FRASER VALLEY

OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)

COURSE IMPLEMENTATION DATE: September 2001
COURSE REVISED IMPLEMENTATION DATE: May 2006
COURSE TO BE REVIEWED: May 2010
(four years after UPAC approval) *(month, year)*

OFFICIAL UNDERGRADUATE COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.
Shaded headings are subject to change at the discretion of the department – see course syllabus available from instructor

MATH 312	Mathematics & Statistics	3
COURSE NAME/NUMBER	FACULTY/DEPARTMENT	UFV CREDITS

Vector Calculus
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This course extends the ideas and techniques of calculus to higher dimensions. Topics include the calculus of space curves (parametrization, tangent/normal/binormal, Frenet formulae, curvature), general orthogonal curvilinear coordinates, the calculus of vector fields (line integrals, surface integrals) and the core results of vector calculus (Stokes' theorem, Divergence theorem, and Green's theorem.)

PREREQUISITES: MATH 211
COREQUISITES: NONE
PRE or COREQUISITES:

SYNONYMOUS COURSE(S):
(a) Replaces: **MATH 212**
(b) Cross-listed with:
(c) Cannot take: **MATH 212** for further credit.

SERVICE COURSE TO: *(department/program)*

TOTAL HOURS PER TERM: **60**

STRUCTURE OF HOURS:

Lectures:	**60**	Hrs
Seminar:		Hrs
Laboratory:		Hrs
Field experience:		Hrs
Student directed learning:		Hrs
Other (specify):		Hrs

TRAINING DAY-BASED INSTRUCTION:
Length of course:
Hours per day:

OTHER:
Maximum enrolment: **36**
Expected frequency of course offerings: Bi-annual
(every semester, annually, every other year, etc.)

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)	☐ Yes	☒ No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)	☒ Yes	☐ No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:	☐ Yes	☒ No

Course designer(s): Greg Schlitt
Department Head: Gillian Mimmack — Date approved:
Supporting area consultation (UPACA1) — Date of meeting:
Curriculum Committee chair: — Date approved:
Dean/Associate VP: Jacalyn Snodgrass — Date approved:
Undergraduate Program Advisory Committee (UPAC) approval — Date of meeting: **November 29, 2000**

LEARNING OUTCOMES:

Upon successful completion of this course, students will:
This course completes the calculus sequence 111, 112, 211, 312. On completion of the course, a successful student will be able to understand and use the fundamental forms of derivative and integral in a 2- or 3- dimensional situation, and interpret the techniques and results both geometrically and analytically. In particular, he or she will be able to:

1. recognize, formulate and solve problems concerning paths in space, using such devices/techniqes as parametrization and re-parametrization, differentiation, frenet frames, and curvature, and interpret the results. Such problems will include both those of a computational and conceptual nature.

2. recognize, formulate and solve problems concerning vector fields in the plane and space, using such devices/techniques as line integral, surface integral, div, gradient, and curl (in Cartesian coordinates and in general orthoganal curvilinear coordinates) and interpret the results. Such problems will include both those of a computational and conceptual nature.

3. understand the use the fundamental results of vector calculus including the theorems of Stokes and Green, and the divergence theorem. He and She will be able to appreciate and articulate the way in which these theorems interrelate, and generalize and extend the one-dimensional results of basic calculus.

Students will learn to perform calculations both by hand and on computer (using a computer algebra system).

METHODS: *(Guest lecturers, presentations, online instruction, field trips, etc.)*

The course will be primarily lecture-based, with some computational support provided by a computer algabra system such as Maple. Evaluation will include quizzes, tests, assignments and a final exam.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

☐ Examination(s) ☐ Portfolio assessment ☐ Interview(s)

☒ Other (specify): Course Challenge

☐ PLAR cannot be awarded for this course for the following reason(s):

TEXTBOOKS, REFERENCES, MATERIALS:

[Textbook selection varies by instructor. An example of texts for this course might be:]

Calculus of Several Variables (4th Ed.) Robert Adams, Addison Wesley
Vector Calculus (4th Ed.) J. Marsden & A. Tromba, Freeman

SUPPLIES / MATERIALS:

Access to a computer algebra system.

STUDENT EVALUATION:

[An example of student evaluation for this course might be:]

The weighting of various components may vary from instructor to instructor and from year to year, although there must be at least two midterms, and the comprehensive final exam must be worth from 30% to 50% of the final grade.

An example of student evaluation for this course:

Quizzes	10%
Assignments	20%
Tests (2)	30%
Final Exam	40%

COURSE CONTENT:

[Course content varies by instructor. An example of course content might be:]

1. Curves in Space
   Vector valued functions, differentiation, parametrized curves, tangent, normal and binormal, Frenet frame, Frenet formulae, curvature

2. Generalized orthogonal curvilinear coordinates

3. Vector Fields
   Vector fields, div grad and curl, conservative fields, stream lines

4. Integration over Paths and Surfaces
   Path integrals, line integrals, parametrized surfaces, integrals of scalar and vector functions over surfaces

5. Integral Theorems
   Green's theorem, Stokes' theorem, Divergence theorem.
   Applications
   Introduction to differential forms (if time permits).