UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE:	May, 1994
COURSE REVISED IMPLEMENTATION DATE:	Sept, 2004
COURSE TO BE REVIEWED:	Sept, 2008
(Four years after implementation date)	(MMMM YY format)

OFFICIAL 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 and the material will vary - see course syllabus available from instructor

FACULTY/DEPARTMENT: **Science, Health and Human Services / Mathematics and Statistics**

COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS
MATH 320		**3**

COURSE DESCRIPTIVE TITLE: **Advanced Calculus of One Variable**

CALENDAR DESCRIPTION:

This course introduces some techniques of real analysis. Topics include infinite series, uniform convergence, Taylor series, the Riemann integral, improper integrals, and an introduction to analysis in abstract metric spaces.

PREREQUISITES: **MATH 214**
COREQUISITES: **None**

SYNONYMOUS COURSE(S)
(a) Replaces: ______ *(Course #)*
(b) Cannot take: ______ *(Course #)* for further credit.

SERVICE COURSE TO:
______ *(Department/Program)*
______ *(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: ______

MAXIMUM ENROLLMENT: **36**
EXPECTED FREQUENCY OF COURSE OFFERINGS: **every second year**

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

AUTHORIZATION SIGNATURES:

Course Designer(s): ______ Math Department

Chairperson: ______ Peter Mulhern *(Curriculum Committee)*

Department Head: ______ Gillian Mimmack

Dean: ______ Jackie Snodgrass

PAC Approval in Principle Date:

PAC Final Approval Date: November 26, 2003

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

This course will solidify the students' understanding of the precise notion of definition, theorem and proof in analysis that was begun in Math 214. This will be done while completing the rigorous study of the major topics in real analysis: series and integrals. Functions are often defined using series or integrals that depend on a parameter. Such functions will introduce the key idea of uniform convergence. Sufficient tests of uniform convergence, such as the Weierstrass M-test and the tests of Abel and Dirichlet, will be used to study the continuity and differentiability properties of functions defined with series and integrals. A rigorous definition of the Riemann integral will be given and its major properties developed. Improper integrals will then be defined and the parallel between integrals and series will be emphasized. Metric spaces will be introduced. This will show that such ideas as distance, limits and continuity exist in settings much more general than on the real line. This will begin the study of advanced, abstract mathematics.

On completion of the course, the student will be able to:

1. understand the definition and major properties of the Riemann integral.
2. use convergence tests, such as the Weierstrass M-test or those of Abel and Dirichlet, to determine whether a series or integral that depends on a parameter converges uniformly and thus be able to determine whether the function is continuous, differentiable, etc.
3. use Taylor polynomials to approximate smooth functions and give precise error estimates on the approximation.
4. understand the notion of an improper integral and be able to determine when such integrals converge.
5. exhibit an understanding of metric spaces and the induced topological concepts of limit, continuity, open set, and accumulation point in this abstract setting and see the analogues with the real line.

METHODS:

This course is primarily lecture-based. Evaluation includes quizzes, tests, and a final exam.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR (Please check :) ☒ Yes ☐ No

METHODS OF OBTAINING PLAR:

Course challenge.

TEXTBOOKS, REFERENCES, MATERIALS:

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

The textbook is chosen by a departmental curriculum committee. Recent text used:

Barlte, R.G. and Sherbert, D.R. 2000. *Introduction to Real Analysis*. Wiley.

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

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

The weighting of the 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. A student must obtain at least 40% on the final exam in order to pass 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. Series:
    a. Series of constants – review

   b. Series of functions – convergence, uniform convergence, tests for uniform convergence – Weierstrass M-test, Abel and Dirichlet tests – continuity and differentiability of functions defined using series
   c. Taylor series – uniform approximation by polynomials, analytic functions

2. Integrals:
   a. The Riemann integral
   b. Improper integrals
   c. Absolute and conditional convergence
   d. Integrals that depend on a parameter – uniform convergence
   e. Application – Laplace transform

3. Metric Spaces:
   a. Definition and examples
   b. Limits and continuity of metric spaces
   c. Topologies induced by metrics – open and closed sets, accumulation points, density, compactness
   d. Complete metric spaces