UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE:	May 1994
COURSE REVISED IMPLEMENTATION DATE:	September 2009
COURSE TO BE REVIEWED:	September 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**

MATH 316		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Numerical Analysis
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This course covers the construction and application of numerical computing solutions to mathematical problems that include applications of linear algebra, differentiation and integration, non-linear equations, the approximation of functions, and ordinary differential equations.

PREREQUISITES: **MATH 112 and MATH 221 and knowledge of a programming language acceptable to the department.**

COREQUISITES:

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**

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

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: Aug. 31, 2007

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

This course introduces students to some basic numerical techniques for solving equations in one variable and for linear systems, numerical differentiation and integration, and approximating solutions of ordinary differential equations. Students also learn how error can be estimated and approximation can be improved. Students are also required to implement some of the algorithms and to use some existing software packages.

This course is designed to enable students to:

1. understand the inherent limitations of floating point representation and machine accuracy.
2. become acquainted with the mathematics behind some of the basic classical techniques for finding solutions to numerical problems.
3. become acquainted with some basic algorithms in approximation theory.

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:
Burden and Faires. *Numerical Analysis*. 5th edition. PWS.

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	10%
Tests (2)	40%
Final Exam	40%

COURSE CONTENT:

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

1. Solutions of equations in one variable
   a. The Bi-section method
   b. Fixed-point iteration
   c. The Newton Method
   d. Error analysis for iterative methods

2. Interpolation and polynomial approximation
   a. Interpolation and the Lagrange polynomial
   b. Divided differences

c. Numerical differentiation and integration
d. Numerical differentiation
e. Richardson's extrapolation
f. Elements of numerical integrability
g. Initial value problems for ordinary differential equations
h. Elementary theory of initial value problems
i. Euler's method
j. Higher-order Taylor methods
k. Runge-Kutta methods
l. Stability and stiff differential equations

3. Iterative techniques in matrix algebra
    a. Norms of vectors and matrices
    b. Eigenvalues and eigenvectors
    c. Iterative techniques for solving linear systems
    d. Error estimates and iterative refinement

4. Approximation theory
    a. Discrete least squares approximation
    b. Orthogonal polynomials and least squares approximation