UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE:
COURSE REVISED IMPLEMENTATION DATE: September 2003
COURSE TO BE REVIEWED: September 2007
(Four years after implementation date) (MONTH YEAR 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: **MATHEMATICS AND STATISTICS**

MATH 235		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

MATHEMATICAL MODELING
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This course introduces the student to the techniques of *mathematical modeling*: the construction of a mathematical description of a real-world situation, and the analysis of this description. All computation will be done in a CAS (computer algebra system) environment (such as MAPLE), enabling the student to concentrate on creating and criticizing the models.

PREREQUISITES: **MATH 112 or MATH 116**
PRE or COREQUISITES: **At least one of: MATH 106, MATH 152, MATH 211, MATH 221, or MATH 270**

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:	**30**	Hrs
Seminar:		Hrs
Laboratory:	**30**	Hrs
Field Experience:		Hrs
Student Directed Learning:		Hrs
Other (Specify):		Hrs

TRAINING DAY-BASED INSTRUCTION
LENGTH OF COURSE: _____
HOURS PER DAY: _____

MAXIMUM ENROLLMENT: **24**
EXPECTED FREQUENCY OF COURSE OFFERINGS: _____

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): Greg Schlitt, David Chu
Chairperson: N. Weinberg, E. Davis *(Curriculum Committee)*
Department Head: S. Milner
Dean: K. Wayne Welsh
PAC Approval in Principle Date:
PAC Final Approval Date: December 4, 2002

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

I. OBJECTIVE
An introduction to the modeling process. In this course the students will focus almost exclusively on using mathematics that is already known to them to analyze real-world problems. Only minimal amounts of new theory will be presented.

II. LEARNING OUTCOME
Creative and empirical model construction: Given real world scenarios, the student will learn to identify a problem, make assumptions and collect data, propose a model, test the assumptions, refine the model as necessary, fit the model to data if appropriate and analyze the underlying mathematical structure of the model in order to appraise the sensitivity of the conclusions.

III. OBJECTIVE
An introduction to mathematics in a computer environment

IV. LEARNING OUTCOME
Students will be required to become proficient with using MAPLE to perform the computations needed in developing and analyzing the models studied.

METHODS:

Class hours are divided between lecture and hands on model development. All classes are held in a computer lab environment so that a CAS system may be used.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR (Please check :) X☐ 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:]

1. A First Course in Mathematical Modeling (2nd ed.), F. Giordano & M. Weir, Brooks/Cole, 1996.
2. Operations Research (Applications and Algorithms), W. Winstron, Duxbury, 1994.
3. Applying Mathematics, D. Burghes et al., John Wiley & Sons, 1982.
4. Multivariable Mathematics with MAPLE, (Linear Algebra, Vector Calculus, and Differential Equations), J. Carlson, & J. Johnson, Prentice Hall, 1997.

SUPPLIES / MATERIALS:

MAPLE software

STUDENT EVALUATION:

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

This may vary from instructor to instructor. A typical breakdown would be as follows:

Assignments/projects	40 – 50%
In-class test/quizzes	20 – 30%
Final exam	30 – 40%

A student must obtain at least 40% on the final exam to pass the course.

COURSE CONTENT:

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

Introduction to MAPLE: arithmetic, basic algebra, graphing, certain computations from calculus, (certain specific MAPLE needed to

work with difference equations, differential equations and curve fitting will be introduced at the appropriate place in the course). Students will study the methodology and be able to identify and follow certain basic steps to constructing a mathematical model.

Students will be required to generate and interpret models of selected types of real world problems. These models may include:

- Graphical models of a qualitative nature
- Models using proportionality
- Models requiring optimization
- Models using difference equations
- Models using differential equations
- Empirical models (curve fitting to date using least squares fitting, splines, etc.)

Additional topics may be chosen from among the following: (This depends on student background and time constraints.)

- Model fitting and forecasting: analytic methods: simple linear regression, multiple linear regression, moving average forcasting methods, smoothing
- 2-dimensional physical systems (e.g. constructing models of distance and angle in the plane).
- Dimensional analysis
- Interactive systems (e.g. Systems of differential equations, predator-prey models)