UNIVERSITY COLLEGE of the FRASER VALLEY

PAC FORM #2 (Page 1)

COURSE IMPLEMENTATION DATE:
COURSE REVISED IMPLEMENTATION DATE: September 1999
COURSE TO BE REVIEWED: September 2003
(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 course from among MATH 106, 152, 211, 221, or 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:	**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: **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 16, 1998

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

This course will serve two purposes:

An introduction to the modeling process

- 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 analyse the underlying mathematical structure of the model in order to appraise the sensitivity of the conclusions
- Model Analysis: Given a model, the student learns to work backwards to uncover and analyze the implicit underlying assumptions

An introduction to mathematics in a computer environment:

- Graphing functions and data
- Representation of mathematical data structures and their manipulations (functions, matrices, lists, etc.)
- Computer algebra: exact and approximate equation solution, exact and approximate differentiation, integration, etc.
- Implementation of techniques from linear algebra and/or statistics (depending on student background)

METHODS:

Lectures and directed student activity, both in a computer lab, using CAS software. Each student will have access to a computer.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

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

METHODS OF OBTAINING PLAR:

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:

STUDENT EVALUATION:

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

This may vary somewhat 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%

Students would be expected to complete several projects throughout the semester (probably working in small teams). The projects would be judged on the efficacy of the models constructed, the analysis of those models, and the presentation and communication of the analysis and conclusions.

COURSE CONTENT:

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

Topics will include the following:

- Introduction to MAPLE: variables, functions, graphing, equation solution, elementary calculus (1.5 weeks)
- Graphs of functions as models (e.g., models from economics)
- Modeling using proportionality (e.g., geometric similarity)
- Models requiring optimization (inventory problems, etc.)
- Models using the derivative (e.g., population models)
- Empirical model construction (poly, interpolation, cubic 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 forecasting 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)