UNIVERSITY COLLEGE of the FRASER VALLEY

PAC FORM #2 (Page 1)

COURSE IMPLEMENTATION DATE:	Sept, 1993
COURSE REVISED IMPLEMENTATION DATE:	Sept, 2005
COURSE TO BE REVIEWED: (Four years after implementation date)	Sept, 2009 (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: **Science, Health & Human Services**

MATH 308		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Linear Programming

COURSE DESCRIPTIVE TITLE

Linear programming is a powerful optimization technique which is used in many areas of business, science and engineering. This course provides an introduction to many applications. The simplex method and variations thereof are covered in depth along with duality theory and sensitivity analysis. Students do analysis by hand as well as with the computer.

PREREQUISITES: **MATH 221**
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: April 28, 2004

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

Successful students will:
1) be able to solve and perform sensitivity analysis for two variable problems using graphical techniques;
2) be able to set up linear programming (LP) problems for a variety of applications;
3) be able to solve small LP problems by hand using the simplex algorithm and variations (including two-phase problems, dual and revised simplex methods);
4) be able to solve larger LP problems using computer programs such as Excel and Lindo;
5) be able to understand the post-optimality information provided by programs such as Excel and Lindo;
6) be able to understand the problems of degeneracy and the possibility of cycling in solving LP problems;
7) be able to complete a sensitivity analysis from the final simplex tableau of an LP problem;
8) be able to compute the final tableau for a given set of basic variables using matrix formulae.

METHODS:

The course is primarily lecture-based, with some use of computer resources for assignments.

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 text is chosen by a departmental curriculum committee. Recent text used:
Winston, W. and Venkataramanan, M. 2003. *Introduction to Mathematical Programming.* 4th edition. Thompson Brooks/Cole.

SUPPLIES / MATERIALS:

Graphing calculator (without a computer algebraic system) for matrix calculations. Access to a computer with Excel is desirable.

STUDENT EVALUATION:

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

Students write two or three tests during the semester, as well as a cumulative final exam. Students are also expected to turn in assignments and/or write quizzes periodically. A student must obtain at least 40% on the final exam in order to pass this course.

An example of student evaluation for this course:

Tests	40%
Final Exam	40%
Assignments and Quizzes	20%

COURSE CONTENT:

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

1. Introduction
   a. Optimization and mathematical programming
   b. Linear programming – formulation
   c. The geometry of linear programs
2. Mathematical prerequisites
   a. Linear algebra
   b. Convex sets

3. Duality theory
   a. Examples of dual linear programs
   b. Transformation among various forms of the linear program

c. The dual problem and its properties
d. The duality theorem
f. Complementary slackness

4. The simplex method
   a. Extreme points and basic feasible solutions
   b. The optimality theorem
   c. Pivoting to a new basic feasible solution
   d. Degeneracy and cycling. Multiple optima
   e. Computational aspects
   f. Geometric interpretation
   g. Artificial variables and the two-phase method
   h. The revised simplex method
   i. The dual simplex method
   j. Computation comparisons among the various versions of the simplex methods

5. Post-optimality problems
   a. Sensitivity analysis
   b. Parametric programming

6. Special linear programs (if time permits)
   a. The transportation problem
   b. The transportation algorithm
   c. Network flows