douglas college **Course Information**

A. Division: ACADEMIC

Date: October, 1985

B. Department: SCIENCE AND MATHEMATICS

New Course: ☐

Revision of Course Information Form: ☒

Dated: May, 1984

C. MAT 450 (Subject & Course No.)

D. Quantitative Methods (Descriptive Title)

E. 3 (Semester Credits)

F. Calendar Description:

Applications of mathematics to business and economics, with emphasis on non-linear models. Includes multivariate functions, probability theory, transformations of data, marginal analysis, Lagrange multipliers, utility theory, non-linear programming, method of least squares, and differential equations. Some topics are optional and may be omitted or included dependent on class interest.

Summary of Revisions:
(Enter date and Section Revised)
e.g. 1982-08-25
Section C,E,F, and R.

1985-09-18

Form Updated

Sections N, Q, R

Sections O & P revised to reflect changes at UBC and SFU

G. Type of Instruction:

	Hours Per Week / Per Semester
Lecture	4 Hrs.
Laboratory	Hrs.
Seminar	Hrs.
Clinical Experience	Hrs.
Field Experience	Hrs.
Practicum	Hrs.
Shop	Hrs.
Studio	Hrs.
Student Directed Learning	Hrs.
Other (Specify)	Hrs.
Total	4 Hrs.

H. Course Prerequisites:

MAT 250 or MAT 120/220

I. Course Corequisites:

Macro/Micro economics helpful

J. Courses for which this Course is a Pre-requisite:

NONE

K. Maximum Class Size:

35

L. College Credit Transfer ☒

College Credit Non-Transfer ☐

Non-Credit ☐

M. Transfer Credit: Requested ☐ Granted ☒

(Specify Course Equivalents or Unassigned Credit as Appropriate)

U.B.C. **MAT 450 - Math 141 (1.5)**

S.F.U. **MAT 450 - Math 158 (3)**

U. Vic. **MAT 350/450 - Math 240(3)**

Other **MAT 450 - Math (200 level) (1.5)**

Course Designer(s)

Divisional Dean

Director / Chairperson

Acting Registrar

G2516 (Rev. Aug./82)

N. Textbooks and Materials to be Purchased by Students (Use Bibliographic Form):

Goldstein, Lay and Schneider - Calculus and Its Applications, 3rd Ed.
Prentice-Hall Publishing

Complete Form with Entries Under the Following Headings: O. Course Objectives; P. Course Content; Q. Method of Instruction; R. Course Evaluation

O. Course Objective & P. Course Content

This is the old MAT 450 starting from a somewhat more elementary point because it includes some methods of integration and probability topics formerly included in MAT 250. Additionally, multiple integrals and periodic functions will be added. Less time will be required reviewing some basic ideas because this course should follow directly on the heels of MAT 250, rather than their being separated by at least a semester.

1. Methods of integration
   - Parts
     - Discounting and compounding income streams
   - Partial fractions
     - The logistic
   - Improper integrals
     - Integrals of negative powers to infinity

2. Probability distributions
   - Normalizing relative density functions
   - Expectation, variance, and standard deviation
   - Testing hypotheses concerning mean by sampling
   - Random variables with infinite domains
   - The exponential and normal probability densities
   - Use of normal distribution tables

3. Cyclic behaviour and the sine and cosine
   - Need for cyclic functions
   - Mechanical generation of sine and cosine waves
   - Graphs of A sin(a+bt), A cos(a+bt)
   - Compounding wave forms
   - Derivative of sine and cosine
   - Equation of simple harmonic motion

4. Functions of several variables
   - Production and utility functions
   - Representation of $z = f(x,y)$ in 3-dimensions

Contours and cross-sections
Isoquants, indifference curves and production frontiers
Slopes in directions of axes and partial derivatives
    Marginal concepts
Total differentials and directional derivative
    Changes in total cost, utility
    Marginal rates of substitution
    Elasticity concepts
        CES and Cobb-Douglas functions
        cross elasticity of demand
        elasticity of substitution
Locating extremes
    First derivative conditions
    Saddle points
    Second derivative test
    Optimizing with constraint
        by elimination of variables
        by Lagrange multipliers
    "Design" problems with and without constraint
    Optimizing utility subject to budget
    The Bowley-box

5. Multiple integrals
    Interated integrals over rectangles
    Integrals over $\{(x,y) \mid g(x)<=y<=f(x),\ a<=x<=b\}$

Topics 5,7,8,9 as time permits and interest dictates.

6. The method of least squares
    Justification for least squares
    Dangers inherent
    Fitting $y=ax+b$, $y=ax$, $y=b$
    Fitting $y=ax^2+bx+c$, etc.
    Fitting $z=ax+by+c$, etc.
    Fitting $y=a^{bx}$, $y=Ae^{bx}$, $y=Ax^b$
    Applications to growth, learning, imputing costs

7. Models employing differential equations
    Domar growth model ($Y=aK$, $I=f(Y)$
    Market equilibrium models with inventories
        $dp/dt = a(D-S)$, $S=f(p)$, $D=g(p)$
        $dp/dt = a(D-S)$, $dS/dt = f(p)$, $D-g(p)$

8. Steepest ascent methods
    "small step" (of. Gauss's method)
    "optimal step"

9. Homogeneous functions
    Returns to scale
    Euler's theorem
    Clark-Wicksteed theorem

Q. Methods of Instruction

Classes meet four hours per week. Abstractions will be developed from specific problems; a significant component of lectures will consequently be solving problems.

Students should expect regular problem assignments that will exercise and expand upon the lecture's topics.

R. Course Evaluation

The final grade assigned for the course will be based on the following:

1. Classroom tests 70%
2. Final Examination 30%

Notes

i. There will be three or more in-class tests spread over the semester.
ii. At the discretion of the instructor the percentage for the classroom tests may be reduced and replaced by problem assignments. If problems are assigned for marking the number of tests may be reduced to two. The maximum to be awarded for assignments is 20%

iii. A comprehensive, three hour exam will be held at the end of the semester.

In the event that the student's letter grade on the final exam is higher than the normally calculated grade, the final grade will be increased one level (i.e. if the term average indicates a C grade and the score on the final exam is an A or B, then a B grade will be awarded).

The calendar states that a C grade is based on consistently average work. Those students who do poorly on the final exam (i.e. the final exam score is well below the average), may be awarded no more than a P grade even though their term average, as normally calculated, indicates a C grade.