Division: ACADEMIC DATE: September 1, 1998

B: Department: SCIENCE & MATHEMATICS New Course: ____

Revision of Course Information form: X

DATED: March, 1993

C: MATH 220 (Subject & Course No.) D: CALCULUS II (Descriptive Title) E: 3 (Semester Credit)

F: Calendar Description

Math 220 is an introduction to integral calculus. It develops the concept of the integral and its applications. Other topics include techniques of integration, improper integrals, sequences and series of numbers, Taylor series, polar coordinates, parametric equations, and separable differential equations.
This course is taught using a graphing calculator.

Summary of Revisions: Sept. 1998

Redistribution of topics between Math 120 and 220 .

Items F, N, M, O, P

G: Type of Instruction: Hours Per Week

Lecture	4 Hrs.
Laboratory	____ Hrs.
Seminar	____ Hrs.
Clinical Experience	____ Hrs.
Field Experience	____ Hrs.
Practicum	____ Hrs.
Shop	____ Hrs.
Studio	____ Hrs.
Student Directed Learning	____ Hrs.
Other	____ Hrs.
TOTAL	4 HOURS

L: College Credit Transfer X

College Credit Non-Transfer ____

H: Course Pre-requisites:
Math 120

I: Course Co-requisites: None

J: Course for which this course is a pre-requisite:
Math 321, Math 421

K: Maximum Class Size:
35

M: Transfer Credit:
Requested X
Granted ____
Specify Course Equivalents or Unassigned Credit as Appropriate:

U.B.C. Math 101
S.F.U. Math 152
U. Vic. Math 101 (1.5 credits)
OTHER:

COURSE DESIGNER(S)

DEAN

VICE-PRESIDENT, INSTRUCTION

REGISTRAR

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N: Textbooks and materials to be purchased by students
(Use Bibliographic Form):

Stewart, **Calculus: Early Transcendentals**, 3rd Edition, Brooks/Cole

A graphing calculator is also required.

O. **Course Objectives**:

General comments:

Math 220 is a second course in calculus. The four-semester sequence of Math 120, 220, 321, and 421 provides the foundation for continued studies in science, engineering, computer science, and a major in mathematics.

Specific objectives:

At the conclusion of this course, the student should be able to:

- compute finite Riemann sums and use to estimate area
- form limits of Riemann sums and write the corresponding definite integral
- recognize and apply the Fundamental Theorem of Calculus
- evaluate integrals involving exponential functions to any base
- evaluate integrals of reciprocal functions
- evaluate integrals involving basic trigonometric functions and integrals whose solutions require inverse trigonometric functions
- be able to choose an appropriate method and apply the following techniques to finding antiderivatives and evaluating definite integrals:

  a) integration by parts
  b) trigonometric and rationalizing substitution
  c) completing the square for integrals involving quadratic expressions
  d) partial fractions
  e) integrals of products of trigonometric functions

- apply integration to problems involving areas, volumes, arc length, work, velocity and acceleration
- be able to determine the convergence or divergence of improper integrals by comparison test

- determine if a given sequence converges or diverges
- determine if a sequence is bounded and/or monotonic
- determine the sum of a geometric series
- be able to choose an appropriate test and determine series convergence/divergence using:

  a) integral test
  b) simple comparison test
  c) limit comparison test
  d) ratio and root tests
  e) alternating series test

- distinguish and apply concepts of absolute and conditional convergence of a series
- determine the radius and interval of convergence of a power series
- approximate a differentiable function by a Taylor polynomial, determine the remainder term, and compute the error in using the approximation
- find a Taylor or Maclaurin series representing specified functions by:

  a) "direct" computation
  b) means of substitution, differentiation or integration of related power series

- find the area of a region bounded by the graph of a polar equation or parametric equations
- find the lengths of curves in polar coordinates or in parametric form
- solve first order linear differential equations by method of separation of variable; apply to growth and decay problems

P. **Course Content**

1. Introduction to the Integral

- sigma notation
- Riemann sums
- the definite integral
- the Fundamental Theorem of Calculus
- antiderivatives; elementary substitutions
- applications to area under and between curves, volume and work

2. Techniques of Integration

- parts
- trigonometric substitution
- trigonometric integrals (products and powers)
- partial fractions (linear factors and distinct quadratic factors)
- rationalizing substitutions
- improper integrals

3. Applications of Integration

- areas between curves
- volumes by slicing and cylindrical shells
- work
- separable differential equations
- arc length

4. Infinite Series

- sequences
- sum of a geometric series
- absolute and conditional convergence
- comparison tests
- alternating series
- ratio and root test
- integral test
- power series
- differentiation and integration of power series
- Taylor and Maclaurin series
- polynomial approximations; Taylor polynomials

5. Parametric Equations and Polar Coordinates

- areas and arc lengths of curves in polar coordinates
- areas and arc lengths of functions in parametric form

6. Optional Topics (included at the discretion of the instructor)

- tables of integrals
- approximation of integrals by numerical techniques
- Newton's law of cooling, Newton's law when force is proportional to velocity, and logistics curves
- a heuristic "proof" of the Fundamental Theorem of Calculus
- the notion of the logarithm defined as an integral
- further applications of Riemann sums and integration
- binomial series

Q. **Method of Instruction**

Lectures, problem sessions and assignments.

R. **Course Evaluation**

Evaluation will be carried out in accordance with Douglas College policy. The instructor will present a written course outline with specific evaluation criteria at the beginning of the semester. Evaluation will be based on the following criteria:

1.	Weekly quizzes	..... 0-40%
2.	Tests	.....20-70%
3.	Assignments	..... 0-15%
4.	Attendance	..... 0-5%
5.	Class participation	..... 0-5%
6.	Final examination	..... 30%

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