douglas college **Course Information**

A: Division: Academic

Date: May 1994

B: Department: Science and Math

New Course: _____

Revision of Course Information Form: x

Dated: January 1979

C: Math 421 (Subject & Course No.) D: Introduction to Differential Equations (Descriptive Title) E: 3 (Semester Credit)

F: Calendar Description:
This is a first course in the theory of ordinary differential equations. Topics include the solution of first- and higher order differential equations, power series solutions, Laplace transforms, linear and non-linear systems, stability, Euler methods and applications.

Summary of Revision:

Sections F, H, N, O, P, R

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	Hrs.

H: Course Prerequisites: Math 232 and Math 321

I: Course Corequisites: None

J: Course for which this course is a prerequisite: None

K. Maximum Class Size: 35

M Transfer Credit:
Requested _____
Granted x

L: College Credit Transfer x

College Credit Non-Transfer _____

Specify Course Equivalents or Unassigned Credit as Appropriate

U.B.C. Math 315(3)
S.F.U. Math 310(3)
U. Vic. Math 201(1.5)
Other:

Susan Hanson
COURSE DESIGNER(S)

DIVISIONAL DEAN

DIRECTOR/CHAIRPERSON

REGISTRAR

N: Textbooks and materials to be Purchased by Students:

Zill, Dennis G. A First Course in Differential Equations, PWS-KENT Publishing Company, 1993.

O. Course Objectives:

Upon completion of Math 421 the student should be able to:

- recognize and solve separable, homogeneous, exact and linear first-order differential equations
- determine whether or not a unique solution to a first-order or linear nth-order initial-value problem exists
- solve Bernoulli and Ricatti equations
- determine orthogonal trajectories of a given family of curves
- solve problems involving applications of linear equations including: growth and decay, series circuits, thermodynamics and mixture applications
- solve problems involving applications of non-linear equations including: logistic function, chemical reaction and law of mass action applications
- determine whether or not a set of functions is linearly dependent or independent
- determine whether or not a set of solutions to a differential equation are linearly dependent or independent using the Wronskian
- use reduction of order to find a second solution from a known solution
- solve homogeneous linear equations with constant coefficients
- express linear differential equations in terms of differential operators
- use the method of undetermined coefficients to solve nonhomogeneous linear differential equations for which the nonhomogeneous term can be annihilated
- solve nonhomogeneous linear differential equations using variation of parameters
- analyze problems involving simple harmonic motion
- recognize and solve Cauchy-Euler equations
- use power series techniques to solve differential equations in the neighborhood of ordinary points
- use the method of Frobenius to solve differential equations about regular singular points
- state the definition of the Laplace transform of a function and the sufficient conditions for its existence
- determine the Laplace transforms of basic functions, derivatives, integrals and periodic functions and find inverse transforms
- use the convolution theorem and translation theorems to find Laplace transforms and their inverses
- use Laplace transforms to solve initial value problems, integral equations and integrodifferential equations
- solve systems of differential equations using differential operators or Laplace transforms
- reduce higher order linear differential equations to systems in normal form
- use Euler methods to approximate solutions to differential equations
- analyze trajectories of autonomous first-order differential equations and comment on the stability of critical points
- find equilibrium solutions of second order differential equations
- find trajectories associated with simple linear and non-linear systems of equations and determine critical points

P. Course Content:

1. First-Order Differential Equations: separable, homogeneous, exact, linear, Bernoulli, and Ricatti equations and applications

2. Higher Order Differential Equations: reduction of order, homogeneous linear equations with constant coefficients, differential operators and undetermined coefficients, variation of parameters

3. Equations with Variable Coefficients: Cauchy-Euler equations and power series solutions about ordinary and singular points, Bessel and Legendre equations

4. Laplace Transforms and applications

5. Systems of Linear Differential Equations: operator and Laplace transform techniques, systems of linear first-order equations, reduction of higher order equations to linear normal form

6. Non-linear Systems and Stability: solutions and trajectories of autonomous systems, stability of critical points

7. Numerical Solutions: Euler Methods

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 some of the following:

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%