Douglas College

If Revision, Section(s) Revised:	C, H
Date of Previous Revision:	June 30, 2002
Date of Current Revision:	September 2004

C: Math 2421 **D:** Introduction to Differential Equations **E:** 3

Subject & Course No. Descriptive Title Semester Credits

F: Calendar Description: Calendar Description: This is a first course in ordinary differential equations. Topics include the theory and applications of linear and non-linear ordinary differential equations (ODE's) and systems of ODE's. Formal solution methods are investigated as well as power series, Laplace transform, matrix and numerical/computer methods. Qualita

Allocation of Contact Hours to Type of Instruction / Learning Settings Lecture 3 – 4 hours/week	Math 1220 and Math 2232 or special permission
	I: Course Corequisites: None
for each descriptor) 4	**J:** Course for which this Course is a Prerequisite None
Number of Weeks per Semester: 15	**K:** Maximum Class Size: 35

L: PLEASE INDICATE**:**

☐ Non-Credit

☐ College Credit Non-Transfer

X College Credit Transfer:

M: Course Objectives / Learning Outcomes

Upon completion of this course a student will be expected to:

identify and solve first order separable, homogeneous, exact, linear, Bernoulli and Ricatti equations
determine the existence and uniqueness of a solution of a first order initial value problem
determine families of solution curves and their orthogonal trajectories
set up and solve differential equations involving motion, population growth, chemical reactions/mixing, electrical circuits etc.
determine whether or not a set of function is linearly independent. Understand and use the properties of the Wronskian
reduce the order of a higher order DE from the information of a known solution
identify and solve homogeneous linear constant coefficient DE's and Cauchy-Euler DE's
use differential operator notation to express DE's
solve non-homogeneous DE's using method of undetermined coefficients and variation of parameters
analyze and describe all aspects of harmonic motion; damping, resonance, forced motion
use power series to find representations for solutions of a DE near an ordinary point
use the method of Frobenius to solve DE's near regular singular points (optional)
use the definition of the Laplace transform to verify its properties
determine Laplace transforms of simple functions, derivatives, integrals, step and impulse functions
with the use of tables, determine inverse Laplace transforms
use convolution and translation theorems to find Laplace transforms and their inverses
solve and verify properties of DE's using Laplace transforms
solve systems of DE's using Laplace transforms or operator techniques
reduce a higher order linear DE to a first order linear system of DE's
find eigenvalues and eigenvectors of a square matrix
use matrix methods to solve first order autonomous linear systems of DE's
find stationary point(s) of a DE
determine the stability of a solution near a stationary point
analyze and discuss trajectories in the phase plane
generate analytical, graphical or numerical output from a computer algebra system (MAPLE) to assist in the analysis of a DE

N: Course Content:

1. First Order Differential Equations: separable, homogeneous, exact, linear, Bernoulli and Ricatti equations and applications.
2. Higher Order Linear Differential Equations: General theory, reduction of order, homogeneous constant coefficient and Cauchy-Euler equations, undetermined coefficients and variation of parameters methods for non-homogeneous equations.
3.