CAMOSUN COLLEGE	***School of Arts & Science*** ***MATHEMATICS DEPARTMENT*** **MATH 262** **Applied Differential Equations** **2007 Q3**

COURSE OUTLINE

The Approved Course Description is available on the web @ _____

Ω *Please note: this outline will be electronically stored for five (5) years only. It is strongly recommended students keep this outline for your records.*

1. Instructor Information

(a)	Instructor:	Gilles Cazelais		
(b)	Office Hours:	On web site		
(c)	Location:	CBA 158		
(d)	Phone:	370 - 4495	Alternative Phone:	
(e)	Email:	cazelais@camosun.bc.ca		
(f)	Website:	http://pacificcoast.net/~cazelais/		

2. Intended Learning Outcomes

(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)

Upon completion of this course the student will be able to:

1. Classify a differential equation (DE) by type (ordinary differential equation ODE vs. partial differential equation PDE), order, and linearity.
2. Verify an implicit/explicit solution of an ODE.
3. Determine existence and uniqueness of solution of a first-order IVP.
4. Model real-life phenomenon with linear/non-linear DE (for example, vibration problems such as the spring-mass system, radioactive decay, mixture problems, draining a tank, falling bodies with/without air resistance).
5. Sketch approximate solution curves for a first-order IVP using direction field.
6. Solve various types of first-order DE: separable DE, linear DE (using integrating factor), exact DE and non-exact DE (by making it exact), homogeneous DE of a certain degree, Bernoulli DE.
7. Determine existence and uniqueness of solution of a n^{th}-order IVP.
8. Solve 2^{nd}-order linear homogeneous/nonhomogeneous DE using the method of reduction of order.
9. Solve higher-order linear homogeneous/nonhomogeneous DE with constant coefficients.
10. Solve 2^{nd}-order nonhomogeneous DE using the method of variation of parameters.
11. Solve Cauchy-Euler equation.
12. Solve systems of linear equations.
13. Classify a point for a DE as ordinary point, regular singular point, or irregular singular point.

14. Find power series solution of a DE about an ordinary point.
15. Find series solution of a DE about a regular singular point.
16. Apply the Frobenius Theorem to find series solution of a DE about a regular singular point.
17. Use a Laplace transform and its properties to solve an IVP of a linear DE with constant coefficients.
18. Use Euler and Runge-Kutta methods to find a solution of a DE.

3. Required Materials

(a)	Texts	Dennis G. Zill, *A First Course in Differential Equations with Modeling Applications*, 8th Edition
(b)	Other	

4. Course Content and Schedule

(Can include: class hours, lab hours, out of class requirements and/or dates for quizzes, exams, lectures, labs, seminars, practicums, etc.)

5. Basis of Student Assessment (Weighting)

(Should be linked directly to learning outcomes.)

(a)	Assignments	10%
(b)	Quizzes	40%
(c)	Exams	50%
(d)	Other (eg, Attendance, Project, Group Work)	

6. Grading System

(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)

Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
95-100	A+		9
90-94	A		8
85-89	A-		7
80-84	B+		6
75-79	B		5
70-74	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at **camosun.ca** or information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	*In progress*: A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	*Compulsory Withdrawal:* A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy E-1.5 at **camosun.ca** for information on conversion to final grades, and for additional information on student record and transcript notations.

7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College calendar, at Student Services or the College web site at camosun.ca.

STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**. It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, at Student Services and on the College web site in the Policy Section.

ADDITIONAL COMMENTS AS APPROPRIATE OR AS REQUIRED

Course Outline

1. Introduction to Differential Equations
· Definitions and Terminology (section 1.1)
· Initial-Value Problems (section 1.2)
2. First-Order Differential Equations

· Solution Curves Without the Solution (section 2.1)
· Separable Variables (section 2.2)
· Linear Equations (section 2.3)
· Exact Equations (section 2.4)
· Solutions by Substitutions (section 2.5)
3. Modeling with Differential Equations
· Linear Equations (section 3.1)
· Nonlinear Equations (section 3.2)
4. Differential Equations of Higher-Order
· Linear Differential Equations: Basic Theory (section 4.1)
· Reduction of Order (section 4.2)
· Homogeneous Linear Equations with Constant Coefficients (section 4.3)
· Undetermined Coefficients — Superposition Approach (section 4.4)
· Variation of Parameters (section 4.6)
· Cauchy-Euler Equations (section 4.7)
5. Modeling with Higher-Order Differential Equations
· Linear Equations: Initial-Value Problems (section 5.1)
- Spring/Mass Systems: Free Undamped Motion (5.1.1)
- Spring/Mass Systems: Damped Motion (5.1.2)
- Spring/Mass Systems: Driven Motion (5.1.3)
- Series Circuit Analogue (5.1.4)
· Linear Equations: Boundary-Value Problems (section 5.2)
· Nonlinear Equations (section 5.3)
6. Series Solutions of Linear Equations
· Solutions About Ordinary Points (section 6.1)
· Solutions about Singular Points (section 6.2)
7. Laplace Transforms
· Definition of the Laplace Transform (section 7.1)
· Inverse Transforms and Transforms of Derivatives (section 7.2)
· Operational Properties I (section 7.3)
- Translation of the s−Axis (7.3.1)
- Translation of the t−Axis (7.3.1)
· Operational Properties II (section 7.4)
- Derivatives of a Transform (7.4.1)
- Transforms of Integrals (7.4.2)
· The Dirac Delta Function (section 7.5)
8. Systems of Linear First-Order Differential Equations
· Preliminary Theory (section 8.1)
· Homogeneous Linear Systems (section 8.2)
- Distinct Real Eigenvalues (8.2.1)
- Repeated Eigenvalues (8.2.2)
- Complex Eigenvalues (8.2.3)
· Nonhomogeneous Linear Systems (section 8.3)
- Variation of Parameters (8.3.2)
9. Numerical Solutions of ODE
· Euler Methods (section 9.1)
· Runge-Kutta Methods (section 9.2)
· Multistep Methods (section 9.3)