



**CAMOSUN COLLEGE**  
**School of Arts & Science**  
**Department of Mathematics & Statistics**

**MATH-252-X02**  
**Applied Differential Equations**  
**Fall 2019**

**COURSE OUTLINE**

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The course description is online @ <http://camosun.ca/learn/calendar/current/web/math.html>

Ω Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.

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**1. Instructor Information**

(a) Instructor	Gilles Cazalais
(b) Office hours	<a href="https://sites.google.com/site/cazelais">https://sites.google.com/site/cazelais</a>
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(f) Website	<a href="https://sites.google.com/site/cazelais/home/math252">https://sites.google.com/site/cazelais/home/math252</a>

**2. Intended Learning Outcomes**

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

1. Solve various types of first-order differential equations (DEs): separable, linear, exact, nth-degree, homogeneous, and Bernoulli.
2. Solve higher-order linear DEs using a variety of techniques including reduction of order, variation of parameters, and undetermined coefficients.
3. Model real-life phenomenon with DEs, including exponential growth and decay, falling bodies with and without air resistance, LCR circuits, and mass-spring systems.
4. Find a power series solution for a linear DE.
5. Use a Laplace transform and its properties to solve a linear IVP.
6. Solve systems of linear DEs using matrices.

**3. Required Materials**

Dennis G. Zill, A First Course in Differential Equations with Modeling Applications, 10th Edition, Brooks/Cole, 2009.

**4. Course Content and Schedule**

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

2. First-Order Differential Equations

Separable Variables (section 2.2)

Linear Equations (section 2.3)

Exact Equations (section 2.4)

Solutions by Substitutions (section 2.5)

### 3. Modeling with First-Order Differential Equations

Linear Models (section 3.1)

### 4. Higher-Order Differential Equations

Preliminary Theory { Linear Equations (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 Models: 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)

### 6. Series Solutions of Linear Equations

Review of Power Series (section 6.1)

Solutions About Ordinary 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 (7.3.2)

Operational Properties II (section 7.4)

Derivatives of a Transform (7.4.1)

Transforms of Integrals (7.4.2)

Transforms of a Periodic Function (7.4.3)

The Dirac Delta Function (section 7.5)

### 8. Systems of Linear First-Order Differential Equations

Preliminary Theory { Linear Systems (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)

## 5. Basis of Student Assessment (Weighting)

Three tests: 50%

Comprehensive final exam: 50%

## 6. Grading System

Standard Grading System (GPA)

Competency Based Grading System

## 7. Recommended Materials to Assist Students to Succeed Throughout the Course

## 8. College Supports, Services and Policies



### Immediate, Urgent, or Emergency Support

If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @

<http://camosun.ca/about/mental-health/emergency.html> or <http://camosun.ca/services/sexual-violence/get-support.html#urgent>

### College Services

Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at <http://camosun.ca/>

### College Policies

Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at <http://camosun.ca/about/policies/>. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

### A. GRADING SYSTEMS <http://camosun.ca/about/policies/index.html>

The following two grading systems are used at Camosun College:

#### 1. Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5

70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

## 2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

## B. 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 <http://camosun.ca/about/policies/index.html> for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	<i>Incomplete:</i> 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	<i>In progress:</i> 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	<i>Compulsory Withdrawal:</i> 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.