



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

**MATH-252-All Sections**  
**Applied Differential Equations**  
**Winter 2021**

**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**

<b>(a) Instructor</b>	Patricia (Pat) Wrean		
<b>(b) Office hours</b>	Mon 11:30 am – 1:20 pm, Thurs and Fri 10:30 am – 11:20 am		
<b>(c) Location</b>	Email me before the start of office hours and I'll email you the link to the Collaborate session (NOT accessible via the Collaborate tab in D2L, since office hours are common to all students, not just one section)		
<b>(d) Phone</b>	250-370-4542	<b>(d) Phone</b>	
<b>(e) E-mail</b>	wrean@camosun.bc.ca		
<b>(f) Website</b>	D2L and <a href="http://wrean.ca/math252/">http://wrean.ca/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**

Any scientific calculator, or the scientific calculator app at Desmos: <https://www.desmos.com/scientific> . You may not use a calculator/app with graphing capability.

The set of practice exercises will be available on D2L.

Optional Text: Dennis G. Zill, *A First Course in Differential Equations with Modeling Applications*, 11<sup>th</sup> Edition, Metric Version, Brooks/Cole, 2018. Previous editions or non-metric versions are also acceptable. Students interested in alternate Open Educational Resources textbooks should check the course website at <http://wrean.ca/math252> for options.

## 4. Course Content and Schedule

- Chapter 1. Introduction to Differential Equations
  - Definitions and Terminology (section 1.1)
  - Initial-Value Problems (section 1.2)
- Chapter 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)
- Chapter 3. Modeling with First-Order Differential Equations
  - Linear Models (section 3.1)
- Chapter 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)
- Chapter 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)
- Chapter 6. Series Solutions of Linear Equations
  - Review of Power Series (section 6.1)
  - Solutions about Ordinary Points (section 6.2)
- Chapter 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)
- Chapter 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)

**Grade Calculation:** The final grade will be calculated according to the following breakdown:

Three term tests:	55%
Assignments:	10%
Final Exam:	35%

**Tests:** There will be three term tests. The first time a student misses a test for any reason, the weight of the missed test will be transferred to the final exam. No documentation is required for the first absence. Further absences will be treated on a case-by-case basis.

Although you will have access to the course website and certain other resources during the test, please be aware that a thorough understanding of the course material will be required to complete the test during the time limit.

Tentative test dates:

DX01: Thursday, February 11; Thursday, March 11; Tuesday, April 6

DX02: Friday, February 12; Friday, March 12; Tuesday, April 6

**Assignments:** The assignments are online via the Camosun WeBWork server. The lowest assignment grade will be dropped when calculating the average of your assignments. This allows a student to miss one assignment for any reason, including illness, without penalty. Each student can also ask for a week's extension on one assignment for any reason, no questions asked.

**Late Submissions:** The online assignments close on the due date and late online submissions will not be accepted.

**Collaboration:** Students are encouraged to collaborate (work together) on assignments and to consult the Math Lab tutor and/or the instructor when stuck. However, you must be prepared to answer similar questions on your own for the tests and final exam, so it is vital that you yourself understand all of the assigned questions and work that you turn in.

**Final Exam:** The final exam will cover the entire course and will be 3 hours long. As stated in the current college calendar, "students are expected to write tests and final examinations at the scheduled time" Exceptions will only be considered due to emergency circumstances as outlined in the calendar. Holidays or scheduled flights are not considered to be emergencies.

**Academic Integrity:** The Department of Mathematics and Statistics has prepared a handout called Student Guidelines for Academic Integrity to help you interpret college policies involving student conduct, academic dishonesty, plagiarism, etc. The course website has a link to the handout on the About page. It is your responsibility to become familiar with the contents of the document and the college policies it references.

## 6. Grading System

- Standard Grading System (GPA)
- Competency Based Grading System

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

Help from the Math Lab in Tech 142 is available online: <http://camosun.ca/services/help-centres/math-help.html> . You can book a live chat session or get quick questions answered via email.

Students with disability-related academic barriers are encouraged to consult with the Centre for Accessible Learning (CAL) to see whether they are eligible for exam or in-class accommodations. The CAL website is <http://camosun.ca/services/accessible-learning/> .

## 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.

## Territorial Acknowledgement

Camosun College campuses are located on the traditional territories of the Lkwungen and WSÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.