



## COURSE OUTLINE

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

Ω Please note: the College electronically stores this outline for five (5) years only.  
It is **strongly recommended** you keep a copy of this outline with your academic records.  
You will need this outline for any future application/s for transfer credit/s to other colleges/universities.

### 1. Instructor Information

(a)	Instructor:	Patricia Wrean (Pat)		
(b)	Office Hours:	Posted on office door and website		
(c)	Location:	CBA 153		
(d)	Phone:	(250) 370-4542	Alternative Phone:	
(e)	Email:	wrean@camosun.bc.ca		
(f)	Website:	<a href="http://wrean.disted.camosun.bc.ca/">http://wrean.disted.camosun.bc.ca/</a>		

### 2. Intended Learning Outcomes

(No changes are to be made to these Intended Learning Outcomes as approved by the Education Council of Camosun College.)

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 or explicit solution of an ODE/initial value problem (IVP).
3. Determine the existence and uniqueness of a 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, population dynamics [logistic equation], radioactive decay, Newton's law of cooling/warming, spread of a disease, chemical reactions, mixture problems, draining a tank – Torricelli's law, series circuits, falling bodies with/without air resistance, slipping chain).
5. Model real-life phenomenon with a system of linear or nonlinear DE's (for example, radioactive series, mixture problems, population dynamics (predator-prey model, competition model), electrical networks).
6. Sketch approximate solution curves for a first-order IVP using a direction field.
7. Sketch solution curves of an autonomous first-order DE by drawing and analyzing the one-dimensional phase portrait.
8. 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.
9. Determine the existence and uniqueness of a solution of a  $n^{\text{th}}$ -order IVP.
10. Solve  $2^{\text{nd}}$ -order linear homogeneous and nonhomogeneous DE using the method of reduction of order.
11. Solve higher-order linear homogeneous and nonhomogeneous DE with constant coefficients.
12. Solve  $2^{\text{nd}}$ -order nonhomogeneous DE using the method of variation of parameters.
13. Solve Cauchy-Euler equations.
14. Solve systems of linear equations.
15. Sketch trajectories of a system of two linear first order DE by drawing and analyzing the two-dimensional phase portrait.
16. Classify a point for a DE as an ordinary point, regular singular point, or irregular singular point.
17. Find power series solution of a DE about an ordinary point.
18. Find series solution of a DE about a regular singular point.
19. Apply the Frobenius Theorem to find series solution of a DE about a regular singular point.
20. Use a Laplace transform and its properties to solve an IVP.

### 3. Required Materials

- (a) Texts: Dennis G. Zill, *A First Course in Differential Equations with Modeling Applications*, 9<sup>th</sup> Edition, Brooks/Cole, 2009.
- (b) Calculator: Only regular scientific calculators (non-programmable, non-graphing) will be permitted for quizzes and exams. The use of other electronic devices such as cell phones, MP3 players, iPods, electronic translators, etc., during exams is not allowed.

## 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
  - Solutions About Ordinary Points (section 6.1)
  - Solutions about Singular 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:** To get a C or higher in the course, you must pass the final exam (50% or higher) and have an overall average of 60% or higher, computed from:

Quizzes:	40%
Assignments:	10%
Final Exam:	50%

which is then converted to a letter grade using the standard Camosun grade scale. There is one exception: if your term work is at least 50% and you received 60% or higher in the final exam, then you will receive a C in the course even if your overall average is under 60%.

**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 and place.” Exceptions will only be considered due to **emergency** circumstances as outlined in the calendar. Holidays or scheduled flights are not considered to be emergencies.

**Quizzes:** The lowest quiz grade will be dropped when calculating the average of your quizzes. This allows a student to be absent on any one quiz day for any reason, including illness, without penalty. If more than one quiz is missed and adequate documentation is provided, a make-up quiz will be given.

**Assignments:** The lowest assignment grade will be dropped when calculating the average of your assignments. This allows a student to miss any one assignment for any reason, including illness, without penalty.

**Late Policy:** Assignments that are late will be given a 25% penalty if the solutions have not yet been posted to the course website. Once the solutions have been posted, late assignments will not be accepted.

**Collaboration Policy:** Student are encouraged to collaborate (work together) on assignments. However, you must be prepared to answer similar questions on your own for the quizzes, so it is vital that you yourself understand all of the assigned questions and work that you turn in.

## 6. Grading System

(No changes are to be made to this section unless the Approved Course Description has been forwarded through the Education Council of Camosun College for approval.)

### 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	Minimum level of achievement for which credit is granted; a course with a "D" grade cannot be used as a prerequisite.	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 E-1.5 at [camosun.ca](http://camosun.ca) 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, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. (For these courses a final grade will be assigned to either the 3 <sup>rd</sup> course attempt or at the point of course completion.)
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.

## 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](http://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 the College web site in the Policy Section.

**Math Room:** Technologies Centre (TEC) 142 (phone: 370-4492): This drop-in centre is freely available for your use to work on math homework and to seek help from the tutor on staff (see hours posted on door).