UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 1999
REVISED COURSE IMPLEMENTATION DATE: September 2015
COURSE TO BE REVIEWED: (six years after UEC approval) January 2021
Course outline form version: 05/29/14

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: MATH 255 **Number of Credits:** 3 Course credit policy (105)

Course Full Title: Ordinary Differential Equations
Course Short Title (if title exceeds 30 characters):

Faculty: Faculty of Science **Department (or program if no department):** Mathematics and Statistics

Calendar Description:

This course provides theory and techniques needed to solve ordinary differential equations, with an emphasis on applications. Topics include first- and second-order linear differential equations, nonlinear equations, series solutions, Laplace transform methods, and linear systems of differential equations.

Note: This course is offered as MATH 255 and ENGR 255. Students may only take one of these for credit.

Prerequisites (or NONE): MATH 112 or at least a B in MATH 118.

Corequisites (if applicable, or NONE):

Pre/corequisites (if applicable, or NONE): MATH 211 and one of the following: MATH 152, MATH 221, or PHYS 221.

Equivalent Courses (cannot be taken for additional credit)
Former course code/number:
Cross-listed with: **ENGR 255**
Equivalent course(s): **ENGR 255**
Note: Equivalent course(s) should be included in the calendar description by way of a note that students with credit for the equivalent course(s) cannot take this course for further credit.

Transfer Credit
Transfer credit already exists: ☒ Yes ☐ No
Transfer credit requested (OReg to submit to BCCAT):
☐ Yes ☒ No (if yes, fill in transfer credit form)
Resubmit revised outline for articulation: ☐ Yes ☒ No
To find out how this course transfers, see **bctransferguide.ca**.

Total Hours: 45
Typical structure of instructional hours:

Lecture hours	40
Seminars/tutorials/workshops	
Laboratory hours	5
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	**45**

Special Topics
Will the course be offered with different topics?
☐ Yes ☒ No
If yes, different lettered courses may be taken for credit:
☐ No ☐ Yes, repeat(s) ☐ Yes, no limit
Note: The specific topic will be recorded when offered.

Maximum enrolment (for information only): 36

Expected frequency of course offerings (every semester, annually, every other year, etc.): annually

Department / Program Head or Director: Cynthia Loten	**Date approved:**	October 27 2014
Campus-Wide Consultation (CWC)	**Date of posting:**	January 23, 2015
Faculty Council approval	**Date approved:**	November 28, 2014
Dean/Associate VP: Lucy Lee	**Date approved:**	November 14, 2014
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	January 30, 2015

Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Solve first-order differential equations by recognizing the equations as either linear, separable and/or exact;
2. Apply the Existence and Uniqueness Theorem;
3. Solve second-order homogeneous linear equations with constant coefficients and associated initial value problems;
4. Test solutions of second-order linear equations for linear independence using the Wronskian.
5. Solve second-order nonhomogeneous equations by the method of undetermined coefficients and variation of parameters;
6. Interpret vibrational models;
7. Find series solutions of second-order linear equations near an ordinary point and a regular singular point;
8. Use the method of Laplace transforms to solve differential equations involving step functions and impulse functions;
9. Solve homogeneous linear systems with constant coefficients;
10. Interpret solutions to linear systems of equations as trajectories in phase space.
11. Formulate mathematical models and use technology to solve them

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods (guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion)

Lectures and demonstrations of Maple.

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Text(s) and Resource Materials (if more space is required, download supplemental Texts and Resource Materials form)

	Author Surname, Initials	Title (article, book, journal, etc.)	Current Ed.	Publisher	Year
1.	Boyce and Di Prima	Elementary Differential Equations	☒	Wiley	
2.	Zill	A First Course in Differential Equations with Modeling Applications	☒	Brooks/Cole	
3.			☐		
4.			☐		
5.			☐		

Required Additional Supplies and Materials (software, hardware, tools, specialized clothing, etc.)

Typical Evaluation Methods and Weighting

Final exam:	40%	Assignments:	15%	Midterm exam:	30%	Practicum:	%
Quizzes/tests:	15%	Lab work:	%	Field experience:	%	Shop work:	%
Other:	%	Other:	%	Other:	%	Total:	100%

Details (if necessary): Students must achieve at least 40% on the final exam in order to receive credit for this course.

Grading system: Letter Grades: ☒ Credit/No Credit: ☐ Labs to be scheduled independent of lecture hours: Yes ☐ No ☒

Typical Course Content and Topics

Use of graphing calculator and Maple is expected.

1. Direction fields, mathematical models.
2. First-order linear and non-linear differential equations, separable equations, autonomous equations, population dynamics, exact equations, integrating factors.
3. The Existence and Uniqueness Theorem (without proof).
4. Second-order homogenous linear equations with constant coefficients, linear independence, Wronskian, characteristic equation.
5. Nonhomogeneous equations, method of undetermined coefficients, variation of parameters, vibrational models.
6. Series solutions near an ordinary point and a regular single point, Euler equations.
8. Laplace transform, step functions, discontinuous forcing functions, impulse functions.
9. Systems of first-order homogeneous linear equations with constant coefficients, eigenvalues, phase plane analysis.