

COURSE OUTLINE		
TERM: Fall 2022	COURSE NO: MATH 235	
INSTRUCTOR:	COURSE TITLE: Introduction to Differential Equations	
OFFICE: LOCAL: E-MAIL: @capilanou.ca	SECTION NO(S):	CREDITS: 3.0
OFFICE HOURS:		
COURSE WEBSITE:		

Capilano University acknowledges with respect the Lil'wat, Musqueam, Squamish, Sechelt, and Tsleil-Waututh people on whose territories our campuses are located.

COURSE FORMAT

Three hours of class time, plus an additional hour of supplemental activity delivered through on-line or other activities for a 15-week semester, which includes two weeks for final exams.

COURSE PREREQUISITES

One of MATH 109 (C-) or MATH 126 (C-); and one of MATH 152 (C-), MATH 252 (C-) or MATH 200 (C-)

CALENDAR DESCRIPTION

An introduction to ordinary differential equations; first order equations; higher order linear differential equations; linear systems; power series techniques; Laplace transform method; the phase plane, applications.

COURSE NOTES

MATH 235 is an approved Quantitative/Analytical course for baccalaureate degrees.

MATH 235 is an approved Science course.

REQUIRED TEXTS AND/OR RESOURCES

Textbook: Edwards, C.H. and Penney, D.E. *Differential Equations: Computing and Modeling*. 4th ed. Prentice Hall, 2008.

Calculator: Students must have a graphing calculator with symbolic capabilities and linear algebra operations. The Mathematics and Statistics Department recommends a T.I.-89 calculator. Graphing calculator instruction (in the classroom or in workshops) will only be given using this calculator. Any student who intends to use any other calculator must have it approved by his/her instructor at the start of the semester. The use of a calculator may be restricted on tests and exams.

COURSE STUDENT LEARNING OUTCOMES

On successful completion of this course, students will be able to do the following:

- Solve a variety of ordinary differential equations and related initial value problems, including standard first-order and higher-order linear differential equations with constant coefficients.

- Execute a variety of solution methods, including matrix and eigenvalue techniques and Laplace transforms.
- Use differential equations and systems of differential equations to model a variety of applications including those from geometry, mechanics, electrical engineering and biology.
- Draw general conclusions about the behaviour of physical systems with an emphasis on population and velocity models and mechanical systems.
- Extract information about the solutions of an autonomous differential equation or system of differential equations using phase diagrams and phase-plane portraits.
- Use appropriate numerical methods to approximate solutions of differential equations.
- State and apply theorems, definitions, and formulas used in the course.
- Demonstrate the appropriate use of a computer algebra system as a tool in problem solving.

COURSE CONTENT

Topics	Weeks (approx.)
<u>First Order Equations</u> : Separation of variables, exact and near-exact equations, integrating factors; homogeneous equations; higher order equations reducible to first order; applications of first order differential equations to geometry, biology, physics and electrical engineering.	2.5
<u>Linear Differential Equations</u> : Existence and uniqueness of solutions, linear independence and Wronskians; solution of homogeneous equations; particular solutions of non-homogeneous equations, method of undetermined coefficients and variation of parameters; applications to mechanics and electrical circuits.	4.0
<u>Systems of Linear Differential Equations</u> : Matrix notation; method of elimination; operator methods; applications to mechanics and electrical networks; matrix eigenvalue methods.	2.5
<u>Systems in the Plane</u> : Trajectories in the plane; phase plane analysis; equilibrium points; stability; linear and almost linear systems.	1.5
Laplace Transforms & Methods	1.0
Term Tests and/or Quizzes	1.5
Final Exam Period	2.0

EVALUATION PROFILE

Final grades for the course will be computed based on the following schedule:

Term Work	*55%
Final Exam	*35%
Personal Evaluation	10%
TOTAL	100%

- * If the percentage achieved on the Final Exam is higher than the percentage achieved on the Term Work component, then the Final Exam weight will be increased to 55% and the Term Work will be decreased to 35%.

Term work will consist of tests, quizzes, projects and/or assignments. While the weighting of individual tests, etc. is at the discretion of the instructor, no single test will exceed 25% of the final total. The weight of the different components comprising term work will be announced in class in advance.

Specific dates and details regarding the Evaluation Component will be provided by the instructor.

PERSONAL EVALUATION

In the absence of exceptional circumstances, which are determined at the instructor's discretion, the personal evaluation component of the final grade will be pro-rated to the rest of the grade. For example, a 10% personal evaluation component would be determined by dividing the remaining mark out of 90 by 9. The most common circumstance justifying an increased personal evaluation mark is a student's improved performance in the final examination relative to the term work, which the instructor feels justifies an elevated letter grade.

SUPPLEMENTAL 4TH HOUR ACTIVITY

Each section has, in addition to the scheduled classroom time per week, a supplemental activity. This activity might be a scheduled tutorial or lab, an on-line activity, a group meeting, or some other activity as indicated by the instructor. Students are expected to participate in this additional activity. If this is not possible, students should consult their instructor to determine how this missed activity can be completed. It is in the student's best interest to ensure that any missed course activity is completed.

GRADING PROFILE

Letter grades will be assigned according to the following guidelines:

A+ 90 - 100%	B+ 77 - 79%	C+ 67 - 69%	D 50 - 59%
A 85 - 89%	B 73 - 76%	C 63 - 66%	F 0 - 49%
A- 80 - 84%	B- 70 - 72%	C- 60 - 62%	

Students should refer to the University Calendar for the effect of the above grades on grade point average.

TESTS

Dates for tests will be announced beforehand in class.

HOMEWORK

It is expected that students spend at least 8 hours per week doing course work outside of class time.

ASSIGNMENTS

Assignments are due at the beginning of class, unless otherwise announced. Late assignments may receive a grade of zero.

INCOMPLETE GRADES

Grades of Incomplete "I" are assigned only in exceptional circumstances when a student requests extra time to complete their coursework. Such agreements are made only at the request of the student, who is responsible to determine from the instructor the outstanding requirements of the course.

MISSED EXAMS/QUIZZES/LABS

A score of zero will be assigned unless the student meets all of the following conditions:

1. Circumstances clearly beyond the control of the student caused the exam, test, quiz, lab, etc. to be missed. Such circumstances include serious illness or injury, or death of close family member. They do not include forgetting about the test, lack of preparation for the test, work-related or social obligations.
2. The student has notified the instructor (or the School of STEM office staff, if the instructor is not available) that they will miss the exam, test, quiz, lab, etc. Such notification must occur in advance, if possible, or at the latest, on the day of the exam, test, quiz, lab, etc.
3. Proof of the circumstances may be required.
4. The student has been fully participating in the course up until the circumstances that prevented the writing of the exam, test, quiz, lab, etc. Fully participating means attending almost all of the classes and turning in almost all assignments in the course.

The options for making up any missed grades offered to the student who meets the four conditions are decided by the instructor. They will not necessarily meet the convenience of the student.

Make-up exams, quizzes and/or tests are given at the discretion of the instructor. They are generally given only in medical emergencies or severe personal crises. Some missed labs or other activities may not be able to be accommodated. Please consult with your instructor.

FINAL EXAM PERIOD

Students should note that the final exam period is from **date to date** (*including Saturday, date*), and that they can expect to write exams at any time during this period. Individual exam times will not normally be rescheduled because of holidays, work, or other commitments. While efforts are made to spread exams throughout the exam period, an individual's particular course combination may result in exams being scheduled close together, or spread widely through the entire exam period.

ATTENDANCE

Regular attendance is essential. If classes are missed, it is the student's responsibility to become aware of all information given out in the classes or tutorials, including times of examinations and assignment deadlines.

ENGLISH USAGE

Students are expected to use correct standard English in their written and oral assignments, exams, presentations and discussions. Failure to do so may result in reduced grades in any part of the Evaluation Profile. Please refer to the guidelines provided in the Capilano Guide to Writing Assignments (available from the University Bookstore).

MATHEMATICAL LANGUAGE

Use of proper Mathematical terminology and notation is an important component of Mathematics. Marks may be deducted for improper usage. For full details, please refer to your instructor.

MATHEMATICS LEARNING CENTRE (MLC)

Instructional help and reference texts are available to students in the Learning Commons located in the Library in LB126.

ON-LINE COMMUNICATION

Outside of the classroom, instructors will (if necessary) communicate with students using either their official Capilano University email or eLearn; please check both regularly. Official communication between Capilano University and students is delivered to students' Capilano University email addresses only.

UNIVERSITY OPERATIONAL DETAILS**Tools for Success**

Many services are available to support student success for Capilano University students. A central navigation point for all services can be found at: <https://www.capilanou.ca/student-life/>

Capilano University Security: download the CapU Mobile Safety App

Policy Statement (S2009-06)

Capilano University has policies on Academic Appeals (including appeal of final grade), Student Conduct, Cheating and Plagiarism, Academic Probation and other educational issues. These and other policies are available on the University website.

Academic Integrity (S2017-05)

Any instance of academic dishonesty or breach of the standards of academic integrity is serious and students will be held accountable for their actions, whether acting alone or in a group. See policy S2017-05 for more information: <https://www.capilanou.ca/about-capu/governance/policies/>

Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances, are prohibited and will be handled in accordance with the Student Academic Integrity Procedures.

Academic dishonesty is any act that breaches one or more of the principles of academic integrity. Acts of academic dishonesty may include but are not limited to the following types:

Cheating: Using or providing unauthorized aids, assistance or materials while preparing or completing assessments, or when completing practical work (in clinical, practicum, or lab settings), including but not limited to the following:

- Copying or attempting to copy the work of another during an assessment;
- Communicating work to another student during an examination;
- Using unauthorized aids, notes, or electronic devices or means during an examination;
- Unauthorized possession of an assessment or answer key; and/or,
- Submitting of a substantially similar assessment by two or more students, except in the case where such submission is specifically authorized by the instructor.

Fraud: Creation or use of falsified documents.

Misuse or misrepresentation of sources: Presenting source material in such a way as to distort its original purpose or implication(s); misattributing words, ideas, etc. to someone other than the original source; misrepresenting or manipulating research findings or data; and/or suppressing aspects of findings or data in order to present conclusions in a light other than the research, taken as a whole, would support.

Plagiarism: Presenting or submitting, as one's own work, the research, words, ideas, artistic imagery, arguments, calculations, illustrations, or diagrams of another person or persons without explicit or accurate citation or credit.

Self-Plagiarism: Submitting one's own work for credit in more than one course without the permission of the instructors, or re-submitting work, in whole or in part, for which credit has already been granted.

Prohibited Conduct: The following are examples of other conduct specifically prohibited:

- Taking unauthorized possession of the work of another student (for example, intercepting and removing such work from a photocopier or printer, or collecting the graded work of another student from a stack of papers);
- Falsifying one's own and/or other students' attendance in a course;
- Impersonating or allowing the impersonation of an individual;
- Modifying a graded assessment then submitting it for re-grading; or,
- Assisting or attempting to assist another person to commit any breach of academic integrity.

Sexual Violence and Misconduct

All Members of the University Community have the right to work, teach and study in an environment that is free from all forms of sexual violence and misconduct. Policy B401 defines sexual assault as follows:

Sexual assault is any form of sexual contact that occurs without ongoing and freely given consent, including the threat of sexual contact without consent. Sexual assault can be committed by a stranger, someone known to the survivor or an intimate partner.

Safety and security at the University are a priority and any form of sexual violence and misconduct will not be tolerated or condoned. The University expects all Students and Members of the University Community to abide by all laws and University policies, including B.401 Sexual Violence and Misconduct Policy and B.401.1 Sexual Violence and Misconduct Procedure (found on Policy page <https://www.capilanou.ca/about-capu/governance/policies/>)

Emergency Procedures

Students are expected to familiarise themselves with the emergency policies where appropriate and the emergency procedures posted on the wall of the classroom.