

## COURSE OUTLINE

### Mathematics 342 [A01]: Intermediate Differential Equations

#### Instructor(s)

**Lecturer** Boualem Khouider, professor

**Research Area** Applied Mathematics, Climate Modeling

**Email** [email@uvic.ca](mailto:email@uvic.ca)<sup>1</sup>

**Phone** 250-721-7439 (Use only in case of emergency)

**Office** David Turpin Building A550

#### General Course Information

**Number of Units** 1.5

**Pre-requisites** Math204 or Math 200 (or Math 205) and Math 201

#### Office Hours and Assistance

**Tuesday** 13:30 pm to 3:30 pm, DTB A550

**Wednesday** 2:00 pm to 4:00 pm, DTB A550

or By appointment (send email to book one)

**Other Help** The Mathematics & Statistics Assistance Centre is a large space where students can go to work, on their own or in groups, and to discuss math & stats problems. The Centre is staffed with talented Teaching Assistants who are happy to discuss primarily first and second year course material with you. Please see <http://www.math.uvic.ca/~msassist/index.html> for more information.

**Math Club** Students in Undergraduate Mathematics and Statistics (SUMS) was founded in 2014 as the reincarnation of a previous undergraduate course union that had been inactive for a few years. Please see <http://www.uvic.ca/science/math-statistics/current-students/undergraduate/sums/index.php> for more information.

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<sup>1</sup>You are encouraged to send me email about everything related to the course. It is the preferred way of communication. However, don't expect immediate answer, allow at least 24 hours. I won't answer lengthy math questions via email. Please come to office hours for such questions.



## Learning Objectives

- Gain in depth expertise and general knowledge in modern solutions of elementary differential questions
- Introduction to modelling with differential equations
- Introduction to qualitative analysis of dynamical systems using differential equations

## Course Material and Online Resources

**Textbook: Required** William C. Boyce and Richard C. DiPrima, **Elementary Differential Equations and Boundary Value Problems, 10th Edition**. Feel free to use an earlier edition (if you can get it for free or at a cheaper price) but you are responsible for any inconsistencies, especially regarding the suggested problems. One copy of the 10th edition will be put on reserve at the library.

UVic Bookstore or SUBtext may have used copies of either the 10th or earlier editions. Though the text may not vary much between editions, the section and problem numbering maybe affected. Be careful!

Recommended supplement: Student solution manual of the textbook.

**Calculator** If a calculator is allowed in tests and examinations in a course offered by the Department, then the only acceptable calculator is the Sharp EL-510R, EL-510RN or EL-510RNB. It may be purchased at the UVic Bookstore or elsewhere for about \$15. A calculator is permitted in this course.

Course website: go to <https://www.uvic.ca/science/math-statistics/current-students/undergraduate/courses/> and click on the course number: Math 342. This course outline, a list of suggested problems, important announcements, the homework assignments and their solutions (after due dates), as well as sample exams will be posted there. Please check for updates regularly.

## Class Meetings

This course has no tutorials. It is important to attend the lectures. Class meets everywhere TWF from 11:30 to 12:20 in Cornett B129. The first lecture will be Wednesday Sept. 05, 2018.

## Specific Topics

- Introduction: General review of first order and linear second order differential equations



- Series solutions of second order linear equations: ordinary and singular points, Frobenius method, and applications to special functions of mathematical physics, Hermite, Legendre, Bessel's equations, etc. (Chap. 5)
- Systems of first order linear equations: Repeated and complex eigenvalues, non homogeneous systems and applications to spring-mass systems and electric circuits (Chap. 7)
- Qualitative analysis of nonlinear differential equations: equilibrium solutions and their linear stability, almost (locally) linear systems, phase portrait, periodic solutions and limit cycles, and application to predator-prey system, competing species, and Lorenz system (Chaos and strange attractors) (Chap. 9)
- Numerical methods: Euler, Runge-Kutta, & Multistep methods (Chap. 8).

## Evaluation and Grading

There will about six (6) homework assignments handed out in class approximately once every two weeks. They are due on Friday the following week. There will be two midterm exams held in class at the dates indicated below, and a final exam of three hours.

**To pass the course you must pass the final examination.** Among those passing the final exam, final numerical scores are determined by the following scheme.

Homework Assignments	Midterms	Final Exam
Bi-weekly	Oct. 12th , Nov. 23rd	TBA
30%	30%	40%

Students are expected to spent a minimum of 3 to 4 hours a week to work on their assignments PLUS and extra one hour per lecture to prepare and review the lecture material. Reading the textbook before coming to class will help you focus more in class on the parts you least understand. Reviewing your notes from previous lectures will help you better connect it to the material of the upcoming lecture and be better prepared to ask questions in class, which I highly encourage!

**Multi-section Course Policy** This is not a multi-section course.

**Accessibility** Students with diverse learning styles and needs are welcome in this course.

In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the Centre for Accessible Learning (CAL) as soon as possible. The CAL staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations <http://uvic.ca/cal>. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.



**Grading** Percentage scores will be converted to letter grades according to the university-wide standard table  
(Undergraduate: <http://web.uvic.ca/calendar/undergrad/info/regulations/grading.html#>). (Graduate: <http://web.uvic.ca/calendar/grad/academic-regulations/grading.html#>).

**Final Examination** Off-schedule final examinations (i.e., deferred examinations) are given only in accordance with the university policy as outlined in the Calendar. If you are unable to write a final examination due to illness, accident or family affliction, please refer to the following webpages for detailed instructions how to proceed:  
Undergraduate: <http://web.uvic.ca/calendar/undergrad/info/regulations/concessions.html> Graduate: <http://web.uvic.ca/calendar/grad/registration/concessions.html> Students are **strongly advised not to make plans for travel or employment during the final examination period** as special arrangements will not be made for examinations that conflict with such plans.

**Supplemental Examinations.** The Department of Mathematics and Statistics does not award 'E' grades or offer Supplemental Examinations in any of its courses.

## Policies and Ethics

**Attendance** The university Calendar states 'Students are expected to attend all classes in which they are enrolled.'  
Undergraduate: <http://web.uvic.ca/calendar/undergrad/info/regulations/attendance.html> Graduate: <http://web.uvic.ca/calendar/grad/academic-regulations/attendance.html#>

Our courses are conducted on that basis. If you miss an announcement (information concerning midterms, corrections to assignment, etc.) because you did not attend class, you must accept the consequences of not having learned of the change.

**Guidelines on Religious Observances** Where classes or examinations are scheduled on the holy days of a religion, students may notify their instructors, at least two weeks in advance, of their intention to observe the holy day(s) by absenting themselves from classes or examinations. Instructors will provide reasonable opportunities for such students to make up work or missed examinations.

**Missing work** If you miss one homework assignment with justification, your homework grade will be based on the rest of the assignments provided you did at least four. If you miss one midterm with justification, then your other midterm will count 20% and the final exam 50%. **If you miss more than 2 homework assignments or both midterms with justification then we need to talk. It is likely that in such a case you haven't accomplished the minimum amount of course work required to pass the course, even if you do well on the final exam!**

**Academic Integrity** Academic integrity is intellectual honesty and responsibility for academic work that you submit individual or group work. It involves commitment to the



values of honesty, trust, and responsibility. It is expected that students will respect these ethical values in all activities related to learning, teaching, research, and service. Therefore, plagiarism and other acts against academic integrity are serious academic offenses.

**The responsibility of the institution**

Instructors and academic units have the responsibility to ensure that standards of academic honesty are met. By doing so, the institution recognizes students for their hard work and assures them that other students do not have an unfair advantage through cheating on essays, exams, and projects.

**The responsibility of the student**

Plagiarism sometimes occurs due to a misunderstanding regarding the rules of academic integrity, but it is the responsibility of the student to know them. If you are unsure about the standards for citations or for referencing your sources, ask your instructor. Depending on the severity of the case, penalties include a warning, a failing grade, a record on the students transcript, or a suspension.

It is your responsibility to understand the University's policy on academic integrity:

Undergraduate:

<http://web.uvic.ca/calendar/undergrad/info/regulations/academic-integrity.html#>

Graduate:

<http://web.uvic.ca/calendar/grad/academic-regulations/academic-integrity.html>

## How to Succeed in This Course

Read the textbook before coming to class. Review your class notes in the evening or during the day of the lecture while it is still fresh in your head. Make sure your knowledge of calculus and algebra is up to date. Having a calculus textbook (or your old notes) on you when studying can be handy.



## Course Schedule (Dates are approximate)

COURSE SCHEDULE				
Week	Starting	Hol?	Lecture B-D 10th Ed.	Hwk Due
0	Sep. 3		Intro. & 5.1	No
1	Sep. 10		5.2–5.4	No
2	Sep. 17		5.5–5.7	Hwk#1
3	Sep. 24		7.3–7.5	No
4	Oct. 1		7.6–7.7	Hwk#2
5	Oct. 8	Thanksgiving: Mon.	7.8–7.9	<b>Test #1: F. Oct. 12th</b>
6	Oct. 15		9.1–9.3	Hwk#3
7	Oct. 22		9.4–9.5	No
8	Oct. 29	Halloween: Wed. There is class!	9.6–9.8	Hwk#4
9	Nov. 5		8.1–8.3	No
10	Nov. 12	Reading Break: MTW	8.4	Hwk#5
11	Nov. 19		8.5–8.6	<b>Test #2: F. Nov. 23rd</b>
12	Nov. 26		9.7–9.8	No
13	Dec. 3		Miscellaneous Topics and Review	



**Suggested Problems:** A list of suggested problems from the textbook (9th Edition) will be provided on the course website. Although these problems will not be marked, students are strongly encouraged to do them diligently and check their work against the answers at the back of the text. Most of the problems of the tests and final exam will be similar to the assignment problems.

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