

COURSE OUTLINE

MATH 446/550: Advanced PDEs

Instructor

Lecturer David Goluskin, Assistant Professor

Research Area Nonlinear differential equations, computational methods, fluid dynamics, polynomial optimization

Email goluskin@uvic.ca¹

Office David Turpin Building A539

General Course Information

Number of Units 1.5 (credit only for one of MATH 446 or MATH 445B)

Pre-requisites One of MATH 335, MATH 336, MATH 434; and MATH 342; or permission of the department

Office Hours

Monday, Wednesday 4:30–5:20 PM, DTB A539

By appointment schedule via email

Learning Objectives

- Become familiar with the derivation and basic properties of some of the most common PDEs arising from applications in physics and other fields.
- Learn how to derive explicit solution formulas (when possible) and use them to study properties of solutions.
- Learn how to study solutions of linear and nonlinear PDEs when explicit solution formulas do not exist.
- Develop self-learning skills through a project involving detailed study of a chosen PDE.

¹For mathematical questions, please use office hours instead of email. I answer all emails but have had problems with UVic's spam filter, so if you don't hear back from me I probably didn't get your email.



Course Material and Online Resources

Textbook The required text is *Partial Differential Equations* (Second Edition) by Lawrence C. Evans. It may be possible to use the first edition instead of the second edition.

Course webpage <http://web.uvic.ca/~goluskin/math446>

Class Meetings

Lectures are MWTh 3:30–4:20 PM in Clearihue Building A118. Lectures run January 7 through April 4, 2019. There is no tutorial.

Specific Topics

The following is a tentative list of topics. We will cover only a subset of the material in each chapter of the text.

- Introduction to PDEs with numerical examples
- Some classic linear PDEs (chapter 2)
- Nonlinear first-order PDEs (chapter 3)
- Transform methods (chapter 4)
- Introduction to Sobolev spaces (chapter 5)
- Studying linear PDEs without solution formulas (chapters 6–7)
- Introduction to nonlinear PDEs without solution formulas

Evaluation and Grading

There will be 5 or 6 homework assignments, due approximately every 2 weeks. There will be a midterm exam, *tentatively* scheduled for the week of February 25. There will be a final project requiring study of a chosen PDE, culminating in a written report and a presentation in class. A list of possible final projects will be provided. The project will be completed by the last day of lecture, and there will be no final exam. Your final percentage grade will be computed according to the following scheme.

| Assignments | Midterm exam | Project |
|-------------|--------------|---------|
| 60% | 20% | 20% |

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 Makeup midterm exams will not be offered. In most cases, late assignments will not be accepted. If there is a valid reason for missing a course component, it will be omitted from the calculation of the course grade.

Academic Integrity Collaborative work on homework assignments is encouraged, but solutions ultimately must be written alone and represent each student's own understanding. 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

Start the assignments early, so that you have as many days as possible to think about problems on which you initially get stuck. Collaborate with peers and come to office hours as needed.

Important dates

| | |
|------------|---|
| 7 Jan. | First day of lecture |
| 20 Jan. | Last day to drop course without forfeiting 50% of tuition fees |
| 23 Jan. | Last day to add course |
| 10 Feb. | Last day to drop course without forfeiting 100% of tuition fees |
| 18–22 Feb. | Reading break – no classes |
| 28 Feb. | Last day to withdraw from course without penalty of failure |
| 4 Apr. | Last day of the course |

