

## AM4815B/9505B (Winter 2025) Course Outline

### 1. Course Information

AM4815b/9505b --- Partial Differential Equations II (Winter 2025).

Prerequisites: AM3815 --- Partial Differential Equations I

Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Counselling) to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

### 2. Instructor Information

Instructors	Email	Office	Phone	Office Hours
Dr Xingfu Zou	xzou@uwo.ca	MC284	88781	TBA

Students must use their Western (@uwo.ca) email addresses when contacting the instructor. Office hours will be determined after consulting with students in the first class, and will be in-person in my office MC284.

### 3. Course Syllabus, Schedule, Delivery Mode

Course topics: This is a cross listed course and is a combination of the two courses AM4815 (undergraduate) and AM9505 (graduate). Previously, AM4815 focused on Green's functions under various scenarios of the domain and boundary conditions, and their applications to **linear inhomogeneous** PDEs, while AM9505 intended to offer an introduction to **nonlinear** PDEs for graduate students in applied mathematics. Considering the nature of combination of two totally different courses, my plan is naturally a combination of the syllabuses of the two courses with carefully chosen adoption and abandonment in the two syllabuses. They include:

*Green functions for some common second order linear nonhomogeneous DEs under various boundary scenarios; nonlinear reaction diffusion (R-D) equations, existence of solutions and their long time dynamics (steady state solutions and their stability, pattern formation, traveling waves); and first order PDEs and the method of characteristics.*

Course outcomes: Students are expected to be able to (i) understand the notion of Green functions in various situation and their roles in expressing and explaining solutions and know how to find Green function for not too complicated DEs; (ii) understand the notion of steady state solution to R-D equations and their role in determining the long time behaviour of the solutions and know how to

analyse a given R-D equation/system in terms of these topics; (iii) know how to employ the method of characteristics to solve some linear and quasi-linear first order PDEs.

Delivery mode: classes and exams will all be in-person. Approximately (first) 6 weeks will be on Green functions for linear nonhomogeneous DEs, followed by one week on linear and quasi-linear first order PDEs, and the rest on the nonlinear R-D equations.

Classes begin: January 6, 2025

Spring Reading Week: February 15 – 23, 2025

Classes end: April 4, 2025

Exam period: April 7 – 30, 2025

## 4. Course Materials

**Textbook:** Due to the nature of combination of two totally different courses, no single text can be specified, and the materials will be chosen from more than one texts. Below are the two text books on which, much of lectures will be mainly based:

(A) Richard Haberman, Applied Partial Differential Equations, 5th edition, Pearson, 2013. Students are welcome to purchase second-hand copies of this textbook. Prices vary online, from \$69.10 CAN at biblio.com to \$85.55CAN at AbeBooks.com.

(B) John David Logan, An Introduction to Nonlinear Partial Differential Equations, John Willy & Sons, 2<sup>nd</sup> Ed, 2008.

Some materials not included in these two books may also be adopted/added in lectures and will be testable in the midterm or final exam. As such, skipping classes may result in disadvantageous consequences. I will try to make lecture notes available, but there may be a time lag as it takes time to typeset the notes. However, such an offer by no means should encourage students to skip classes.

All course material will be posted to OWL: <https://westernu.brightspace.com/>

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the OWL Brightspace Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

## 5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Assignment	15 %.	See explanation below.
Midterm Test	35 %.	<u>Tuesday February 25, 7:00-9:00pm</u> (room to be announced later)
Final Exam	50 %.	To be determined by the registrar's office

**For assignments**, problems will be assigned on OWL, and completed assignments will be collected by the specified due times. Submitted assignment will be marked in such a way that (i) each completed question will given a basic “completion mark” and (ii) only some selected questions will be fully marked . There will be five assignment in total, approximately evenly distributed over the twelve weeks. Graduate students may be required to do some different and/or more problems in some of the assignments. Group study and discussion when working on assignments (and preparing for exams) are encouraged, but copy-each-other in completing assignments is not allowed. Copying from other sources in your assignments is also not permitted. When a copying case is identified, it will be reported to the department chair.

**Midterm and final**, will be in-person and close-book. No notes and electronic devices, including calculators and cell phones, are allowed. The midterm will cover materials of the first six weeks, and the final exams will accumulative. Problem sets of the midterm and final exams for AM9505 students will be a bit different from those for AM4815 students, reflecting higher expectations for graduate students.

**Note:** This is a course for senior undergraduate students and graduate students, therefore **good presentations** (e.g., neat, logical and rigorous mathematical arguments and computations) of your answers to the problems in assignments, test and exam are encouraged and expected. When marking the assignments, the test and the exam, this factor will be considered.

#### **General information about missed coursework**

Students must familiarize themselves with the University Policy on Academic Consideration – Undergraduate Students in First Entry Programs posted on the Academic Calendar:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/academic\\_consideration\\_Sep24.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf).

This policy does not apply to requests for Academic Consideration submitted for attempted or completed work, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar’s webpage: [https://registrar.uwo.ca/academics/academic\\_considerations/](https://registrar.uwo.ca/academics/academic_considerations/)  
All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests normally must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request without supporting documentation in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Final Examinations scheduled during official examination periods (Defined by policy).
- Midterm (Designated by the instructor as the one assessment that always requires documentation when requesting Academic Consideration).

When a student mistakenly submits their one allowed Academic Consideration request without supporting documentation for the assessments listed above or those in the Coursework with Assessment Flexibility section below, the request cannot be recalled and reapplied. This privilege is forfeited.

## Evaluation Scheme for Missed Assessments

For assignments, the due of an assignment can be extended if an Academic Consideration request is made and granted before the solutions of that assignment is posted. For an approved missing assignment, its weight will be shifted to the rest of the assignments.

For the midterm, if a student is approved to miss it, the student can write a make-up on Friday February 28, between 8:30am-4:30pm; and student is further approved to missing the make-up, the weight of the midterm will be shifted to the cumulative final exam, making it work 85%.

For the final exam, when a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under Special Examinations), especially for those who miss multiple final exams within one examination period.

## 6. Additional Statements

### Religious Accommodation

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing or the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays: <https://www.edi.uwo.ca>.

### Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at: [https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic Accommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf).

**Academic Policies:** The website for Registrar Services is <https://www.registrar.uwo.ca/>.

In accordance with policy,

[https://www.uwo.ca/univsec/pdf/policies\\_procedures/section1/mapp113.pdf](https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf), the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

No electronic devices will not be permitted on both the midterm and final exams.

**Scholastic offences** are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: [https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).