

APPLMATH 3815A - Course Outline - FW 2023-24

1. Course Information

Course Name: Partial Differential Equations 1

Times and Location: Lectures are held Mon/Wed/Fri from 8:30am to 9:20am in NCB-117.

List of Prerequisites

Either (i) Mathematics 1600A/B; Applied Mathematics 2402A/B; Calculus 2303A/B or Calculus 2503A/B; or (ii) Calculus 2402A/B and Statistical Sciences 2503A/B. In each course a minimum mark of 60% is required.

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

Dr. Geoff Wild

Professor, Department of Mathematics

Email: gwild@uwo.ca (put APPLMATH 3815A in the subject line or your message may be missed)

Phone: ext 88784

Office Hour: Mondays 4:30 pm on Zoom (meeting ID on OWL)

Students must use their Western (@uwo.ca or @ivey.uwo.ca) email addresses when contacting their instructors. I will do my best to reply to emails within two business days. I don't routinely check work email on the weekend. It is very difficult to discuss mathematics over email. Technical questions are best asked during my office hour.

3. Course Syllabus, Schedule, and Delivery Mode

Course Content

Boundary value problems for Laplace, heat, and wave equations; derivation of equations; separation of variables; Fourier series; Sturm-Liouville Theory; eigenfunction expansions; cylindrical and spherical problems; Legendre and Bessel functions; spherical harmonics; Fourier and Laplace transforms.

Course Learning Outcomes

By the end of the course you will be able to do three things:

1. identify prototypical linear partial differential equations and connect each to the physical phenomenon it is intended to model using information provided by auxiliary conditions;

2. use the separation-of-variables technique to solve partial differential equations in one-dimension and higher-dimensions, and in different coordinate systems;
3. use transforms to solve partial differential equations.

Tentative Schedule of Topics:

Topic	Approx # Lectures	Chapters
The Heat Equation	2	1
Separation of Variables	2	2
Fourier Series	2	3
Laplace's Equation	3	2
The Wave Equation	2	4
Sturm-Liouville Problems	3	5
Vibrating Membranes	4	7
Laplace's Equation on a Cylinder	2	7
Spherical Problems	3	7
Nonhomogeneous Problems	3	8
Fourier Transforms	4	10
Laplace Transforms	2	13

Key Sessional Dates

Classes begin:	September 7, 2023
Last day to add:	September 15, 2023
No classes:	September 29, 2023
Holiday:	October 9, 2023
Reading Week:	October 30 to November 5, 2023
Last day to drop:	November 13, 2023
Classes end:	December 8, 2023
Exam period:	December 10 to 22, 2023

Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will not change. Any assessments affected will be conducted online as determined by the course instructor.

Course Materials

Required: Either a hardcopy or ebook version of *Applied Partial Differential Equations with Fourier Series and Boundary Value Problems*, 5th Ed (Pearson Education), by Richard Haberman.

Students are responsible for checking the course OWL site (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.

Learning Management System (OWL)

Detailed course information will be posted to OWL. Online quizzes will be conducted through OWL.

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

Technical Requirements

Assignments will be collected via Gradescope, a free web-based platform. Students will need to upload assignments to Gradescope, and this will require the use of a digital camera. Graded assessments will be returned via Gradescope.

4. Methods of Evaluation

Course Grade

The final course grade will be determined by student performance on

Assignments [24%]: There will be three assignments throughout the term, worth 8% each. The first assignment will be due in early October, the second in early November, and the third in early December.

Quizzes [6%]: There will be three quizzes throughout the term, worth 2% each. There will be one quiz in each of September, October, and November. Quizzes will be administered on OWL and are meant to test basic knowledge.

Midterm Test [25%]: **Saturday October 21, 10am to 12pm, Elborn College 2168.** Tentatively, the midterm will cover material from Ch 1 to 5, inclusive. Notes, books, calculators and other devices will be prohibited.

Final Exam [45%]: The final exam will be scheduled by the Registrar for the December Exam Period. It will be three hours in length and will be cumulative. Notes, books, calculators and other devices will be prohibited.

Make-up Dates

A make-up Midterm Test will be available to students whose request for accommodation is approved by their home Faculty (see information below). The make-up Midterm Test will be held on Saturday October 28 (the Saturday before Reading Break begins). Students whose accommodation includes Saturday October 28 will see the weight of the Midterm Test shift to the Final Exam.

A make-up Final Exam will be available to students whose request for accommodation is approved by their home Faculty (see information below). The make-up Final Exam will be held in January 2024.

5. Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Assessments Worth Less Than 10% of Course Grade

I can accommodate requests for short extensions, i.e., extensions that do not jeopardize my ability to provide timely feedback to the class as a whole. If granted, accommodations on time scales longer than three days will be made by shifting weight to the next supervised assessment (Midterm Test or Final Exam).

Assessments Worth At Least 10% of Course Grade

For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the [University's medical illness policy \(click here\)](#) and review the [Student Medical Certificate \(click here\)](#). In the event that the links do not work, type either

- https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration.pdf (for policy)
- https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf (for certificate)

into your browser.

Absences From Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (e.g., 3 or more exams in 23-hour period, 4 or more exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under Special Examinations).

Accommodation and Accessibility

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult [the University's list of recognized religious holidays \(click here\)](#), which is updated annually. Alternatively, you may wish to enter

- <https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>

directly into your browser.

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. Students can consult [the policy on Academic Accommodation for Students with Disabilities \(click here\)](#). Alternatively, type

- [www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf)

into a browser.

6. Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca> (click here).

In accordance with [policy \(click here\)](#), 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. The policy referenced above can also be accessed by typing

- https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf

into your browser.

Use of calculators or other electronic devices will not be permitted on tests and exams.

Scholastic offences are taken seriously and students are directed to read the appropriate [policy \(click here\)](#), specifically, the definition of what constitutes a Scholastic Offence. This policy can also be accessed by typing

- http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

into your browser.

In the event of a health lock-down, tests and examinations in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at <https://remoteproctoring.uwo.ca> (click here).

7. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/> (click here).

Students who are in emotional/mental distress should refer to Mental Health@Western by visiting their website <https://uwo.ca/health/> (click here) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will information about support services for survivors, including emergency contacts [is available \(click here\)](#). If you cannot access the link you can type

- https://www.uwo.ca/health/student_support/survivor_support/get-help.html

into your browser. To connect with a case manager or set up an appointment, please email support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact [Accessible Education \(click here\)](#) if you have any questions regarding accommodations. If the link provided does not work, type

- http://academicsupport.uwo.ca/accessible_education/index.html

into your browser.

Learning-skills counsellors at the [Student Development Centre \(click here\)](#) are ready to help you improve your learning skills (alternatively, type <https://learning.uwo.ca> into your browser). They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/> ([click here](#)).