Introduction to Partial Differential Equations
Fall 2024

Syllabus

Course Description:

This course aims to achieve the following two primary goals of many pure and applied scientific disciplines that can be summarized as follows:

i) *formulate/devise a collection of mathematical laws (i.e., equations) that model the phenomena of interest*;

ii) *analyze (solutions of) these equations in order to extract information and make predictions*;

The end result of i) is often a system of partial differential equations (PDEs). Thus, ii) often involves the analysis of a system of PDEs. This course provides an application-oriented introduction to some fundamental aspects of both i) and ii).

I will cover various topics in PDEs from the ABC's to the (probably) advanced during this course. I will move from one topic to another, and there is no such text that I follow chapter by chapter, so most of the time (if not all), I cannot tell the student what to prepare for the upcoming lectures (in fact, I do not recommend doing so, at least for my class). However, I do need students to review topics from a previous course, such as integration by parts, that they are not solid in. Going over their class notes seems necessary based on the experience of students who have survived that course.

Prerequisites

integration and differentiation (both single-valued and multi-valued); linear algebra; (the basics of) ordinary differential equations

Text Book

There is no required textbook for this course and students will take and read their class notes for this course. Indeed, these lectures are based on a collection of notes from the instructor. However, I list the following classic books which may better your understanding of certain topics

- Lecture notes on equations from mathematics and physics, Jiang Lishang, etc., 3rd edt (recommended)

- Partial Differential Equations: An Introduction, W. A. Strauss, 2nd edt (strongly recommended)

- Partial Differential Equations, L.C. Evans, 2010 (for motivated students)

- Partial Differential Equations, A. Friedman (for motivated students)

Lectures

- Thursday, 1:00 PM-3:35 PM, F201

Course Assessment:

The course grades will be computed as follows:
20% Homework (collected weekly in class)
40% Mid-term: two tests (see dates below)
40% Final exam (to be announced)

Class attendance

I do NOT require class attendance for this course. However, students are strongly recommended and encouraged to attend the lectures on a regular basis, except under extreme circumstances. This course is a self-organized, continuous process, and class performance will be part of your semester grade.

Tests

Two mid-term tests will be given on the following tentative dates in class
Test 1: Oct 24, Thursdays;
Test 2: Dec 5, Thursday.
No make-up test will be given. If you are not able to take the test, **an excuse email is required** for my record at least one day before the test and your other tests will carry more weights towards your semester grade, otherwise a zero grade will be given for the test.

Final Exam

Date to be announced. Missing the final exam will **NOT** be accepted. It is the student's job to check the test information.

Homework

There will be a total of 12 homework assignments, all of which will be graded. Homework will be collected in lectures on Thursdays each week and I will drop the two lowest grades towards the final HW grade. Some of the homework problems will appear on the quizzes unchanged. Although homework will be collected and graded on an individual basis, discussion with classmates is allowed and strongly encouraged and will help you learn the material faster and understand it better. However, copying other people's work is strictly NOT acceptable and will result in the loss of all HW grades (see Academic Honesty below). I will regularly update the HW problems on this page.

Academic Honesty:

Every student should understand the University's policies regarding academic honesty and strictly adhere to these standards. While discussing homework problems with the instructor and your classmates is permitted (and encouraged), I have zero tolerance for copying HW solutions, and any violation of university policy will be reported to all appropriate authorities without hesitation. Violation of my codes will result in a downgrade of your grade for this course.