Partial Differential Equations

Math-SHU 263

Instructor Info —

Zhuo-Cheng Xiao

Office Hrs: 4:15-5:15p MW

Rm W903, New Bund campus

Brightspace and Gradescope

zx555@nyu.edu

Course Info ———

Mon & Wed

2:15 - 4:10 pm

Rm S301

Overview Many laws of physics are formulated as partial differential equations. This course discusses the simplest examples, such as waves, diffusion, gravity, and static electricity. Nonlinear conservation laws and the theory of shock waves are discussed, as well as further applications to physics, chemistry, biology, and population dynamics.

Prerequisite: Grade C or better in either MATH-SHU 262 (Ordinary Differential Equations) or MATH-SHU 362 (Honors Differential Equations), AND grade C or better in either MATH-SHU 151 (Multivariable Calculus) or MATH-SHU 329 (Honors Analysis II).

Equivalency: This course counts for MATH-UA 263.

Fulfillment: Math Constrained Math elective; Honors Math elective

Materials

Textbook

Partial Differential Equations: An Introduction (2nd Edition). (Walter A. Strauss)

Learning Objectives

We will mainly cover chapters 1-6 of the textbook. The required topics are.

- Where PDEs come from
- Linear 1st order PDEs
- Wave equations
- Diffusion equations
- Reflections and sources
- Boundary value problems
- Solving PDEs with Fourier series
- Harmonic functions and Laplace equations

Time permitting, we will also cover (but not necessarily all below):

- Green's formula and Green's functions (Ch 7)
- Computation of solutions (Ch 8)
- Eigenvalue problems (Ch 11)
- Distributions and Transforms (Ch 12)

Grading Scheme

Weekly Homework	Midterm	Final
30%	30%	40%

Grades will follow the standard NYU math scale.

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D	F
Cutoff	95	90	85	80	75	70	65	60	50	<50

- There is no grade curving, grade normalization, or any form of extra credit.
- Students who fail to observe classroom norms may have their letter grades reduced.
- During exams, the use of any electronic device, including cell phones, is not allowed, regardless of whether the student is actually using it or not. So is the use of books, notes, calculators, or any other object extraneous to the exam. A student who fails to observe these norms will receive a grade of zero on that test.
- Homework regrade must be requested within 7 days after the release of that grade.
- Exam regrade must be requested within 3 days after the release of that grade.
- Severe breach of academic integrity will be reported to NYU Shanghai Academic Affairs.

Exams The midterms will be in class. We generally tolerate computational errors provided that the student correctly and concisely demonstrates all computational steps. On the other hand, only a small portion of scores will be granted if only the final answer is provided without any justifications.

Homework Policy

- Homework should be submitted as pdf files on Gradescope, which always dues on *Wednesday, 11:59pm* unless otherwise specified.
- No late homework will be accepted.
- Our grader will return your homework grade in one week.
- Both handwritten and latex formatted are fine, but the students are responsible for the submitted files' readability and completeness.

Make-up Policy Make-up exams or assignments might be allowed in limited scenarios provided that the student gets approval from the instructor *before the due date*. Approval may be granted for typical excuses including medical reasons, religious holidays, and family emergencies.

Remote Setup If students have difficulty attending classes, they should consult the instructor and their advisors in advance.

This course is primarily in-person until the university instructs otherwise. The remote teaching method is a substitute for short-term and emergent reasons, based on students' requirements (due to covid issues, etc.).

If the student cannot attend the in-person class, they need to email the instructor in advance to request a Zoom link for the remote meeting to follow the class in a synchronized fashion.

Academic Integrity All students are expected to adhere to the codes of academic integrity specified by New York University.