

# SABANCI UNIVERSITY SPRING 2020-2021

## MATH-522

### Partial Differential Equations

**Instructor: Nilay Duruk Mutlubas**

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**Lecture Hours:** Thursday 12.40-15.30

**Office Hours:** By appointment.

Lectures will be live-streamed unless a technical difficulty occurs. You can find the Zoom link for the lecture on SUCourse+. In order to have access, you must be logged in with your Sabancı account. The online lectures will be recorded and uploaded afterwards, so that you can also watch them at a later time. They are going to be published on SUCourse+ via Google Drive. Supplementary materials will also be uploaded on SUCourse+ to study before/after the lectures. **You are responsible for every announcement made in class or in SUCourse+. Not attending the class or not following SUCourse+ regularly is not an excuse, in case you miss something.**

#### Course Content

Linear and quasilinear first order equations, main concepts. Classification, the concept of a well-posed problem. Weak solutions, regularity. Initial and/or boundary value problems. The heat equation, the wave equation and the Laplace equation. Sobolev spaces. Second order elliptic equations. Linear evolution equations.

#### Course Materials

- **L.C. Evans**, Partial Differential Equations, Graduate studies in mathematics, AMS.
- **W.A. Strauss**, Partial Differential Equations, Second edition, John Wiley&Sons.
- **F. John**, Partial Differential Equations, Fourth edition, Springer.
- **J. Jost**, Partial Differential Equations, Third edition, Springer.

#### Objectives

This course aims to give insight into linear theory of partial differential equations. Students will learn how to obtain representation formulas for solutions of elliptic, hyperbolic and parabolic type partial differential equations.

#### Course Outline

Week 1: Introduction; classification, basic definitions, linear PDEs  
Weeks 2-4: Laplace equation  
Week 5: Heat equation  
Weeks 6-7: Wave equation  
Week 8-10: Sobolev spaces  
Week 11: Second-order elliptic equations (**Week 12- Bayram holiday**)  
Week 13: Second-order elliptic equations  
Week 14: Linear evolution equations, semigroup approach.

## Course Policies

In preparation for the assignments, study groups are encouraged, but each student must write the final version on her/his own. Grading will be as follows:

	<b>Percent</b>
Take-home 1 (Laplace equation)	25 %
Take home 2 (Heat and wave equations)	25%
Take- home 3 (Sobolev spaces)	25%
Take-home 4 (Second-order elliptic equations)	25%

- One week duration will be provided for each take-home and there will be no make-up.
- Every document that requires a student submission,
  - i. must be in pdf format, and hand-written,
  - ii. must have name, surname, student ID, and signature on the top left corner of the document on each page submitted,
  - iii. Sabancı Student ID card or a valid ID card with name and photo on it must be placed on the top right corner of the first page.
  - iv. Submissions must be uploaded as a single pdf file.
- Any submission that is not in the described format will NOT be taken into account.