



**Wintersemester 2025/26**

**Lecture**

**Introduction to Partial Differential Equations**

**Lecturer:** Dr. Rodrigo Avalos

**Start:** Monday, 13th October 2025

**Time:** Mondays, 16:00-18:00 hrs. and Wednesdays, 14:00-16:00 hrs.

**Place:** Hörsaal N15 / M2 (C-Bau Mathematik/Physik)

**Tutorial:** 2 hours/week **Tutor:** Olivia Vicanek Martinez **Start:** TBA.

**Time:** TBA **Place:** TBA

**Study programs:** Master in Mathematics and in Mathematical Physics

**Modul number:** MAT-55-21; 9 ECTS points

**Study areas:** Analysis; differential geometry; mathematical physics

**Language:** English

**Description:**

The objective of the course is to provide an introduction to the theory of linear partial differential equations of second order, with a special focus on elliptic equations. Specific topics include:

- Examples of important linear PDEs and their motivation;
- Harmonic functions and Green's function;
- Maximum and comparison principles;
- Sobolev spaces and L<sup>2</sup>-theory of weak solutions to elliptic equations;
- Eigenvalue problems;
- Heat kernel and basic properties of the heat equation

**Prerequisites:**

Bachelor's degree in mathematics or equivalent.

**Literature:**

1. David Gilbarg and Neil S. Trudinger, Elliptic partial differential equations of second order, Springer Grundlehren, (2001).
2. Michael E. Taylor, Partial Differential Equations I, Appl. Math. Sciences 115, Springer 1996.
3. Lawrence C. Evans, Partial Differential Equations, American Mathematical Society (1998).

**Exam:** The final examination will be oral and, to be admitted to it, students will need to get 50% of all points on the exercise sheets.