

Differential Equations in Mathematical Physics
July 17-August 11, 2023 —SMI Summer School Perugia
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In this course, we will discuss some physical models where partial differential equations (PDEs) appear. In particular, we will study three basic PDEs from mathematical physics, that are: Laplace's equation (elliptic), heat equation (parabolic), and wave equation (hyperbolic). The second part of the course we will discuss Sobolev spaces that are a starting point to find weak solutions to more general elliptic PDEs .

Textbook: [1] L.C. Evans, Partial Differential Equations, AMS, 1998.

- Program of the first part: material from chapters 2 of [1]:
 1. Physical models and PDEs
 2. Laplace's equation
 3. Heat equation
 4. Transport equation and wave equation
- Program of the second part material from chapters 5 and 6 of [1]:
 5. Sobolev space
 6. Application to existence of a weak solution to second order elliptic PDEs

Prerequisites: Real Analysis, basic measure theory, and integration.