ICTP SAIFR | International Centre for Theoretical Physics
South American Institute for Fundamental Research

Campus of IFT-UNESP – São Paulo, Brazil

May 1 – June 30, 2025

MINICOURSE ON PARTIAL DIFFERENTIAL EQUATIONS: ANALYTICAL AND NUMERICAL TOOLS

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In this minicourse, we aim to introduce the participants to the expansive field of Partial Differential Equations (PDEs). These equations serve as powerful tools for modeling a remarkable spectrum of natural phenomena—ranging from quantum effects at nanometer spatial scales and femtosecond timescales, to fluid dynamics at scales familiar from everyday life, and even up to the evolution of galaxies and cosmic structures across billions of years.

Here, perhaps at the expense of some depth, we propose a comprehensive survey of tze different types of PDEs. We will not only study their analytical properties, but also explore their numerical approximations, which will, in turn, help us visualize these properties and behaviors more clearly. To this end, we will delve into fundamental analytical tools that are essential not only for demonstrating the existence, uniqueness, and stability of solutions for a given type of problem, but also for establishing the convergence of the numerical approximations we will be producing.

Ultimately, the aim is to provide a balanced understanding of both the theory and practical techniques for solving PDEs. By combining analytical and numerical approaches, we seek to equip the participants with the tools necessary for addressing real-world problems and advancing their study of these powerful equations.

There is no registration fee and limited funds are available for local expenses. Students enrolled in the minicourse can receive credits through the IFT-UNESP graduate physics program. The lectures will be broadcast live via Zoom.

Application deadline:
April 1, 2025

Online application and more information:
ictp-saifr.org/mpde2025