



Overview: This 5-day, 30-hour course on *Theoretical and Numerical Analysis of Differential Equations and Their Applications*, offered at the University of Cagliari, will cover both theoretical and numerical aspects of differential equations, with a focus on solving real-world problems in science and engineering. The course, prepared by faculty from the University of Cagliari and partner universities, is available at undergraduate, graduate and PhD levels. Participants will earn **3 ECTS** credits upon completion.

Organizers: **Berke Kaleboğaz** (Hacettepe University), **Rafael Díaz Fuentes** (University of Cagliari), **Fatma Gamze Düzgün** (University of Cagliari) **Eylem Öztürk** (Hacettepe University), **José Rafael Rodríguez Galván** (University of Cádiz), **Giuseppe Viglialoro** (University of Cagliari).

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Course 1. General Introduction to Ordinary Differential Equations & Applications to Real-World Models

Contents: *Some Types of Linear ODEs and Systems, Mathematical Modellings and Applications of linear ODEs and Systems*

Course 2. Some types of linear PDEs and Systems & Numerical Methods for PDEs

Contents: *Some Types of Linear PDEs and Systems: Boundary Value Problems and Modelling- Galerkin Methods for PDEs: Analysis, Implementation and Application*

Course 3. Mathematical Modelling and Applications of PDEs and Systems

Contents: *Introduction to Second Order PDEs, From Laplace's Equation to Chemotaxis Systems*