Numerical approximation of fractional differential problems of the Caputo type

M. Luísa Morgado

University of Trás-os-Montes e Alto Douro, Portugal

`luisam@utad.pt`

Fractional differential equations have become increasingly powerful in modelling real-world phenomena. From modelling biological tissues and electrical circuits to describing financial markets and environmental systems, their applications are vast. In this course, we start with the theory of initial value problems for ordinary Caputo type fractional differential equations and highlight the main challenges in the numerical approximation of this type of problems. We then move on to the analysis of initial boundary value problems for fractional partial differential equations used in the modelling of anomalous diffusion processes. Here we focus on finite difference schemes for their numerical solution and on strategies for dealing with the potential singularities in the solution of such problems.