

Short course

Extended Thermodynamics and Kinetic Theory of Gases

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Days: April 23, 24, 26, 29, 30

Room 3.74, Department of Mathematics, Braga

(Lab. 2, DMat, Campus de Gualtar)

Abstract. The course is intended to cover classical and modern approaches to the modelling of non-equilibrium processes and discussion of possible applications of partial differential equations in this context.

Session 1 (April 23, 14:30-16:30)

Classical models of non-equilibrium processes; basic principles, derivation of governing equations; diffusion, Navier-Stokes equations for viscous fluids, Fourier model of heat conduction.

Session 2 (April 24, 9:00-11:00)

Extended thermodynamics; basic principles, mathematical structure, governing equations, closure relations; wave propagation in extended thermodynamics.

Session 3 (April 26, 9:00-11:00)

Special problems in classical and extended modelling; heat conduction in bounded domain; shock waves in classical and extended modelling; dissipative processes and equations for the shock structure.

Session 4 (April 29, 9:00-11:00)

Theory of mixtures; non-equilibrium processes in mixtures; chemically reacting mixtures; detonation and deflagration modelling.

Session 5 (April 30, 9:00-11:00)

Kinetic theory of gases; basic modelling assumptions, Boltzmann equation, H-Theorem, model equations; macroscopic equations, hydrodynamic limit, closure relations; method of moments and its relation to extended thermodynamics. Some basic problems of kinetic theory of gases.

Please be aware that, with the exception of the first two sessions, some changes in the time and room can be introduced later (the days are fixed).

The course is organized by the ANAP group of the research Centre of Mathematics (CMAT) and by the PDMA Doctoral Programme, in the framework of the ERASMUS+ Staff Mobility.