



## Gemeinsames Mathematisches Kolloquium der Universitäten Marburg und Gießen

## Am Mittwoch, dem 2. Juli 2025 spricht

## Prof. Dr. Volker Mehrmann

von der Technischen Universität Berlin in Marburg über

## Energy based mathematical modeling and control of open physical systems

16.30 Uhr Tee und Kaffee im Seminarraum VII (Ebene 5, Raum 05 D 01)
17.00 Uhr Vortrag im Hörsaal IV (Ebene 4, Raum 04 A 30)
Im Anschluss ist eine Nachsitzung geplant

Mathematical models in form of differential equations are used in all areas of science and engineering for the simulation, control and optimization of physical systems. Ideally such models are close to the real physical system in the sense that the physical properties are encoded in the mathematical structure of the equations. The model equations should be easy to analyze and allow for good numerical methods that reflect the physical properties as well. A modern modeling paradigm is that of port-Hamiltonian systems, which orginates from Hamilton dynamics enriched with inputs, outputs and constraints. We will describe this framework and analyze its properties from an algebraic, analytic and geometric point of view. We will illustrate the successful use of the model class at the hand of the control of district heating networks modelled by the energy based formulation of the incompressible Euler equations.

