# Distributed Systems and Control

Course description

Distributed control systems include large-scale physical systems, engineered multi-agent systems, as well as their interconnection in cyber-physical systems. Representative examples are electric power grids, camera networks, and robotic sensor networks. The challenges associated with these systems arise due to their coupled, distributed, and large-scale nature, and due to limited sensing, communication, and control capabilities. This course covers modeling, analysis, and design of distributed control systems as well as applications in various engineering domains. Topics covered in the course include

- the theory of graphs with an emphasis on algebraic and spectral graph theory;

- basic models of interconnected dynamical systems and multi-agent systems;

- continuous-time and discrete-time distributed averaging and consensus algorithms;

- coordination algorithms for rendezvous, formation, flocking, and deployment;

- distributed algorithms computation and optimization over networks; and

- applications in robotic coordination, coupled oscillators, social networks, sensor networks, power grids, and epidemics.
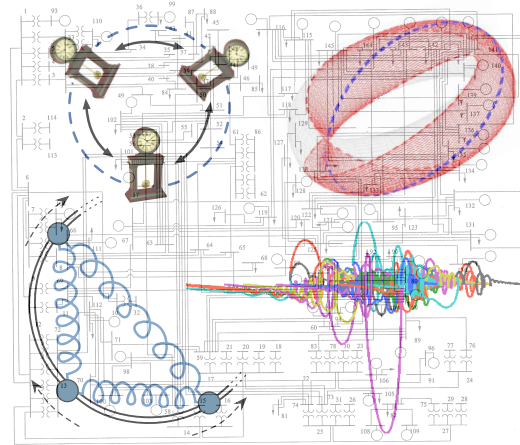
Lecture Location and Schedule

Lectures:	Tuesdays	16:00 to 18:00	CAB G 61
Exercises:	Fridays	10:00 to 12:00	ML H 44
Office hours:	Wednesdays	14:00 to 15:00	ETL I 10

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Prerequisites

Control systems (227-0216-00L), Linear system theory (227-0225-00L), or equivalents, basic Matlab skills as well as sufficient mathematical maturity.

Grading

The class is based on biweekly homework assignments (50%) and a final exam (50%).