EPFL

EE-734 | **Decentralized and Distributed Control**

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Cursus	Sem.	Type
Electrical Engineering		Obl.

Language of teaching	English
Credits	2
Session	
Exam	Oral presentation
Workload	60h
Hours	**21**
Courses	21
Number of positions	**40**

Frequency

Only this year

Remark

Next time: 2 to 9th June, 2020

Summary

This course offers an introduction to the analysis of large-scale dynamical systems and the design of control schemes when approaches based on centralized computations are inapplicable.

Content

Advances in technology and telecommunications are steadily broadening the size of systems that can be controlled. Examples are smart grids, which are perceived as the future of power generation, and networks of sensors and actuators, which enable monitoring and control of processes spread over large geographical areas. As an alternative to centralized regulators, that are often impractical for large#scale systems, decentralized and distributed approaches to control have been developed since the 70's. Particular attention has been recently given to distributed control architectures based on model predictive control which are capable to cope with physical constraints.

The first part of the course will focus on classical results on stability analysis of large#scale systems, decentralized control and decentralized controllability. Then, distributed control design methods will be covered. In the last part of the course, more emphasis will be given on distributed regulators based on optimization and receding horizon control. Recent advances on decentralized and scalable design of local controllers will be also presented, together with applications to microgrids.

Outline:

- Introduction to large#scale systems and multivariable control
- Stability analysis of large#scale systems
- Design of decentralized and distributed controllers for unconstrained systems
- Decentralized and distributed model predictive controllers
- Approaches to the scalable design of control architectures

Keywords

Large-scale systems, decentralized control, distributed control.

Learning Prerequisites

Required courses

Basics of control theory (required), multivariable control (recommended).

Learning Outcomes

By the end of the course, the student must be able to:
- Analyze large-scale systems and design control architectures.