EE-715

Optimal control

Faulwasser Timm, Jiang Yuning

Cursus	Sem.	Type
Advanced Manufacturing		Opt.
Electrical Engineering		Opt.

Language of teaching	English
Credits	4
Session	
Exam	Project report
Workload	120h
Hours	**47**
Courses	41
Exercises	6
Number of positions	

Frequency

Every 2 years

Remark

Next time : Spring 2022

Summary

This doctoral course provides an introduction to optimal control covering fundamental theory, numerical implementation and problem formulation for applications.

Content

Optimization and optimal control play pivotal roles in many engineering applications – ranging from autonomous vehicles, robotics and chemical reactors to smart girds and aeronautics. The course will cover the following topics:

Basics of optimal control theory

- Optimality conditions for static problems
- Formulation of optimal control problems
- Gateaux derivative
- Pontryagin Maximum Principle

Numerical optimal control

- Indirect methods
- Direct solution methods
- Efficient derivative computation

Advanced aspects of optimal control

- Existence of optimal solutions
- Dual variables
- Singular problems
- Dissipativity and turnpike properties

Receding-horizon control of sampled-data systems

- Sufficient stability conditions with and without terminal constraints
- Economic cost functions
- Differences of continuous time and discrete time formulations

Outlook

- Robust optimal control
- Modeling and implementation aspects

Note

Learning Outcomes

By the end of the course, the student must be able to:

- Solve control problems arising in their research projects by means of optimal control approaches.

Assessment methods

Project Report.