EE-736

Optimal Control for Dynamic Systems

Faulwasser Timm, Jiang Yuning

Cursus	Sem.	Type
Electrical Engineering		Opt.
Robotics, Control and Intelligent Systems		Obl.

Language of teaching	English
Credits	3
Session	
Exam	Oral presentation
Workload	90h
Hours	**44**
Courses	32
Exercises	12
Number of positions	**30**

Frequency

Every 2 years

Remark

Next time: Spring 2026

Summary

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

Content

- Recap of finite dimensional optimization and numerical methods for optimization
- Fundamentals of Caculus of variations and optimization in function spaces
- Closed-loop and open loop optimal control
- Calculus of variations and optimal control
- Pontryagin's Maximum Principle
- Numerical optimal control
- Singular problems and minimum time control
- Dissipativity and optimal control
- Hamilton-Jacobi-Bellman equations
- Sampled-data predictive control
- Research outlook
- Exercises: pen and paper, programming; depending on the individual knowledge of the students

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

Oral presentation.

Resources

Bibliography

• LIBERZON, Daniel. Calculus of variations and optimal control theory: a concise introduction. Princeton university press, 2011

Moodle Link

• https://go.epfl.ch/EE-736