Summary
Provides the students with basic notions and tools for the analysis and control of dynamic systems. Shows them how to design controllers and analyze the performance of controlled systems.

Content
• Introduction to automatic control
• Closed-loop transfer functions
• Analysis of dynamic systems
• Design and analysis of PID controllers
• Loop shaping controller design
• State space analysis and control design
• Introduction to digital implementation

Keywords
Analysis and design of control systems, stability, PID control, loop shaping, state space control

Learning Prerequisites
Required courses
• Real analysis
• Complex analysis
• Physics
• Signals and systems

Important concepts to start the course
• Represent a physical process as a system with its inputs, outputs and disturbances and derive its dynamic equations, A1
• Represent a linear system by a transfer function

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

- Analyze a linear dynamical system (both time and frequency responses), A3
- Construct and analyse a discrete-time model for a dynamic system, A5
- Design a PID controller, A7
- Design a simple controller for a dynamic system, A8
- Assess / Evaluate the stability, performance and robustness of a closed-loop system, A12
- Define (specifications) the adequate control performance for dynamic systems, A13
- Propose several control solutions, formulate the trade-offs, choose the options, A14

Transversal skills

- Communicate effectively with professionals from other disciplines.
- Set objectives and design an action plan to reach those objectives.
- Use both general and domain specific IT resources and tools
- Access and evaluate appropriate sources of information.

Teaching methods

Lectures, written exercises, computer-based exercises and MOOC-based laboratory sessions

Expected student activities

- Participate to lectures, exercises and laboratory sessions
- Homework of about 2 hours per week

Assessment methods

Written exam

Supervision

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<td>Office hours</td>
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<td>• Supervised hands-on computer sessions</td>
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Resources

Bibliography

Ressources en bibliothèque
- Feedback Control of Dynamic Systems / Powell

Notes/Handbook
Slides / notes available online.

Moodle Link
Prerequisite for

- Multivariables Systems
- Advanced Control Systems
- Non-linear Control
- Model Predictive Control
- Identification of Dynamical Systems