

UE Nonlinear and predictive control



Level
Baccalaureate
+5



ECTS
6 credits



Component
UFR PhITEM
(physique,
ingénierie, terre,
environnement,
mécanique)



Semester
Automne

- > **Teaching language(s):** English
- > **Open to exchange students:** Yes
- > **Code d'export Apogée:** PAX9GIAL

Presentation

Description

Non linear control (20 h)

1. Introduction to nonlinear systems: representation and specific features
2. Nonlinear systems analysis: stability, tangent linearization, Lyapunov methods
3. State feedback control of nonlinear systems: approximate linearization, exact linearization, backstepping, sliding modes
4. State observers for nonlinear systems: Extended Kalman Filter, Output injection, High gain designs
5. Observer-controller schemes: adaptive methods, output feedback control

Predictive control (14 h)

- Predictive control
 - Introduction to constraints
 - Finite horizon predictive control
 - Stability conditions
 - Examples
- Predictive control of nonlinear systems
 - Closed loop stability
 - Control parametrization
 - Optimization tools

- Examples
- Complete case study

List of examples from Mechatronics: Inverted pendulum, tilting trains, elastic crane, Boeing aircraft, chain of masses linked through springs, automate-manual transmission (AMT), etc.

Prerequisites: State space and transfer approaches for linear systems, optimisation

Course parts

UE Nonlinear and predictive control - CM

Lectures (CM)

34h

Period : Semester 9

Bibliography

Non linear control

- "Nonlinear systems", H. Khalil - Prentice-Hall, 2002.
- "Nonlinear control systems", A. Isidori - Springer Verlag, 1995.

Useful info

Place

> Grenoble

Campus

> Grenoble - Scientific Polygon