



# UE Nonlinear and predictive control

 ECTS  
6 crédits

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

 Période de  
l'année  
Automne (sept.  
à dec./janv.)

- > **Langue(s) d'enseignement:** Anglais
- > **Ouvert aux étudiants en échange:** Oui
- > **Code d'export Apogée:** PAX9GIAL

## Présentation

### 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

---

## Heures d'enseignement

UE Nonlinear and predictive control - CM

CM

34h

**Période :** Semestre 9

---

## Bibliographie

### Non linear control

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

## Infos pratiques

---

### Lieu(x) ville

› Grenoble

---

### Campus

› Grenoble - Polygone scientifique