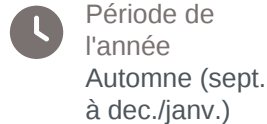
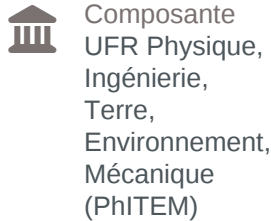


UE Nonlinear and predictive control



Diplômes intégrant cet élément

- Master Electronique, énergie électrique, automatique

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

Présentation

Description

This course offers a comprehensive journey into **modern nonlinear control**, equipping students with both fundamental insights and powerful design tools. After exploring how nonlinear systems are modeled and what makes their behavior unique, the class dives into stability analysis, **linearization** techniques, and **Lyapunov-based methods**. Students then learn a broad range of state-feedback strategies—including exact and approximate linearization, backstepping, and sliding modes—before tackling advanced observer design such as EKF, output-injection, and high-gain observers. The course concludes with adaptive and output-feedback schemes, providing a solid foundation for tackling real-world nonlinear control challenges.

This course also offers a modern and applied introduction to **optimal and model predictive control (MPC)**, one of today's most powerful frameworks **for controlling complex, multivariable systems under constraints**. Students learn how to predict system evolution, formulate and solve real-time optimization problems, and design feedback strategies that ensure performance, safety and robustness. Through intuitive examples—ranging from simple nonlinear dynamics to aerospace-inspired case studies—the

course highlights MPC's unique ability to handle constraints, integrate optimality criteria, and operate seamlessly with nonlinear models. By the end of the class, students gain both the theoretical foundations and practical understanding needed to implement MPC in cutting-edge industrial and research applications.

Heures d'enseignement

CM	CM	34h
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Période : Semestre 9

Bibliographie

Reference textbooks :

- 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