

**AUTOMATIQUE ET PHÉNOMÈNES NON-LINÉAIRES****AUTOMATIC CONTROL WITH NONLINEAR PHENOMENA****Lecturers:** Gérard SCORLETTI, Giacomo CASADEI

| Lecturers : 12.0 | TC : 18.0 | PW : 4.0 | Autonomy : 14.0 | Study : 0.0 | Project : 0.0 | Language : FR

**Objectives**

The performance requirements in technological systems have led to the widespread use of feedback control and the emergence of non-linear phenomena. However, the most commonly used correctors are based on linearity. The course presents the behaviour of non-linear systems and introduces methods for predicting the occurrence of these non-linear behaviours in closed-loop systems designed under the linearity assumption - it will address how to modify the control architecture to avoid these phenomena. The course will also present how to design a control architecture for a system which is described by a non-linear model. (Prerequisite to the Master "Automatic Control Engineering" and basis for the options "Aeronautics" and "Ground Transportation").

**Keywords :** Automatic control, Nonlinear Systems, Control, Analysis**Programme**

- Introduction and problem formulation.
- Analysis of closed-loop systems in presence of nonlinearities.
- Analysis of nonlinear systems: a general approach.
- Control of nonlinear systems.

**Learning outcomes**

- Analysis of the dynamical closed loop system behavior in presence of nonlinearities.
- Control of nonlinear systems.
- Practical application to industrial cases.

**Independent study****Objectifs :** Develop an engineering design procedure by relying on the knowledge acquired during the AF.**Méthodes :** Solve a practical and original control problem in the presence of non-linearities by applying the methods and tools acquired during the AF.**Core texts**

G. Casadei et G. Scorletti, *AUTOMATIQUE & PHÉNOMÈNES NON LINÉAIRES*, Document de cours ECS a 3, 2021  
G. Scorletti *COMMANDE MULTI-ACTIONNEURS MULTI-CAPTEURS.*, Document de cours ECS a 4, 189 pages, 2018  
H. Khalil *NONLINEAR SYSTEMS 3D EDITION*, Prentice Hall, 2002

**Assessment**

Individual written final test 2 hours (Knowledge) and individual oral evaluation of Autonomy (Know-How).  
Final AF mark =  $2/3 * K + 1/3 * KH$ .