

Non-linear control



Component

École Nationale
Supérieure
d'Électrotechnique
d'Électronique
d'Informatique
d'Hydraulique
et des
Télécommunications

In brief

- > **Amety's Code:** N8EE13C
- > **Open to exchange students:** Yes

Presentation

Objectives

This course aims to introduce students to the analysis and control of non-linear systems.

Description

Upon completion of this course, students will be able to:

Identify the nature of nonlinear phenomena present in a given system (saturation, rotation, bilinearity, coupling between dynamics, discontinuities, etc.);

Calculate the equilibrium points of a nonlinear system;

Distinguish between different concepts of stability (local, global, asymptotic, exponential);

Apply Lyapunov's first method to analyse the stability of a nonlinear system, in particular by studying the stability of the linearised system around an operating point;

Apply Lyapunov's second method to analyse the stability of the nonlinear system, particularly for large signals, and estimate the stability domain if necessary;

Synthesise different types of nonlinear control laws to ensure optimal closed-loop performance (bang-bang control, sliding mode control, linearising state feedback control).

In addition to the lectures, tutorials allow students to manipulate these concepts and apply them to the analysis and control of real systems with nonlinearities. Finally, a project involving the synthesis and implementation of non-linear control laws for a wheeled mobile robot trajectory tracking problem is proposed. This work is carried out in simulation, within the framework of a supervised design office.

Pre-requisites

N8EE13A - State Space

N8EE13B - Nonlinear Systems