Advanced Control TER

Component
École Nationale Supérieure d'Électrotechnique d'Électronique

In brief

- **Ametys Code:** N9EE19D
- **Open to exchange students:** Yes

Presentation

Objectives

1) Develop a holistic methodology for designing control architectures: from theoretical system modeling to the implementation of controllers on real-time computers.
2) Acquire the ability to independently develop an engineering-type approach to address a control issue while meeting the requirements of a specification.
3) Independently acquire knowledge and expertise from technical documentation and scientific literature, then apply it to solve the problem at hand.

Description

Format: The study and research topic (TER) "Advanced Control" is primarily a TER. In this context, an open-ended problem is posed, for which there is no single answer. In order to develop students' ability to methodically design an approach to solve this problem, teaching is conducted in a semi-supervised manner. This gives students the opportunity to explore different avenues independently.

Theme: The problem to be solved involves designing a control law to achieve positional control of a translator-type electromechanical system (a system designed to move loads, as found in various industrial sectors). This design implements a comprehensive approach which, based on a given set of specifications, begins with modeling the system to be controlled. Based on this model, initial conventional controllers are developed in simulation, then their ability to meet the specifications is quantified and analyzed. More advanced controllers are then designed and studied to assess whether they provide a better response to the specifications. Among the various controllers analyzed, a choice must be made as to which one will then be discretized for real-

time implementation on the actual device. Experimental validation on the translator is the final step, allowing for final adjustments to the controllers in relation to the required performance to be achieved.

Pre-requisites

- Methodologies for modeling dynamic systems for control purposes (multiple courses within the Energy program),
- Synthesis of P, PI, PID, and other types of controllers, and selection of the synthesis method based on the characteristics of the system to be controlled (in conjunction with the course “N7EE05C: Synthesis of Controllers and Control Architectures”),
- Modeling of systems in state space (Course “N8EE13A: Analysis and synthesis of systems in state space”),
- Synthesis of discrete controllers (in conjunction with the Course “N7EE05B: Sampled systems”),