**COIL project proposal: Reaction wheel inverted pendulum**

**Summary:**

The Applied Physics undergraduate programme at the Amsterdam University of Applied Sciences (AUAS) aims to organize a Collaborative Online International Learning (COIL) project with either a (Mechanical) Engineering or Information Technology study programme at a partner university. In this project students from both universities collaborate to build, test, and analyse a ‘reaction wheel inverted pendulum’. This project involves programming skills, analyzing sensor data, and practical application of electronics and mechanics.

Afbeelding met fiets, Auto-onderdeel, machine, engineering

Automatisch gegenereerde beschrijving

**Schedule:**

A pilot project of limited scope can be organized in February/March 2025. Subsequently, the full-scale COIL project will commence in December/January of the following academic year.

The duration of the project is 5-7 weeks. Every week there is at least one mandatory online meeting between students of both universities. Additional collaboration is encouraged.

**Participants:**

45-55 second year students from AUAS participate in the COIL project. These students have previously followed a theoretical course on the laws of mechanics. They have also mastered basic programming skills. Additionally, they have gained extensive experience in project work. In this COIL project these students are divided in 10-14 teams.

Each team from AUAS is linked with a team from the partner university. Ideally, these teams have a similar size. The students from the partner university have a background in (Mechanical) Engineering or Information Technology. Preferably, their expertise and skill sets are complementary to those of the AUAS students, to ensure mutual interdependence during the project execution.

Afbeelding met schets, tekening, cirkel, lijn

Automatisch gegenereerde beschrijvingThe project is under supervision of 3 AUAS teachers, in addition to several teachers from the partner university.

**Content:**

Students build an inverted pendulum with a flywheel at the top. The aim of the project is to develop a device which keeps the (inherently unstable) pendulum upright by utilizing PID-controllers.

The students attach a gyroscope and acceleration sensors to the pendulum. These sensors are connected to a Raspberry Pi. Students write a Python code which processes the sensor data, and consequently generates an output signal to an electromotor linked to the flywheel. Through an iterative process students improve the software and the hardware to (better) balance the pendulum.

The COIL project contains the following tasks: Writing a project plan (optional), designing the device, calibrating sensors, coding, building a device, testing, analyzing results, writing a manual (optional), participating in a contest (optional). Students from the two universities will divide some of these tasks and collaborate on others.

**Learning outcomes:**

In addition to various technical skills, students acquire intercultural competences and practice language skills. Furthermore, students gain experience in interdisciplinary and online collaboration.

**Contact information:**

We would be glad to discuss further details or possible modifications to the project. Please feel free to Mark Bosman at [m.bosman@hva.nl](mailto:m.bosman@hva.nl) for any questions or an online meeting.