Research Field And Department	AEROSPACE DEPARTMENT, PLASMA PROPULSION LABORATORY (EP2 team)
Supervisor	Marco Riccardo Inchingolo
Title of the Work	Thrust balance improvements for plasma thruster testing in vacuum chamber

Abstract:
In our laboratory (EP2 laboratory) we build and test plasma thrusters in vacuum chambers. These types of thrusters produce very low thrust, in the mN range, specialized instruments called thrust balances have been developed to measure thrust levels in this range. In our group we have built a pendulum-type thrust balance [1] to evaluate the performance of our thruster prototypes. This balance is composed by several sub-systems that need to work sequentially: balance alignment, calibration, displacement measurement. Currently this process is performed manually and requires subsequent post-processing to obtain a final value of thrust. Additionally, the calibration system requires special handling and several improvements are possible.

During this activity, the student would have to write software to automatize the thrust level acquisition and obtain a real time thrust measurement. On the other hand, the thrust balance calibration system has margins for improvements and a partial mechanical redesign should be performed.

Main Tasks to Carry Out:

- Full understanding of the working principle of a pendulum type thrust balance
- Mechanical concept design of improvements to the calibration system
- Automatization of the thrust acquisition process through LabView and/or python.

Expected Background:

- Familiarity with laboratory activities
- Familiarity with CAD and software design (background with any software is sufficient)
- Excellent GPA

References:

[1] M. R. Inchingolo et al. “Thrust Measurements of a waveguide Electron Cyclotron Resonance Thruster”. In: Journal of Applied Physics 135.9 (Mar. 2024). doi: 10.1063/5.0186778. url: https://doi.org/10.1063/5.0186778.