

## Design, research and development of surface tension equipment with teaching purpose

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### ABSTRACT

The importance of the experimental study of surface phenomena is not sufficiently reflected through the experiments carried out in teaching laboratories. The possibility of having cheaper equipment would be of great value for science and applied technologies students. The main objective of this project is the design of a piece of equipment measure the surface tension of liquids for teaching purposes, using the Du Noüy ring technique. Data acquisition will be based on the loading cell and HX711 module. Measurement tests of three different liquids are taken: water, olive oil and fuel. Then, a budget will be made, a basic comparison with the Krüss K20 equipment, and finally the conclusions. Necessary studies have been done to verify the design. Regarding the manufacture of some of the designed components, the tool used was UltiMaker Cura, where the characteristics of the parts were programmed for the 3D printing. Electronic components chosen to carry out the automation of the equipment; an Arduino UNO board, a Nema 17 engine with EasyDriver controller and a Loading Cell with an HX711 amplifier for data acquisition. The system implementation is done through 3 different software. Loading cell calibration and equipment operation are programmed in Arduino IDE.

*Keywords:* Surface tension; Liquids; Cellular membrane; Load cell

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