

## **A Low Cost Education Proposal Using Strain Gauges and Arduino to Develop a Balance**

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**Abstract :** This paper presents a low cost education proposal to be used in engineering courses. The engineering education in universities of a developing country that is in need of an increasing number of engineers carried out with quality and affordably, pose a difficult problem to solve. In Brazil, the political and economic scenario requires academic managers able to reduce costs without compromising the quality of education. Within this context, the elaboration of a physics principles teaching method with the construction of an electronic balance is proposed. First, a method to develop and construct a load cell through which the students can understand the physical principle of strain gauges and bridge circuit will be proposed. The load cell structure was made with aluminum 6351T6, in dimensions of 80 mm x 13 mm x 13 mm and for its instrumentation, a complete Wheatstone Bridge was assembled with strain gauges of 350 ohms. Additionally, the process involves the use of a software tool to document the prototypes (design circuits), the conditioning of the signal, a microcontroller, C language programming as well as the development of the prototype. The project also intends to use an open-source I/O board (Arduino Microcontroller). To design the circuit, the Fritizing software will be used and, to program the controller, an open-source software named IDE®. A load cell was chosen because strain gauges have accuracy and their use has several applications in the industry. A prototype was developed for this study, and it confirmed the affordability of this educational idea. Furthermore, the goal of this proposal is to motivate the students to understand the several possible applications in high technology of the use of load cells and microcontroller.

**Keywords :** Arduino, load cell, low-cost education, strain gauge

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