

NFPA Education and Technology Foundation – Progress Report

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The goal of this project is to increase the use of pneumatic systems by introducing mechanical engineering students to pneumatic actuators and control valves. In ME2110: Creative Decisions and Design, students are exposed to and immersed in the mechanical design process through various labs and an end-of-semester design competition. The students design and build a mechatronic device using a supplied mechatronics and pneumatics kit. The final competition in the course consists of a design review, where machines are judged by numerous people from industry, and a head-to-head performance contest. The competition attracts hundreds of spectators including friends, family, and industrial sponsors.

The pneumatics kit components are shown in Figure 1. Student teams are supplied with an air tank, actuators, control valves, tubing, and connectors. During the mechatronics portion of the course, students include these pneumatic components in the design and construction of their competition device. Device functions typically include moving the machine, moving objects, sensing, and interfering with the intended operation of opposing machines. The rapid, powerful motion provided by the pneumatic actuators has significant value in performing these functions, so designs that incorporate them effectively are typically successful in the competition. During the process of designing and building their device, students receive a large amount of hands-on experience with the pneumatic components.

The size of the ME2110 class has been steadily growing. In the Fall 2013 semester, 268 students were enrolled in ME2110. The support provided by this project has enabled us to purchase additional components to accommodate the larger number of students. Additionally, we have used the supplied funds to expand the pneumatics kit. A needle valve, shown in Figure 2, has been added to the kit supplied to each team. By regulating the air flow, the needle valve allows devices to utilize more controlled motion from the actuators. The needle valve is manually adjustable, so teams may adjust the flow to achieve the desired motion.

The support provided by this project has enabled us to expose a larger number of students to pneumatic systems, and introduce them to a variety of pneumatic components.

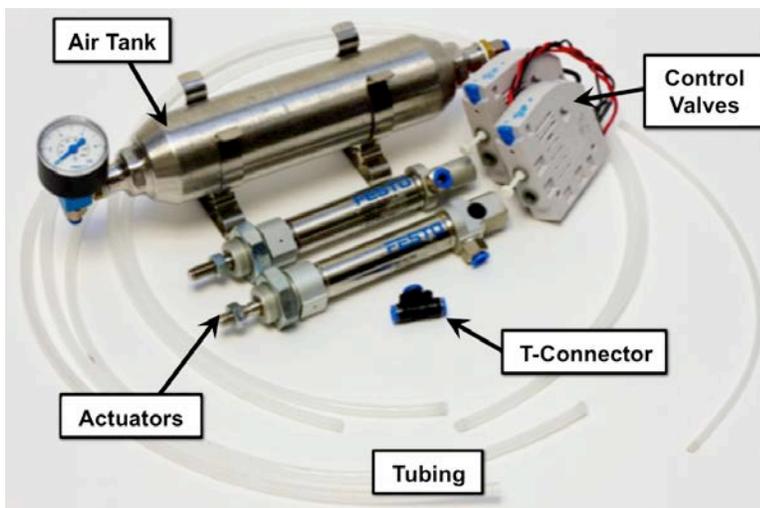


Figure 1. ME2110 Pneumatics Kit.



Figure 2. Needle Valve.