



## Introduction to Materials Recitation Overview

The goal of the Fundamentals of Engineering courses is to introduce freshman students to a variety of topics relevant to many Engineering pursuits. One topic emphasized is the properties of common engineering materials. We completely reworked the materials recitation for spring semester with newly developed objectives:

- Measure two basic materials properties: modulus of elasticity and density
- Compare materials on a materials selection chart
- Discuss the various applications and uses of the materials

### Materials Property Measurement:

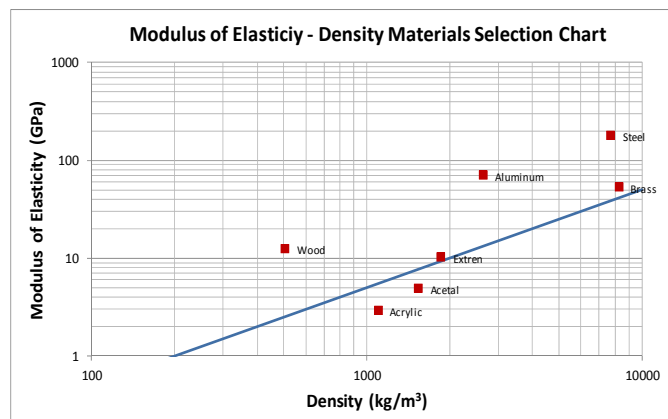
Students measure the density and stiffness of steel, aluminum, brass, wood, acrylic, acetal, and Extren. Extren is an advanced fiber-reinforced polymer, and is the construction material for the pedestrian bridge connecting Estabrook Rd. to the new Tickle Engineering Building, which will be the new home of Civil Engineering and Industrial Engineering.



Students measuring the deflection of the cantilever beam under load with a dial gage.

### Materials Selection Chart:

Students plot the results of their measurements on a materials selection chart, as shown at the right. The chart is important for selecting materials for controlling vibrations, where a high stiffness and low mass is a necessity. The results are compared to an arbitrary criteria, shown by the solid line. We discuss the importance of properly selecting materials, and other factors that would affect the materials selection, such as strength, thermal properties, electrical properties, and others.



### Innovative Engineering Materials Included in Recitation:

- Shape memory wire: students bent the wire in any shape desired, heated the wire, and watched it return to the original shape.
- Heat-shrink tubing: students heated the tubing and watched it shrink to half the diameter
- Magneto-rheological fluid: students pushed on a syringe filled with magneto-rheological fluid and saw how stiff the fluid became when a magnet was brought near the fluid.
- Super-absorbent polymer: students were able to make snow by adding water to a super-absorbent polymer.
- Shear-thickening fluid: students were able to see how a mixture of cornstarch and water would behave like a solid when hit rapidly.