Objective

Orientation of Mechanics of materials lab.

HOOK'SLAW

The Hooke's Law Apparatus is a practical application of hook's law of elasticity. This law is an approximation that states that the extension of a spring is in direct proportion with the load applied to it. Many materials obey this law as long as the load does not exceed the material's elastic limit. Materials for which Hooke's law is a useful approximation are known as linear-elastic or "Hookean" materials. Hooke's law in simple terms says that strain is directly proportional to stress.

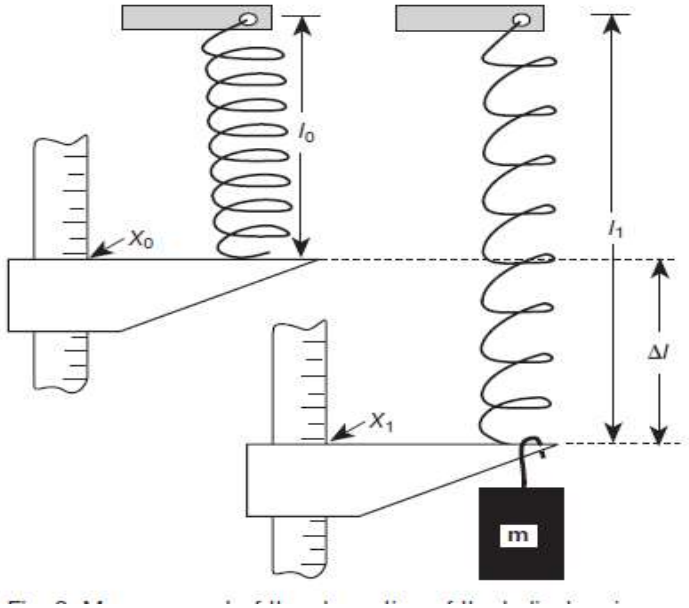

Figure 1 Hooke's Law Apparatus

Shear Stress Apparatus:

The force which tends to cut off or parts off one portion of the component from the other is called shear force.

Stresses produced on the area under shear, due to shearing forces, are called shearing Stresses. Shear stress is denoted by **τ**.

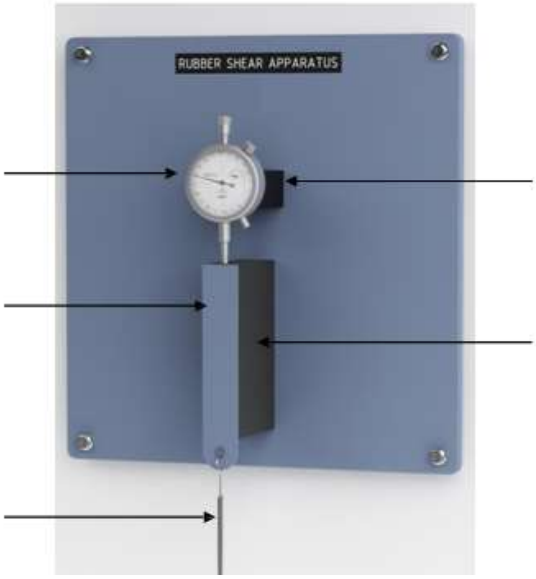

Figure 2 Shear Stress Apparatus

Universal Testing Machine

A universal testing machine, also known as a universal tester materials testing machine or materials test frame, is used to test the tensile stress and compressive strength of materials. It is named after the fact that it can perform many standard tensile and compression tests on materials, components, and structures.

According to the loading type, there are two kinds of tensile testing machines.

- **Screw Driven Testing Machine:** During the experiment, elongation rate is kept constant.
- **Hydraulic Testing Machine:** Keeps the loading rate constant.
  The loading rate can be set depending on the desired time to fracture.

The Universal Testing Machine Apparatus unit consists of Tension and compression section as well as, a control box connected with computer for obtaining graph and required values

Figure 3 Universal Testing Machine

Beams:

1. Simply supported beam

A simply supported beam is a type of beam that has pinned support at one end and roller support at the other end. Depending on the load applied, it undergoes shearing and bending. It is the one of the simplest structural elements in existence

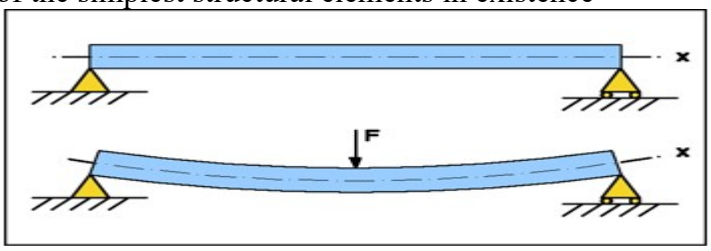

Figure 4 Simply supported beam

2. Cantilever beam

A cantilever beam is fixed at one end and free at other end. It can be seen in the image below

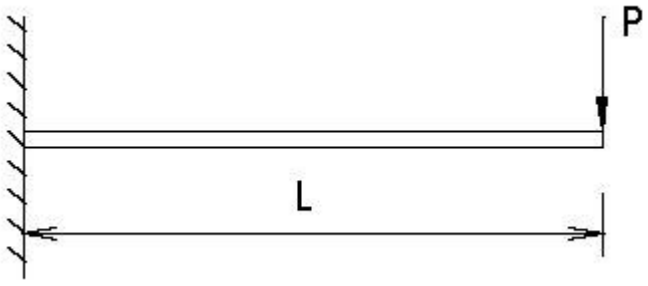

Figure 5 Cantilever beam

3. Overhanging beam

An overhanging beam is a beam that has one or both end portions extending beyond its supports. It may have any number of supports. If viewed in a different perspective, it appears as if it is has the features of simply supported beam and cantilever beam.

Figure 6 overhanging beam

4. Continuous beam

A continuous beam has more than two supports distributed throughout its length. It can be understood well from the image below.

Figure 7 continuous beam

5. .**Fixed beam** fixed beam is a type of beam whose both ends are fixed

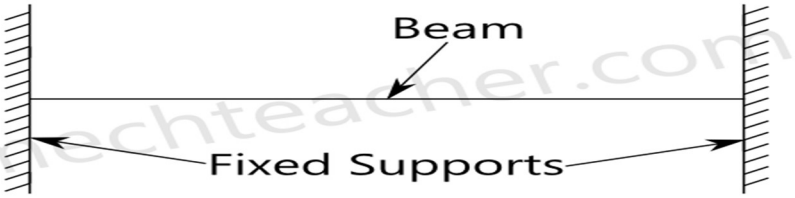

Figure 8 Fixed beam

Buckling Apparatus:

There are usually two primary concerns when analyzing and designing structures: (1) the ability of the structure to support a specified load without experiencing excessive stress and (2) the ability of the structure to support a given load without undergoing unacceptable deformation. In

some cases, however, stability considerations are important especially when the potential exists for the structure to experience a sudden radical change in its configuration. These considerations are typically made when dealing with vertical prismatic members supporting axial loads. Such structures are called columns. A column will buckle when it is subjected to a load greater than the critical load denoted by Pcr. That is, instead of remaining straight, it will suddenly become sharply curved as illustrated in Figure

Figure 9 Buckling Apparatus