



SNS COLLEGE OF TECHNOLOGY



23MCB204 – SOLID MECHANICS

UNIT I - SIMPLE STRESSES AND STRAINS



Strength of Materials



Stress and Strain

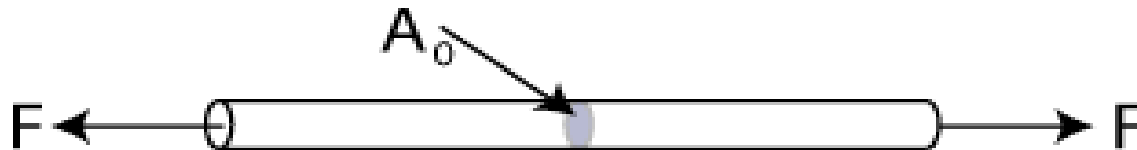
Strength of materials, also called **mechanics of materials**, is a subject which deals with the behavior of solid objects subject to stresses and strains.



STRESS



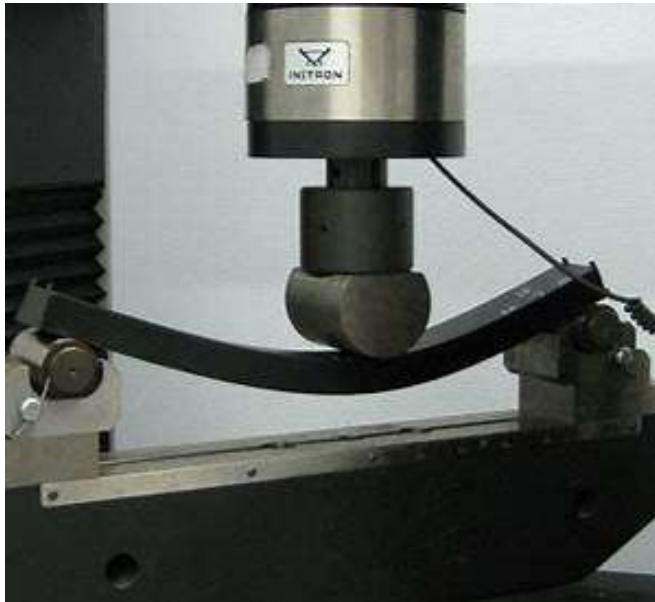
Stress is defined as the resistance force acting per unit cross section area of the component



$$\text{Stress, } \sigma = \frac{\text{Force}}{\text{Cross-Sectional Area}} = \frac{F}{A_0}$$

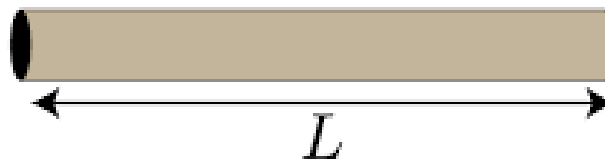


STRAIN



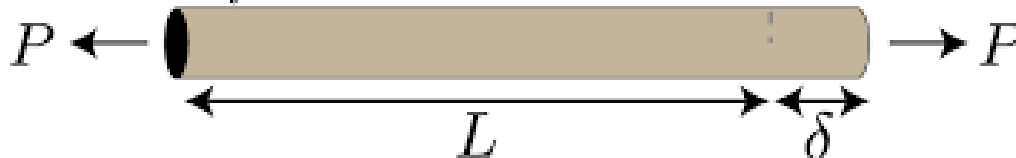
Strain is the response of a system to an applied stress. When a material is loaded with a force, it produces a stress, which then causes a material to deform.

a. Rod



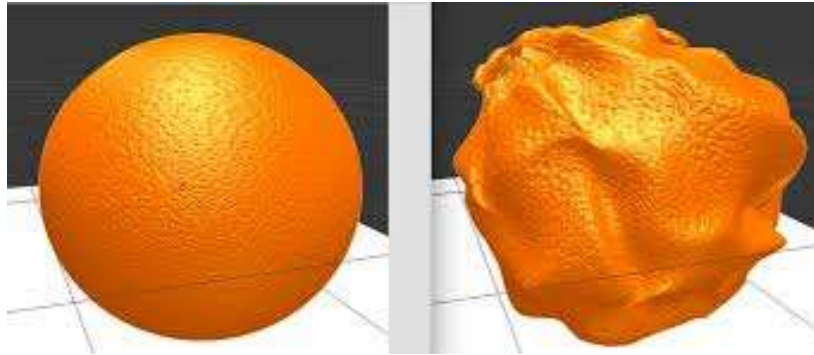
$$\text{Strain} \\ \varepsilon = \frac{\delta}{L}$$

b. Uniaxially Loaded Rod





DEFORMATION



In materials science, deformation refers to any changes in the shape or size of an object due to an applied force or a change in temperature



Types of Loads

In the mechanics of the deformable bodies, the following types of loads are commonly considered:

- Dead loads—static in nature, such as the self-weight of the roof.
- Live loads—fluctuating in nature, do not remain constant- such as a weight of a vehicle moving on a bridge.
- Tensile loads.
- Compressive loads.
- Shearing loads.