***Mechanics of materials is a branch of mechanics that studies the internal*** effects of stress and strain in a solid body that is subjected to an external loading.

Mechanics of materials is a study of the relationship between the external loads on a body and the intensity of the internal loads within the body.

Stress is associated with the strength of the material from which

the body is made, while strain is a measure of the deformation of the body.

Homogeneous material has the same physical and mechanical properties throughout its volume

isotropic material has these same properties in all directions.

* The elongation or contraction of a line segment per unit of length is referred to as ***normal strain.***
* ***Nominal or engineering stress is obtained by*** dividing the applied load *P by the specimen’s original* cross-sectional area.
* N***ominal or engineering strain is obtained by*** dividing the change in the specimen’s gauge length by the specimen’s original gauge length.

**Ductile Materials**

* A material subjected to large deformations/strains before it fractures is called a *ductile material. (Metals)*

**Brittle Materials**

* A material that exhibits little deformation or no yielding before failure is referred to as *brittle material. (Glass, concrete, ceramic)*
* It does not have well-defined yield point, thus it is *standard practice to define its yield strength using a graphical procedure called* ***the offset method.***

**Hooke’s law**

“**for relatively small deformations of an object, the displacement or size of the deformation is directly proportional to the deforming force or load”**.

**Strain Hardening**

* When a ductile material is loaded into the *plastic region and then unloaded, elastic strain is recovered.*
* **Modulus of Resilience (***ur***)**
* It is the maximum amount of energy per volume that a material can absorb while elastically deforming.
* **Modulus of Toughness (*ut*)**
* **It** is the ability of a material to absorb energy in plastic deformation. It is defined as the amount of strain energy density (strain on a unit volume of material) that a given material can absorb before it fractures.
* **Creep**
* When material support a load for long period of time it will deform until a sudden fracture occurs.
* **Fatigue**
* When metal subjected to repeated cycles of stress or strain, it will ultimately leads to fracture.