MECHANICAL PROPERTIES OF SOLIDS MINDMAP.

Stress and Strain :→

→ **Elasticity**: property of body due to which it tends to regain its original shape and size.

→ **plasticity**: property due to which body does not regain it original shape and size.

→ **Stress**: The restoring force per unit area. $\sigma = \frac{F}{A}$

→ **Strain**: Change in configuration per unit original configuration.

$$\text{Longitudinal Strain} = -\frac{\Delta L}{L} \qquad \text{Volumetric Strain} = \frac{\Delta V}{V} \qquad \text{Shearing Strain} = \frac{\Delta x}{L} = \tan\theta \simeq \theta$$

Hooke's Law :—

For small deformations:

Stress $\propto$ Strain

Stress = K × strain

K = modulus of elasticity.

Poisson's Ratio :—

$$\nu = \frac{\text{Lateral strain}}{\text{Longitudinal strain}}$$

• Important Relations—

$$Y = 3B(1-2\nu)$$

$$Y = 2\eta(1+\nu)$$

$$Y = \frac{9B\eta}{\eta + 3B}$$

Energy Stored in a Stretched Wire :→

$$E = \frac{1}{2} \times \text{stress} \times \text{strain} \times \text{Volume}$$

Stress – Strain Curve :—

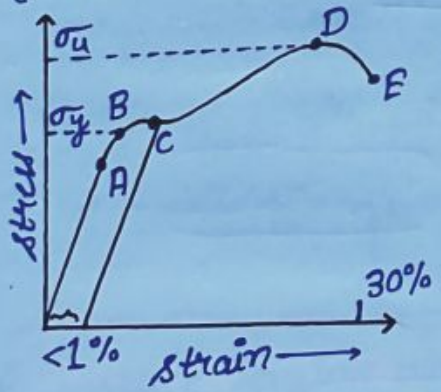
A = Proportional limit.

B = Yield point

E = Fracture point.

σ_u = Yield strength

σ_y = Ultimate Tensile Strength



→ If D and E are close – Brittle Material.

→ If D and E are far apart – Ductile Material.

Elastic Moduli :→

1). Young's Modulus of Elasticity:

$$Y = \frac{\text{Tensile or compressive stress}}{\text{Longitudinal strain}}$$

$$Y = \frac{\sigma}{\varepsilon} \qquad Y = \frac{FL}{A\Delta L}$$

2). Shear Modulus:

$$\eta = \frac{\text{Shearing stress}}{\text{shearing strain}} = \frac{F}{A\theta}$$

3). Bulk Modulus:

$$B = \frac{\text{Hydraulic stress}}{\text{Hydraulic Strain}} = \frac{-P}{\Delta V/V}$$

NEET SLAYER