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→ Stress = $\frac{\text{Force}}{\text{area}}$ → $\frac{N}{m^2}$, $\frac{lb}{in^2}$

(SI , US)

* normal Stress :

$$\sigma = \frac{P}{A}$$

* tensile stress. (+)

* Comperessive stress. (-)

→ Strain

* normal Strain :

$$\varepsilon = \frac{\Delta L}{L}$$

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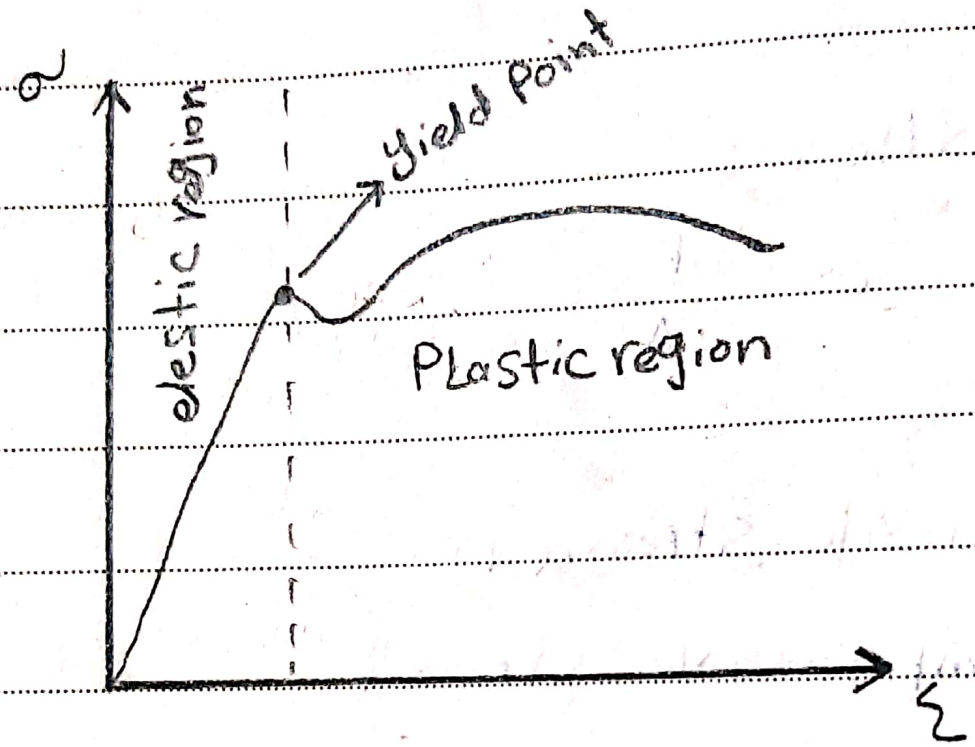
→ Stress - Strain diagram:



→ HOOKE'S Law:

$$\sigma = E\,\varepsilon$$

↙ Young's modulus

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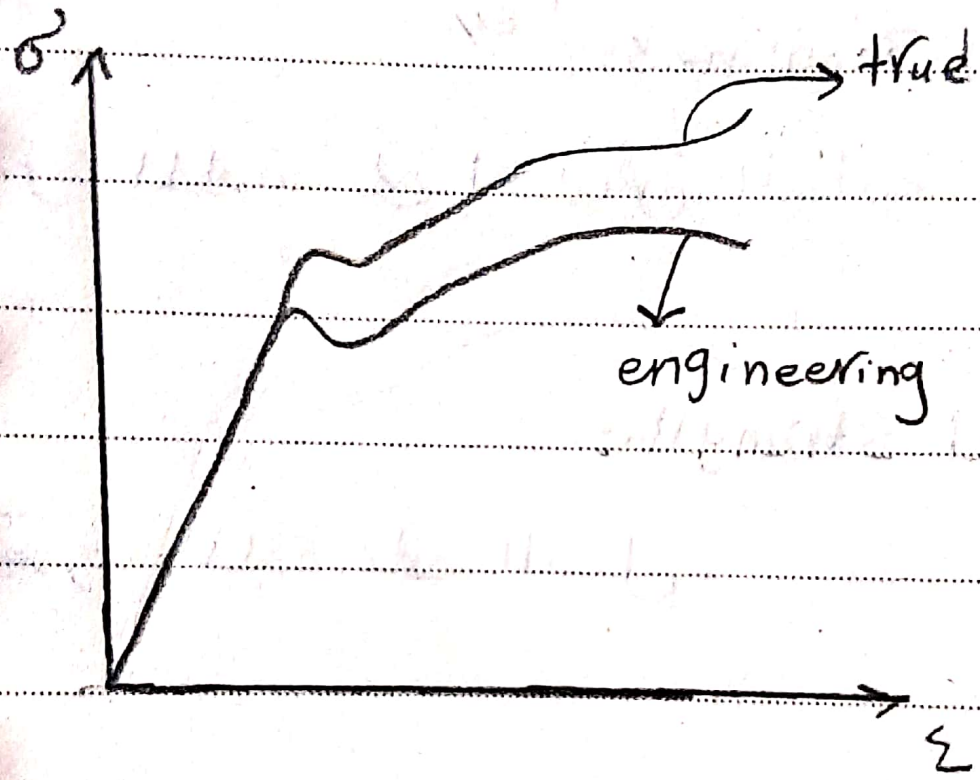
→ Shear Stress :

$$\tau = \frac{F}{A} \quad , \quad \tau = G\gamma$$

Hooke's Law



$$\sigma_t = \frac{P}{A} \quad , \quad \sigma_t = \sigma_e (1 + \varepsilon_e)$$

$$\sigma_e = \frac{P}{A_o} \quad , \quad \varepsilon_t = \ln (1 + \varepsilon_e)$$

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* Material Ductility:

قدرة المادة على التشوه اللدن قبل الإنكسار.

* Material Toughness:

قدرة المادة على إمتصاص الطاقة حتى تنكسر.

* Material Strength:

قدرة المادة على التحمل.