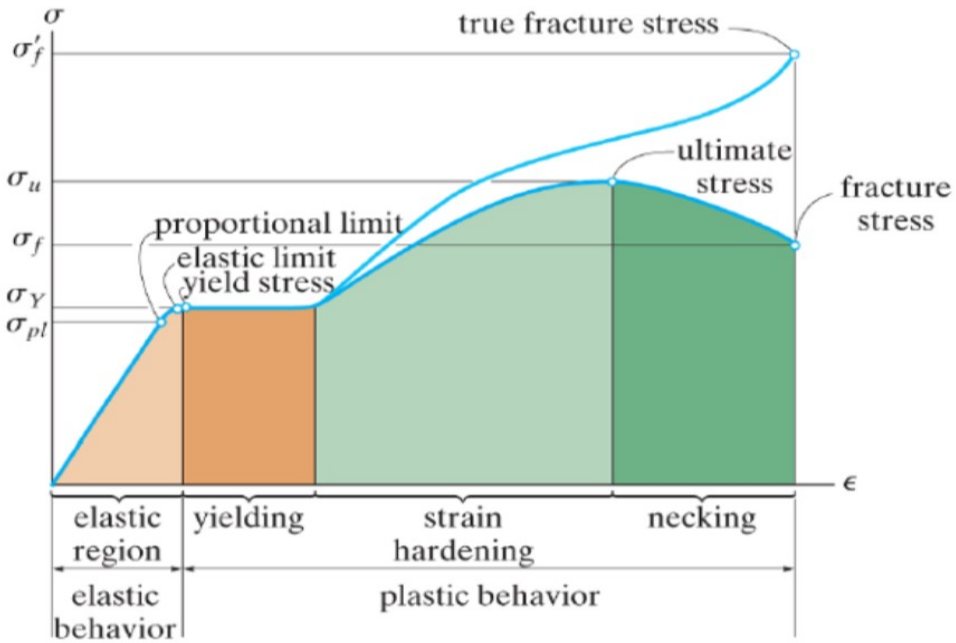
Stress-strain program



Conventional and true stress-strain diagrams for ductile material (steel) (not to scale)

Elastic behavior

- A straight line
- Stress is proportional to strain
- Upper stress limit σ_{pl}
- If load is removed upon reaching the limit, specimen will return to its original shape

Yielding

- Material deforms permanently (plastic deformation)
- Yield strength σ_Y
- Once the load is removed, specimen continues to elongate without any increase in load
- Materials referred to as being perfectly plastic
- The *torsional force* cause **the slip line**

Strain hardening

- Ultimate stress σ_u
- While specimen is elongated, its x-sectional area will decrease
- Decrease in area is fairly uniform over entire gauge length

Necking

- At ultimate stress, x-sectional area begins to decrease in a localized region
- Specimen finally breaks at fracture stress σ_f