ME-2104 ENGINEERING MATERIALS LAB

EXPERIMENT: 1

TENSILE TEST

SUBMITTED BY:

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TENSILE TEST

- **OBJECTIVE**

  To estimate the mechanical properties of materials (Aluminium) using a Universal Testing Machine.

- **APPARATUS REQUIRED**

1. Universal Testing Machine (UTM): A tensile test on a UTM involves a hydraulic pump, oil sump, and load dial indicator. The machine has adjustable crossheads for gripping the specimen, which are moved by oil pressure through connecting pipes.
2. Strain gauge: A strain gauge measures an object's deformation by detecting changes in electrical resistance, which are used to calculate the strain when the object is stressed.
3. Vernier Calliper: A Vernier calliper is a tool for measuring dimensions with high accuracy using a primary and sliding scale.

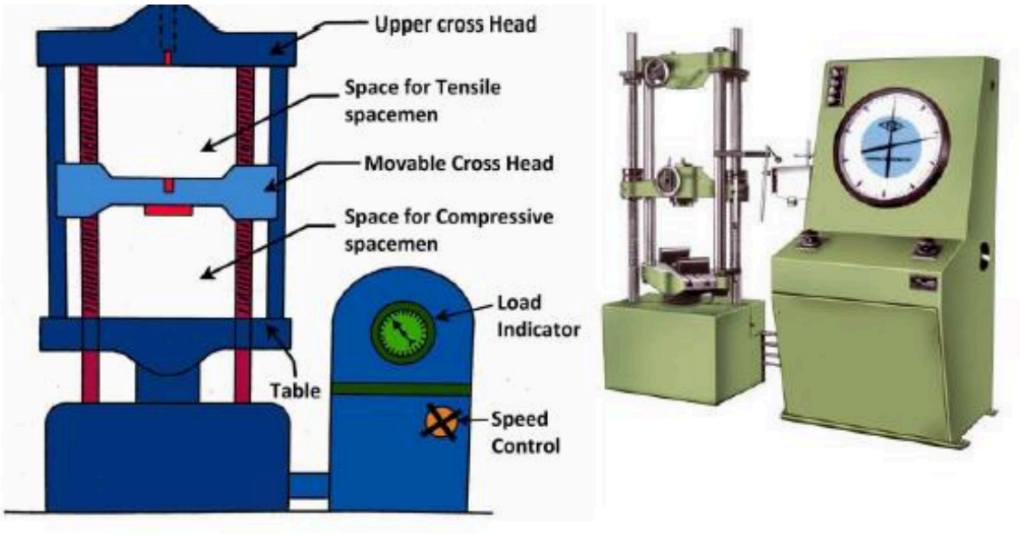


Fig. 1. UTM machine and its parts

• SOME BASIC FORMULAE

Engineering stress, $\sigma = \frac{F}{A_0}$

Engineering strain, $\varepsilon = \frac{\Delta L}{L_0}$

For Yield strength offset line 0.2 % of strain

True stress, $\sigma_t = \sigma\,(1 + \varepsilon)$

True strain, $\varepsilon_t = ln\,(1 + \varepsilon)$

Holloman's equation:

$\varepsilon = \varepsilon_e + \varepsilon_p \qquad \sigma = K(\varepsilon_p)^n$

Where,

σ = stress, ε = strain

F= Load applied

A_o = Initial area = $\frac{\pi}{4} {d_o}^2$

ε_p = plastic strain

ε_e = elastic strain

K = strength coefficient

n = strain hardening exponent

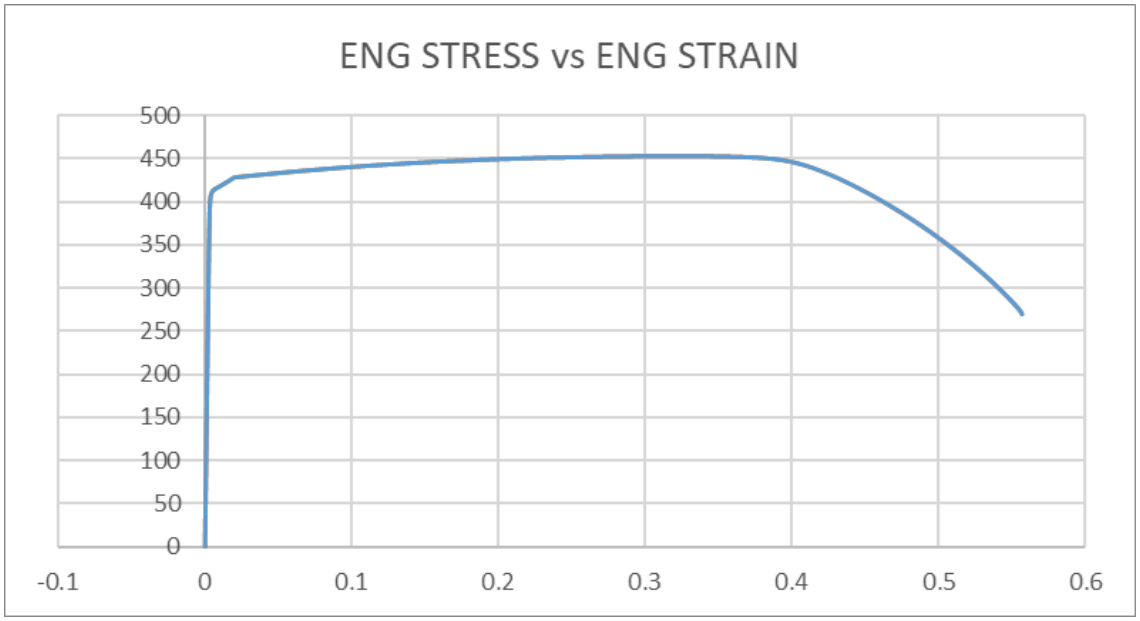
• OBSERVATIONS

- Machine used (make and model) =
- Workpiece Materials =
- Cross-head velocity (mm/s) =
- Initial diameter of specimen d1/Thickness =
- The initial gauge length of specimen L1 =
- The initial cross-section area of specimen A1 =
- Load of yield point Ft =
- Ultimate load after specimen breaking F =
- Final length after specimen breaking L2 =
- Diameter Of specimen at breaking place d2 =
- Cross section area at breaking place A2 =

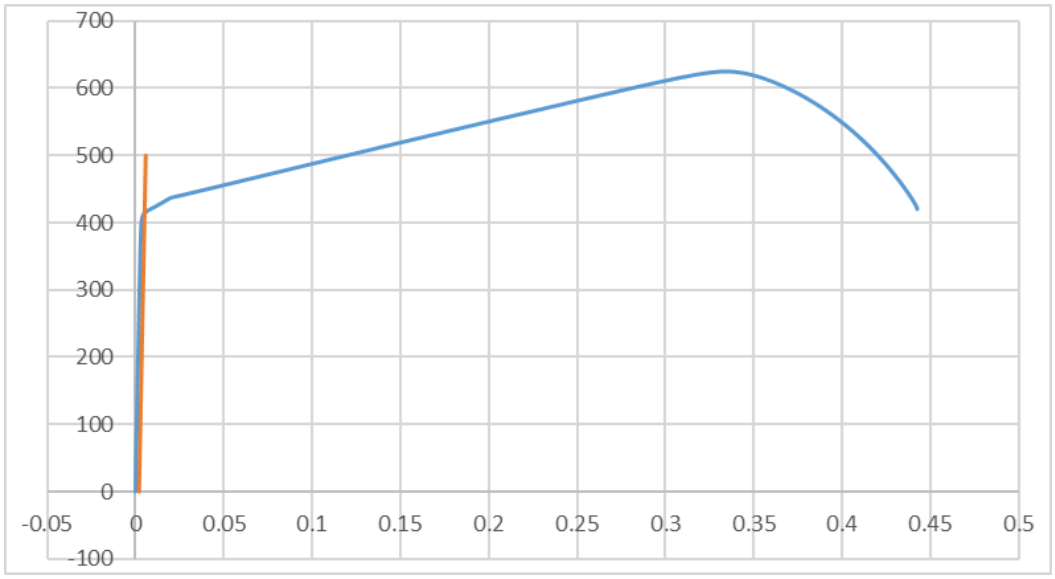
Mechanical Property	Aluminium
Young modulus (MPa)	
Yield stress (MPa)	
Ultimate Tensile Strength (MPa)	
Strain hardening exponent	
Toughness (J/mm3)	
Resilience (J/mm3)	

- **GRAPHS**

1) ENG STRESS vs ENG STRAIN

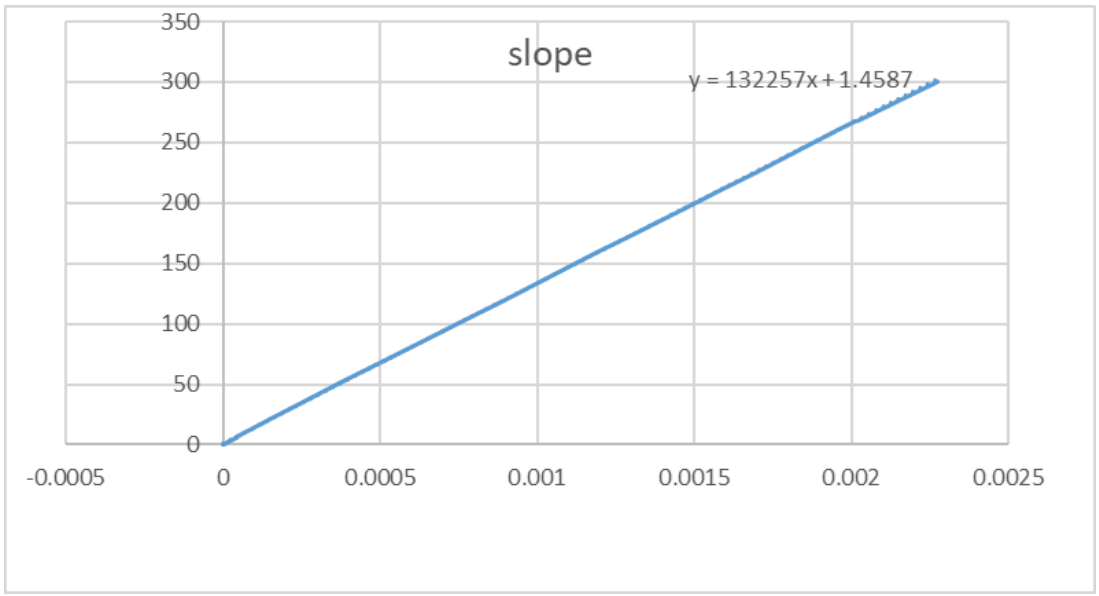


2) TRUE STRESS vs TRUE STRAIN



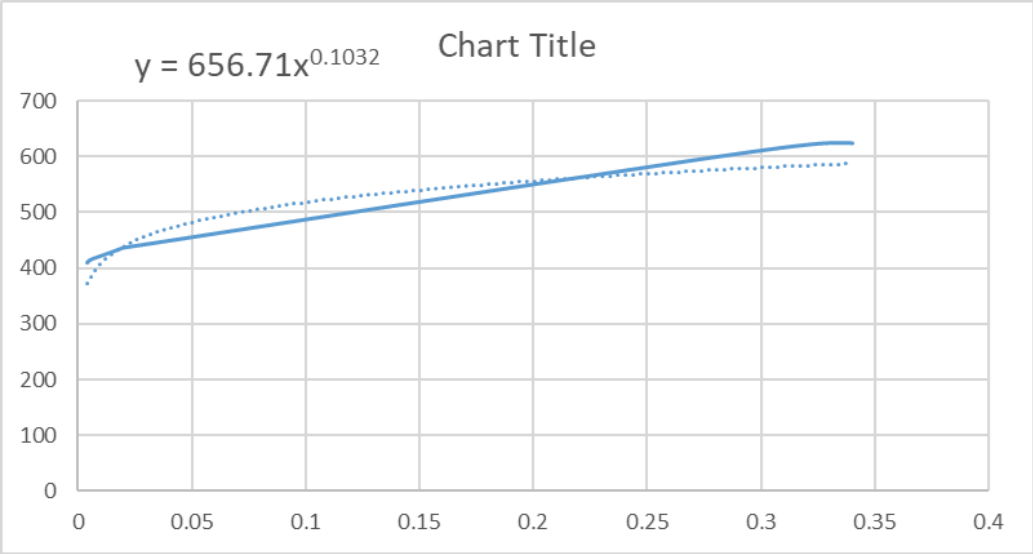
Yield Point : (0.0051, 409.15)

3) SLOPE DETERMINATION GRAPH



Slope = 132257

4) VALUE OF N



N = 0.1032