ME218 - Solid Mechanics Lab

Student Design Experiment Group : **S2G9**

Members: Eknoor Singh, Balbir Yadav, Rushikesh Bhor, Dinesh Dabi

---

1. **Objective**

   (a) To find the critical buckling load of an axially loaded mild steel column that is fixed-ended by studying the axial compression vs. lateral displacement plot at the centre.

   (b) To compare the effect of boundary condition (fixed-ended column vs pin-ended column) on critical buckling load

2. **Experimental plan**

   (a) First, measure the geometric dimensions of the specimen columns used.
   (b) Then, fix it in the Universal Testing Machine between the end supports.
   (c) Apply the compressive load axially, noting the behaviour at all points.
   (d) Observe and note the critical buckling load from the Univeral Testing Machine and measure lateral displacement of the mid-point using a LVDT.
   (e) Repeat the test for both the support conditions (fixed-ended and pin-ended)

3. **Analysis to be performed**

   Calculate slenderness ratio, critical loads, maximum lateral displacement for both support conditions, i.e. fixed and pinned.

4. **Expected outcomes**

   (a) The lateral deformation at the mid point is expected to rise steadily till the critical buckling load and then sudden bending/buckling takes place

   (b) The theoretical critical buckling load for column is $P_{cr,ideal} = \frac{\pi^2 EI}{{L_{eff}}^2}$

   (c) Since $L_{eff,fixed} = \frac{L_{eff,pinned}}{2}$, $P_{cr,fixed}$ should be 4 times of $P_{cr,pinned}$.