

**Lab – 4**  
**Principal axes of a given cross-section in a thin walled beam**

**Objective:**

To determine the principal axes and the orientation of principal planes of an L section beam.

**Procedure:**

- i) Measure the thickness of the web and flange of the L section. Also measure the length of the flange and the height of the web to determine the values of  $I_{zz}$ ,  $I_{yy}$ ,  $I_{yz}$ .
- ii) Adjust the dial gauges to remove any zero error while supporting the pans with your hands to have the no load initial setup.
- iii) Fix the y-direction load  $P_y$ , and for some random z-direction load  $P_z$ , note the beam deflections  $\delta_y$  and  $\delta_z$ .
- iv) Increase the loads in each of the pan and calculate the ratio of loads and the ratio of deflections produced. They should be almost equal i.e., the difference between these two ratios should be very small.
- v) Repeat the steps above for different values of  $P_y$  and  $P_z$ .

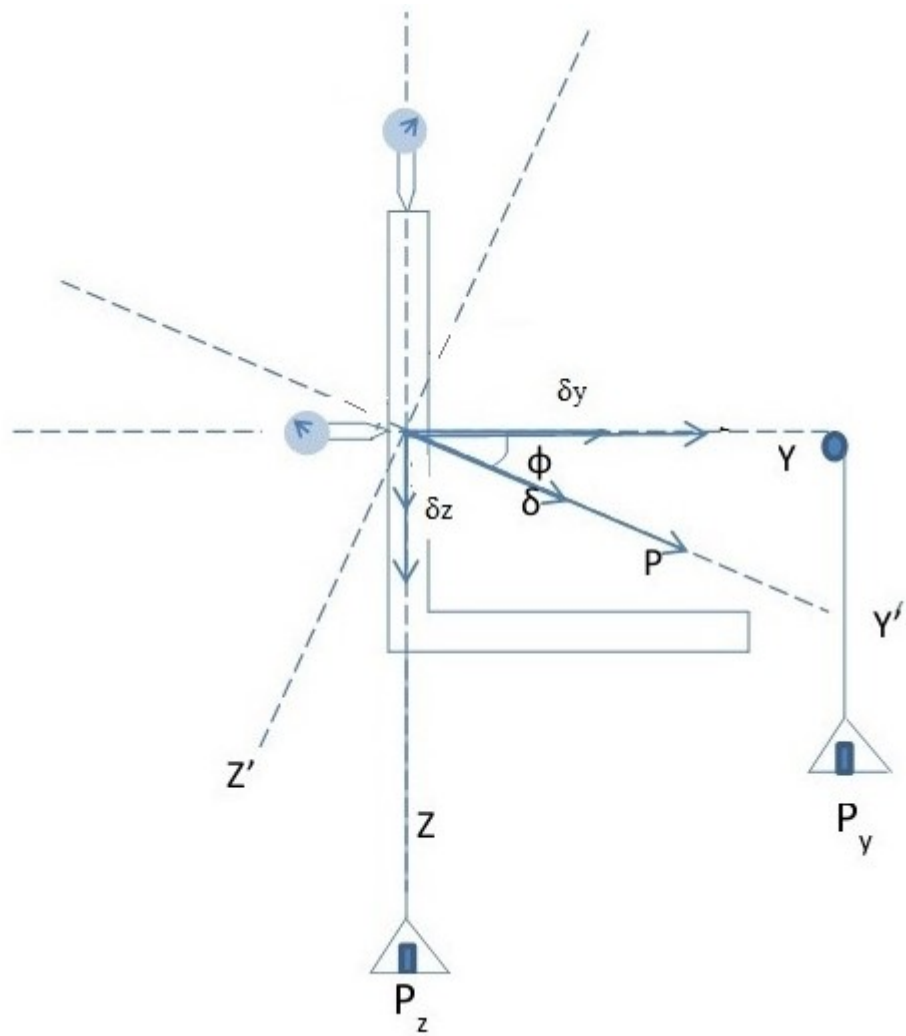
**Equations:**

Theoretical  $\tan 2\phi = \frac{-2I_{yz}}{I_{yy} - I_{zz}}$

Experimental

$$\tan \phi = \frac{P_y}{P_z} = \frac{\delta_y}{\delta_z}$$

**Experimental Setup**



**Tabulation:**

Sl.No.	$P_y$ (kg)	$P_z$ (kg)	$\delta_y$ (mm)	$\delta_z$ (mm)	$P_y/P_z$	$\delta_y/\delta_z$