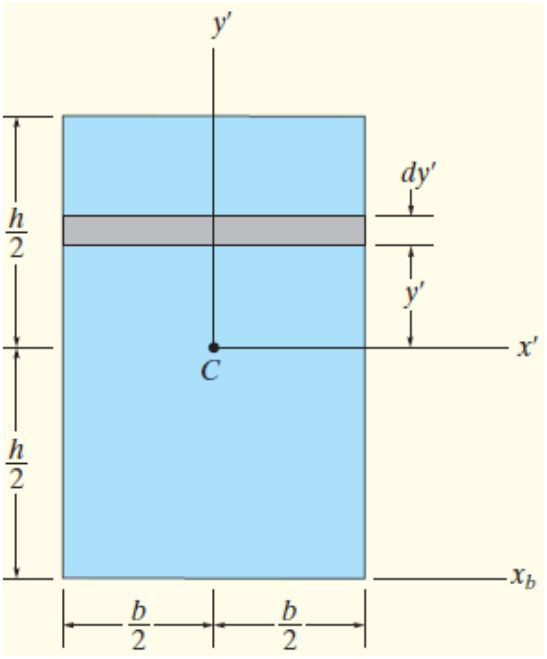
Academic year 2024/2025

2nd Year **Mechanics of Materials (Material Strength)**

T.D N° 3 (Axial and Polar Moments of Inertia)

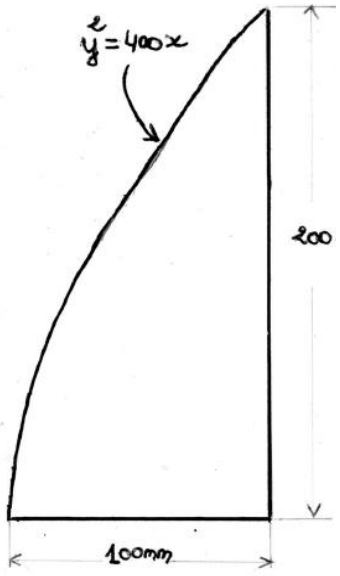
Problem 1 : (rectangular area)

1) Determine the moment of inertia for the rectangular area shown below with respect to :
(a) the centroidal *x*' axis using direct integration of an horizontal strip,
(b) the axis $x_b$passing through the base of the rectangle using direct integration,
2) Determine the polar moment of inertia about the centroid C. (the pole or *z*' axis is perpendicular to the *x*' – *y*' plane and passing through the centroid *C*).



Problem 2 : (irregular area)

Determine the moment of inertia I with respect to the x axis lying on its base.(base = 100 mm, h = 200 mm, $y^2 = 400.x$)
Choose the appropriate rectangular differential element (strip)

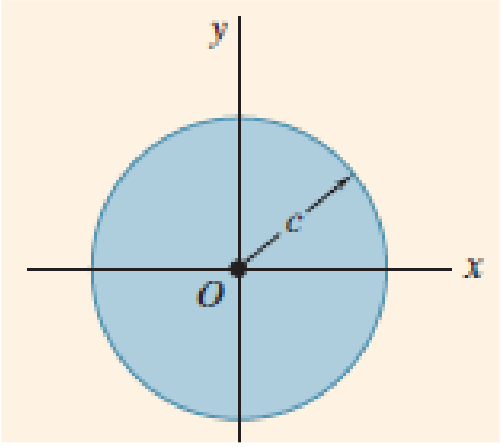


Problem 3 : (Parabolic Spandrel)

For the parabolic spandrel used in Problem 3 (TD 2). Using the appropriate differential element for each case, determine :
a) The moment of inertia about the x axis (I_x).
b) The moment of inertia about the y axis (I_y).

Problem 4: (circular area)

For this circular area, determine:
(a) the polar moment of inertia I_p or J_O,
(b) the rectangular moments of inertia I_x and I_y.



Problem 5 : (composite area)

Without doing integration, Calculate the moments of inertia I_x and I_y with respect to the x and y axes for the L-shaped area shown in Fig.

Problem 6: (composite area)

A semicircular area of radius 150 mm has a rectangular cutout of dimensions (see figure).
Calculate the moments of inertia I_x and I_y with respect to the x and y axes.