



Mechanics of Materials I:

Fundamentals of Stress & Strain and Axial Loading

Dr. Wayne Whiteman

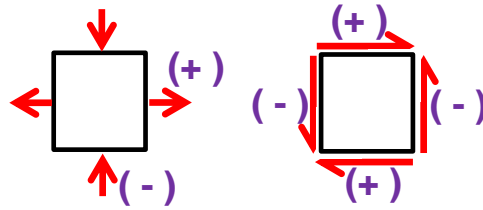
Senior Academic Professional and Director of the Office of Student Services
Woodruff School of Mechanical Engineering

Module 25 Learning Outcome

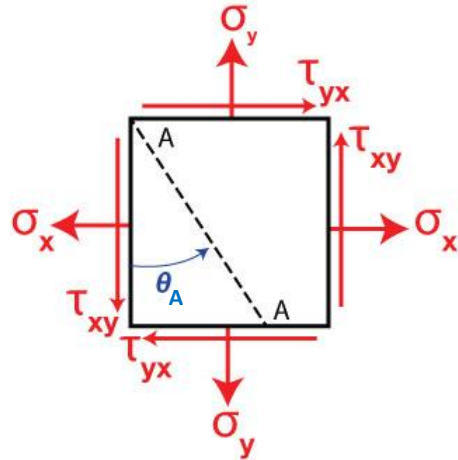
- For a given set of plane stress conditions, determine the stresses on any given plane at a point using Mohr's Circle

Mohr's Circle

$$\left(\sigma_n - \frac{\sigma_x + \sigma_y}{2} \right)^2 + (\tau_{nt} - 0)^2 = \left(\frac{\sigma_x - \sigma_y}{2} \right)^2 + \tau_{xy}^2$$



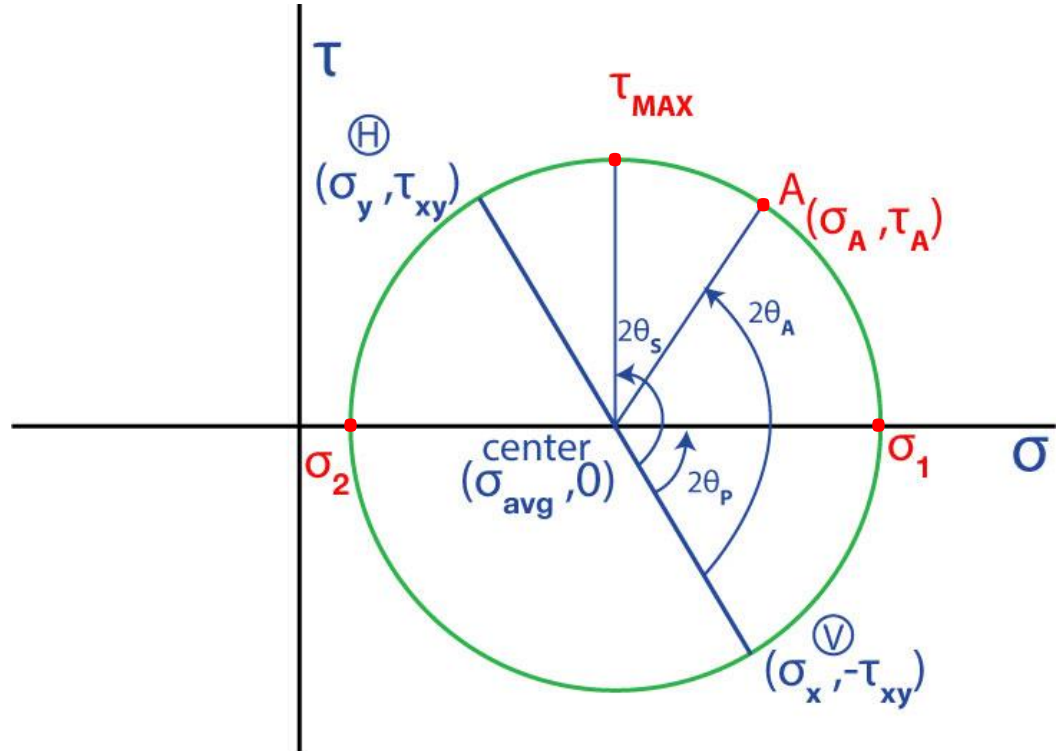
Radius = $\sqrt{\left(\frac{\sigma_x - \sigma_y}{2} \right)^2 + \tau_{xy}^2}$ Center: $\left(\frac{\sigma_x + \sigma_y}{2}, 0 \right) = (\sigma_{AVG}, 0)$



Horizontal face

Vertical face

$$H = (+\sigma_y, +\tau_{yx}) \quad V = (+\sigma_x, -\tau_{xy})$$



Example

The stress block shown represents the stresses on two orthogonal planes through a point in a structural member. Using Mohr's circle, find:

- The principal stresses and the maximum shear stress at that point, and show the planes on which they act on a properly oriented stress block
- The normal and shear stresses on plane AA through the point on a properly oriented stress block

