Mechanics of Materials II:

Thin-Walled Pressure Vessels and Torsion

Dr. Wayne Whiteman
Senior Academic Professional and Director of the Office of Student Services
Woodruff School of Mechanical Engineering

Georgia Institute of Technology

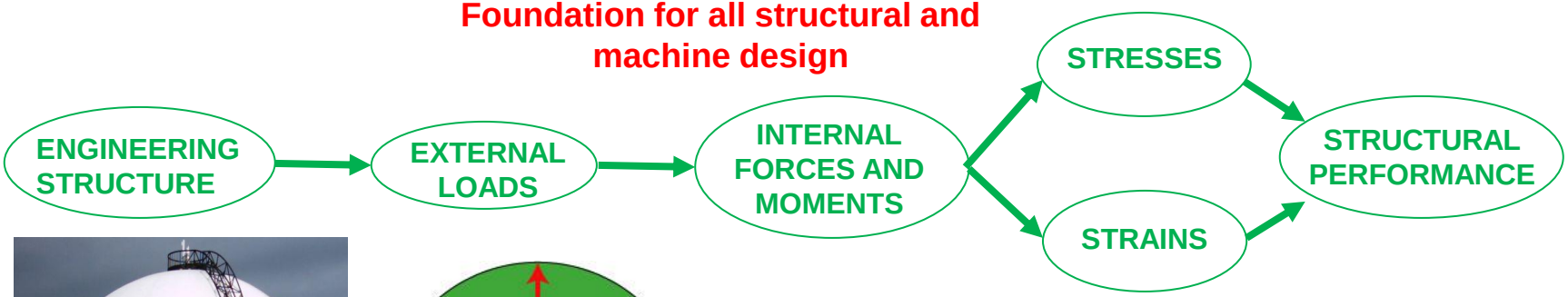
Module 6 Learning Outcome

- Develop an expression for longitudinal stress for a spherical thin-walled pressure vessel in terms of the pressure and the dimensions of the vessel

Mechanics of Materials

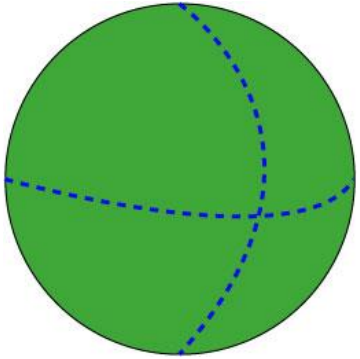
Georgia Tech

Foundation for all structural and machine design

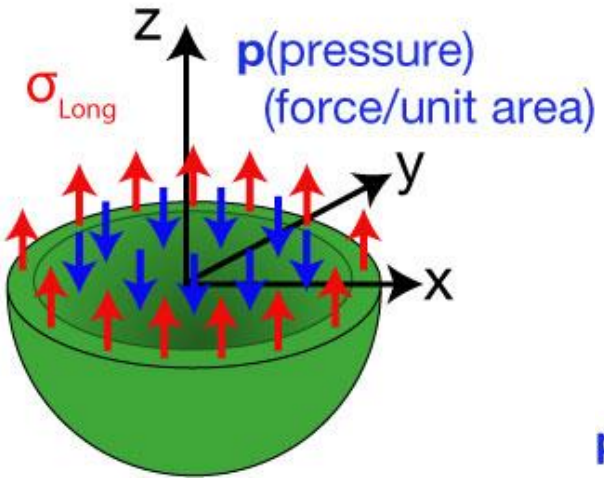


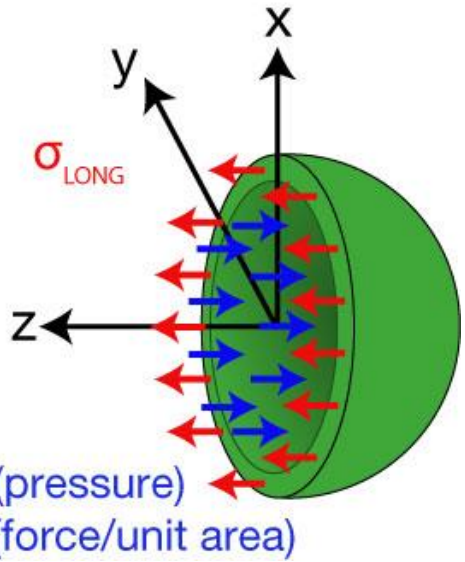
Spherical Thin-Walled Pressure Vessels

Let's again look at a section cut

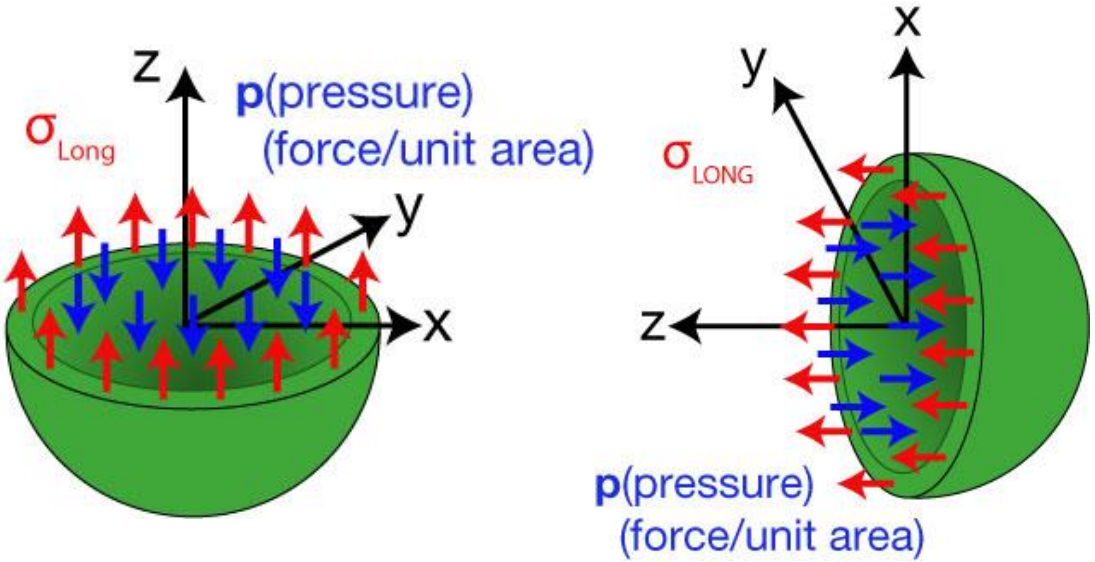


We will neglect the weight of the contents and the weight of the structure itself. These forces are generally many orders of magnitude less than the forces due to the internal pressure and the forces from the resulting stresses in the cross-section.





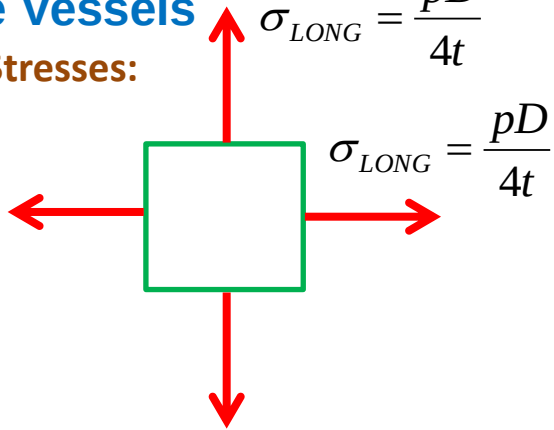
Spherical Thin-Walled Pressure Vessels



Thin-Walled Pressure Vessels

Spherical Stresses:

$$\sigma_{LONG} = \frac{pD}{4t}$$



$$\sigma_{LONG} = \frac{pD}{4t}$$

Mohr's circle for Plane Stress