[**3.4: Stress**](#_lshjj8zdvc4p) **3**

[**3.5: Cartesian Stress Components**](#_rjz17dxune11) **3**

[**3.6 Mohr’s Circle for Plane Stress (one face is z=0)**](#_46klyff4oxba) **3**

[**3.8: Elastic Strain**](#_cviohxr4pm4v) **4**

[**3.10: Normal stresses for beams in bending**](#_2wwr7cmche3v) **4**

[**3.12: Torsion**](#_w5ly4r7hmlp8) **5**

[**3.13: Stress Concentration**](#_alqrbebirl62) **6**

[**4.1: Spring Rates**](#_c99njj3aegql) **6**

[**4.2: Tension, Compression, and Torsion**](#_j1hvhoqnpl88) **6**

[**4.3: Deflection Due to Bending**](#_8b4req43z1h1) **6**

[**4.5: Beam Deflection by Superposition**](#_91qa4f3c2wqw) **6**

[**4.7: Strain Energy**](#_7y7gszx9ymk2) **6**

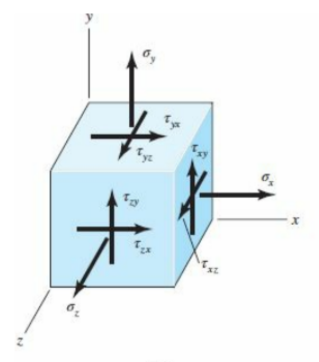
[**4.8: Castilgliano’s Theorem**](#_6zexwpsdbjel) **7**

* Stress
  + Recognize when a stress state corresponds to plane stress
  + Identify all the stresses at a point from different loadings
    - Axial
    - Normal due to bending
    - Shear due to bending
      * Transverse shear
        + Neglected for long, (l/d>10) and/or thick members
    - Torsion
  + Draw a Mohr’s circle
* Torsion
  + Compute shear stresses due to torsion
* Critical stress point
  + The ability to compute relevant stresses at different points in a structure and determine what is the critical point in the element
* Compute spring constant
  + And stiffness for axial and torsion
* Obtain deflection of a beam
* Use superposition
* Castigliano’s theorem
  + To compute deflection of a point
  + Be able to compute maximum deflection/slope for any location
  + Problem 4-58 is a good example

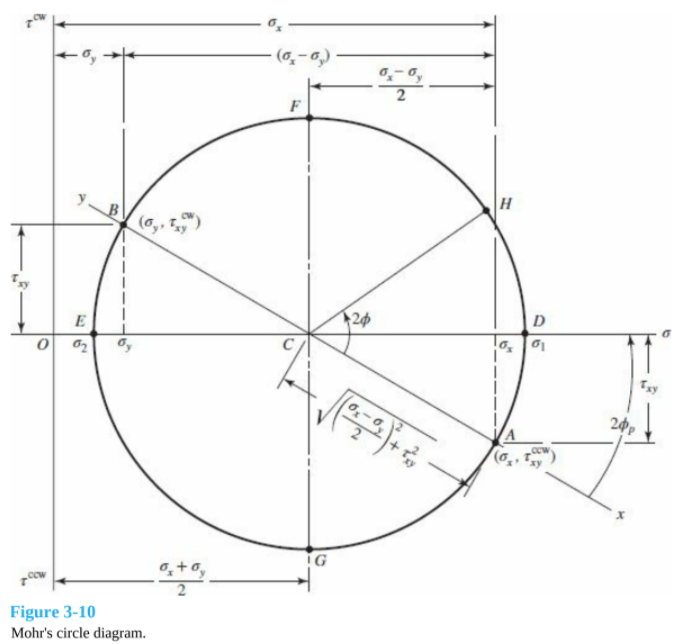
# 3.4: Stress

* + We have normal stress and tangential shear stress

# 3.5: Cartesian Stress Components

* + 
  + In order to keep equilibrium

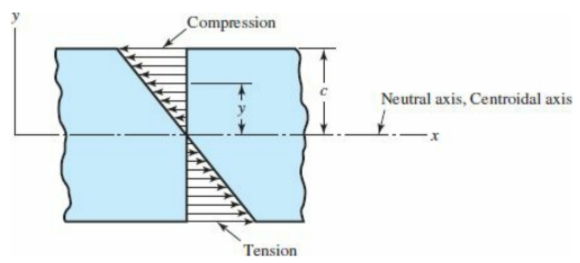
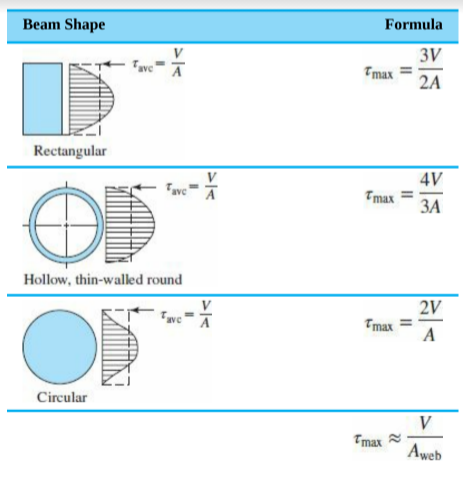
# 3.6 Mohr’s Circle for Plane Stress (one face is )

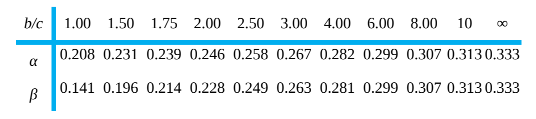
* + Center
  + Radius
  + Principle stresses:
    - Max stress: Center + Radius
    - Center - Radius
    - Radius
  + is a rotation of the element in the real world
    - rotation on mohr circle is in real world
    - is rotation to get to max shear
    - is rotation to get to principal stress plane
  + 

# 3.8: Elastic Strain

* + Hooke's Law
  + Poisson’s ratio
    - * Negative because positive tension causes swishing in other axis
    - If stress in all three planes

# 3.10: Normal stresses for beams in bending

* + 
  + 
* Shear stresses for beams in bending
  + Transverse shear stress from the vertical shear force

    - Max shear stress occurs along the neutral axis
    - For a rectangular cross section:
    - Last one in the table is for thin-walled I beams
  + Remember to do a mohr’s circle to find true maxes based off of element rotation
    - 

# 3.12: Torsion

* + Circular cross section
  + Rectangular cross section (), is longest side

# 3.13: Stress Concentration

* + Max stress around a geometric discontinuity
    - Table A-15

# 4.1: Spring Rates



# 4.2: Tension, Compression, and Torsion

* + Solid round bar

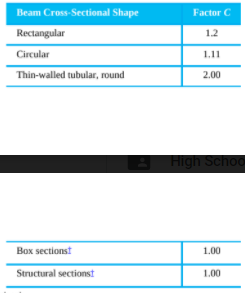
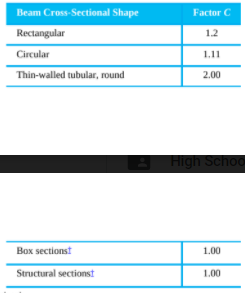
# 4.3: Deflection Due to Bending

* + Curvature:
  + Deflection:
  + Slope at end:
  + Moment:
  + Shear:
  + Load:

# 4.5: Beam Deflection by Superposition

* + Table A-9 has simple loadings

# 4.7: Strain Energy

* + Tension and compression ()
  + Torsion ()
  + Direct shear ()
  + Bending
  + Transverse Shear

# 4.8: Castilgliano’s Theorem

* + - is in direction and at the point we want to know deflection
  + Don’t forget chain rule with these partial derivatives
  + We already know under axial and torsion that
  + Tension and compression
    - * If for example the force was a function of another force happening in multiple directions, you take the partial with our direction in question because of chain rule
  + Torsion
  + Bending
    - * So if , Force times distance, then the partial derivative would be