Design Lab 2

- Draw FBD and then find reactions in both planes
- Draw BMD for both planes; find resultant BM for critical section
- Use von-Mises criteria and determine diameter d_1, then get $d_2 = 1.2d_1$

$$\sigma_{eq} = \sqrt{\left(\frac{4F}{\pi d_1^2} + \frac{32M}{\pi d_1^3}\right)^2 + 3\left(\frac{16M}{\pi d_1^3}\right)^2} = \frac{S_{yt}}{n_d}$$

- Neglect stress due to axial load (to simplify the math)
- **Choose standard size?, recalculate d_1, $r=(d_2 - d_1)/2$**
- **Now generate SN curve for the critical section and get S_f**

Design Lab 2

- Calculate SCF and Notch sensitivity and then get Fatigue SCF
- Apply these on the respective stresses
- Calculate von-Mises stress for mid-range and amplitude part
- Using MGL approach, calculate S_a, check if $n_f = \frac{S_a}{\sigma'_a} \sim 2$
- If not re-design

$$\left(\frac{d_1^{new}}{d_1}\right)^3 = \frac{\sigma'_a}{(\sigma'_a)_{new}};\ (\sigma'_a)_{new} = \frac{S_a}{n_d}$$

- **Choose standard size for d_2; Recalculate all SCFs and notch sensitivities to get Fatigue SCF**
- **Generate SN diagram (as size factor will change now), then check if $n_f \sim 2$**