

# Project 3

Due 20 Nov 2020

Dr. Smith is now convinced he wants to install a St. Peter's Cross mechanism with his leg vise, but he wants to size the pieces to limit the bending deflection. This project will build off the analysis already performed in Projects 1 and 2, for those who desire, past analysis may be repeated to recover some of the points lost.

- Past project point recovery
  - Assume Dr. Smith applies a force of 20 lbs at the end of the screw handle.
  - You may choose appropriate dimensions and parameters as needed (for example: handle length and screw pitch).
  - **Hint:** Use simple physics principles (i.e. work done, mechanical advantage) to determine the force in the screw exerted. Formulas that you find via Google will be needlessly complicated (friction effects may be neglected).
  - Relate the force applied on the handle to force in the vise screw (up to 10 points recovery possible)
  - Perform statics analysis on the vise chop with a St. Peter's Cross to find forces in the vise screw, workpiece, and in the St. Peter's cross mechanism (up to 20 points recovery possible)
  - Calculate the bending moment in the St. Peter's cross mechanism (up to 15 points recovery possible)
- Design the St. Peter's Cross members such that under the loading case designed for they deflect no more than 0.5 in. Compare at least three different beam designs (cross-sections) in your analysis (70 points)
- Do the stresses and displacements you have found seem reasonable for your chosen materials? What surprised you in your analysis? (20 points)
- Your overall presentation quality (legibility, professionalism, grammar) will also be worth 10 points