Laboratory $^{\#}$4 Design Optimization

March 7 – March 21

Objectives

- Enhancing solid mechanics analysis tool in NX
- Familiarizing with NX Menus
- Learning the Design Parameter Optimization Using the FEA Function of NX
  - ◊ Defining a Design Optimization Problem:
    1) Introducing Design Objective
    2) Specifying Design Variables and Their Bounds
    3) Specifying Design Constraints
    4) (Determining Search Parameters)
  - ◊ Result interpretation.

Instructions

1. Download the the NX optimization menus instruction and familiarize with them

2. Design a single component as by drawings in Fig. 1.

3. Perform a solid mechanics analysis using the boundary conditions defined in Fig 2. Use Aluminum 6061 properties.

4. Run an optimization analysis with stress minimization as objective function. Set the notch diameter as your parameter in the range between 0.1 in and 0.8 in and starting point of 0.125 in. Also, set the maximum stress constraint to…….

5. Using the   optimized value for the notch diameter perform another optimization this time with the objective function minimizing the mass of the bracket. Also, the design variable is the bracket thickness. Set the range of values between 0.3 in and 1.5 in, starting at 1.5 in. Your constraint should still be the maximum allowable stress of…….

6. Do you think a global minimum optimization algorithm would be a better choice for such an analysis, or seeking for a local minimum would be sufficient? Why? Present your results and comment on the experience
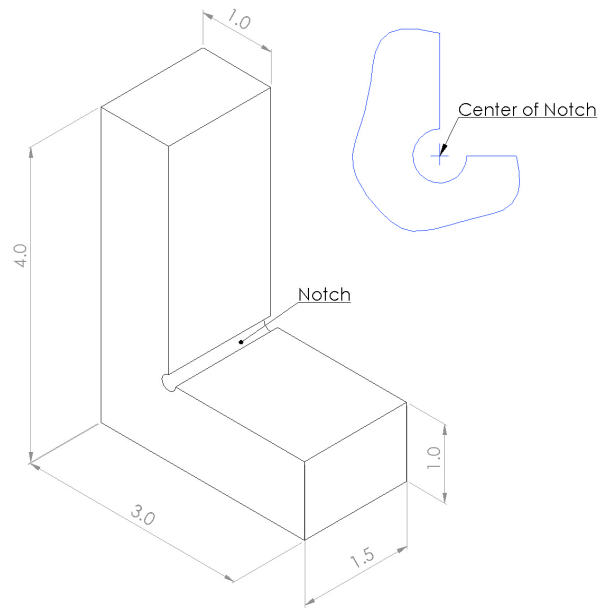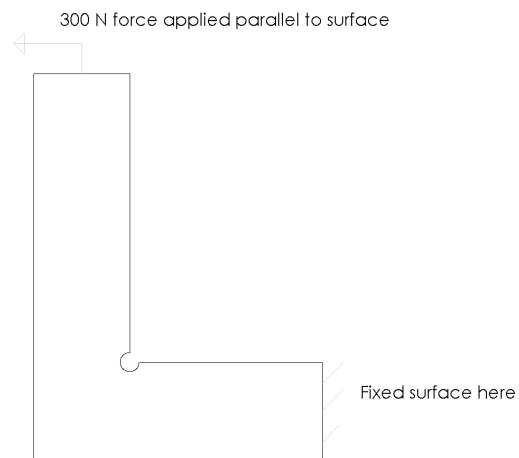
Figure 1 Part Dimensions

Figure 2 Loading Force

7. Write a Laboratory Report (with images of results) in the usual format.