FEA workshop

For the FEA Workshop you will complete five Solidworks Simulation[1] tutorials and produce an individual report. You will, of course, be learning to use the SolidWorks software, but the main goal is to gain some insights into FEA modeling. Thus, your report should focus on the fundamentals of the modeling much more than the mechanics of using Solidworks. The report should contain five sections, one for each tutorial. Each section should focus on the element of FEA identified in its description. Your report should include graphs and screen shots as necessary to prove you are competent on the tutorials and support your answers to the questions.

Due: 4 November 2020

Submission: Submit your workshop as a single pdf file, following the naming convention "me481-2020f-feaworshop-lastFirst.pdf" (example: me481-2020f-feaworshop-doeJohn.pdf), to your respective Laulima Assignments Tab.

Topic: Mesh size and convergence
Model: Hook

Discuss the effect of mesh size on simulation time (quantitatively) and accuracy. In addition to running the model with a default mesh size and the finest mesh size, as in the tutorial, also run the model at the coarsest mesh size. Keep track of the minimum factor of safety (FOS_min) to three decimal places for all three mesh sizes. (e.g. course = 7.xxx, default = 7.xxx, fine = 7.xxx) and produce your own convergence plot using these three values (i.e. don't use the Solidworks tools to create the convergence plot, rather plot these values yourself). Compare your results to several of your peers and comment on significance.

Topic: Material model
Model: AW Control Arm

Discussion the material library and specifically the types of material models available (e.g. isotropic, orthotropic, etc.). How many material properties fully define the "orthotropic" material model for structural simulations?

1 - Note: If you are having trouble accessing some capabilities, try using *Solidworks Simulation* **not** *Solidworks SimulationXpress*.

Topic: Symmetry
Model: AW Anchor Plate

Discuss the ways to increase the accuracy **and/or** reduce the solution time with symmetry. Perform analysis on the model using symmetry and compare the results quantitatively. Is the minimum factor of safety the same? Is it in the same place? Is the solution time the same? What exactly is the symmetry boundary condition? (i.e. what degrees of freedom does it constrain?)

Topic: Boundary Conditions and Sanity Check
Model: AW Spider

Quantitatively discuss the importance of boundary conditions. Develop bounds for the expected results (i.e. "hand" estimates). Compare your results? Is the solution consistent? Believable?

Topic: Load Conditions
Model: AW Link

Follow the tutorial's suggested loading conditions, but also carefully read the description of how the part is used and, if necessary, change the load conditions to better model the part's use condition. Quantitatively discuss the results. Do the changes significantly affect the expected failure rate of the part?