Introduction to Computer-Based Structural Analysis

(Used in Structural Mechanics Course)

Purpose

In this project, students will compare computer analysis techniques with traditional analysis techniques learned in class.

Learning Objectives

Students will gain hands-on experience utilizing computer applications to analyze structures. Students will also compare the results of their computer analyses with analyses conducted using hand-calculations in order to learn about the similarities and differences in the two different analysis methodologies. Finally, students will present their problem they analyzed and their results comparison to the class.

Overview

Students will choose between two different analysis programs. The first analysis program option is called PocketStatics. This program is available as a free resource and has the capability to analyze 2D beam, truss, and frame structures, such as those students have analyzed in class. The second program is SAP2000 Student Edition.

Project Steps

1. Select a problem from the HW problems completed during the semester. Problems should be challenging enough as to provide some modeling effort, but not too overly complicated as to get lost in the details. Submit your problem for review.
2. Once your problem has been approved, select the analysis tool that you will be using. There are two analysis program options available to use for this project both are available on the NEEShub (nees.org): PocketStatics and SAP2000 Student Edition. Students will need to register on NEEShub in order to access these resources.
3. Conduct hand calculations to analyze the structure you have chosen. Submit the results if verification of the answers are needed.
4. Model your structure using the selected program and run the analysis. Utilize the hand calculations as a guide for refining your model.

5. Once you are satisfied with the analysis results, prepare a deflected shape plot, reaction plot, shear diagram, and moment diagram based on the results of the computer analysis.
6. Prepare a presentation that provides an overview of the problem analyzed. Outline the steps you took in the analysis. Include a comparison of the results of the analysis conducted utilizing the selected computer program and your hand-calculated analysis. The comparison should focus on similarities and differences in the results. If there are differences, some discussion as to the cause of the differences should be included. The target duration for the presentation is 10 minutes.
7. Deliverables to be submitted: Copies of your hand-calculations, deflection and reaction plots, shear and moment diagrams, and copies of your presentation slides.