OPTI 421/521 – Introductory Optomechanical Engineering

Homework 3.

Part 1. Short answer

1) For three types of prisms with 25 mm clear aperture: **Penta, Dove, and Rhomboid**
   a. Sketch the prism to scale, allowing a 25 mm collimated beam.
   b. Use the pencil bounce trick to see how *x*, *y*, and *z* directions are transformed by the prism. Show your axes on the sketch and write down the mirror matrix for this prism. Test it to see if it's correct.
   c. Sketch a tunnel diagram of the prism, determine the reduced thickness assuming n = 1.5
   d. Describe what you think would happen to the LOS if you rotate the prism by small amounts in each direction (roll, pitch, yaw). Include both effects -- line of sight direction and image rotation.

Part 2: Derivation

Mirror Matrices

Write the mirror matrix for the Porro prism.
Use rotation matrices to show how the line of sight direction and orientation (image roll) are changed for small prism rotations about all 3 axes.

Replace one of the reflections with a roof. Describe this prism and write its matrix. Show how line of sight is changed with small perturbations of each angle.

Part 3) SolidWorks assignment

Install Solidworks into your PC or use UA computers in Optics Library or Engineering Library

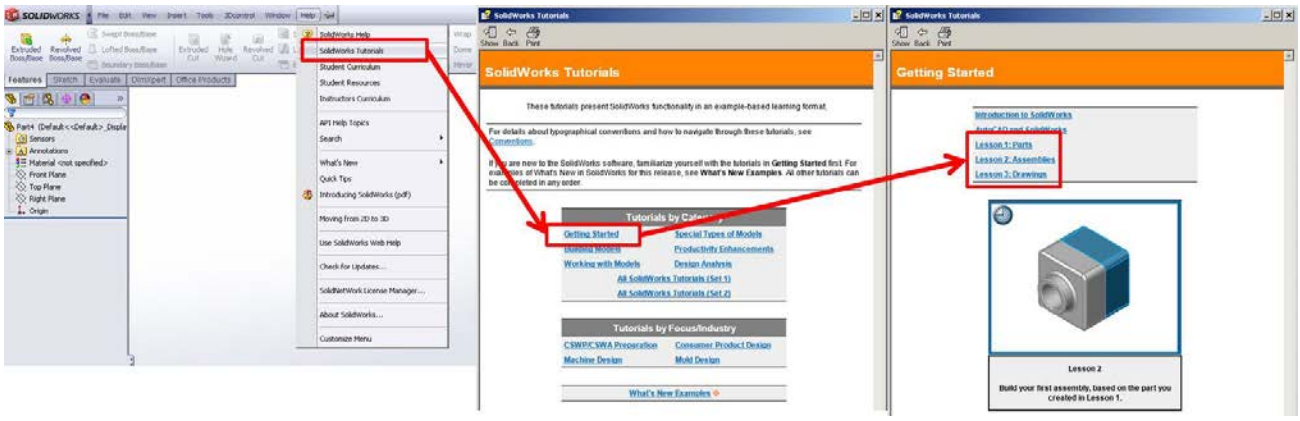

Figure 1 Solidworks > Help > Solidworks Tutorial > Getting started > Lessons

Run through the "Getting Started" tutorials

Lesson 1 – Parts

Lesson 2 – Assemblies

Lesson 3 – Drawings

For each lesson, provide an image of the completed part, assembly, or drawing.

Create two simple solid models:

Part 1: Rectangular part with 2 holes in it

Part 2: Axisymmetric part with a hole through it.

Create three-view drawings of each part using ASME Y14.5 conventions for dimensioning and tolerancing. Make sure to correctly determine and specify tolerance zones as appropriate.

- Correctly show dimensions for linear size, diameter, position. Define datum references as necessary.

- For Part 1, use feature control frames to specify the top surface as flat to 0.002" and parallel to the bottom to 0.01°. Also, ne of the sides should be perpendicular to the bottom to 0.02°. Each hole should be round to 0.001", perpendicular to the bottom to 0.02°. The hole position should be within ±0.002" of ideal.

- For Part 2, choose an outer feature as datum A. Specify cylindricity to be within 0.001". Specify that the axis of the bore (through hole) is concentric to A to within 0.01°. (use a tolerance zone).
  Choose an another feature, and set the requirement of 0.002" total indicator runout for this feature with respect to the inner bore

Part 4. Rules of Thumb

Provide three rules of thumb using the format provided.