IAT 106 – Lab 5

Model Making Mini-Project

In this lab, you will do a variety of exercises as part of a mini project designed to help you further develop your ability to see and think spatially, and to further develop your sketching and modeling skills. The mini-project is comprised of four components

i. Generating six orthographic views of an assembly and its parts
ii. Building a cardboard model of the assembly using the orthographic views as references
iii. Constructing an Onshape model of the assembly with parts
iv. Completing a section of reflective questions that you will answer based on the previous activities (i), (ii) and (iii).

Project Details and Requirements

The project must be done ***in teams of two***. The orthographic sketches and models will be done in the online labs. The digital model and reflective questions must be handed in at start of the next lab (06).

Description:
In this lab you will have an opportunity to explore the relationship between three approaches to represent your ideas and how they assist you to improve your spatial thinking and communicating skills.
You have been given a spatial problem as part of a pre-Lab (please see pre-Lab Week 05). Please come prepared to the lab with a solution to the given problem. In the labs you will first generate six orthographic views of the solution geometry (for each part) using your sketching and representational skills learned over the last two labs. Followed by building a physical model and creating a digital model using OnShape.

1. **Sketching the multi-views of the conceived parts individually**
2. **Building a Physical Model**
3. **Creating a digital model**
4. **Reflective questions**

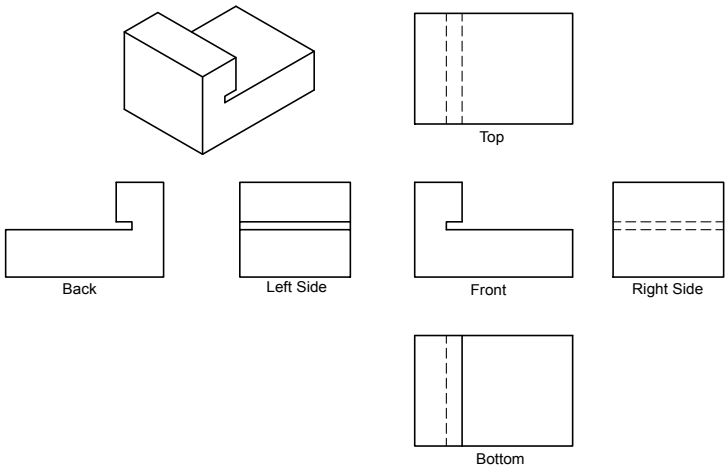
Materials Needed for this Lab:
- two sheets of square grid papers
- two sheets of 12x16 inch cardstock (cardboard)
- a retractable knife (box cutter)
- Scotch or masking tape
−Metal ruler
−Pencil and eraser

Step I

Sketching: (45 min. total): In this step, you will sketch 6 orthographic views (top, bottom, front, back, Left side and Right Side) of each component of your conceived geometrical design, one by one.

1. You will use a square grid paper for this part. Please choose an appropriate scale to draw these drawings. Make sure your sketches do not exceed the paper limit, and if they do, join (tape) two sheets of square grids to make room for all 6 ortho drawings.

2. **Draw Orthographic Views:** Rather than the traditional 3 views, you will be drawing 6 views (see the illustration below) plan or top, bottom, front, left side, right side and back view (opposite of front view).
   a. Establish the scale for this exercise.



   b. Establish and record the basic dimensions (length, width, height) of each component.
   c. Draw the plan (top) view using the dimensions you decided. Once you have this done, you can establish the front view below by using extension lines. Next, draw the bottom view using construction lines extended from the front and top view.
   d. After drawing the plan and front views, use a 45 degrees Mitre line to project the side view.
   e. Last, complete the left side, right side and back views using construction lines extended from the front view.
   f. Dimension all the drawings as required.

Step II

Model Making: (60 min. total): Now that you have six orthographic views of each component sketched out, you will transfer them to the cardboard and create a 3D physical model whose outside dimensions are those of the object.

1. Carefully tape the grid paper over the cardboard. Place tape along the top edge so that you can easily flip it over to see the cardboard.
2. Transfer the multi-view drawings to the cardboard so that you can cut out individual pieces to make your model. To do this, mark all vertices with a thumbtack and connect these vertices with drawn lines. You will use these marks later as references to construct your model.
3. As an option, you may create small tabs with which to adhere other surfaces (see slides)

4. If your model includes an inclined plane, so do not measure the length of the incline from any view in which it appears as a polygon. This is foreshortened and is not the true length. Instead, measure the length from a view in which the inclined plane occurs on edge to get an accurate measurement.
5. Flip over the grid paper draw straight lines to join the appropriate thumbtack marks. In effect, you have now copied your original drawing onto the cardboard. You can now cut the model panels out of the cardboard but **make allowances for cardboard thickness!**
6. Carefully align and tape the panels of your model one piece at a time. You may apply tape on the inside or outside, whichever you prefer.
7. When finished, double-check the model for accuracy and workmanship.

Step III

OnShape Isometric Model: (50 min. total): In this step, you will create a three-dimensional OnShape model of the conceived geometrical assembly.

This is to be done in the same teams of 2 that you were in for the physical model.

Submission: You will submit your design as a partStudio shared file, along with all part files and the assembly file before the start of the next week lab. NOTE: both team members should share: be sure to include both team member names in your submissions.

Step IV

Reflective Questions: (Homework): Now that you have completed your sketching, created the physical model followed by the digital model, we want you to think about and answer the 2 questions below.
This is to be done ***individually***. Write a short answer to each question below. Use the discussion board created for this submission on canvas.

1. **How did the sketches help with making the cardboard model and OnShape?**
2. **If you could change the order in which different representations (sketches, physical and digital model) were made, what would it be and why?**

Grading Criteria

1. **Sketch:** Your sketch will be marked for the creative idea behind your project and the accuracy of the six views and line quality.
2. **Physical Model:** Will be marked on accuracy and workmanship.
   Workmanship: There should not be wide gaps or overlapping edges on your model.
   The outside of the cardboard should correspond to the object faces (cardboard has thickness!)

1. **Digital Model:** You will be graded on the accuracy of the digital model.
2. **Reflective Questions:** You will be graded on the thoughtfulness of your answers and on your writing quality.

Item	Due	Individual or Team	Criteria	Activity Mark	Part Mark	Total
Preliminary Sketches	pre-lab	team			**10**	
Sketch multi-views	during lab	team			**20**	
			Hidden lines responsibly complete drawing	5 15		
Physical models	during lab	team			**40**	
			creativity	10		
			accuracy	15		
			workmanship	15		
OnShape models	before next lab	team			**20**	
			accuracy	20		
Lab report	before next lab	individual			**10**	
			thoughtfulness	10		
			writing	10		
TOTAL						**100**