MODELLING OF 3D ENGINEERING DRAWING II

Related course: KIX2001/KIX3001

OBJECTIVES:
To design and build 3D geometric model
.

EQUIPMENT:
Computer with **Autodesk Fusion** software (Download free trial; valid for only one month)

INSTRUCTIONS:
1. Follow the procedure in this lab sheet.
2. Copy all results into a Word document.
3. Every student must submit the experiment results (in Word) to the lab course Spectrum before end of every experiment week.

REFERENCE(S):
Refer to the main references of KIX2001/KIX3001

LABS:
LAB 1: 3D Modelling Geometric Structure
LAB 2: Open Ended 3D Engineering Drawing

INTRODUCTION:

3D engineering drawing is a vital aspect of modern design and manufacturing, enabling engineers and designers to create accurate representations of objects in three dimensions. This approach enhances visualization in creating prototypes for testing and validation, improves communication among engineers, designers, and manufacturers well as aids in the production process with detailed specifications. Unlike traditional 2D drawings, 3D models provide a more comprehensive view, allowing engineers and designers to visualize complex components and assemblies.

Mastering these skills can significantly enhance student's ability to bring concepts to life effectively. In fact, it is an integral part of modern engineering practices facilitating collaboration, improving accuracy, and ultimately leading to better-designed products.

LAB 1: 3D MODELLING GEOMETRIC STRUCTURE

In this part, a simple instruction to build a complete 3D model will be developed and simulated using Autodesk Fusion (you may also use any other software). It consists of 5 sections; part A until part E

A. BUILD THE BASE PART

1. Select “Create Sketch” and later click “Origin” and select “YZ” plane as shown in Fig. 1. After selecting YZ plane, your design platform will be in the 2D YZ plane.

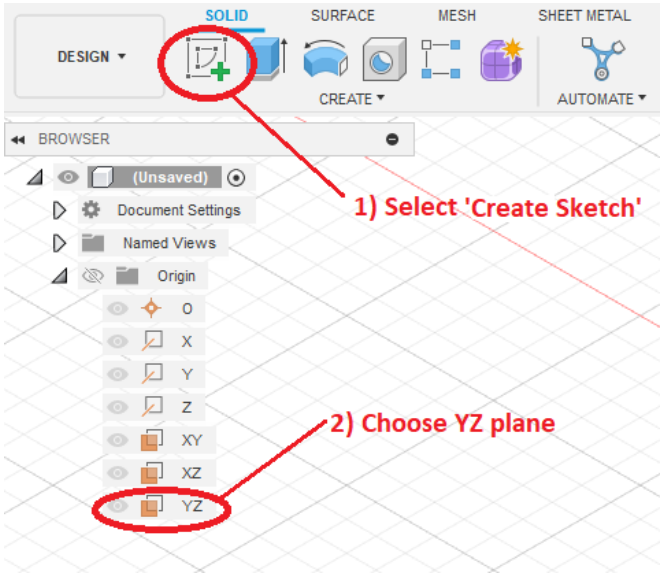


Fig. 1: Create Sketch

2. Select “Line”  and create closed geomerty as shown in Fig. 2. Dimension will be assigned later.
3. Go to “CREATE” and select “Sketch Dimension” as shown in the Fig. 3 to set the dimension accordingly as shown in Fig 4.

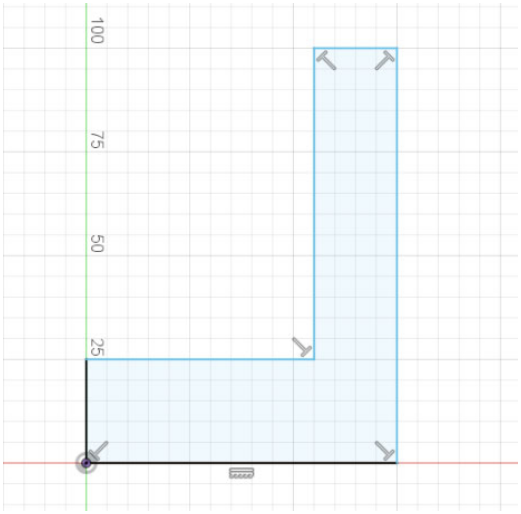


Fig. 2: Create closed geometry

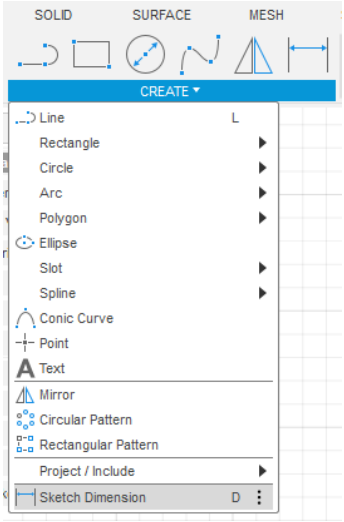


Fig. 3: Sketch dimension

4. Click 

at the right top of the software.

5. Select “Extrude” command from here 

and set accordingly as shown in Fig 5 and click “OK”.

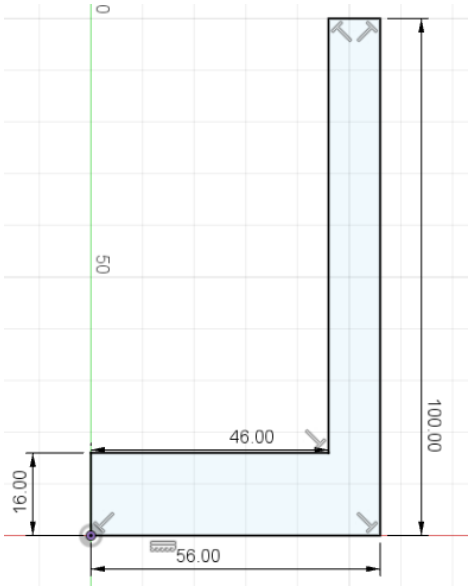


Fig. 4: Dimension of the base

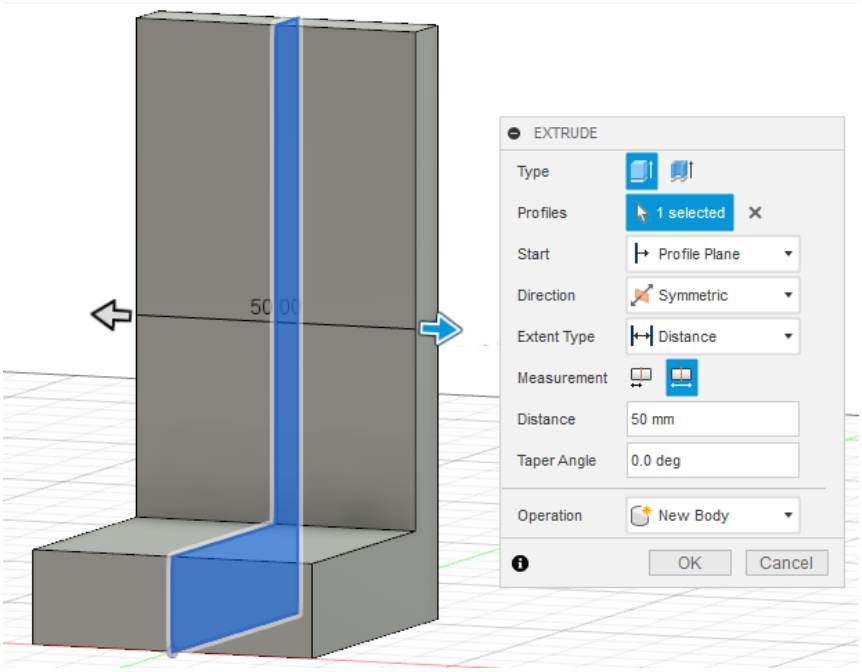


Fig. 5: Structure of the base using ‘Extrude” command.

B. BUILD THE RIB PART

6. Repeat Step 1.
7. Please adjust the placement of the design through these viewing mode to get the best view of your design.

8. Select “Line” and draw a line as shown in the Fig 6. Please make sure the tip of line coincide with the body of base using “coincident” tool.

9. Repeat Step 3 and 4.
10. Go to “CREATE” and select “Rib”. Follow Fig. 7 for the rib setting and click “Ok”.

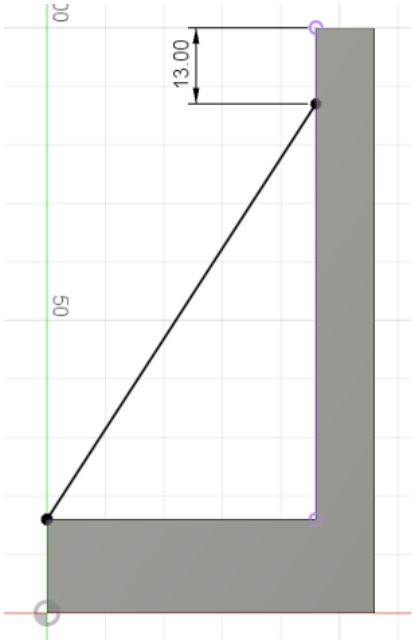


Fig. 6: Rib design

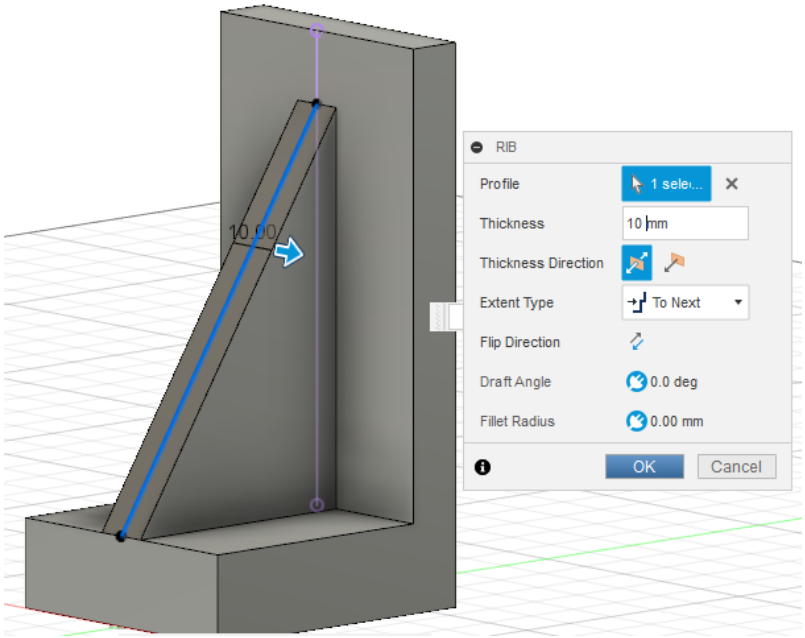


Fig 7: Setting the rib

C. BUILD THE TOP PART

11. Select top face and “create sketch”. Your platform will be like in Fig. 8.
12. Select “Line”  and draw a closed loop. Use “tangent”  to create smooth connection between the straight and curvy line. A symbol of ‘tangent” is an indicator of a smooth connection as shown in the Fig. 9.
13. Select  to create a circle inside the closed loop. Use “Perpendicular”  to ensure proper connection between all lines.
14. Repeat instruction in Step 3 and 4 with the dimension of the closed loop and circle is given in Fig. 10.
15. Select “Extrude” command from here  and set accordingly as shown in Fig. 11 and click “OK”.

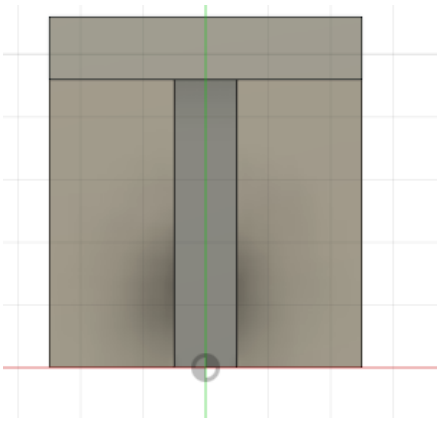


Fig. 8: Design platform

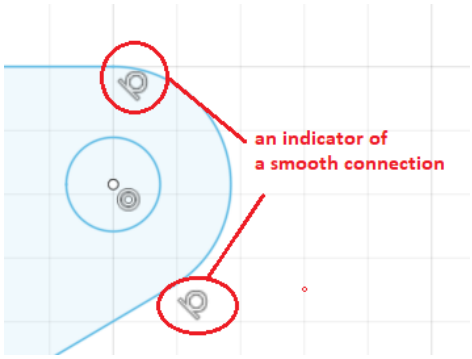


Fig. 9: Tangent feature

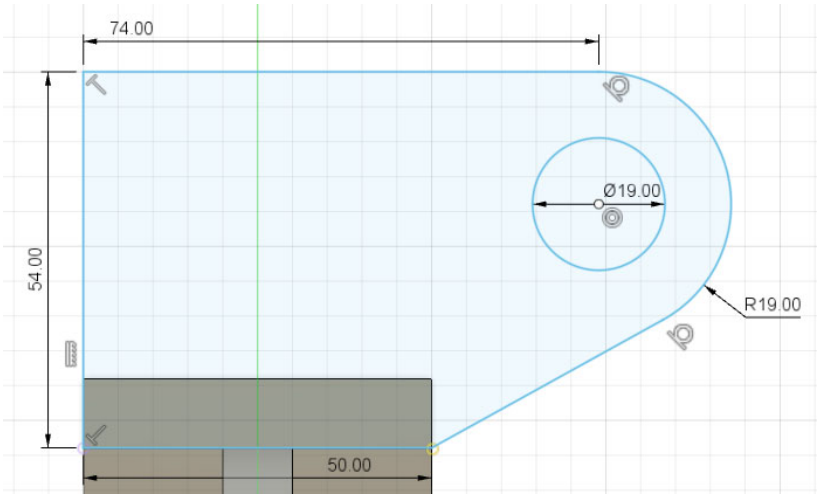


Fig. 10: Dimension of the top

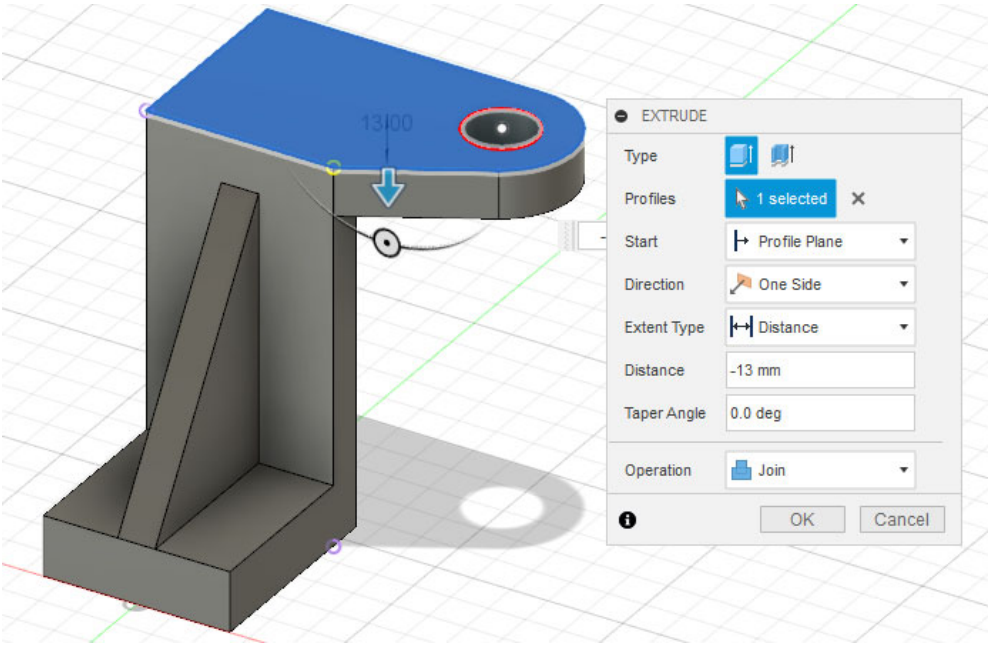
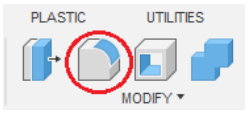


Fig. 11: Extrude setting for top structure.

D. ADD FILLET

16. Click “Fillet” 

and choose 6 edges from the model as shown in Fig. 12.
17. Set the fillet thickess to 3 mm and click “OK”.

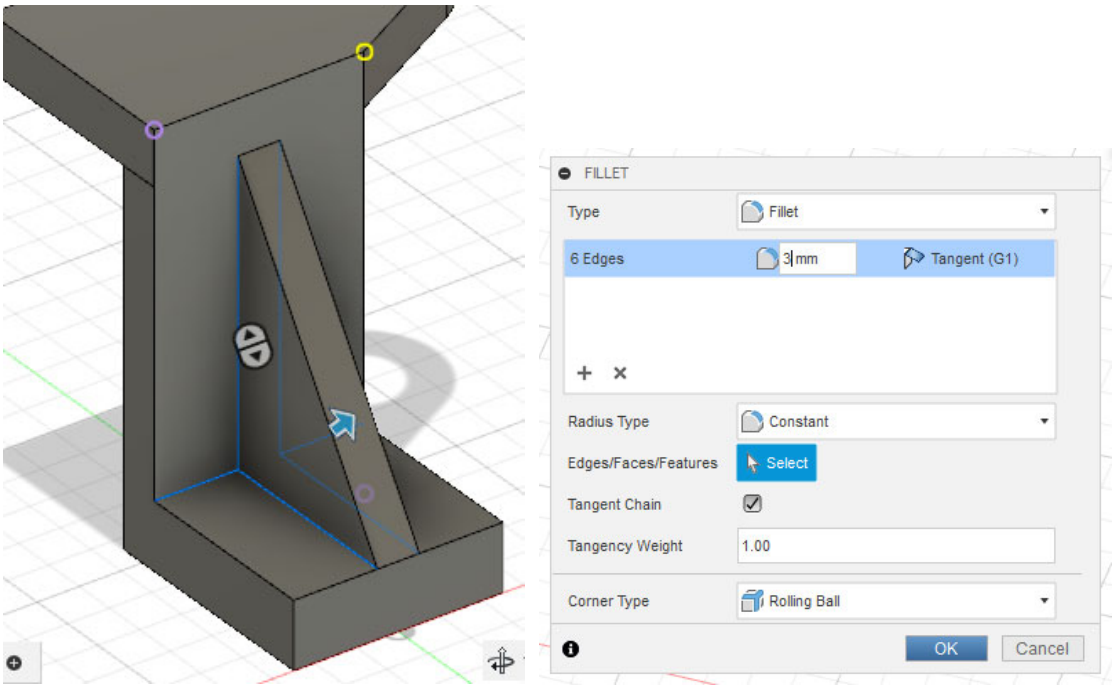


Fig. 12: Setting up the fillet

E. MATERIAL SELECTION

18. Right click of the body and select “Appearance”. See Fig. 13.
19. Select any plastic material from the library and select apply to “Bodies/Components”.
20. Save your design and the final design model is shown in Fig.14.

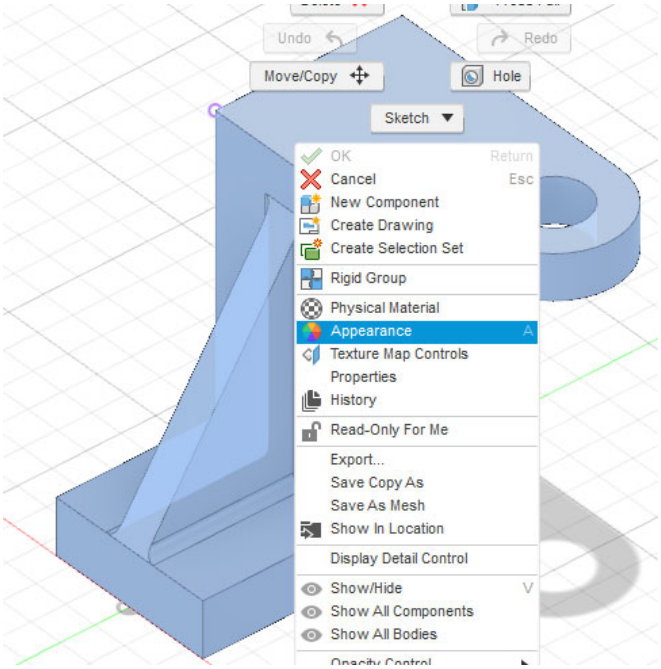


Fig. 13: Material Selection

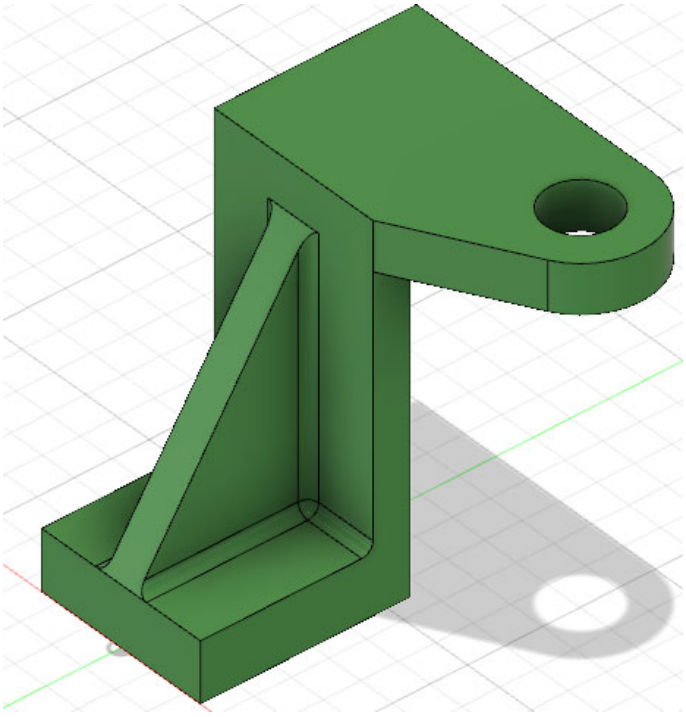


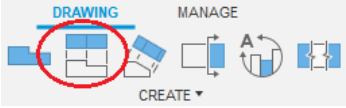
Fig. 14: Final Design Model

E. CREATE MODEL DRAWING

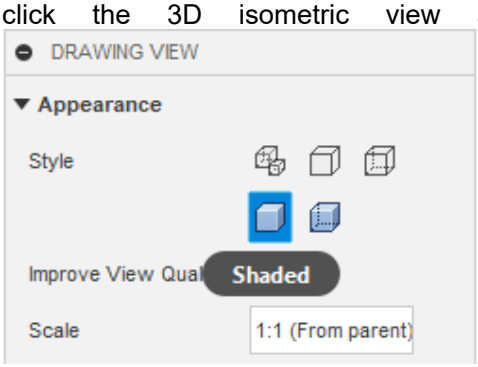
21. Go to “DESIGN” – “DRAWING – “From Design”. Set the drawing setting as shown in Fig.15 and click “OK”.

22. A drawing platform will appear as shown in Fig.16 and set accordingly and click “OK”.

23. Click the body of your design and go to “DRAWING” – “Projected view”



24. Build your side view, top view as well as 3D isometric view as shown in Fig. 17. Double click the 3D isometric view and set the style to be “shaded”.



25. Click” Dimension” 

and set the dimension of your model. Your final 3D drawing is shown in Fig.17.

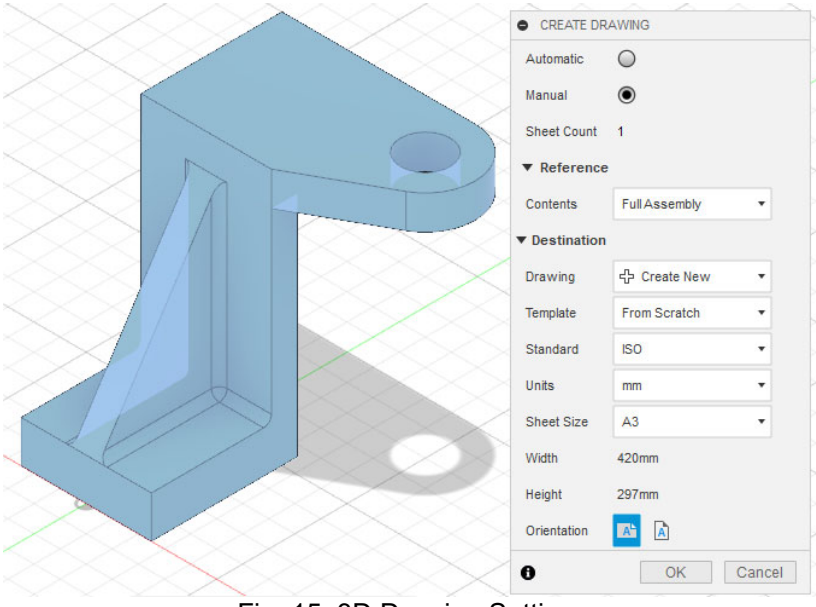


Fig. 15: 3D Drawing Setting.

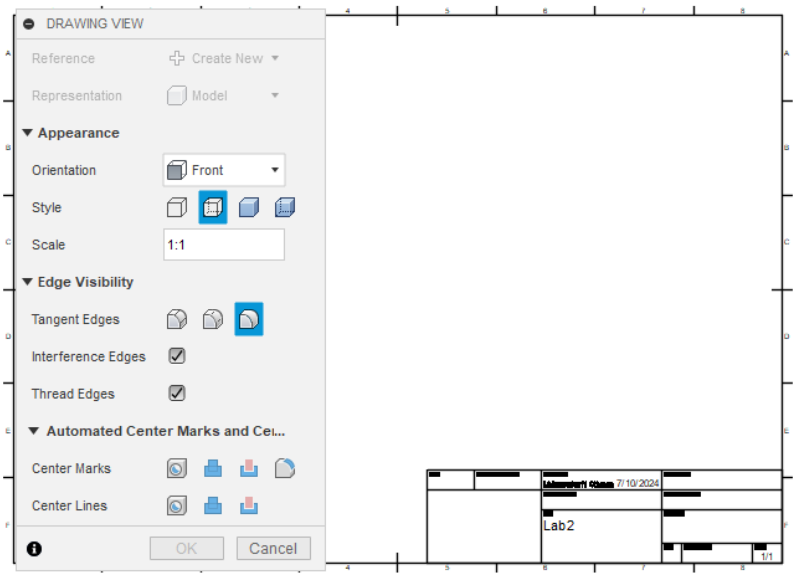


Fig. 16: 3D Drawing Setting.

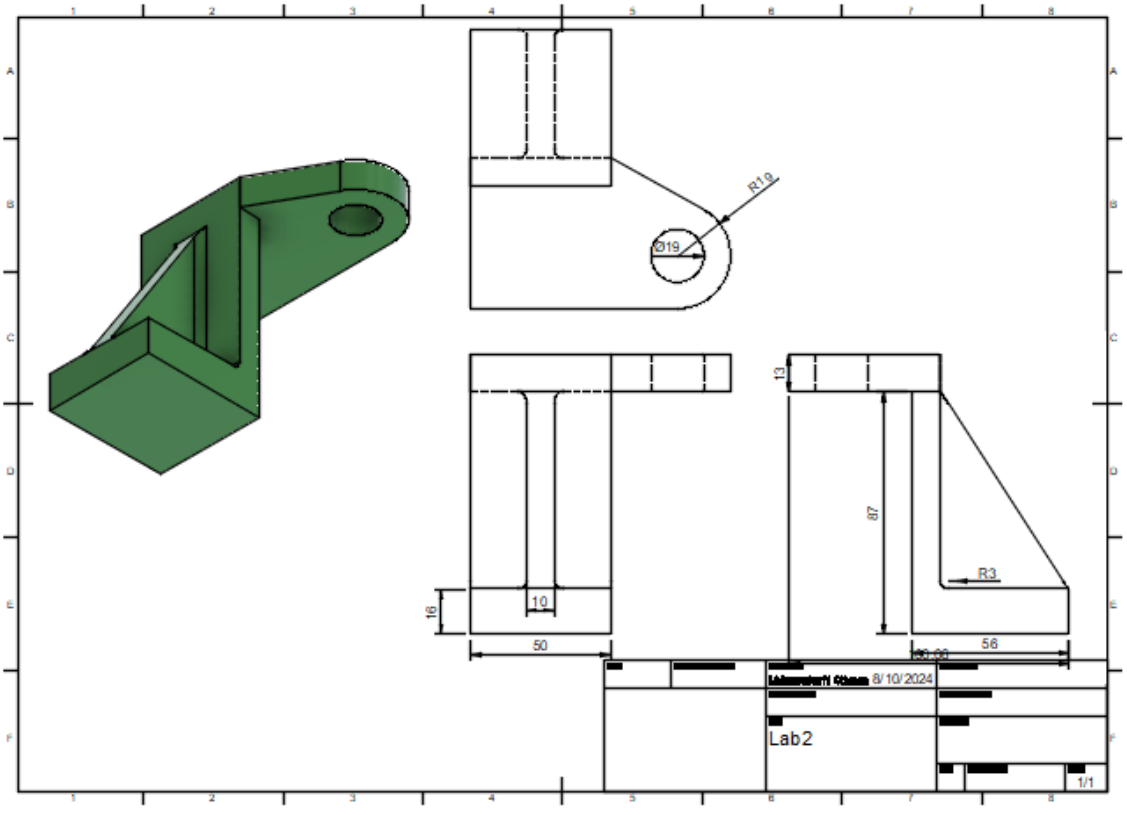


Fig. 17: Final 3D Model Drawing

LAB 2: OPEN ENDED 3D ENGINEERING DRAWING

1. From Lab 1, build your own 3D geometric model. Your 3D model structure should include

    a. 3 main parts; Base, Body and Top. Each part will have different structure. Simple structure such as box, cylinder cannot be used as the main parts unless you modified the structure.

    b. at least two (2) circles,

    c. rib in the body parts

    d. different material selection for different parts (plastic, metal, glass etc),

    e. and complete engineering drawing with dimension.

2. Discussion (include them in your lab report):

    a. If you were asked to fabricate / prototyping the model, ***suggest suitable*** methods and equipment to be used in the prototyping set up. Do you expect the same model structure will be obtained from the actual fabrication? Please discuss.

    b. Please share several strategies for effective 3D modelling (give at least three).

END OF EXPERIMENT