

A Quick Tutorial for Drawing Photolithography Masks in AutoCAD

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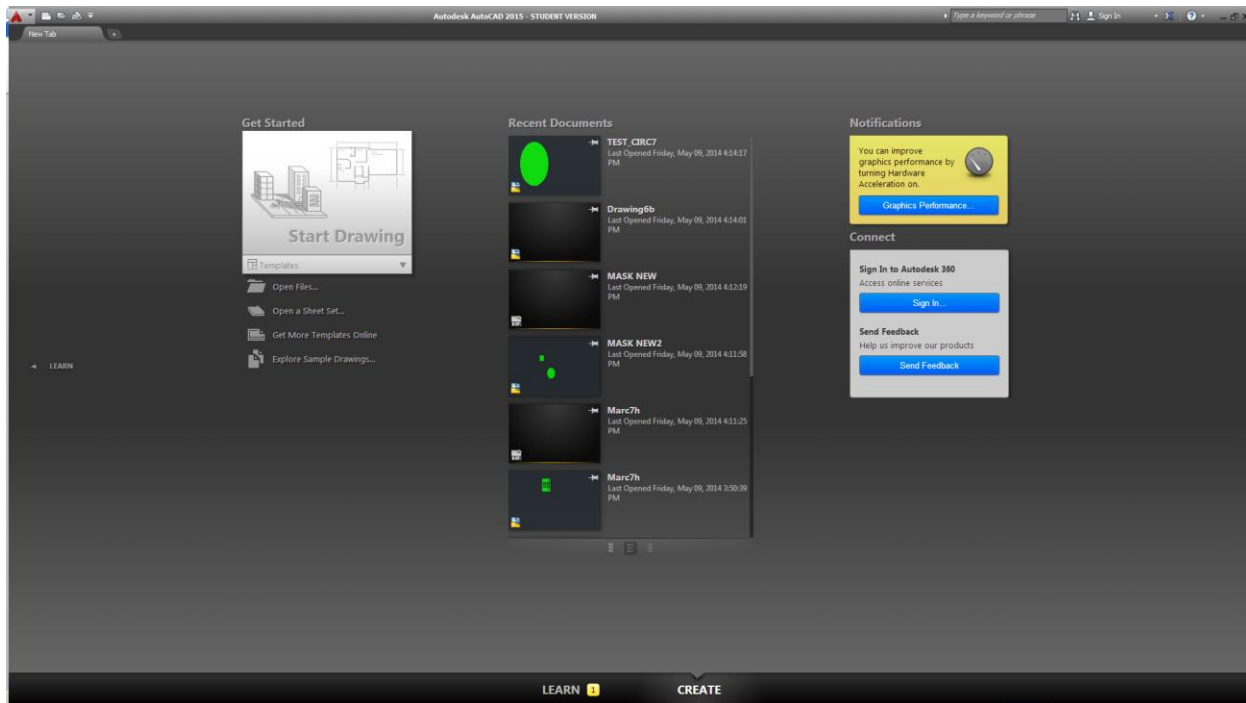
Revision 1

May 09, 2014

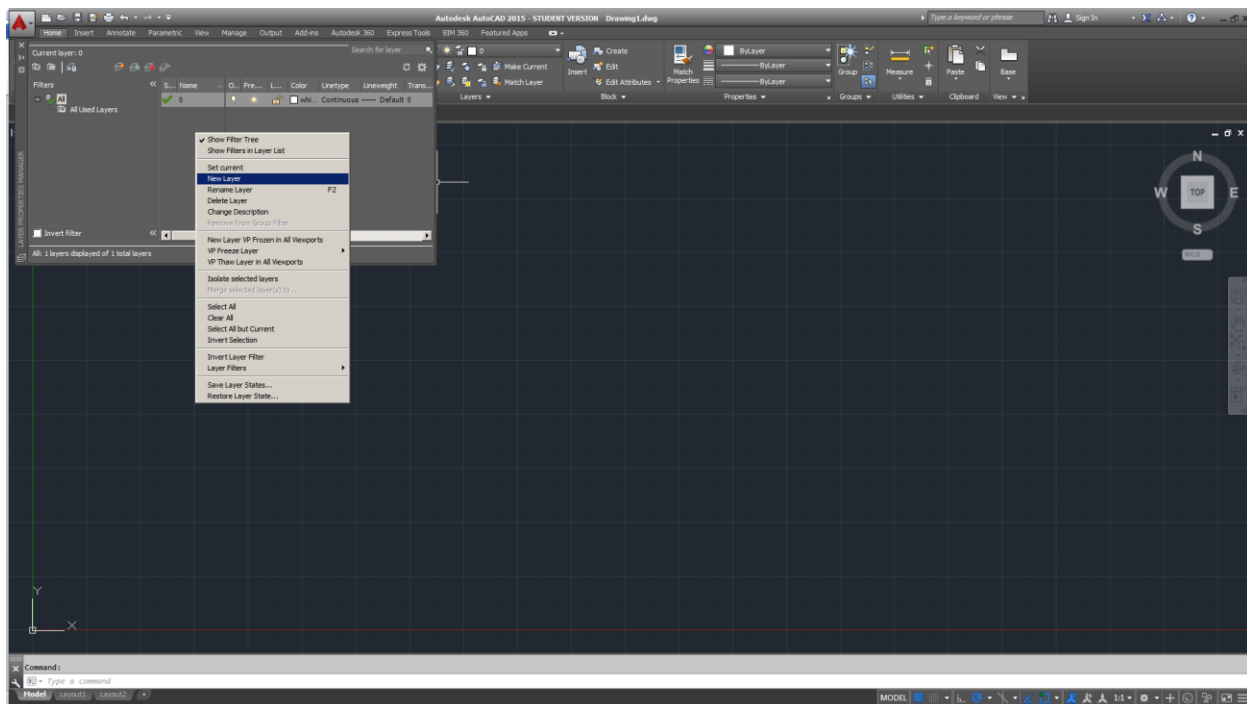
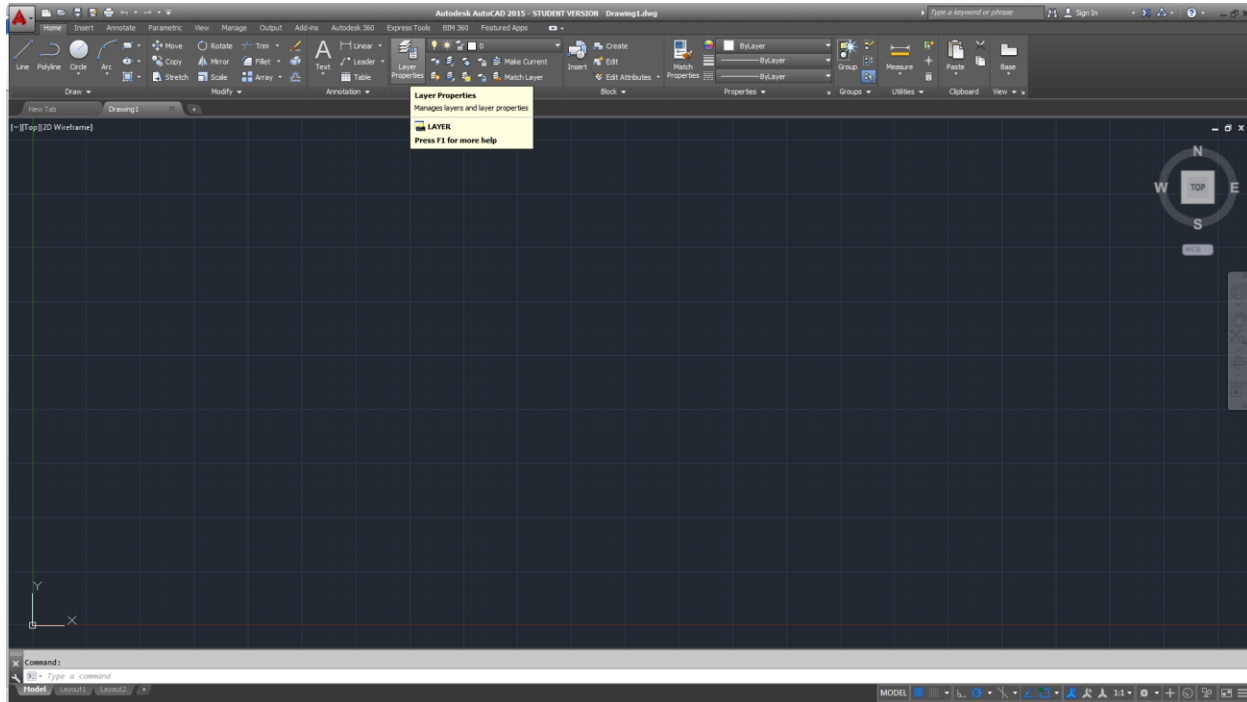
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0 – This tutorial assumes some basic knowledge of AutoCAD. It is by no means comprehensive but serves as a guide for simple mask design.

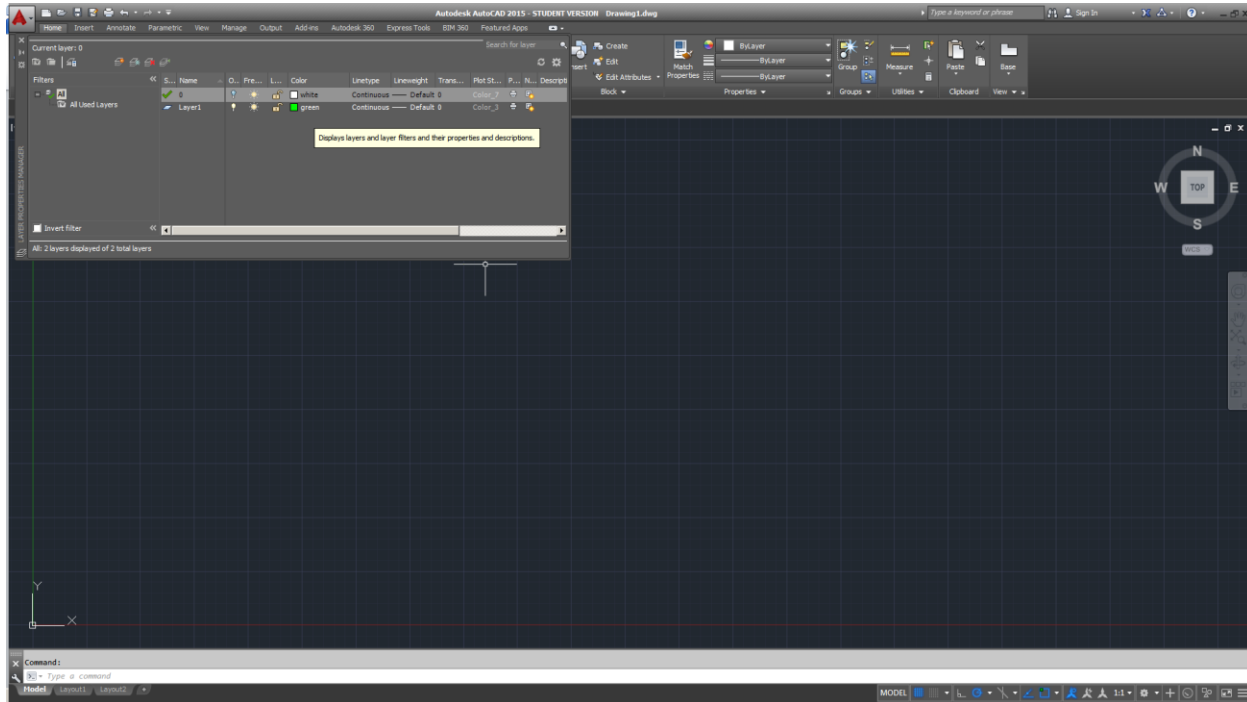
1 – Open AutoCAD 2015



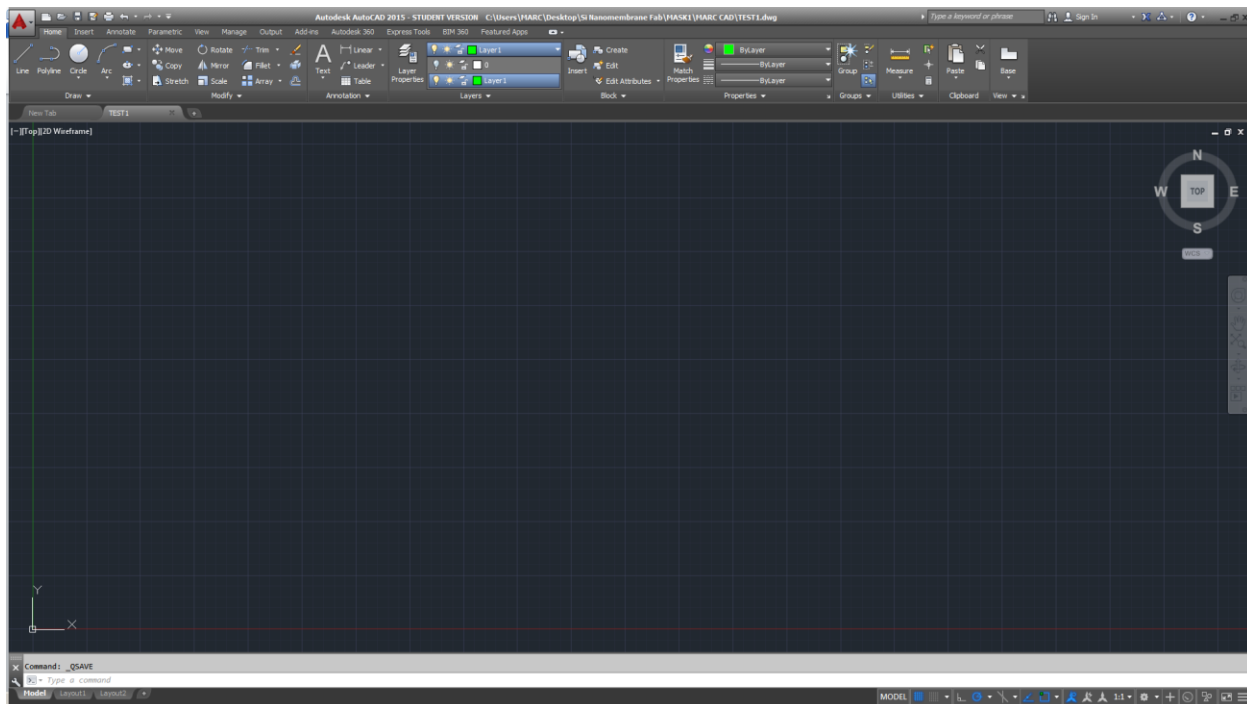
3 – Define a new layer. Here, we named it Layer1.



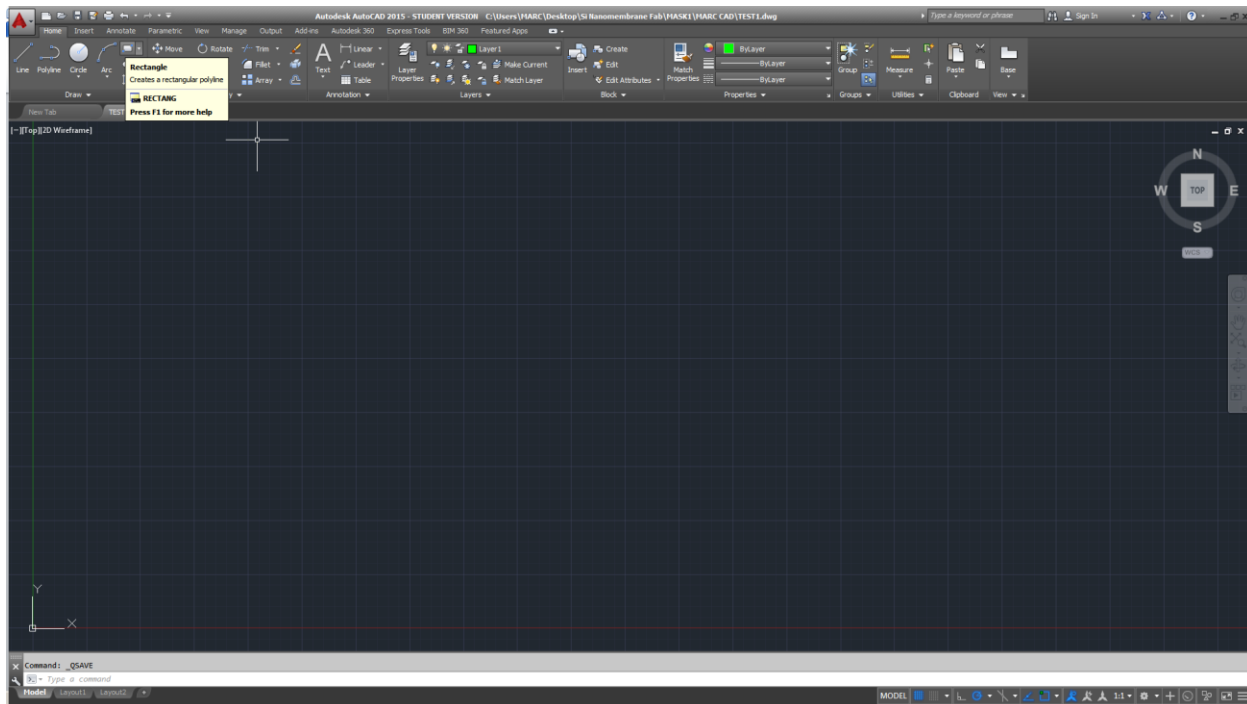
Change its color to distinguish it from other layers. Here we chose green.



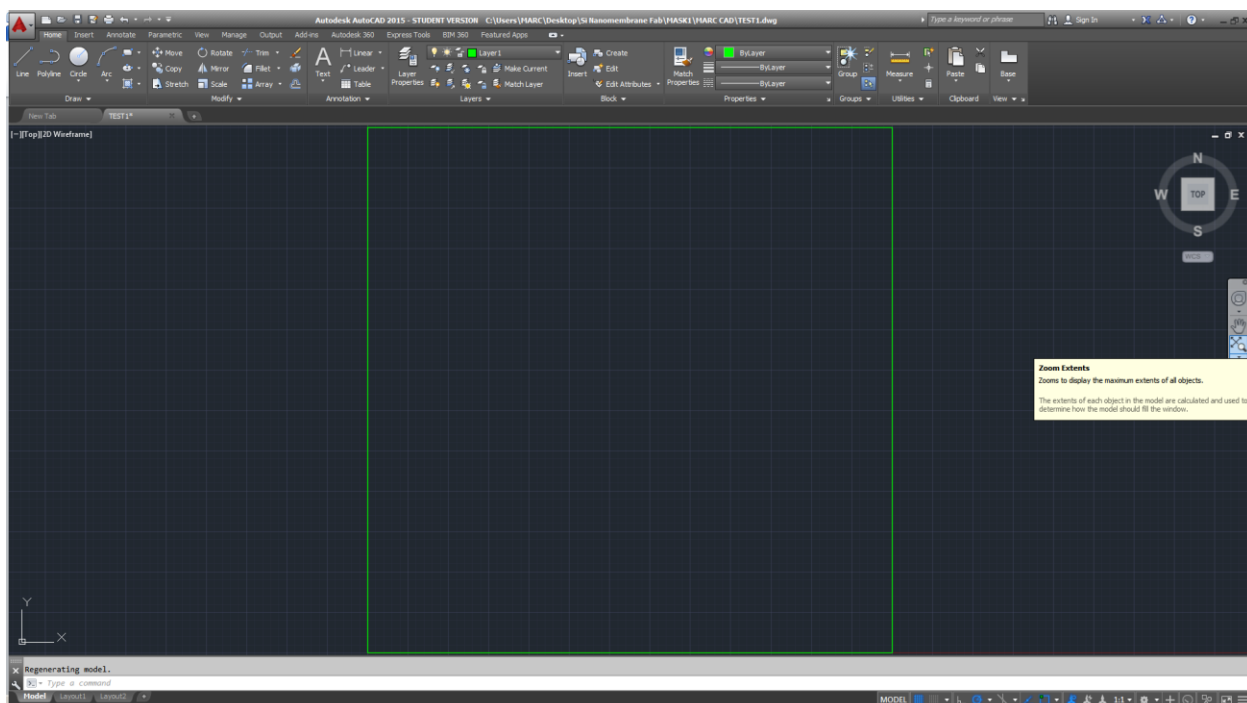
Choose the new layer to work with.



4 – Define the edges of your mask (4 by 4 inches, etc). This will help locate your features relative to the center of the mask and the edges. **Use units of micrometers.** This means that a dimension of 100 nm is defined as 0.1. A 4 by 4 inch square is thus defined as a 101600 by 101600 square. Here, we drew a 101600 by 101600 square to define the mask edges.

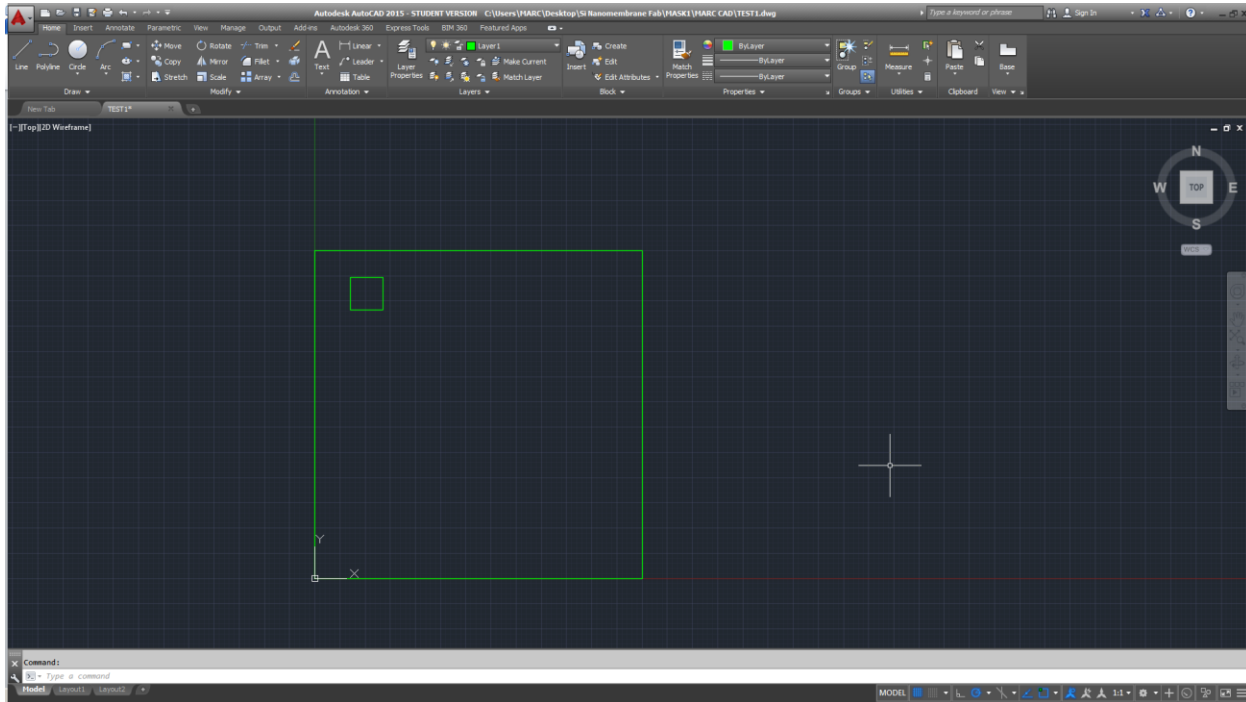


Click on Zoom Extents button to show all mask edges.

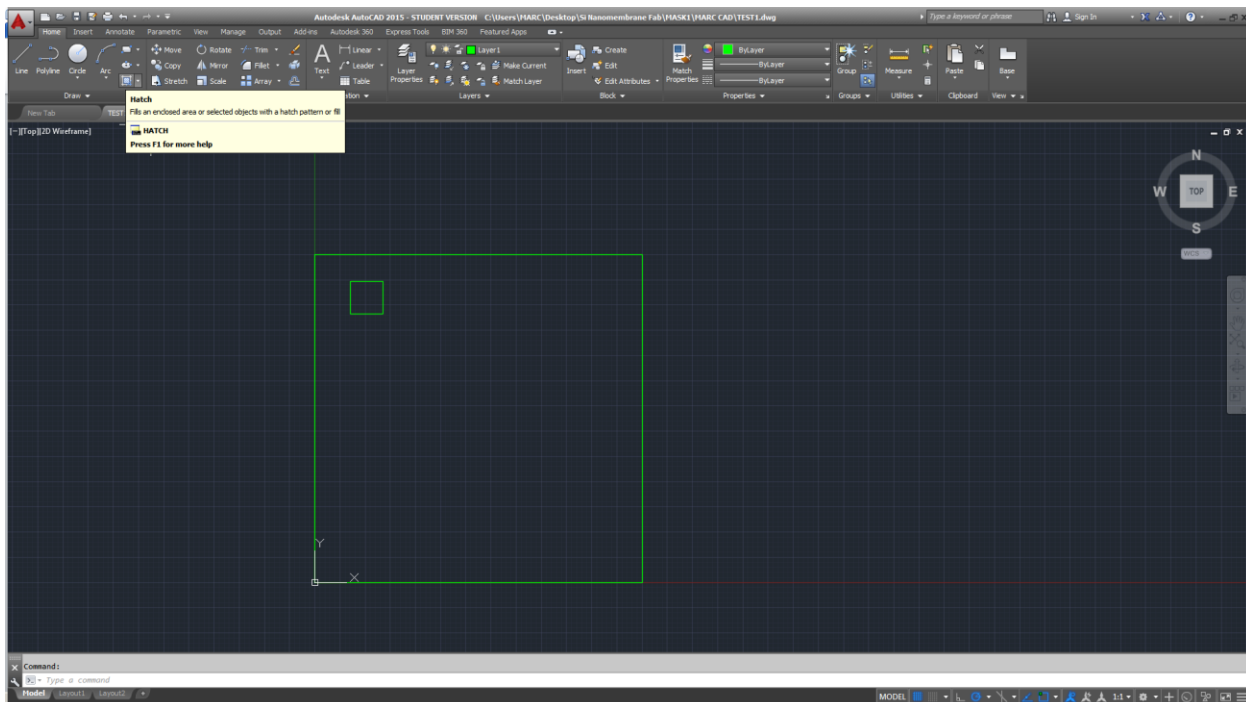


5 – Draw the boundaries of your mask features using rectangles, circles and lines. We will eventually hatch the inside of these boundaries to create the mask features. The hatched area is the area that appears transparent in your final mask.

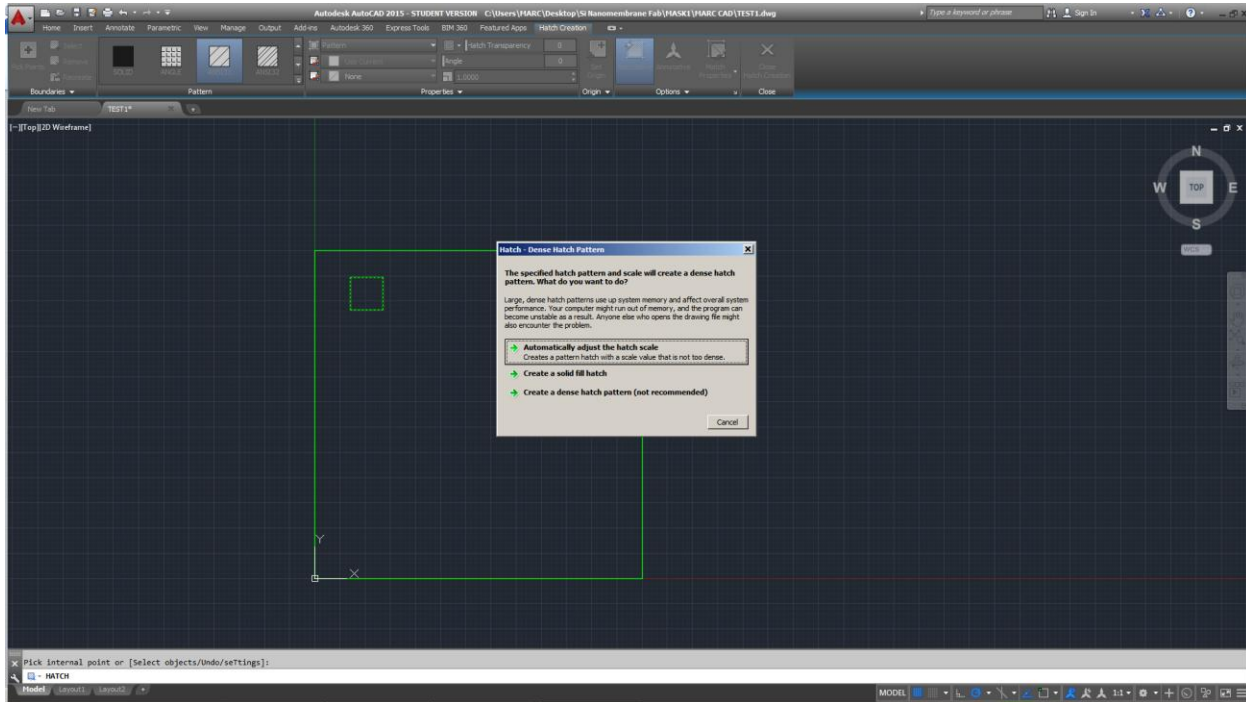
For example, for a square opening, first draw a square.



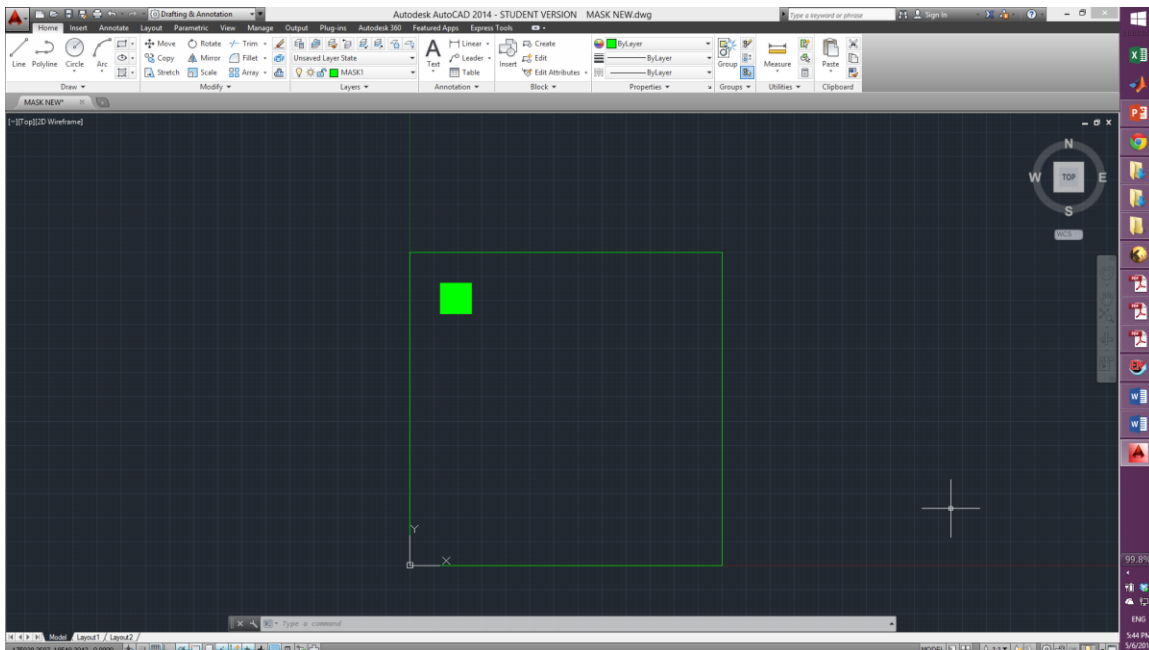
Then hatch the interior of the square.



When prompted for it, select automatically adjust the hatch scale.



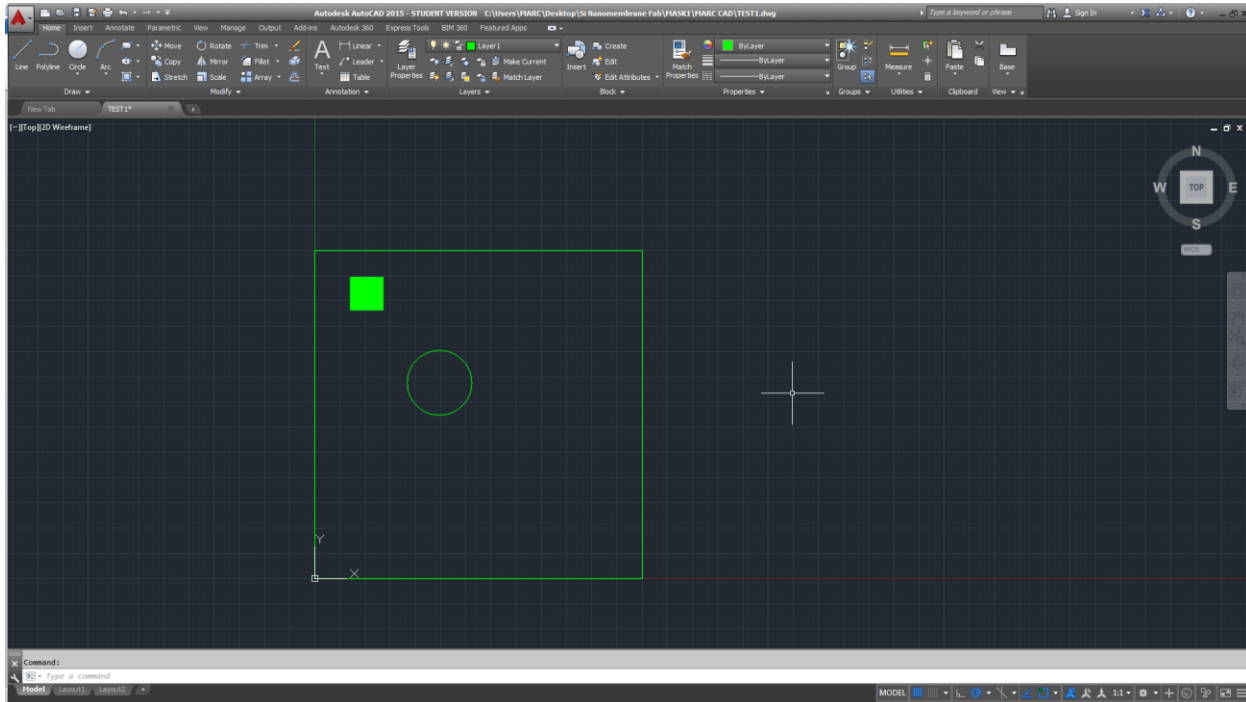
Final hatched area.



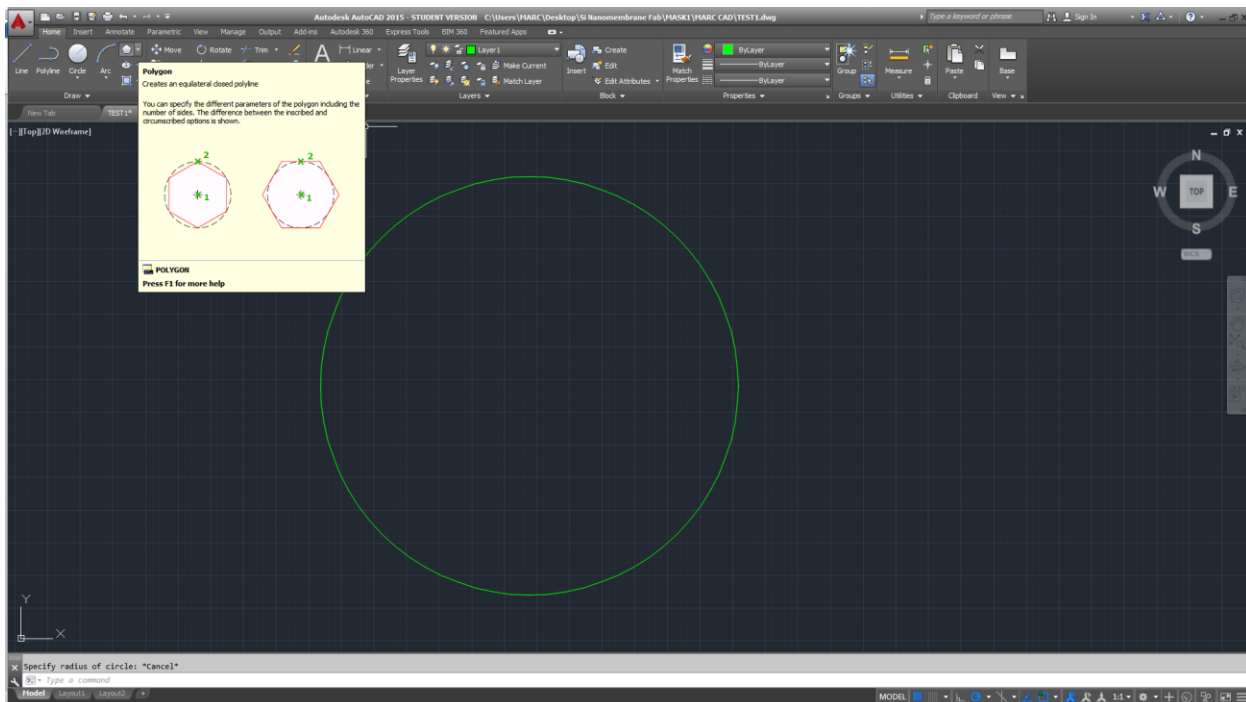
The procedure is a bit trickier for curved and rounded features, especially large rounded areas. It is important to define an “interior” hatch and a “boundary” hatch

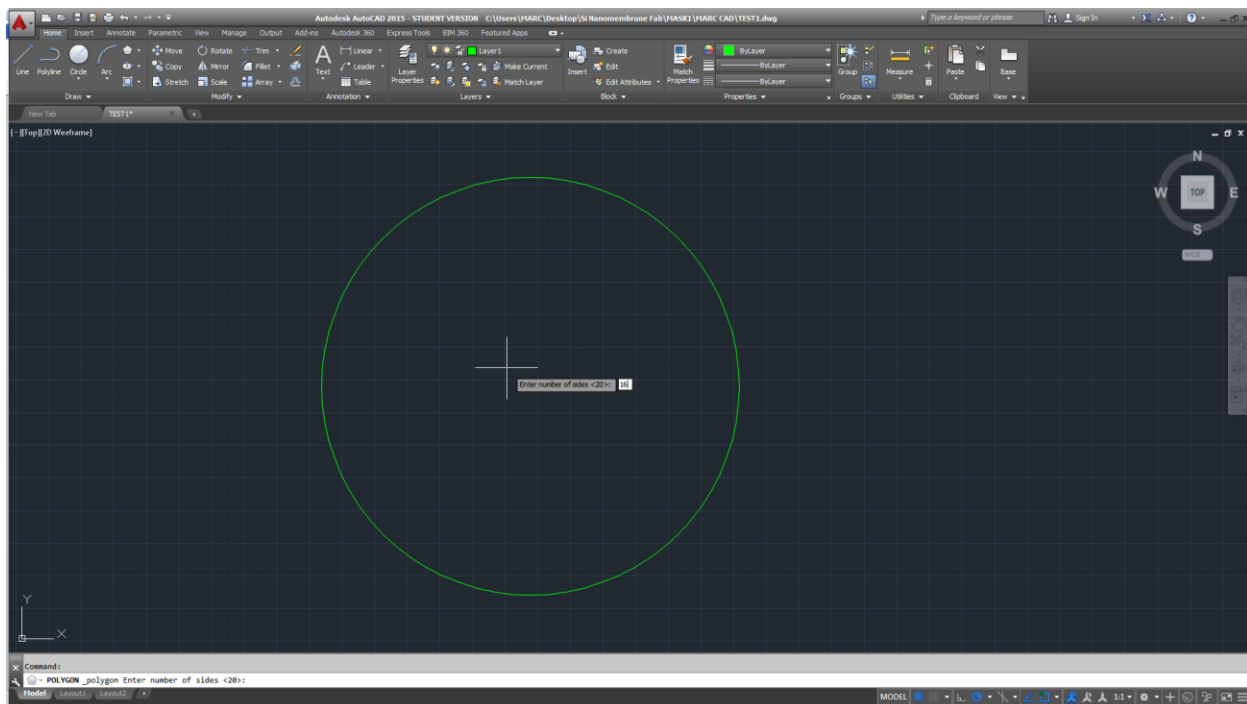
for such areas to reduce the final number of flash counts needed to make the mask. This reduces the time needed to create the mask and therefore its cost. Let's illustrate this with a simple circle as an example.

Draw a circle.

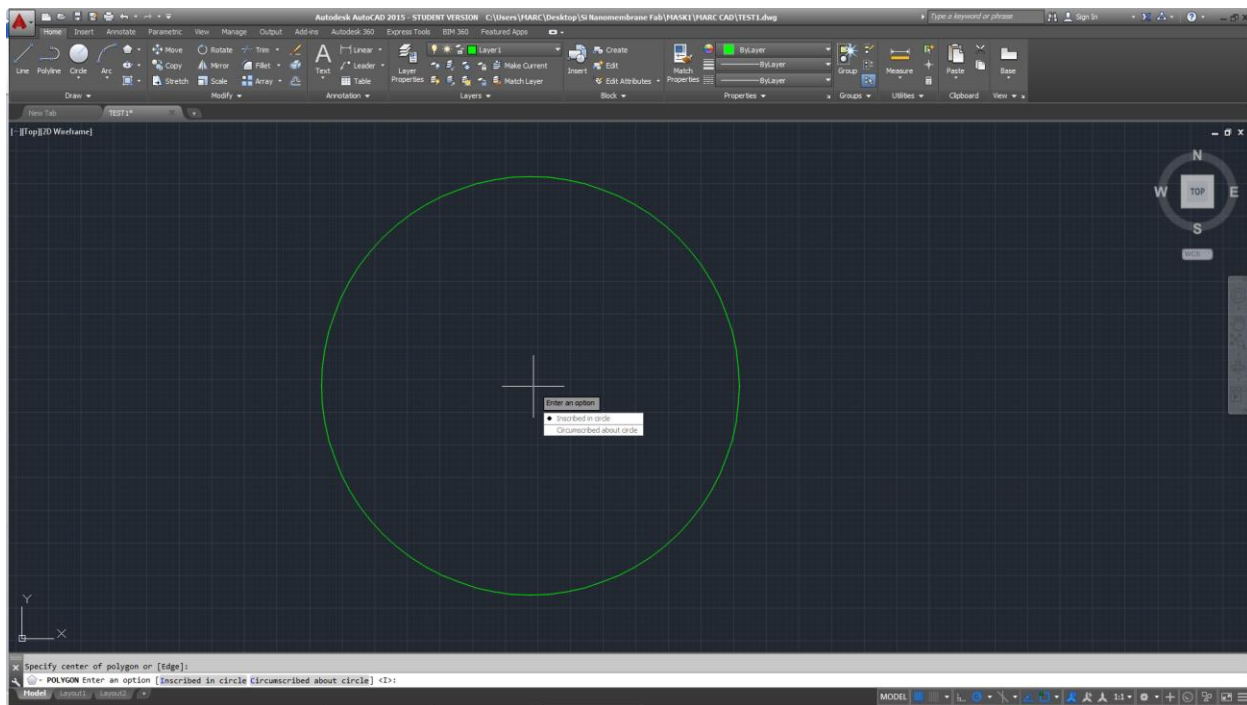


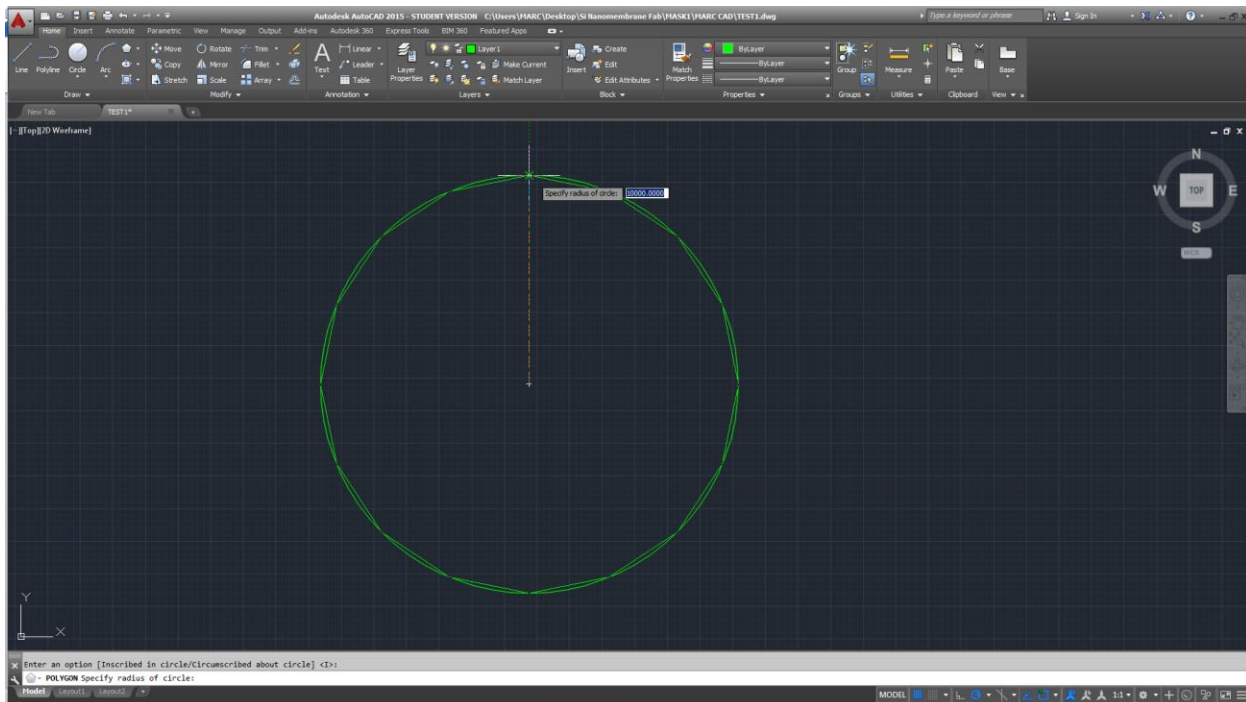
Define a polygon with multiple edges (even number: 4 – 8 – 16) inside the circle.



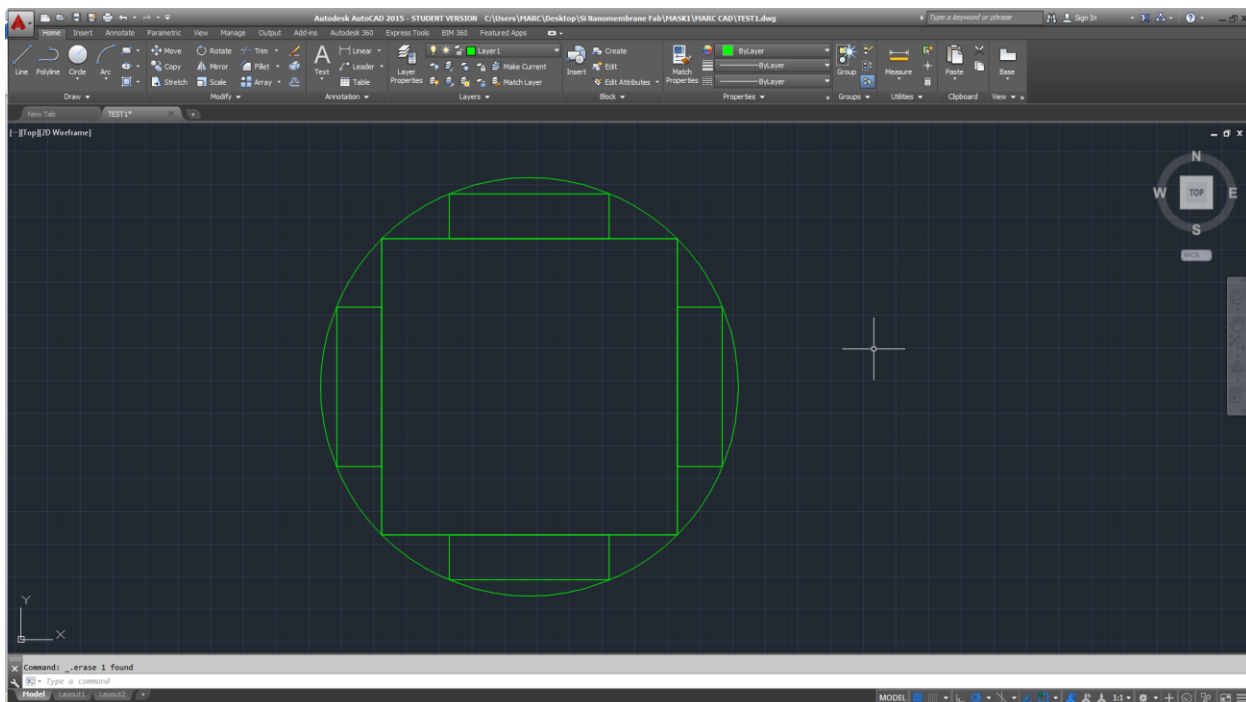


Insert inside the circle (inscribed).

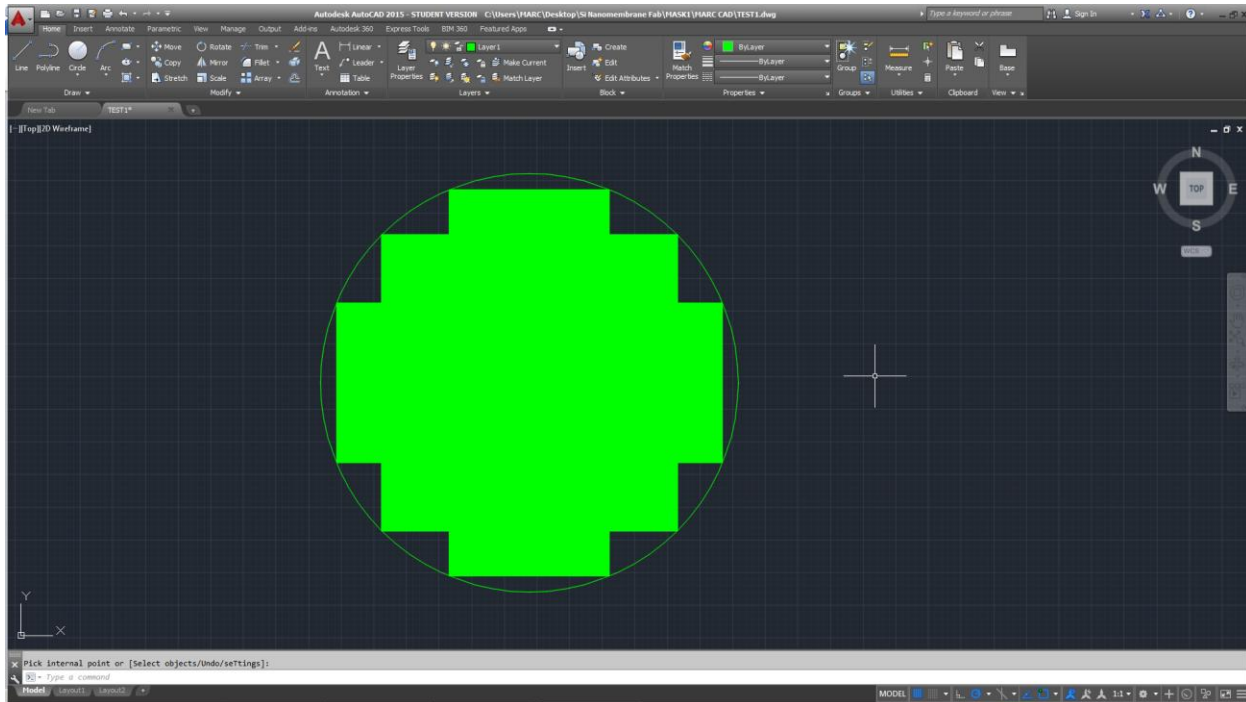




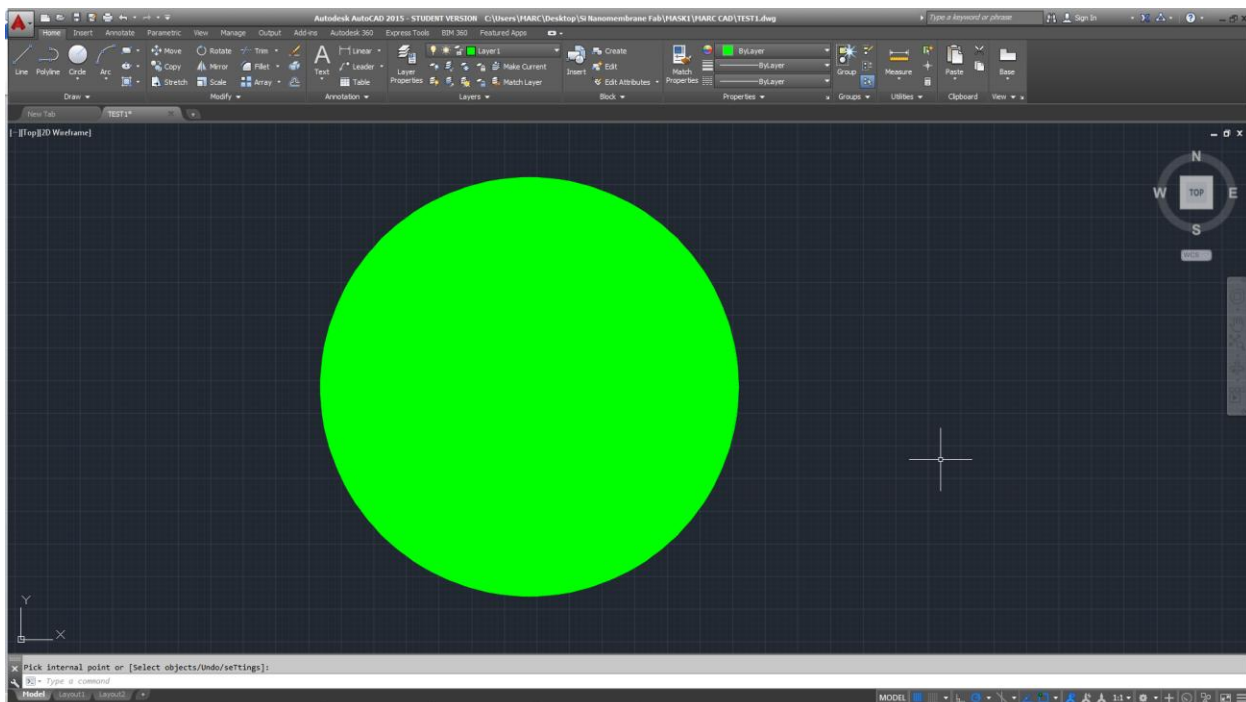
Use the polygon's vertices as a guide to fill the circle with rectangles, and then delete the polygon. This procedure can be used for curved lines by defining a suitable polygon first to get the vertices and then filling with squares and rectangles.



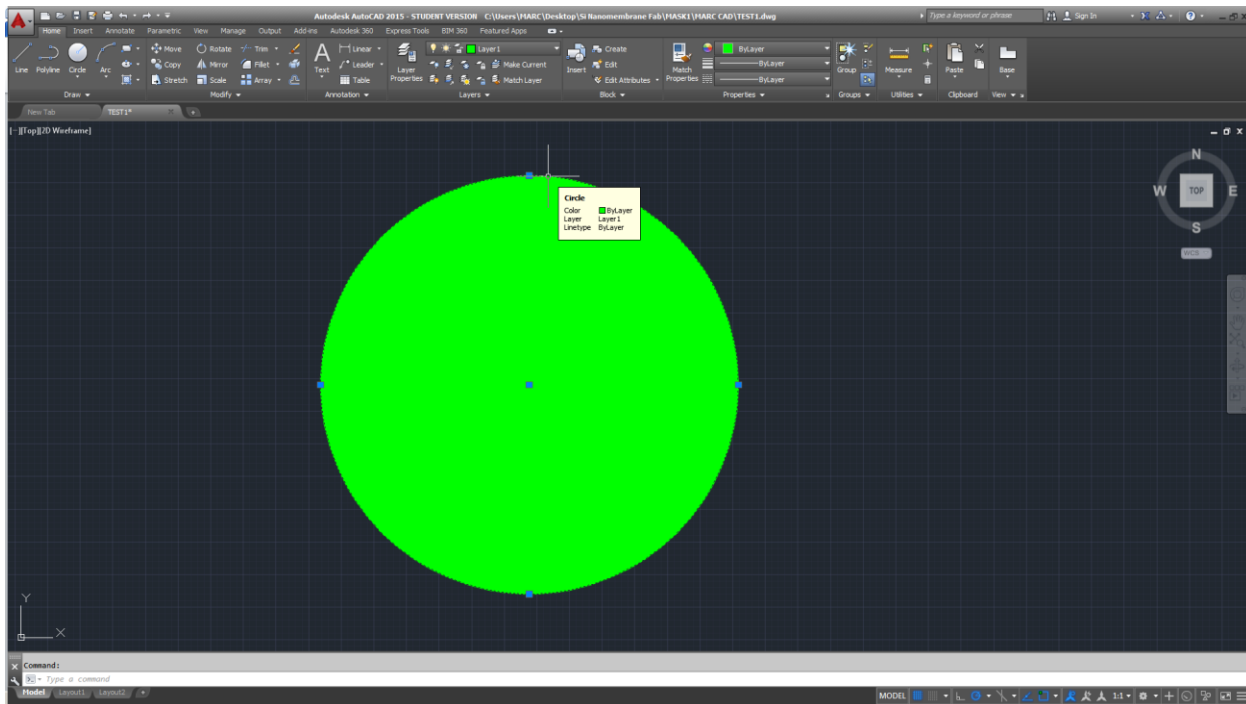
Hatch the inside of the rectangles first. This is the interior hatch area. It is important that this hatching procedure be done in two separate steps.



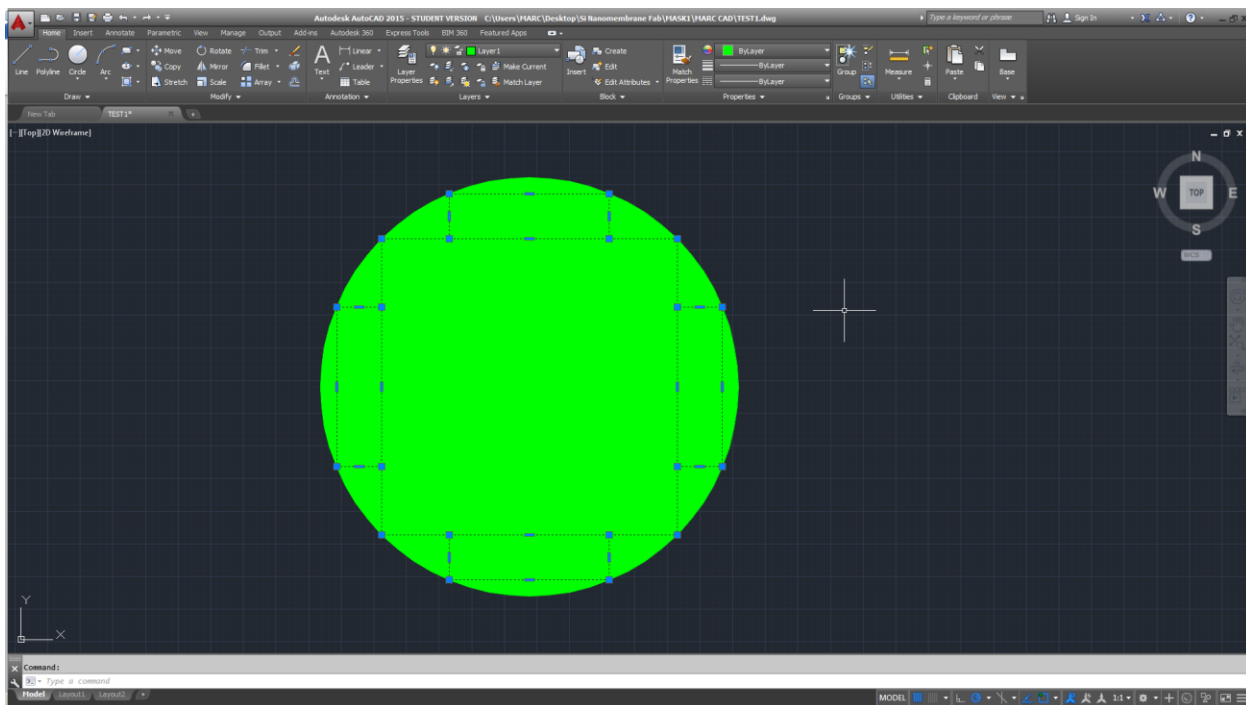
Hatch the remaining curvilinear boundary areas.



6 – After the drawings are all done and the hatching complete, remove all the lines around the hatch areas by selecting them and deleting them.



Remember to also delete the internal lines defining the rectangles.



At the end, the drawing should only have hatched areas with no boundary lines.

