Using Siemens NX 11 Software

Surface Design - Mouse

*Based on a YouTube NX tutorial¹.*

¹https://www.youtube.com/watch?v=k92Id54oBw4
1 – Sketch A.

- Create a model file named mouse.prt and save it into your local folder.
- In the XY-plane draw a sketch consisting in a first circle of 100 mm in diameter centred at the origin, and a second circle of 75 mm in diameter which centre is located in the x-axis, 75 mm left wise from the origin.
- Convert these circles as References by right-clicking on each one and select Convert to Reference in the menu.
- Add two points (as references) at the intersections of the two circles.
- Click the Point button and select the Intersection Point option in the Sketch Point dialog box.
- Select the first circle and then the second one.
- Redo the above operations for the second intersection point.
- Convert these to point to Reference Points as done here above for the circles.
- Draw a reference line starting from one intersection point and finishing at the other.
• Draw a reference circle of 100 mm in diameter and centred on the middle point of the line.

• Using the Studio Spline button , draw approximately a 3-degree spline curve interpolating four point as shown.

• Add a reference point on the intersection between the left and centre circles with positive y-coordinate.

• Constraint the second interpolated point from the left of the spline to lie on the above point.

• Add a reference point on the intersection between the centre and right circles with positive y-coordinate.

• Constraint the third interpolated point from the left of the spline to lie on the above point.

• Constraint the left starting spline point (resp. right ending) to lie on the left (resp. right) circle.

• Constraint the y-coordinate of the left starting spline point (resp. right ending) to be 15 mm (resp. 25 mm).

• Hide all the reference elements (ctrl+b) and exit the sketch mode.
2 – Sketch B: offset, scale and projection.

- Select the spline curve in the visualization window (or in the Part Navigator).
- In the Curve tab of the toolbar click on the Offset Curve button.
- In the Offset Curve dialog box, select Distance as Offset Type and use a distance of 5 mm. Make sure the offset is oriented as shown.
- Click OK to validate.
- Click on the Scale Curve button.
- Select the above offset curve and choose a non-uniform scale \( x=0.9, y=1, z=1 \).
- Hide the initial offset curve.
- Create a new datum plane by clicking the Datum Plane button. We will project the scaled curve on this plane.
- In the Datum Plane dialog box, select At Distance as Type and select the XY plane as Planar Object.
- Set the offset distance 35 mm to the left.
• Click on the *Project Curve* button, and project the scaled curve on the datum plane you just created.
• Hide the scaled curve.

### 3 – Mirroring a curve.

• Click on *Menu ➔ Insert ➔ Associative Copy ➔ Mirror Geometry* and select the projected curve.
• In the *Mirror Geometry* dialog box, select as *Mirror Plane* the XY-plane.

### 4 – Upper surface of the mouse.

• Click on the *Through Curves* button.
• Select the projected (left) curve and click on the *Add New Set* button.
• Select the middle curve and click the *Add New Set* button again.
• Finally, select the last (mirrored) curve and click *OK.*
5 – Moving the Datum Coordinate System.

- Select the Datum Coordinate System (either in the visualization window or in the Part Navigator) and click on the Edit Parameters button.
- In the Datum CSYS dialog box, check if the Type field is set to Dynamic.
- In the Y field, enter 60 (mm) and press Enter.
- Then, rotate the reference frame by 180 degrees around the YC axis and click OK.

- Click on the Back view button.
- You should get the shown view.
7.a – Surface trimming (sketch).

- Create a new sketch in the XZ-plane of the moved Datum Coordinate System. You can notice that the sketch will now be located above the mouse’s surface.
- Double-click on the orange arrow along the local z-axis of the sketch reference frame in order to orient it upwards.
- Draw a 3-point arc of **140 mm** in radius with starting (i.e. left) point coordinate (18, 20) and ending (i.e. right) point coordinate (80, 20).
- Create a symmetric arc w.r.t the x-axis.

- Click on the Bridge Curve button.
- Select as Start Object the upper arc and as End Object the lower arc.
- Click Apply to validate.
• Bridge the other side by selecting as Start Object the lower arc and, as End Object the upper arc.
• Set the Start and End options of the Shape Control field to 1.5
• Note: if you do not manage to select the arcs individually, check if the Curve Rule filter is set to Single Curve.

7.b – Surface trimming.

We will now trim the mouse’s surface by using the above sketch.

• In the Home tab of the toolbar, click on the Trim Sheet button, under the More button of the Feature field.
• In the Trim Sheet dialog box, select as Target the mouse’s surface.
• Select as Boundary the above sketch.
• Select as Projection Direction option Along Vector and select as projection vector the –YC axis.
8 – Surface extrusion.

- Click on the Extrude button and extrude the above trimmed surface contour by 25 mm along the –YC axis.
- In the Settings field, set the Body Type option to Sheet.

9 – Drafting a surface.

- Hide temporarily the (upper) mouse’s surface and click on the Draft button.
- In the Draft dialog box, select Edge as Type and the –YC direction.
- Select the upper edges of the last extrusion and use an angle of 15 degrees.
- Make visible the mouse’s surface.
10 – Trimming the (drafted) extrusion.

- Create a datum plane parallel to the ZX-plane and located 38 mm below it.
- Click on the Trim Body button.
- Select the (drafted) extrusion as Target.
- In the Tool field, select the above datum plane.
- **Note:** if needed, click on the Reverse Direction button in order to keep the right part of the extrusion.

11 – Edge blending.

- Before blending edges, it is a good practice to Sew (i.e. connect) their corresponding surfaces.
- Click on Menu → Insert → Combine → Sew...
- Select as Target the (upper) mouse’s surface and as Tool the (drafted and trimmed) extrusion.

- Click on the Edge Blend button and select the edge connecting the mouse’s surface with the extrusion.
- Enter a blend radius of 3 mm.
12.a – Mouse buttons (sketch).

- Create a new sketch in the ZX-plane of the Datum Coordinate System. Do not forget to set the z-axis of the sketch’s coordinate system to point upwards.
- Draw an ellipse (Ellipse button) of major radius 16 mm, minor radius 7 mm and rotation angle of 0 degrees.
- Constraint the ellipse’s centre to be located along the y-axis and lie 10 mm from the x-axis.
- Construct a symmetric ellipse w.r.t. the x-axis and exit sketch mode.

12.b – Mouse buttons.

The (upper) mouse’s surface will be deformed within the regions defined by the two above ellipses for figuring the mouse buttons.

- Click on Menu ➔ Edit ➔ Surface ➔ Global Shaping.
- In the Global Shaping dialog box, select the (upper) mouse’s surface as Sheet to Deform.
- Select as Region to Deform a first ellipse.
- In the Target Point field, select a 1 mm Offset and use the –YC axis as Projection Direction.
- Click Apply and redo the above operations for the second ellipse.
13 – Closing the mouse bottom.

- Click on the *Bounded Plane* button.
- Select the bottom curves of the mouse in order to close its bottom.
- Sew (*Menu* → *Insert* → *Combine* → *Sew*) this new plane with the remaining of the mouse.
- Add an edge blend of 1 mm between this plane and the remaining of the mouse.
- Finally, hide all the sketches.
14 – Designing the mouse’s wheel.

- In the XY-plane, draw a circle centred at coordinates (5, -38) and of 42 mm in diameter.
- Extrude the circle by 2 mm from either side of the curve in order to obtain a cylinder (check if the Body Type option is set to Solid and the Boolean option to None).
- Apply an edge blend of 1.5 mm on both edges of the cylinder.
- Trim the cylinder by the bottom of the mouse using the Trim Body button.
- Finally, unite the trimmed cylinder with the mouse.

15 – Hole around mouse’s wheel.

- In the Curve tab of the toolbar, click on the Offset Curve in Face button.
- In the Offset Curve in Face dialog box, set the Type option to Constant and select the intersection curve between the mouse’s wheel and its upper face. Set the Offset option to 0.5 mm.
• Divide the upper face of the mouse into two parts using the offset curve as boundary. For this, click on the “Menu ➔ Insert ➔ Trim ➔ Divide face” button.

• Click on the Pull Face button located under the Home tab of the toolbar, under the More button of synchronous Modelling.

• In the Pull Face dialog box, select the small face surrounding the mouse’s wheel.

• Specify the –YC vector and a Distance of 0.5 mm.

• Apply an edge blend of 0.25 mm on the shown edge.

• Finally, hide any visible sketch.
16 – Materials and visualization.

- Select the Assign Material button located in Menu ➔ Tools ➔ Materials and select Polycarbonate as material.
- In the Render tab of the toolbar, click on the True Shading button.
- Select all the mouse surfaces but the external (visible) faces of the wheel.
- Click on the Object Materials button and select the Blue Glossy Plastic button.
- Eventually, hide the Datum Coordinate System.
- You should obtain an object as shown at the beginning of this tutorial.