Design Engineer for a Day

Introduction

Interested in Engineering Design? This session will take you through the process from Concept Generation to Computer Aided Design and include demonstrations of Advanced Manufacturing Techniques. The session will give you, insight into the approach an engineer takes to design of new products and online support to design and manufacture your own product.

Background

Any product design starts with concept development. This could very well be a set of hand sketches of what the product could look like and how it functions. It is even better to have multiple concepts that are evaluated next to select one or develop one with joint features. In this activity, we will quickly take you through the design process from initial concept development, to design, drawing, and rapid manufacture of a prototype. You will see some Additive Layer Manufacture (also termed 3D printing) but use a high-powered laser cutter to quickly cut and etch your design.

The Task

Your task today is to develop your very own key fob from scratch. A cloud-based software will be used as a Computer Aided Design package that can be accessed at vectr.com, the following steps will take through the process.

1. Use an internet browser to navigate to www.vectr.com, register for a free account and sign in. Click on "USE ONLINE" to access the editing tool.

2. Create a new artwork by selecting the "New Artwork" tab, next, select the size to be A4 and give your file a name. You can also change the units if you want.

3. Use the shapes button on the left side bar. Draw a basic circle to start with. Adjust the colour and border of the circle to have a black border of 0.5mm and white fill.

4. Adjust the dimensions by unlocking the aspect ratio lock and type in the values of 80mm for width and 30mm for height. This outline represents the external parameter of the key fob i.e., where the laser will cut out.

5. Repeat steps 3 and 4 to create a circle of 5mm by 5 mm and place it to where you want the key fob hole.

6. Now it is time to add your own design touches, you can use the "Text" tool to enter and edit text, use the Text controls to select the font and alter the size, you can also do that using the muse pointer. What if you select a small font size, will the laser cutter cut it out? Why?
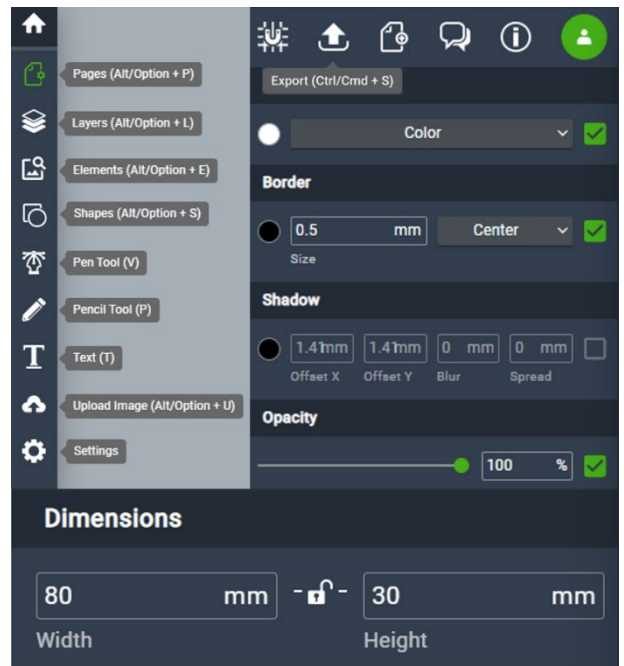
Post a photo or comment on social media or use the QR code to access our Padlet:
https://padlet.com/t_s_o_donovan/EngineerForADay

Connect with **Engineer for a Day** at Heriot-Watt University

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7. Navigate to openclipart.org to search and download ready designs, ensure that you use "silhouette" together with your key word when searching, for example if looking for a car design, search for "car silhouette" then download the file in .svg format.

8. Import the image you got from openclipart.org to your key fob using the Upload Image icon on the left. Adjust the size, position, and orientation until you are happy with the complete design. You can also use the imported image to set the borders of your key fob and/or use the pencil tool to draw your own.

9. The align tools can be used to align the different components in your design, align tools are available in the right-side toolbar, appears only after selecting two objects or more.

10. Use the export button to download your finished design that can be laser cut. Also, you can use the settings button to share a link of your file.
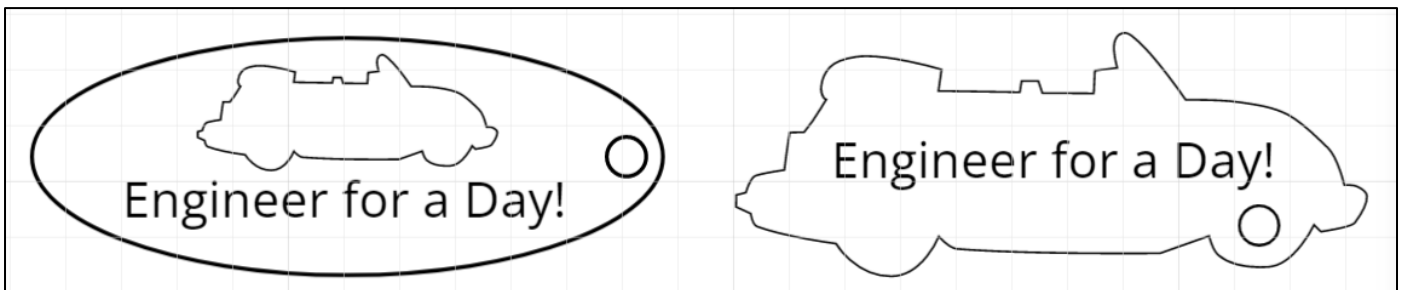
Useful notes

- To select an object, click on any of its parameter lines.
- Mouse scroll + Ctrl can be used to zoom in and out.
- The align tools can be used to align the different components in your design. Align tools are available in the right-side toolbar when multiple items are selected. For detailed step by step guidance, refer to this recording .

Next step

Your design will be processed and uploaded to a laser cutter to perform manufacturing.

- A laser cutter is a computer-controlled device that moves a focused, powerful laser on the X and Y coordinates following your design.
- You can assign different colours to different laser operations:
  - A slower moving, powerful laser will likely cut through the material. This is ideal for the external parameter line of the key fob and the key ring hole.
  - A faster moving, less powerful laser is suitable for engraving or etching of design and text.
  - While colours have no impact on the colours of the finished product, they help communicate different laser settings to the operator.
  - Different materials will require different laser settings for movement and power.

Think about

- What could you do at the design stage to optimize the time required for manufacturing of your design?
- How will the selection of laser power and moving speed affect the finished product?

Health and Safety

Performing operations in a laser cutter may involve fire hazards, sharp edges, and exposure to dangerous fumes. Always refer to your practical work risk assessment and ask for assistance if you are unsure.

Record your participation

After completing the task and posting your work to the Padlet, ensure that you complete this form to record your participation to acquire your Certificate of Participation.