

How digital technologies can relate to my practice?

Module 3: Metalwork & Jewellery.

CREATED FOR

Craft 4.0 - Digital Craft
www.craftproject.eu

This project has been funded with the support from the European Commission.
Grant Agreement Reference: 2018-1-IE01-KA202-038787.

The Partners.

Co-funded by the Erasmus+ programme of the European Union.



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Module Aim.

What, Why, How long?

What?

To provide an introduction of 3D modeling capabilities, highlighting the potential in creating intricate shapes & complex forms that are not feasible through traditional means.

Why?

To outline how digital technologies can add value to existing practices, i.e. exploration of scale, multiplicity and reproduction/ adaptation in finished craft objects. As well as, the ability to create personalized tooling, molds and supports that can assist in the making & prototyping phase of your work.

How long?

This module will include six presentation units which have an estimated reading time of 30 minutes each. You will be provided with other examples that relate to specific craft sectors.

Note

All components seen within the documents have been used with the permission of the creator.



IMAGE BY SABRINNA RINGQUIST
https://unsplash.com/photos/q_sPpAv0MXE

Metalwork & Jewellery.

Introduction to the discipline.

"The practice of forming and fabricating metal into functional & decorative objects."

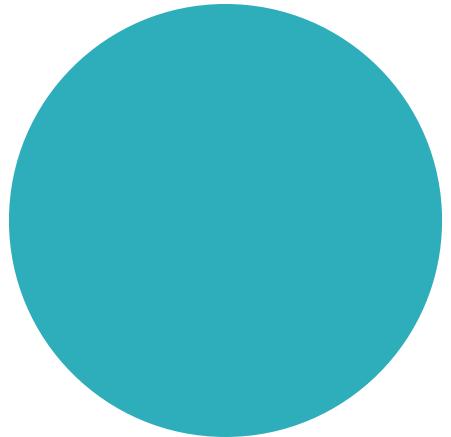
This craft includes techniques such as:

1. Blacksmithing
2. Clock/Watchmaking
3. Enamelling/ Embossing/ Engraving
4. Jewellery
5. Knife Making
6. Casting

“ How might digital technologies **support** our practice in **fabricating metal objects** and **personalized tooling** that can **add value** to our crafting process? ”

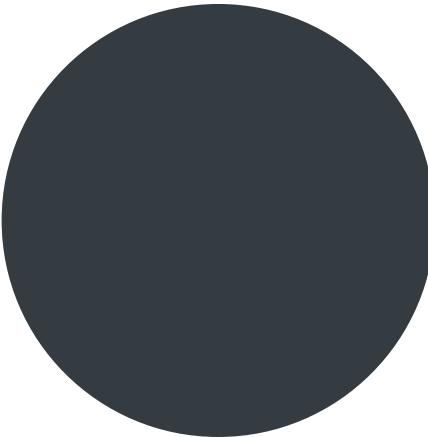
Areas Of Adaption.

Adding value across all stages of the crafting process.



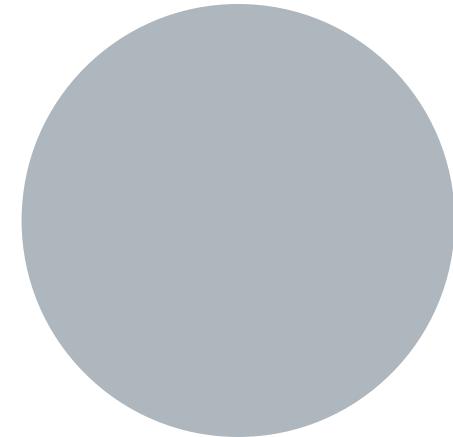
IDEA VISUALISATION

- CAD surface modelling
- Photorealistic 3D rendering
- Laser cutting flat jewellery



TOOLING & CASTING

- 3D printing jewellery prototypes
- 3D printing lost wax process
- Customised plastic press tools



FINAL PRODUCT

- Fully 3D printed jewellery
- SLS 3D printing
- Laser etching packaging

TOPICS COVERED

CAD surface modelling
Photorealistic 3D rendering
Laser cutting flat jewellery

01. IDEA VISUALISATION.

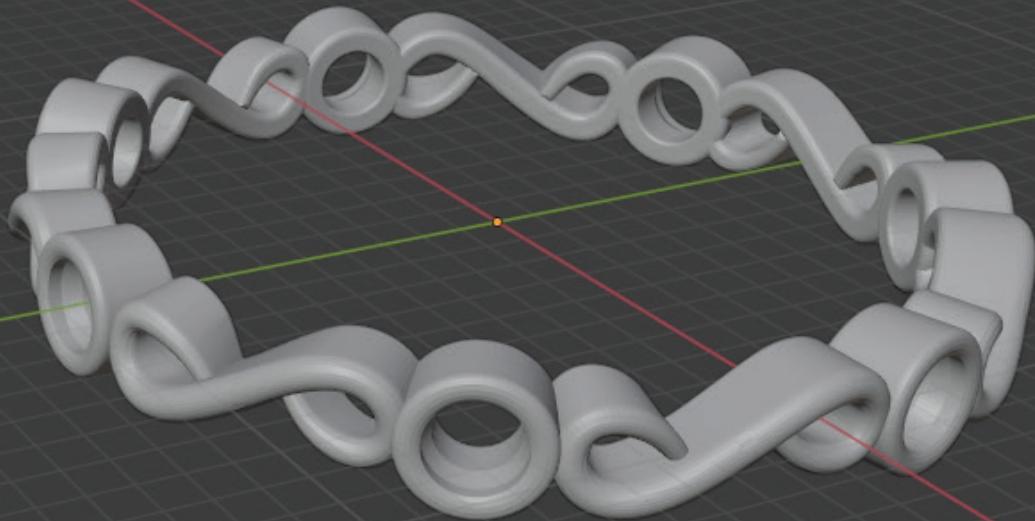
CAD Surface Modelling.

Modelling complex organic forms for jewellery pieces.

Developing your ideas in a digital space with surface modelling software that enables you to control and manipulate the shape with NURB.

General **solid modelling** is suitable for objects with **controlled dimensions**, however, this approach is **difficult when creating** highly detailed or **curved objects**.

Surface-based modelling allows the makers to **create complex, curved or organic pieces** which is more effective for jewellery makers. Alike most CAD, it allows you to work at a **high level of precision** and **create iterations in a faster pace**. Mudbox or RhinoGold are examples of CAD software directed towards this craft area that allows you to build organic objects and add textures/engravings to your designs.



"ETERNITY RING" BY CAD MAKER
<https://www.cgtrader.com/cadmaker>

Photorealistic Renders.

Rendering CAD models with colour, texture & materials.

Creating photorealistic images from your 3D models before physically making the object, creating a clear vision of colour or finishes that could be applied.

As jewellery is a visual based object, **knowing what your design will look like** with the intended materials will allow you to **spot any flaws**. Within software's like Mudbox or RhinoGold, **renders** can show how the piece will **look like in the real world** with **correct lighting and textures**.

These **available software's** hold a **library of different materials** used in the jewellery sector which eases the process of rendering your design. As well as, allowing you to **customise and personalise your design** with engraving features embedded in the software.



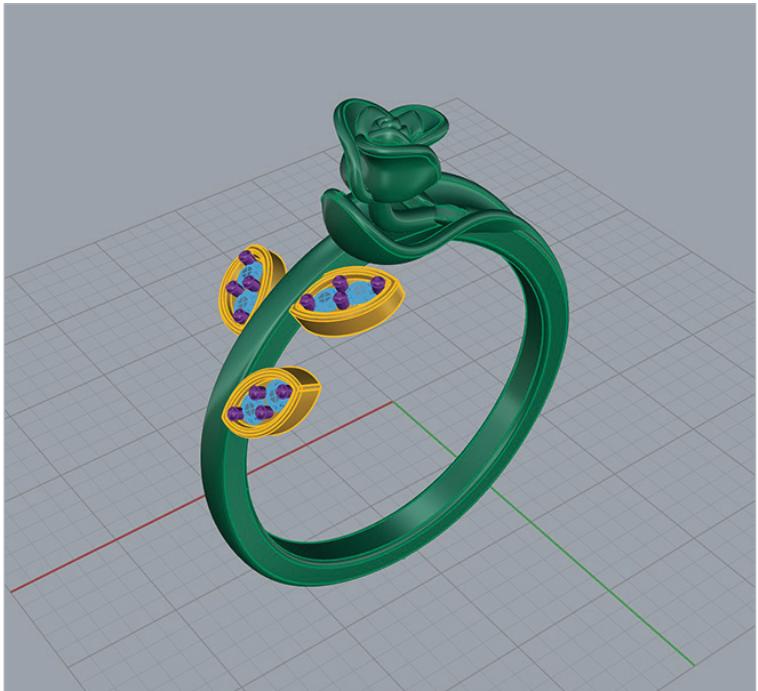
"DEEPIIMAGE RENDER SAMPLE" BY 3DESIGN FR
<https://3design.com/en/deeppimage-renderings-gallery/>

CAD Process Example.

From surface modelling to 3D rendering the design.

"3D MODELLING JEWELLERY IN RHINO3D" BY JAMES GREEN.

<https://sketchfab.com/blogs/community/preparing-and-uploading-3d-jewelry-designs-in-rhino/>



CAD MODELLING USING NURBS

The model is created with NURBS and refining the design by combining different parts into one whole model, and applying material definitions for the rendering phase.

IMPORTING INTO RENDERING SOFTWARE

The model can be rendered in the modelling software or exported as an OBJ file and imported into specific software such as Blender, but in this case SketchFab.



APPLICATION OF MATERIALS

With the material defined, the maker can apply materials, colours and textures to the model and simulate how light may bounce off the model for a realistic feel.



"JEWELLERY RENDERS" BY ERIK TADEVOSYAN
<https://www.behance.net/Erik-Tadevosyan>

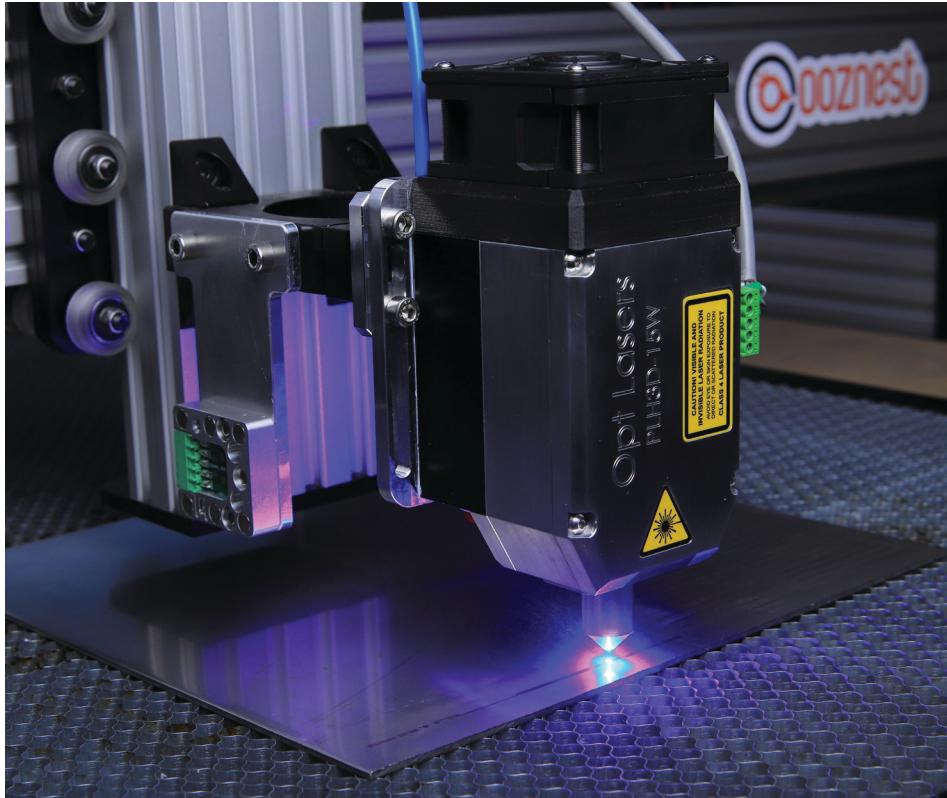


IMAGE BY OPT LASERS
<https://unsplash.com/photos/7NvkRiTzLZE>

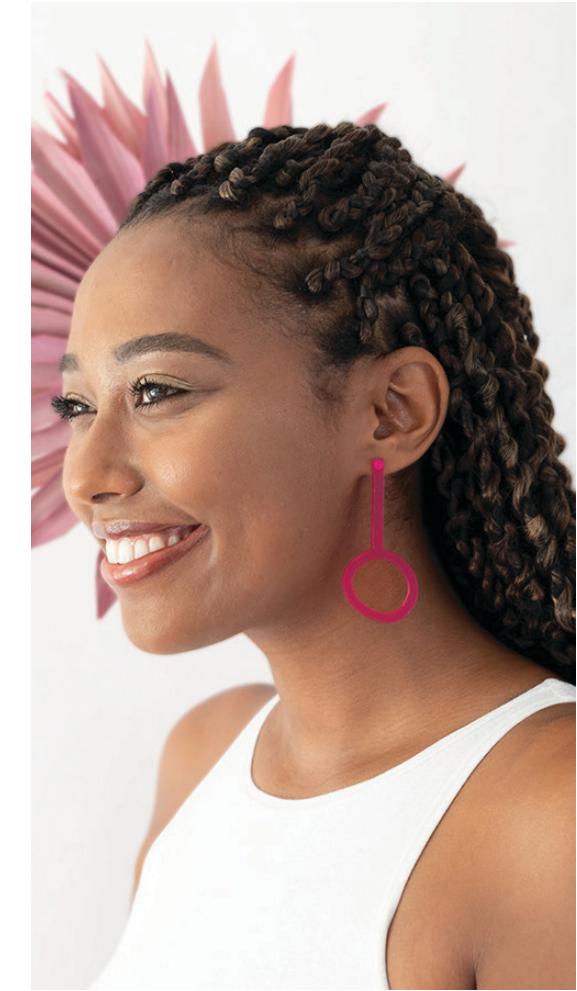
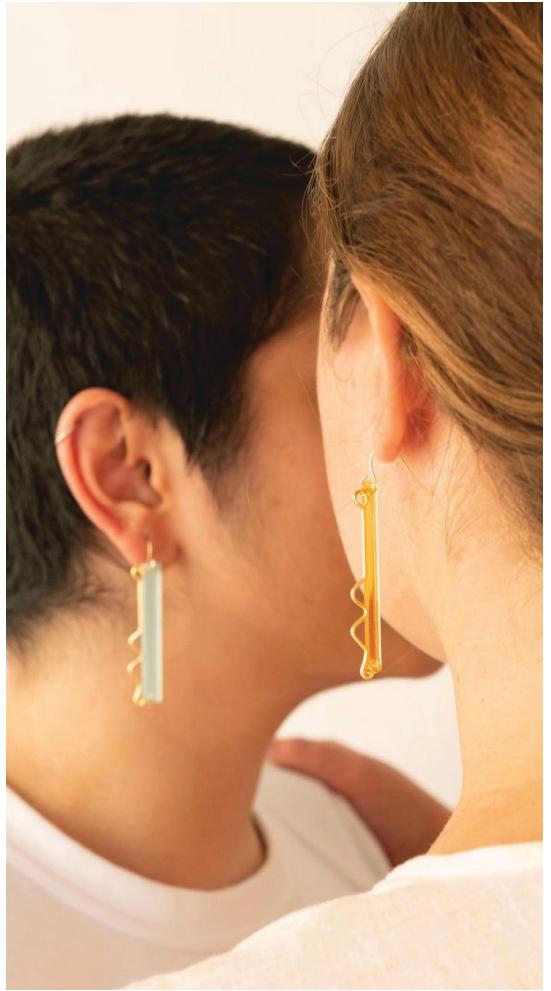
Laser Cutting Jewellery.

Creating precise jewellery pieces with sheet material.

Using laser cutters to create unique flat jewellery or custom engrave your parts in a range of different materials.

Laser cutting provides makers with the **ability to cut schematic illustrations** on sheet materials. By creating a 2D illustration of the design you would like to include on **earrings, necklaces, pendants** or **adding patterns on an existing piece**, a laser cutter can **precisely score, cut, or etch** that design.

This process can be quite trial and error as it depends on the material you are using and the laser process you choose. Laser cutting is a much **faster process to turning out prototypes than 3D printing** when working with flat products.



"SUNNY SIDE JEWELLERY" BY SAHARA ALDRICH
<https://www.sunnysidestudio.shop/>
https://www.instagram.com/sunnyside_studio_

TOPICS COVERED

3D printing jewellery prototypes
3D printing lost wax process
Customised plastic press tools

02. TOOLING & CASTING.



Validating Designs.

Using FDM, SLA or SLS printing to produce prototypes.

With the **3D model produced** on CAD software, the maker can **print the piece** with **FDM, SLA or SLS printers** to **check** the **quality and overall design** before relying on a supplier or online 3D printing service to produce the final part. **SLA or SLS printing** will be **most suitable for jewellery design** due to the technology's **ability to produce high detail** components that are organically shaped.

This will allow the craftsperson to make tweaks before sending the files to be 3D printed in metal or other higher-grade materials. If **one feels** that **3D printing for production** is **not suitable**, it can still **support the process of creating a master model**, later to be used for mould making.

SLS Print Samples.

Printing designs with selective laser sintering technology.

PRINTED ON THE SINTERIT LISA PRO IN PA12 POWDER MATERIAL

<https://www.sinterit.com/sinterit-lisa-pro/>



From left to right:

"INTERLOCKING PENDANT" BY ARIS PAPAMARKAKIS
"VICKY" BY ARIS PAPAMARKAKIS
"MELPOMENI" BY ARIS PAPAMARKAKIS
"BRAIDED RING" BY ANDREW REYNOLDS

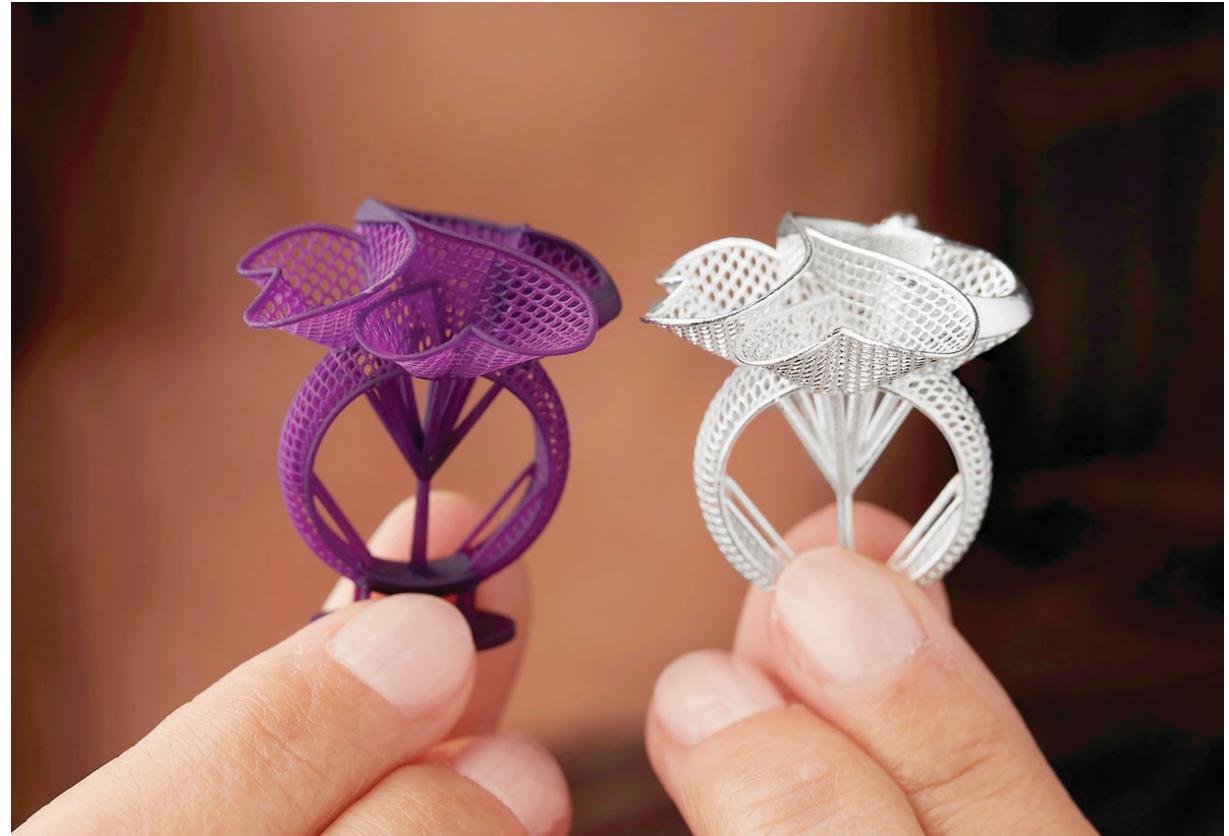
<https://www.myminifactory.com/object/3d-print-interlocking-celestial-necklace-pendant-18676>
<https://www.myminifactory.com/object/3d-print-vicky-82432>
<https://www.myminifactory.com/object/3d-print-melpomeni-24058>
<https://www.myminifactory.com/object/3d-print-braided-ring-22809>

Lost-Wax Casting.

Mould making process with wax 3D printed parts.

With the **advancements in SLA** 3D printing, **wax-like resin** can be used to **produce master models for moulds** using an investment casting method. Instead of a hand-sculpting, a **3D printed part** can provide **high levels of detail** which can then be attached to a wax tree by the sprue. The parts can **then be casted and burned out**, leaving a negative mould of the design.

The **process carries on** with **traditional methods of pouring metal** in the hollow cavity which will create the final part, with **minimal post-processing required**. This process can be used to create many identical moulds that will **simplify the production process**.

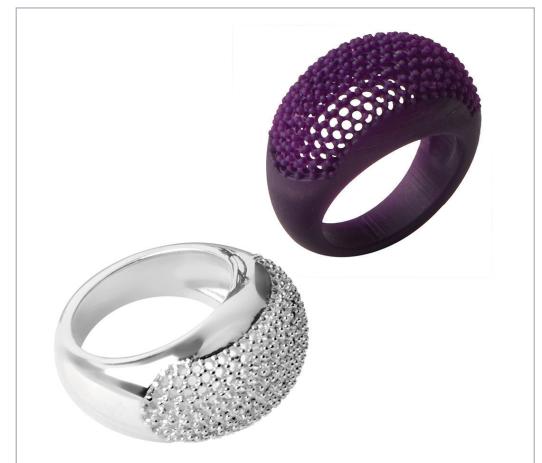
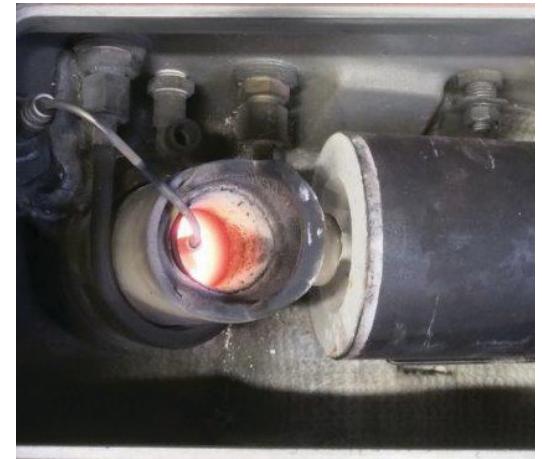


"3D PRINTED WAX MODEL VS CASTED FINISHED PIECE" BY FORMLABS
<https://formlabs.com/blog/3d-printed-jewelry/>

Casting Process.

Adapted from FormLabs.

The maker will **develop their CAD model** and 3D print the part with **"Castable Wax" resin**. The maker will **sprue the parts** that are dry and add wax sprues/ gates to the print, similiar to lost-wax casting. **Creating the mould by** burning out the printed parts and lastly **casting with metal**. The **part can be polished** and is ready to be used.



"CASTING PROCESS WITH WAX RESIN" BY FORMLABS
https://support.formlabs.com/s/article/Introduction-to-Casting-with-Formlabs-Resins?language=en_US

Customised Tooling.

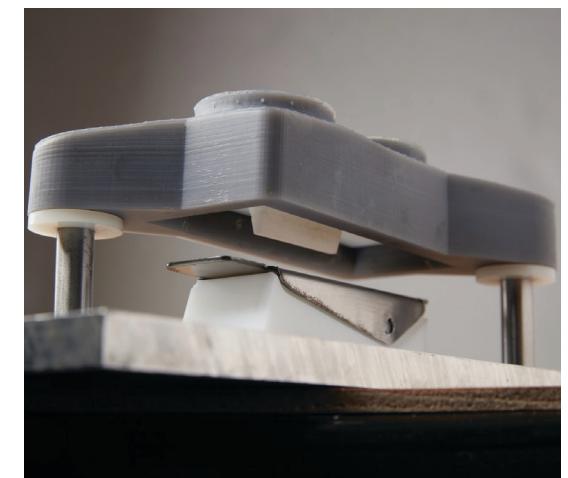
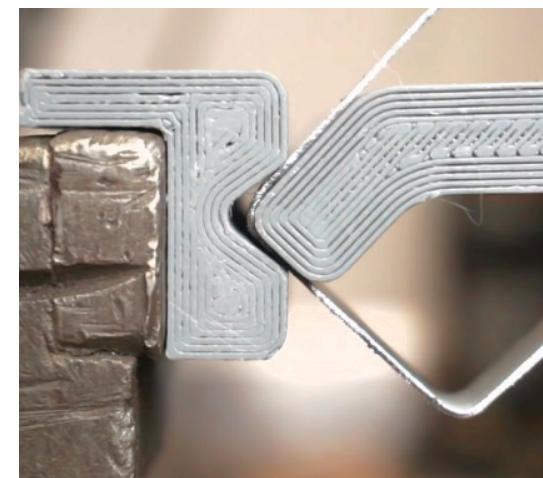
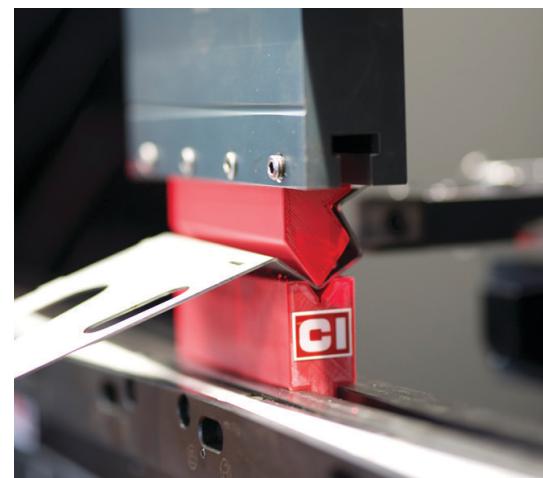
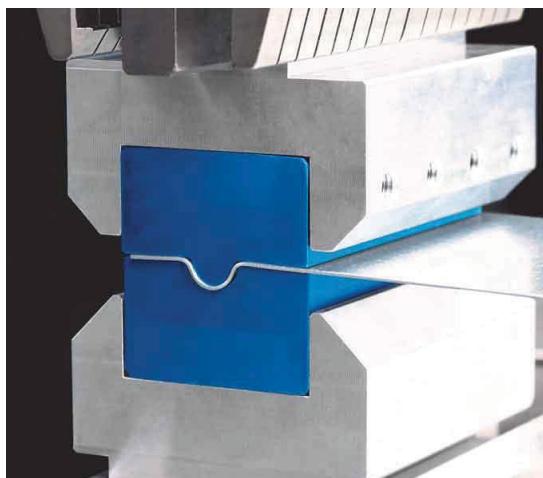
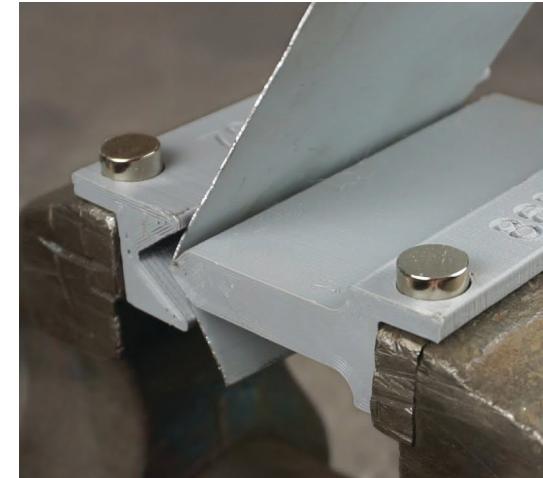
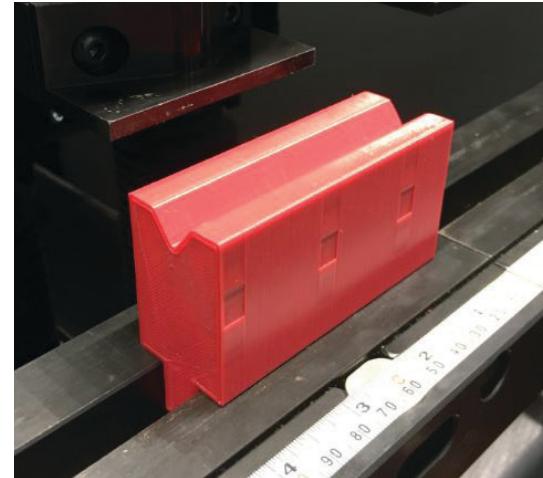
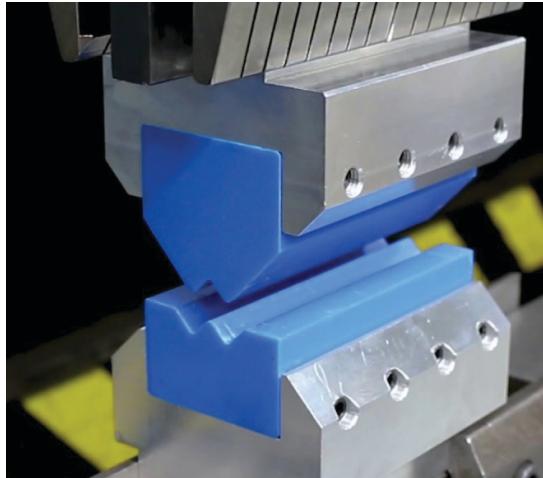
Creating custom metal forming tools.

Forming sheet metal is widely used for manufacturing large vehicle parts which **require CNC machined metal tools**. However, majority of metal workshops produce small units of parts that require low bending force.

3D printing plastic **forming tools** can **shorten development time** and costs due to in-house production. In-house printed tooling can enable metalworkers to **prototype parts** and create iterations of tool designs **that fit the purpose**. SLA printing can provide **strong substitutes for metal** jigs, fixtures and forming tools. FDM printing also give makers the ability to create custom press brake tooling that can **adapt to bench vices or arbour presses**.



"VICE PRESS BRAKE TOOLS" BY BRAUNCNC
<https://www.thingiverse.com/thing:4063689>



"3D PRINTED PRESS TOOLS" BY WILSON TOOLS
<https://www.wilsontool.com/en-us/ideas/additive>

"3D PRINTED PRESS TOOLS" BY CINCINNATI
<https://www.e-ci.com/>

"3D PRINTED PRESS TOOLS" BY BRAUN CNC
<https://www.thingiverse.com/thing:4063689>

"3D PRINTED PRESS TOOLS" BY FORMLABS
<https://formlabs.com/blog/sheet-metal-forming/>

TOPICS COVERED

Fully 3D printed jewellery
SLS 3D printing
Outsourcing print production

03. FINAL PRODUCT.

3D Printed Jewellery.

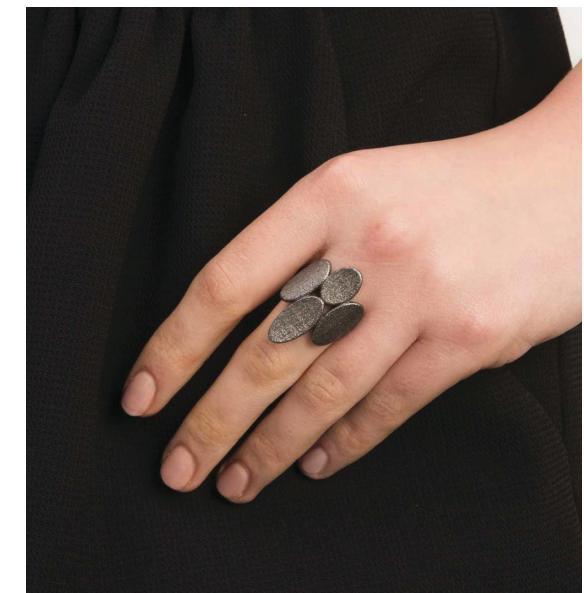
Fully printed jewellery with SLS technology.

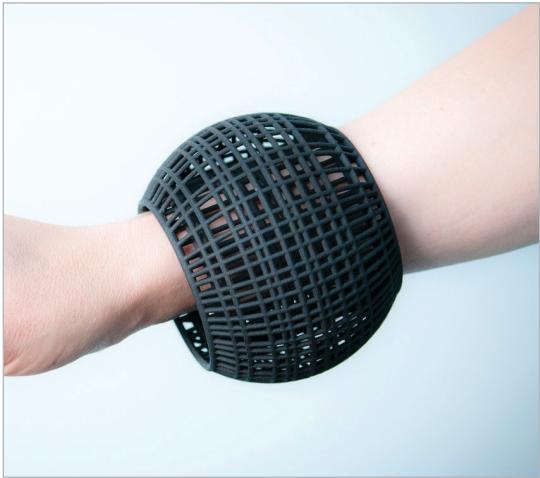
Although, **SLS** and **SLA** 3D printers produce high quality prototypes that can be used to **validate the sizing, form and textures** of the design iterations, many makers **produce** their **final product** through those processes.

SLS has been more commonly used in the costume design and jewellery sector which allows makers to produce final designs **in-house relatively quick**. SLS is a powder-based 3D printer which **does not require support structures** when operating, therefore, allowing the maker to create forms that would be **difficult to produce traditionally**. Powder materials such as **PA12 & nylon** are used more often due to its **strength and flexible properties**.



"ARMURE FAMILY" BY ODO FIORAVANTI
PROJECT ASSISTANT: JUAN NICOLAS PAEZ
http://www.fioravanti.eu/project/Armure_family





"3D PRINTED NYLON JEWELLERY" BY MARIA EIFE
<http://www.mariaeife.com/>

Outsource Production.

Utilising 3D printing services for on-demand printing.

Casting high detailed jewellery pieces can be a **difficult** process even when **creating your own mould** from the lost-wax 3D printing method. Therefore, the **maker can outsource the production** with 3D printing services such Shapeways, Formlabs or Sculpteo who provide a **range of metal material options** and finishes. By **3D printing in metal**, the piece can be **lighter, be of high quality** and give freedom to produce complex shapes.

Jewellery pieces are just one example, but knife handles and objects related to other craft sectors can be outsourced in this way. Jewellery pieces also **do not** have to **confine to metal**, strong and flexible plastics such as **TPU are also used** in this sector.



IMAGE BY MINKUS
<https://unsplash.com/photos/aCniNTiIFd8>

"Well done on getting to the end of this lesson!"

Conclusion to: Metalwork & Jewellery.

**Want to
learn more?**

Visit Craft 4.0 at
www.craftproject.eu

The presented work, produced by the Craft 4.0 Consortium, is licenced under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International Licence.