

Introduction to 3D Printing

Introduction

Welcome to the UTSC Library Makerspace's "Introduction to 3D Printing" session. You must watch this tutorial to gain access to the 3D printers.

At the end of the tutorial is a link to the 3D printing quiz. Once you submit the quiz, you'll receive an email from the Makerspace confirming the completion of the tutorial.

Please be advised that this tutorial is not narrated.

This tutorial will cover:

- Parts of the 3D printer
- 3D print files
- Settings
- Post-processing
- Safety
- Intellectual property
- Makerspace policies

Printer in motion

The 3D printer builds an object layer upon layer, from the bottom up.

How the 3D printer works

- The filament is fed through a tube.
- The extruder heats the filament to a liquid state.
- The object is built on the plate and cools to a solid state again.

Filament

Filament is the material used to print your 3D model.

We have a basic rainbow of colours available, including black, white and grey.

Your object will be printed in one colour only.

We use 2 types of filament:

Most of our prints are made with PLA.

It is mostly made from corn starch.

We don't recommend you print items that touch food or drink because of the filament dyes.

PLA doesn't handle heat well so don't leave your 3D printed object out in the sun.

ABS is a sturdy and durable material.

It's what Legos are made out of.

ABS takes a while to cool down, which may cause warping.

We recommend only experienced users print with ABS.

So how do you find something to print?

[Find a print file online](#)

Do a simple search – for example: “baby Yoda 3D print”.

Thingiverse, Pinshape and Sketchfab are popular file-sharing sites.

Yeggi is a 3D print search engine that searches other sites for print files.

[Design an object](#)

There are free 3D design programs available online.

We offer a workshop on how to create an object to print using Tinkercad.

blender and Fusion 360 are for more advanced designers.

[Scan an object](#)

You can scan an existing object to create a 3D print file.

There are 3D scanner apps available for your device.

The apps are free, but you usually have to pay to export a file.

[File type](#)

Make sure the file type you bring with you to the Makerspace is either STL or OBJ.

3D printing process

Book a 3D printer. See our website for booking instructions: uoft.me/book-equipment.

Bring your file to the Makerspace.

Select your filament colour.

Upload the file to the 3D printer software.

Model settings

Adjust the size and position of the model so that it fits the printer and it's in the centre of the plate.

Our 3D printer is 51 centimeters wide by 40 centimeters high by 40 centimeters deep.

Print settings

Print settings are about how you want your object to be printed.

Usually the default settings are fine.

However, there are times when you may need to make adjustments.

Here are some basic settings:

Layer height

The layer height can be adjusted depending on what you're printing.

A higher layer height is good for large, simple objects.

A thinner layer works for objects with lots of detail.

The smaller the layer, the longer it takes to print your object.

Infill

Infill is the stuff that's inside your object.

You can make your object as dense or hollow as you want.

For most prints, the default 20% setting is good enough.

The more infill you add, the longer your print will take.

Shells

Shells are the outline of the layers of your object.

They reinforce the strength of the outer walls of the print.

The default is two shells, but you can go as high as five shells.

Rafts

A raft is a removable structure that's built onto the bottom of your object.

Rafts are added to give your print stability.

It's important that your object doesn't move while printing.

Supports

Supports are needed if your object has parts that are parallel with the plate.

Like rafts, supports are easily removable.

The layer will fall if there's nothing to hold it up.

What do you think?

If you were printing this model of a water molecule, would you add rafts and/or supports?

Yes.

Add both – a raft will add a solid base layer, and the arms of the molecule will fall down without supports.

Printing instructions

Here is an example of an object on Thingiverse.

Sometimes the creator offers print setting suggestions.

BTW Fish Fossilz are awesome to print!

Post-processing

You can do things to your object to make it look more polished.

Sand the rough edges.

Paint it. Print your object in a light colour if you're going to print it afterwards.

Safety

Pay attention when working with 3D printers.

They have moving parts and generate high temperatures.

Remember:

- Do not reach into the printer while it's moving.
- Do not touch the extruder – it's very hot.

- Be careful when using tools like utility knives and scrapers. Aim the tools away from you.

Intellectual property

Just because you found free material online doesn't mean you can do whatever you want with it.

Every creator has the right to determine how their creations are used.

Before you use it, look for a:

- Copyright notice
- Creative Commons license
- Terms of Use

UTSC Library Makerspace Policies

- 3D printers are available to current University of Toronto students, staff and faculty.
- You must become a Makerspace user before you can book any equipment.
- Every user gets 10 hours of free 3D printing.
- 3D printing not related to course work or entrepreneurial initiatives is \$0.50 per 15 minutes.
- Printing dangerous or offensive objects is strictly prohibited.

Click on the QR code or visit our website to find out how to become a Makerspace user.

uoft.me/makerspace-get-started

Quiz time

It's now time to complete the 3D printing quiz.

uoft.me/3D-printing-quiz

For more information

Website: makerspace.utsc.utoronto.ca

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