7 Key Steps to Print your 3D Model at our McNaughton Center

1. Design your 3D model in a supported file format (*.stl*, *.thing*, *.obj*) using a 3D modelling software [FAQ 2]. Ensure that your model does not violate our printing requirements not goes over the build plate dimensions (**28.5 x 15.3 x 15.5 cm**).

2. Check our Summary of **3D Printing** & **Equipment Rentals** & familiarize yourself with our pricing at our **McNaughton Center page** [FAQs 1, 3, 4]. Once your 3D model is ready, …

3. Fill in the **3D Printing Google Form** & email your STL file to **ieee.mcgill@gmail.com**. Before proceeding with the printing, a McNaughton Officer will check your model's **printing feasibility**, **estimated cost**, **filament color** & **printing resolution** with you.

4. Upon your confirmation, a printing time is selected during an available weekday (please check **Calendar page**). Please note that **FIRST-REQUEST-FIRST-SERVE** priority is ensured.

5. Once your 3D model has been successfully printed, your invoice is sent to you via email. A suitable meeting time is confirmed with you to collect your printed item(s) at the **McNaughton Center** (*Room MC543, McConnell Engineering Building, McGill University*).

6. TWO payment methods are accepted: Interac Email Transfer (**ieee.mcgill@gmail.com**) OR Cash. Pricing is based on *total mass* & *printing time* of the 3D printed model [FAQ 4].

7. Collect your 3D model! If you are interested, we can upload a picture of your 3D model along with your testimony (your model's expected use – personal/research/project) on our **Sample 3D Prints page**. ☺

Frequently Asked Questions *(updates-in-progress)*

1. What are the suggested 3D modelling software? Beginner materials/resources?

MakerBot Replicator 2 (3D Printer)
- *Replicator2* page
- *User Manual* page
- *MakerBot Desktop* software

Beginner 3D Printing Resources
- Anqi Xu's "*Intro to Open-Source 3D Printing*"
- *Thingiverse*: 3D model search database
- *TinkerCAD*: online 3D modelling tool

OpenSCAD (3D Model Scripting)
- *OpenSCAD website*
- *Cheatsheet* (v2014.03)
- *Online software*

Additional Resources
- *SketchUp:* modelling (user-friendly)
- *netfabb*: STL Repair Tool
- *Slic3r*: G-code generator
- *3ders*: online 3DP community
- *meshmixer*: add precise supports

2. How do I estimate my 3D model's material use & cost?

- Download *MakerBot Desktop* & select "***MakerBot Replicator 2***" printer.
- Open your 3D model using the downloaded *MakerBot Desktop* software. If prompted with "***Put object on platform?***", then select "**Move to Platform**". This ensures your 3D model is not floating, but rather is fixed onto the printer platform's surface.
- Next click on SETTINGS, select the printing **Resolution** (Low, Standard, or High) & whether you need a **Raft** and/or **Supports**. You can even change the **Quality** under ***Advanced Options***. **DO NOT CHANGE** the **Temperature** & **Speed** settings.
- Once you're done, click **Save Settings**
- Click on EXPORT PRINT FILE. You can then see the **Print Time** (*e.g. about 1h 25m*) & **Filament Material** used (*e.g. 35.00 g*). Using our pricing, you now know how much your 3D printed model will cost & how long it will take to print!
- Send us your 3D model via *email* upon filling the ***3D Printing Google Form.***

3. What are the 3D printer specifications/limitations?

This has been directly obtained from MakerBot Replicator 2 User Manual:

Print Technology:	Fused Filament Fabrication
Build Volume:	11.2 L x 6.0 W x 6.1 H in [28.5 x 15.3 x 15.5 cm]
Layer Resolution:	High 0.1 mm [0.0039 in]
	Standard 0.2 mm [0.0078 in] → ***Suggested***
	Low 0.3 mm [0.0118 in]
Positioning Precision:	XY: 11 microns [0.0004 in];
	Z: 2.5 microns [0.0001 in]
Filament Diameter:	**1.75 mm** [0.069 in] → ***Minimum Wall Thickness***
Nozzle Diameter:	0.4 mm [0.015 in]
Software Bundle:	*MakerBot Desktop*™
File Types:	*.stl, .obj, .thing*

4. How much does it cost to print a 3D model?

IEEE members get **50% discount!** To estimate printing cost, use *MakerBot Desktop* [FAQ 2].

- **IEEE member**:   printing cost = $1.00 per 10g of material use + $1.00 per 1hr of printing time
- **Non-IEEE**:   printing cost = $2.00 per 10g of material use + $2.00 per 1hr of printing time

5. What printing material is used?

We currently use **1.75mm Polylactic Acid** (**PLA**) filament. It is ***biodegradable***, & its extrusion temperature is between *180°C* & *230°C* (best printing temperature is 210°C-220°C). Ideal adhesion surface (PLA) to use for the 3D printed model is *painter's tape* [ref].