## What is 3D Printing?

Traditional printing lays down a layer of ink to produce an image or text on paper. 3D Printers lay down heated material to create three dimensional objects such as name tags, cups, cell phone cases, etc.

Why 3D Printing?

3D Printing is a signature project of the Maker Movement, a cultural shift from consumption to creation. The growth of the Maker Movement and Makerspaces has grown out of Do It Yourself (DIY) trends and has been fueled by an entrepreneurial spirit looking to use interdisciplinary approaches to spur innovation. The movement is about transferring education to empower everyone to think of him/her-self as a maker. In announcing its *A Nation of Makers* initiative to support the Maker Movement, the White House reminded:

> America has always been a nation of tinkerers, inventors, and entrepreneurs. In recent years, the rise of the Maker Movement and growing community of self-identified "Makers" is a huge opportunity for the United States. In the same way that the Internet and cloud computing have lowered the barriers to entry for digital startups, the democratization of the tools need to design and prototype physical products can support entrepreneurship and a renaissance of American manufacturing.[1]

How Does 3D Printing Work?
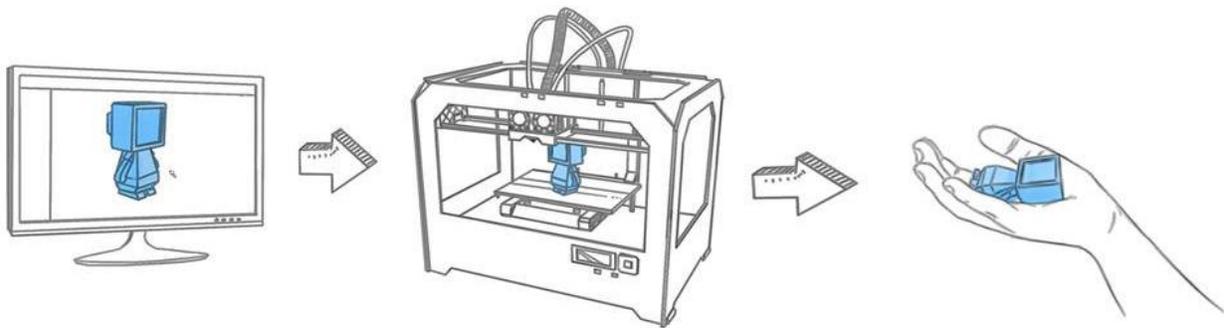
1. Create, modify and/or identify an open source design of an object that you would like to create.
2. Designs are saved as an .STL file type so that way a variety of programs can be used to edit the file.
3. Once you're satisfied with your design, you must prepare the file for your individual printer.
4. Each printer manufacturer provides a slicing program that you use to communicate with your printer. The library uses **Cura for our Ultimakers**, and **Matter Control for our SeeMeCNC Orion**.
5. When you **Save to SD Card**, the slicing program converts the .STL to a .GCODE filetype for each individual machine. .GCODE files are not interchangeable across machines.
6. After you eject the SD Card from and insert it into our 3D Printers, select your file and then select "Print"!
7. Once you start printing, the machine will begin to lay down filament on the build plate and create your object.
8. After a period of time, your project that started as a computer file will be a tangible object!

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[1] [1] FACT SHEET: New Commitments in Support of the Preesident's Nation of Makers Initiative (June 12, 2015) https://www.whitehouse.gov/the-press-office/2015/06/12/fact-sheet-new-commitments-support-president%E2%80%99s-nation-makers-initiative
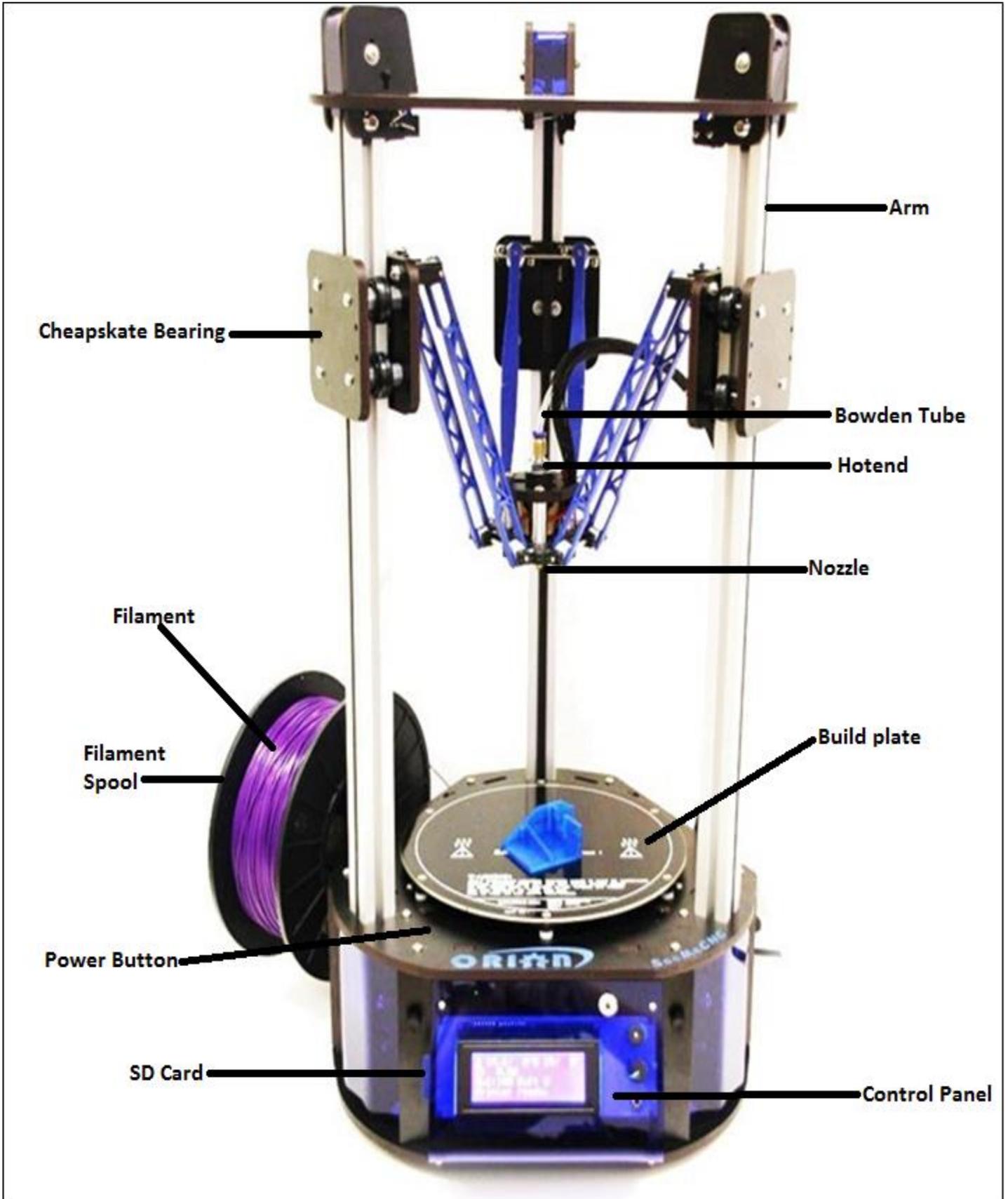
SeeMeCNC Orion: Changing Filament

- Adjust Temps > Temp > Heat nozzle to 210*C. Leave the heat on during this entire process.
- Once the hotend is at operating temperature, you will see filament begin to ooze from the nozzel. This is good.
- Approach the back of the machine and press on the red lever.
- As you're pressing on the red lever, gently pull the filament out of the bowden tube.
- Once the filament is removed from the bowden tube, you should be able to remove the filament reel from the machine.
- Put on your new color and put the filament through the filament guides on the side of the machine.
- Press and hold on the red lever while inserting and pushing the filament through the tube.
- Continue to depress the lever while feeding the filament until you see filament begin to ooze out of the head.
- Once the filament changes color, you're all set!

Print via SeeMeCNC Orion

1. Insert SD Card into the computer.
2. Open MatterControl software
3. In MatterControl, Select Printer: SeeMeCNC Orion
4. Select "+ Add"
5. Select your saved file and press "open"
6. Once the file completes its loading & merging process, select "export."
7. Export file as .gcode to SD Card.
8. Eject SD Card.
9. Insert SD Card into machine.
10. Press "Print".
11. Go to the machine.
12. At the machine, press the knob down.
13. Select "Print File."
14. Navigate to your file and print.

SeeMeCNC Orion Parts

Arm

Cheapskate Bearing

Bowden Tube

Hotend

Nozzle

Filament

Filament
Spool

Build plate

Power Button

SD Card

Control Panel

Ultimaker 2: Changing Filament

REMOVE OLD FILAMENT

- Access the material change menu by going to **"Material" > "Change".**
- Wait a minute while the print head is heating up. By heating it up we ensure that the filament is being melted before retracting it from the nozzle.
- When the nozzle is hot, the Ultimaker 2 will automatically start turning the feeder wheel, through which the filament will be rewind completely. If the filament doesn't come out of the feeder completely you can simply pull it out by hand.

LOAD NEW FILAMENT

- After removing the filament you can start loading the new filament in the same way as done during the first use of your Ultimaker 2. Make sure the old spool of filament is removed from the spool holder and the new one is placed.
- Take the end of the filament, insert it into the bottom of the material feeder and push it until the filament is being grabbed by the knurled wheel. This may require some gentle force. Once the knurled wheel has grabbed the filament, it will slowly move it further into the bowden tube.
- Wait till the filament reaches the first black bowden tube clip and then press the button to continue.
- The Ultimaker 2 will automatically load the filament through the bowden tube, into the print head.
- Now you just have to wait until the filament is coming out of the nozzle - when it does it click Ready on the display.

Print via Ultimaker 2

1. Insert SD Card into the computer.
2. Open Cura software
3. In Cura, select: File > Open
4. Select your saved File and press "Ok
5. Save file to SD Card
6. Once the file is saved to the SD Card (a confirmation appears on the bottom center of the screen), eject the SD Card.
7. Put the SD Card in the Ultimaker machine.
8. Select "Print".

Ultimaker 2 Parts

ULTIMAKER 2 AT A GLANCE

For the full **user manual** in different languages visit www.ultimaker.com/manual-2
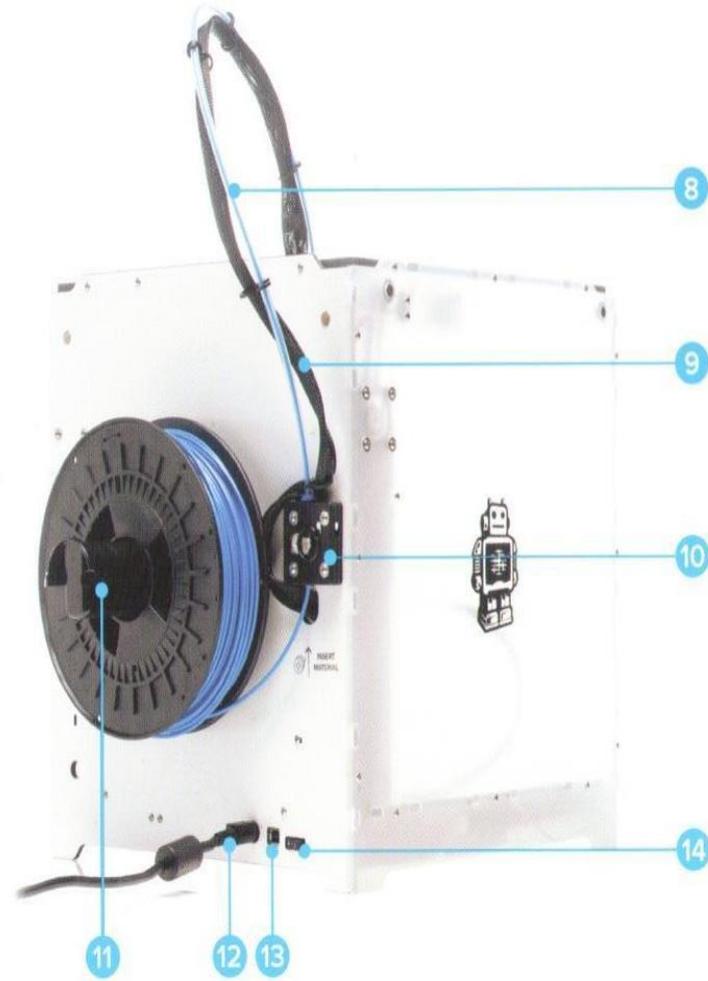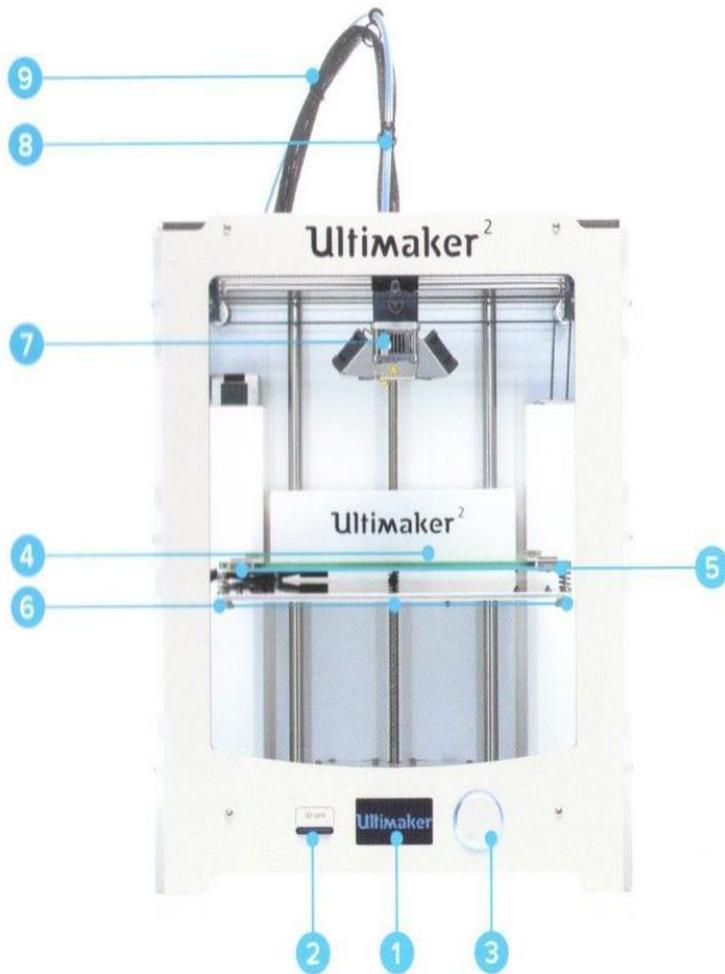
1	Display	**3**	Push/rotate button	**5**	Build plate clamps	**7**	Print head
2	SD card slot	**4**	Build plate	**6**	Build plate screws	**8**	Bowden tube

9	Print head cable	**11**	Spool holder	**13**	USB socket
10	Feeder	**12**	Power socket	**14**	Power switch