



AFRL MAKER HUB
3D PRINTER TRAINING
(FDM)

ABOUT 3D PRINTING

HOW TO RESERVE:

- If not reserved, first come first serve basis
 - Summer: Peak 3D printing time (AFRL Summer Scholars)
- Afrlmakerhub.com
 - Albuquerque, NM
 - Calendar
 - Equipment
 - Fill out form
- If you are not printing 20 minutes after your reserved time or no-show, you will lose your slot.
 - Multiple no-shows: loss of reserving
- We get the submission as an email (MAKE SURE YOUR EMAIL IS CORRECT)
- We will respond back with confirmation/denied, and update our calendar.
- Calendar shows booked slots
- After training: added to our trained log, email with powerpoint and quick reference poster

ABOUT THE PRINTERS

- **FDM: Fused Deposition Modeling**
 - Nozzle like a hot glue gun controlled by machine

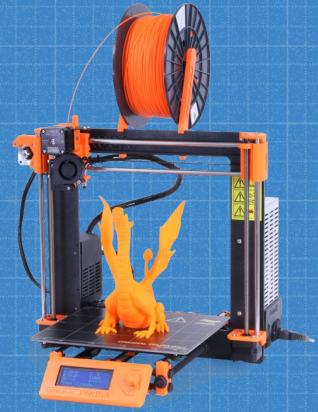
- **SLA: Stereolithography**
 - Tank of resin that is solidified by a laser

WHAT PRINTERS DO WE HAVE?

FDM:

- **5 Prusa I3 MK3S**

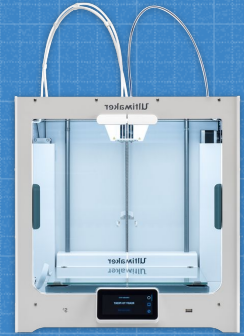
- 1.75mm material
- Single extruder
- Build volume: 9.84" x 8.27" x 7.87"
- Resolution: 50-500 microns layer thickness
- Heated platform
- Software: Prusaslicer
- Materials: ABS, PLA, HIPS, PVA, Wood fill, PETT, Nylon, PETG, etc.
- Files added by SD Card



WHAT PRINTERS DO WE HAVE?

FDM:

- **Ultimaker S5**
 - 3.00mm material
 - Dual printheads
 - BB Core: PVA (Water-soluble support)
 - AA Core: Primary printing material
 - Consult a technician before changing
 - Build volume: 13" x 9.5" x 11.8"
 - Resolution: 50-500 microns layer thickness
 - Heated platform
 - Software: Ultimaker CURA
 - Materials: ABS, PLA, HIPS, PVA, Nylon, etc.
 - Glass bed: use glue for best adhesion
 - Files added by Ultimaker USB flash drive



WHAT TO KNOW BEFORE PRINTING

- Must provide your own material
- Some donated material in cabinet
 - If not labeled "DONATED", do not use!
 - Local vendor: FilamentOne
 - Amazon: MAKE SURE CORRECT FILAMENT SIZE
- Printers are first come first serve if not reserved.
- If your unreserved print time interrupts a reservation, we will stop your print
- Fill out a print slip with information about your print and leave by printer
- Label your spool with one of our spool labels.
 - You may store filament in our air tight containers, unclaimed filament after 1 month will be added to donated supply
- Unlabeled materials will become fair use after 1 month
- When your print is complete, Techs will place part and slip in wooden drawers under 3D printing counters
- Parts left in the hub over 1 month will be recycled.

3D MODELS

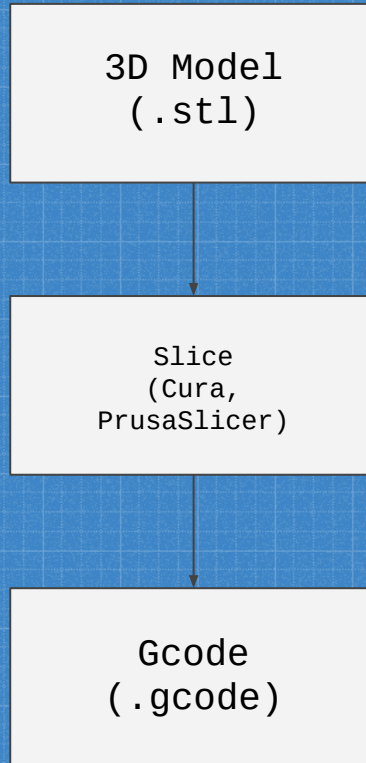
Common 3D designing programs:

- Autodesk Fusion 360
- SolidWorks
- OnShape
- Blender
- TinkerCAD
- SketchUp
- OpenSCAD

If you're looking to print something preexisting:

- Thingiverse.com
- MyMiniFactory.com
- Yeggi.com
- GrabCAD.com
- CGTrader.com
- Pinshape.com
- etc...

FROM MODELING TO PRINTING

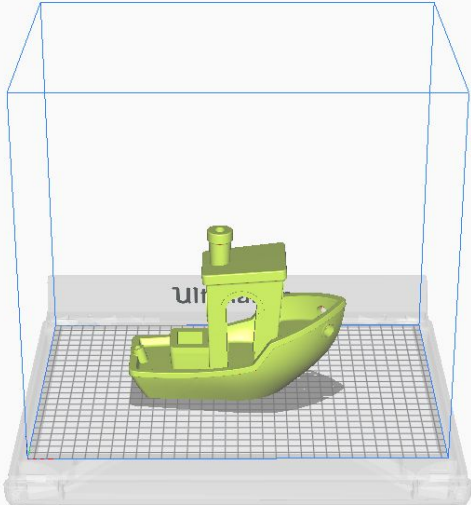


Ultimaker CURA: PREPARE SCREEN

Ultimaker Cura
File Edit View Settings Extensions Preferences Help

cura. PREPARE PREVIEW MONITOR Marketplace Sign in

Ultimaker S5 < Generic ABS AA 0.4 > 2 Ultimaker Natural PVA BB 0.4 < Normal 0.15mm 20% Off On



Print settings

Profile Normal 0.15mm

search settings

- Quality <
- Shell <
- Infill <
- Material <
- Speed <
- Travel <
- Cooling <
- Support <
- Build Plate Adhesion <
- Dual Extrusion <
- Mesh Fixes <
- Special Modes <
- Experimental <

< Recommended ...

UMS_3DBenchy
180.0 x 93.0 x 144.0 mm

1 day 3 hours 22 minutes 194g · 27.59m

Preview Save to File

Ultimaker CURA: PREVIEW SCREEN

Ultimaker Cura
File Edit View Settings Extensions Preferences Help

PREPARE PREVIEW MONITOR Marketplace Sign In

View type Layer view < Color scheme Material Color

Normal 0.15mm 20% On On

Print settings

Profile Normal - 0.15mm

0 2

search settings

- Quality <
- Shell <
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< Recommended

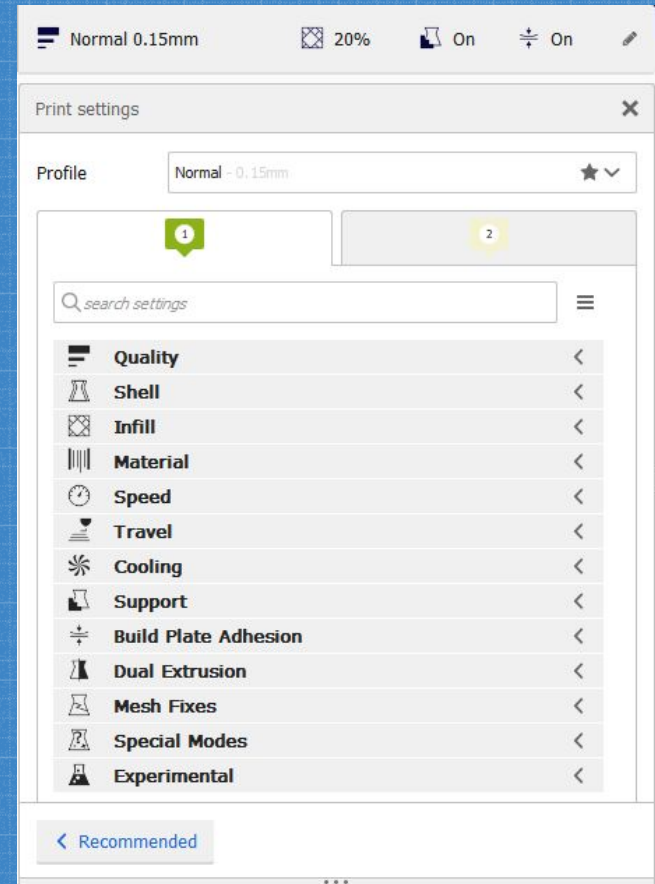
UMS5_3DBenchy
180.0 x 93.0 x 144.0 mm

1 day 20 hours 33 minutes
307g · 41.95m

Save to File

Ultimaker CURA: PREVIEW SCREEN

- Quality: Layer Height
 - 0.06mm- 0.2mm
- Shell: Outline or outer perimeter
- Infill: Percentage of internal contains material
 - 20% is standard, 30% is stronger, anything greater has negligible benefits
- Material: Change material and build plate temps
 - Refer to temperatures recommended from brand
- Speed: How fast printhead travels
- Cooling: Controls fan speed
- Support: supports angles at specified angle
 - Tree support optional
- Build Plate Adhesion: what prints before your part
 - Brim or skirt recommended, raft is bad
- Dual Extrusion, Mesh Fixes, Special Modes, Experimental are used on a case-by-case basis



3D PRINTING TIPS

- Makers Rule: Measure twice, cut once:
 - Double check settings before printing
 - Supports? Correct slicer? Correct temps?
- Recommend watching the first layer
 - Most failures occur during the first layer
- If you need recommendations for printing, ask a tech
- Please throw away scraps, leave tools on tabletops
- Pre-slice before reserving
 - All slicer software is free for all OS's
 - Slicers tell you how long the print will take (decent accuracy)
 - Decreases downtime of printer inactivity, beneficial in the summer
- If your spool is close to empty, weigh it
- Slicers will tell you how much material is needed
- We have the weight of most major spool brands on the scale

Your spool with material - empty spool = approximate material left

Thanks!

ANY QUESTIONS?

You can email us:

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