3D Printing Instructions

Important notes for using the 3D printers:

- **All printing will be done by Lab Staff**
- Printers can **ONLY** be used by students in Bioengineering classes, which require 3D printing, as predefined by the Lab Director.
- Print jobs **MUST** be course-related.
- Print jobs can **NOT** exceed 8 hours.
- One person/group can only submit **3 prints on a given day.**
- You **cannot** remove a print from the print bed. If you do, your **entire group** will be **blacklisted** from using the printer.
- We currently have one style of printer, the **Prusa MK4S,** with a **Maximum Build Volume of 250 x 210 x 220 mm**

How to Print

1. Make your 3D design using the drawing software of your choice (SolidWorks, Onshape, AutoCAD, etc.)
2. Save the file as a .stl file (more details below)
3. Convert the .stl file to .3mf file (more details below)

Saving SolidWorks file as .stl file

1. Select **File>Save As...** (if you get a warning about the file being referenced by other documents, just say **OK**.)
2. Change the *Save as Type* to **STL (*.stl)**.
3. Click the **Options...** button, which will open the *Export Options* dialog box, most of which is shown to the right. Depending upon the final intent of the part, you will likely want to either select **Fine** in the *Resolution* section, or **Custom**, which will allow you to smooth the STL even further. The *Deviation* and *Angle* sliders correspond to the maximum distance and angle errors that will be allowed between points of the triangular mesh and the original model. File size will increase dramatically as you increase the resolution. To see a preview of your triangulated mesh, click the checkbox next to **Preview**.
   Click **OK** once you're happy with your mesh.
4. Click **Save** to save your STL file. You may have to click **Yes** to then actually save the file
   a. Save your file as PennKey_PartName_Course# (eg. mpatte_BE3090_Part1.stl)

Saving onshape file as .stl file

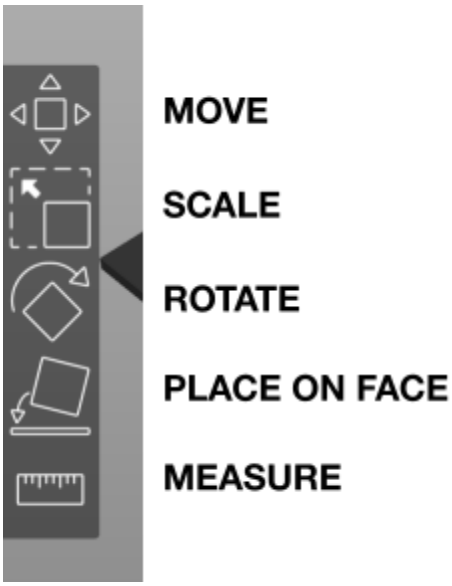
1. Under the Parts section of the navigation panel, right click on the part you want to save and select **Export…**
2. In the new dialog box that pops up"
    a. Name your file your file PennKey_PartName_Course# (eg. mpatte_BE3090_Part1.stl)
    b. Select **STL** as the format
    c. Check the **Export models oriented Y axis up**
    d. Select **Binary** as the STL Format
    e. Select your proper Units
    f. Select **Fine** as the Resolution
    g. Select **Download** as the Options
    h. Select the **Export** button
    i. Navigate to where you would like to save the file and then hit save

Converting the .stl file to .3mf file for printing in the Stephenson Lab Note: See appendix for screen grabs from software

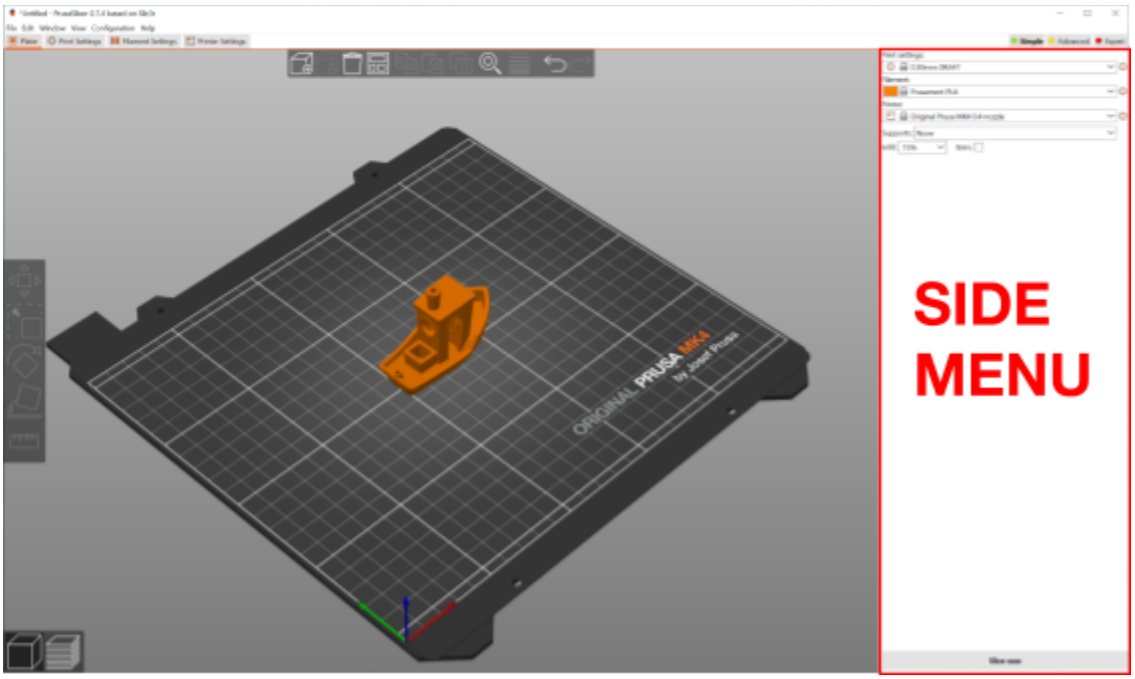
1. Open up the "PrusaSlicer" software on a lab computer. Alternatively, you can download the software for free from the Prusa website (Link).
    a. For software install, after installation go to the Print settings and select the **Original Prusa MK4**.
2. Click **File>Import>Import STL [CTRL-I]** button near the top left hand side and load the .stl file of interest
3. Adjust the position of the drawing so that it lies flat on the surface (the software should do this automatically, but if it doesn't, use the **Place on Face** command on the left hand side).
4. If you wish to move the part click the **Move** command icon (on the left hand side) then click and drag the part to a new location. For detailed adjustment use the side menu on the right to enter coordinates. **(See appendix for Move icon)**
5. If you wish to change the scaling of the part, click the **Scale** icon (on the left hand side) and click+drag to shrink or enlarge your model. For detailed adjustment, use the side menu on the right to change the scaling factor with the **object manipulation box** (located at the bottom of the side menu). You can disproportionately scale by first clicking the lock next to scale factors. Then you can change the scale in each direction separately. **(See appendix for Scale icon and side menu)**
6. If you wish to change the rotation of the part, click **Rotate (**on the left hand side) and manipulate your object about the x, y, and z axes. For detailed adjustment use the side menu on the right to enter the degree adjustments. **(See appendix for Rotate icon and side menu)**

7. Use the Drop down menu in the side menu on the right, entitled Print settings, to change the Quality of the print. ***For most prints the 0.30mm Draft will be sufficient.*** **Note: do not use the ultra detail setting. (See appendix for side menu)**
8. If your part needs supports use the drop down menu in the side menu to enable supports. **(See appendix for side menu)**
9. If your part needs a brim (this is suggested) check the Brim option in the side menu. **(See appendix for side menu)**
10. If you see an **exclamation (**  **) mark** next to your part name in the side menu, you have to **repair your part**. To do so, click the exclamation mark, which should automatically fix the part through Netfabb. This will correct any errors in the object. **(See appendix for side menu)**
11. Use the Drop down menu in the right side menu entitled Filament to select the proper filament for your file. This generally should be **Prusament PLA**. **(See appendix for side menu)**
12. Use the drop down menu in the side menu entitled Printer to select **Original Prusa MK4 0.4 nozzle**. **(See appendix for side menu)**
13. Save the modified .3mf file by clicking File>Save project as **PennKey_PartName_Course# (eg. mpatte_BE3090_Part1.3mf)**
14. Click on **Slice now (**in the bottom of the side menu) [**CTRL-R**]. Note the timestamp under **Estimated printing time** in the side menu **(See appendix for side menu and what we are looking for as the timestamp)**
15. Fill out the 3D print request form and submit all required information and .3mf file. Your PennKey will be checked against an access list.
16. You will receive an email either approving or not approving (along with a reason) the print **within 2 business days**. If approved, the lab staff will add your print to the queue and will print your part when one of the printers is free. This can take an **additional 2 business days**.
17. You can check the status of the 3D printer by going to the 3D printing calendar. Here you will see all the prints on the calendar with their estimated completion time.
18. **After the print is completed, a staff member will set aside the object for you, and you can pick it up during lab hours.**

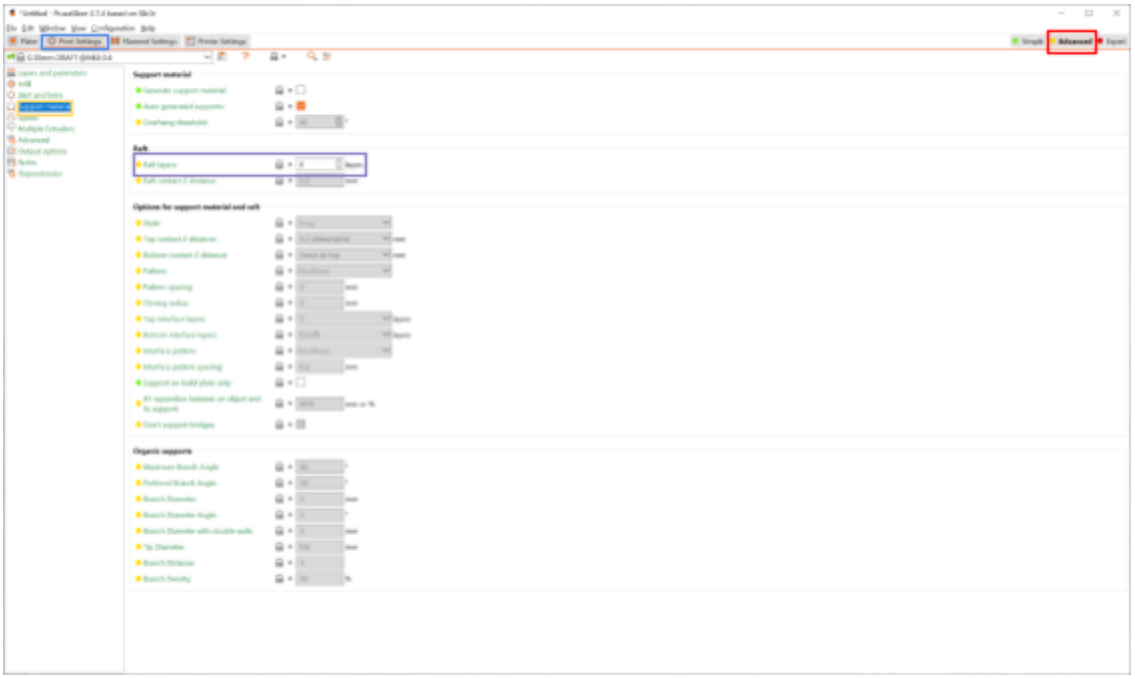
Appendix:



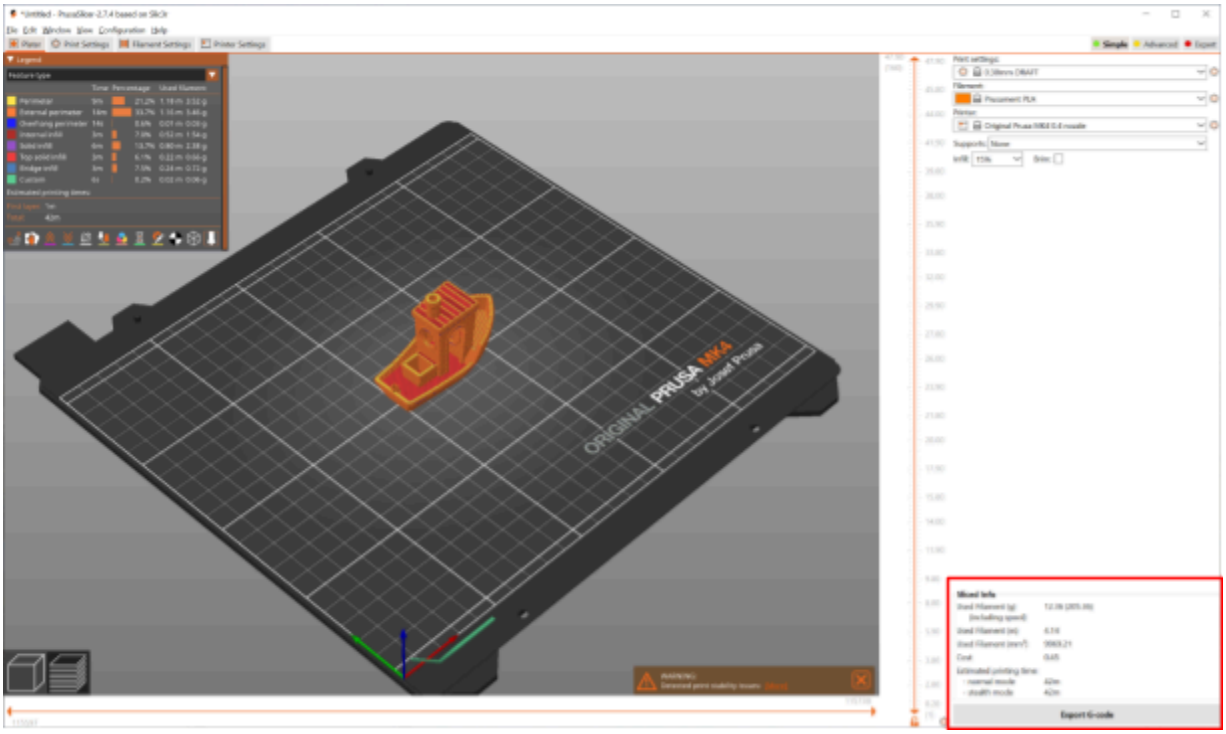
Icon keys for Move [M], Scale [S], Rotate [R], Place on Face [F], and Measure [U]



Side Menu location



Add a raft



Time stamp info