

Key steps to mold-making:

1. Make a stl file or step file of your design (I think fab modules only take stl?)
2. Use Shopbot or Modela to carve the design (this will be the positive of your design)
3. Then use OOMO or other (food-safe, if needed) - rubber like material to make the actual mold (this will be the negative of your design - or your mold)
4. Finally - pour whatever material into your mold to make your design.

TWO WAYS TO MAKE A MOLD IN THE BEGINNING...

SHOPBOT -

Two ways to make your design work in Shopbot:

1. Partworks3d
2. Fab modules (Charles and Nadia both said that Partworks is better...)

TO PUT THE WAX on EITHER MODELA OR SHOPBOT:

For Shopbot:

- Use hot glue gun to glue wax onto a scrap piece of wood. secure wood to existing wood mount as usual.

For Modela: — Use hot glue gun to glue wax directly onto modela? Not sure if you need something in between the two — you may not.

To remove at the end: Use Form one squeeze bottle to remove glue — it's clear and can be found near 3D printers; it's not toxic

Partworks 3d:

- Accepts two file types: Step or Stl
 - DESIGN NOTES:
 - Beforehand - make sure your file is set up correctly in its orientation. The top that you would see on the mold - should be the top in its orientation. This is important as Partworks can only rotate in 90 degree increments.
 - Neither Modela nor Shopbot do undercuts — must be manually
1. Open stl in Partworks — then follow the seven steps. It's pretty straightforward.
 2. First scale — Then size
 3. There are two sizes to note - one is the material size and the other is the part size; the material size often changes when you change the part size - change it back to the material size
 4. How the machine cuts:
 1. Machine starts in center by default — you don't want this. You want the the Machine to start in the lower lefthand corner.
 2. Also note how your xy on your modela or shopbot compares to the xy on the screen. On our first run, we accidentally had a long y on the machine and a short y on the screen. Make sure they match.

3. Start z zero top
4. Then set the margin — how much space around part — machine automatically leaves gap around part. Either use model silhouette...automatic...or designate how much. Note that this will change the dimensions of your object and you'll need to rethink this in order to maintain an edge to your mold
5. For mold making...keep wall...use silhouette
5. Depth of the model - depends on your material thickness — Has to do with z height of model
6. On the page that shows two images of cars — this determines:
 1. If you're doing a two-part cut — You want the cut to go only halfway as deep as your model (I think this is the lower car... it'll make sense when you get there; it may be called the cut plane)
 2. If you want the top of your object to be carved... then make the z cut slightly below the surface - so that the cut is completely carved out.
7. Toolpaths:
 1. Generate roughing tool path
 1. Select tool...small tool or large depends on material...and resolution desired
 2. Strategy...how it carves out most of the mold mold...z level is like contour...use z level...raster x or y is how to use rest of space...use raster y as machine is larger in x; don't use 3d raster!!
 3. Pass deep ...no more than two diameters of tool — be sure to hit calculate
 2. Finishing Tool path
 1. Can change resolution between paths
 2. Don't need to do the cut out tool path part (this probably isn't needed in most designs)
 3. Step 7...look at design — does it make sense?
 4. Save roughing toolpath and finishing toolpath...then go through regular instructions for shopbot/modela
 5. If don't know what to do...just run the machine in zero first

Or use modela!

- If not communicating with tool...type fab in terminal
- Start terminal..type fab
- Modela...uses pngs; can use fab modules to convert stl to pngs
 - In png: Black = bottom...white = top...like PCB — the modela cuts out the black... gray means a less deep cut
- Can also open stls in meshlab
- STL to PNG in Fab:
 - Load STL
 - Change resolution...higher resolution....resolution higher than machine resolution....modela equivalent of 300 DPI.....make image higher than machine higher resolution
- Then make PNG to RML
 - Can also draw png in gray
 - Overlap...make it 0.5...as one in Neil's same thing as zero in shopbot...0.25 means 0.75 overlap in Neil's...0.75...more cuts
 - Offsets are important...
 - Add minus one for offsets
 - Pixel error...lower pixel error...how far away from a specific color; set to 1.5 (I think!)

- Bottom intensity...leave as set
 - Top intensity...leave as set
 - Have to know the height of stl to make the Z access
- Then have go to finish cuts...
- Don't remove yet — need to do the finalizing cuts
- Finish cut — then increase overlap for the finalizing cut

Random notes which don't entirely make sense - but may help:

- **Shopbot....**
- Overlap...is same thing as stepover...lower step over...longer it takes...smallest step over is not less than 5%,of endmill
- Minimize friction with material..if too small, could melt wax

WHEN YOU MAKE THE MOLDS

Safety first:

- Use gloves
- Read material info in each material box
 - OOMO (?) 940 930 920 are food safe
- Could three d print the part — and then put OOMO or other molding material over 3D part.
- Essentially - the rule on materials is to go Hard soft hard soft in exchanging materials between molds vs materials molded.
 - Can be hard to release hard molds from hard molds
 - That's not to say that you can't do hard material to hard material... but that would influence your design (if you did a cement mold with a cement material or something else)
- If doing a Two part mold must use mold release in between — to keep them from sticking

Making the mold...

- Make the positive
- Then make the negative
- Challenges of a 2 sided mold
 - Alignment - add keys...so when push together...automatically align
 - Seam - choose a part line that makes sense and can hide seam
 - Create pour in part from the top
 - Need to add sprues to highest points (hole in the top)...or do push out on bottom...for example...if touret in car
- When designing - SolidWorks mold tutorial can be helpful
- Design and make mold then MIX!

Mixing Materials to make the design from your mold

- Protect table with paper
- Use three plastic cups; have tongue tonsils
- Two supplies for materials
 - One catalyst
 - One plastic
- Shake before hand
- Make sure have the right mix ratio

- Look at material info sheet - in material boxes
- For pot life and cure time
 - Pot life...how long can you work with it until hard...oomo example 15 minutes for pot life
 - Important to know for how long you have to change it before it starts to cure — must have poured into the mold before curing time starts
 - Cure time - how long it takes to cure
- Mixing the catalyst and plastic:
 - Must mix well...more important than not making bubbles
 - Careful not to cross contaminate - use one stick for each material
 - Pour each material directly on stick into cup so doesn't spray
 - Pour each material into different cup first
 - Eyeball to the right ratio...that was indicated in instruction
 - Pour together into third cup
 - Use different mixing straws
 - One way to break bubbles ...pull from high point...like wine...only possible when materials are more viscous
- Finally! Pour into mold
 - Lightly tap edge to make better balance of top...better surface tension

Other notes:

- Oomo....may need to stirred longer
- Vacuum chamber
 - Put mold in when epoxy is filled in
 - Good for removing bubbles
 - Must be in vacuum during pot time (before cure time)
- DESIGN:
 - Think about demolding process - will you be able to get it out of the mold?
 - Legoes slightly tapered for easier release
 - Think about whether a cake would come out of it

Random Computer tips...

PS ax...lists all processes on computer

Can search for Firefox

And then go to kill all Firefox or kill -9 computer program