

CS 3651 Skill Demo 0: Rubber Band Car

Goals:

- Learn the basics of 2D & 3D CAD
- Learn to make simple mechanical assemblies
- Learn to use a laser cutter
- Learn to use a 3D printer

Tools/supplies:

- 1x [12"x24"x3mm Craft Plywood](#)
- 2x [3" #8-32 threaded rod](#)
- 4x [#8-32 hex lock nuts*](#)
- 3x [#8-32 hex nuts*](#)
- 5x [#8 flat washers*](#)
- 4x [O-Rings AS568 Dash Number 114](#)
- 4x [O-Rings AS568A Dash Number 125](#)
- 1x [#8-32 threaded hook](#)
- [Wood glue](#)
- 4x [7"x1/16" Rubber Bands](#)
- 4x [3 1/2" x 1/4" Rubber Bands](#)
- 1 in³ of plastic on the [3D printer in the GUV Prototyping Lab](#) (more may be available if requested)
- Use of the [laser cutter in the GUV Prototyping Lab](#)

* means that McMaster-Carr provides CAD data for this part.

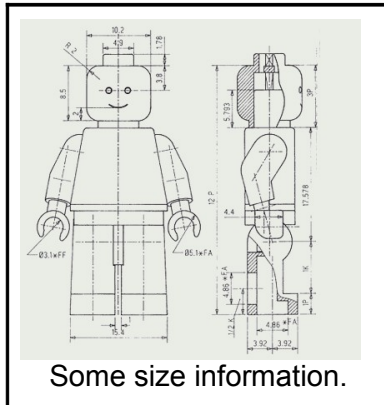
Background:

Your goal is to create a rubber-band-powered car using laser-cut and 3D-printed parts. Since laser-cuttable materials are cheap, and 3D printing is expensive, you'll likely want to save your 3D printing allotment for the wheels of your car.



Hopefully your car will look cooler than this.

Additionally, to demonstrate your mastery of laser cutting, your car needs to have some sort of openable hatch to contain a 'test dummy'. This hatch should be bolted, clipped, snapped, or locked some other way. Using tape alone does not count.



Process:

CAD:

You'll want to start by designing your car in CAD software. We recommend using SolidWorks or Autodesk Inventor, as both are good software for solid modeling, and you have access to them for free through student or site licensing. If you aren't familiar with CAD software, both packages have extensive tutorials and help documentation that can teach you to use them. You may also use OpenSCAD, a parametric 3D "programming" language.

To download Solidworks, use <http://software.oit.gatech.edu>.

To download Inventor, get a student account with Autodesk at <http://students.autodesk.com>

Alternatively, you can use a computer in the GVU prototyping lab, or the virtual machines available through the ECE [Virtual Lab Pool](#).

3D Printing:

You can export parts as .stl files and print them on the GVU 3D printer or the InventionStudio 3D printers. Most of you will be unfamiliar with the process, and can come to the GVU Prototyping Lab during Scott's 'lab hours' or at other times when your TA is available to help you.

Laser Cutting:

You can design a chassis as multiple flat parts that interlock and will be glued together. These parts can be designed as an assembly in your CAD software. Once you have them laid out, there are multiple ways to export them, but we recommend laying them all out at 1:1 scale in a drawing, and exporting that drawing as a DXF file. This can then be opened in Illustrator on the laser cutter computer. Again, for assistance laser cutting, come to the GVU Prototyping Lab during Scott's 'lab hours' or at other times when your TA is available to help you. You may also consider use other laser cutters on campus, including the ones in the Invention Studio.

Iterate:

There's a fair chance that your first design may not work as expected. You may want to assemble your car with masking tape at first to test the design before using more permanent wood glue. Also consider being careful with your plywood usage in case you need to re-cut your entire car.

Additional Goals:

In addition to making a rubber band car that can move, there are some additional goals that will get you some bonus points:

- Having your car roll the farthest on linoleum floor (or be close to the farthest)
- Building your car with three wheels
- Seating your test dummy securely in a tiny car seat

Turn-in Page and Grading

NAME _____ GTID _____

20/100: Make a car that contains your test dummy when lightly shaken by your TA.

Initials _____ Date _____ Time _____

20/100: Make a car that can roll on a 20° slope (no signoff required if you complete the next part):

Initials _____ Date _____ Time _____

60/100: Make a car that can roll 3 feet on linoleum floor under it's own power.

Initials _____ Date _____ Time _____

20 bonus points: Have a car that rolls the farthest, or within 2%.

Initials _____ Date _____ Time _____

5 bonus points: Have a car that rolls the farthest, or within 15%.

Initials _____ Date _____ Time _____

5 bonus points: Securely seat your test dummy, to be determined by your TA.

Initials _____ Date _____ Time _____

5 bonus points: Build your car with three wheels.

Initials _____ Date _____ Time _____