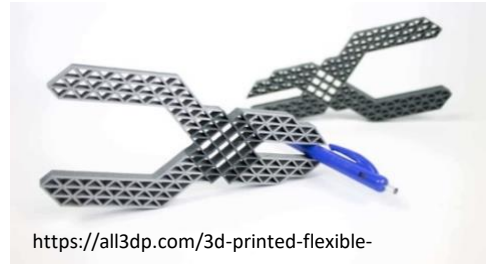


## GitHub Project #2: Print-in-Place Pliers

**Description:** Print-in-place models are functional multiple-component designs, that work immediately after removal from the print bed. No post-processing or assembly is required. These can be created through single material extrusion by carefully designing models and orienting the print to allow for clearance between printed joints where motion or rotation is needed. However, even with optimized print settings, these models can be plagued by crunchy movement due to the irregularities of plastic extrusion. Another method to obtain useful motion is to include a flexible element in the model, whether that is a thin piece of a rigid plastic or a second elastomeric material.



**Objective:** Design and print needle nose pliers that are capable of gripping and picking up through-hole resistors. The pliers should use a flexible material for a spring component that returns them to the open position whenever not in use.



Through-Hole Resistor

**Caveat:** Due to the single multi-material printer in the DFL and the tendency for students to procrastinate, an assembly of 3 parts (2 rigid handles and 1 elastic spring element) is permissible, which allows for the Voron 3D printers to be used to complete the project. However, the assembly must be hand-pressed together and not require any tools to assemble. Before printing the final model, it is recommended to print just the mating geometries to determine the tolerance intervals needed for the correct fit. This will save time and material.

**Tips:** The capacity of the pliers (e.g., how far the pliers open/close) will be dependent on the material and geometry of the spring component. 95A TPU will be available as the flexible material, which was used for the phone case in DF 2100. Thinner geometries will be more flexible (larger capacity for the pliers) but less durable. It is recommended to also print the spring geometry independent of the pliers to assess the amount of flex.

### Deliverables:

- Printed needle nose pliers (that work!)
- CAD model (organized timeline, constrained design, and conforms to Good CAD Practices) save to CHBE 4200 folder
  - *Please save project to a separate folder. Clearly mark which version should be graded.*
- GitHub website (Total text: >500 words)
  - Description of the project with a blurb about print-in-place parts. Perform external research to determine other applications print-in-place has been used (link specific examples). What combination of materials work well for print-in-place?
  - Embedded CAD model
  - About the design and iterative process (e.g., how was the spring component created and how is it retained in the model, materials used)
  - Relevant specifications of the pliers (jaw length, jaw capacity)
  - Table of print settings
  - Picture gallery of iterations and pliers.
  - **.GIF of pliers working**

Don't write this like a boring report. Write it like a web page by including headers, pictures, hyperlinks, etc.

CHBE 4200

**Grading:** CAD model 1/3, physical model 1/3, and GitHub writeup 1/3