

3D Printing and Design Contest

Open to all students who have access to 3D modeling software and an FDM printer.

Revised 2/25/2025

PAY CLOSE ATTENTION TO UNDERLINED ITEMS.

Objectives

- 1) Promote creativity.
- 2) Learn how to use 3D modeling software.
- 3) Exhibit design and troubleshooting skills.
- 4) Adapt to necessary changes from design to physical print.
- 5) Document from design inception, troubleshooting, revising design, and printing.

Topics discussed in this document:

- Scope / Theme
- Contest Guidelines
- Day 1 Expectations / Day 2 Expectations
- Contest Requirements
 - o Clothing requirements
 - o Model Size and Specifications
 - o Documentation / Notebook / Balls of Spaghetti
- Notes
- Clothing Requirements
- Notes from the Chair.

Scope / Theme: “From the Kitchen!”

- This theme will have contestants reverse engineer an item that can be found in the kitchen or dining room and put their own creative spin on it.
- **Contestants will need to find an item that already exists and change it.**
- It does not need to have any commercial or industrial value!
- Do not include copyrighted or registered trademarks of characters or logos.
- **Use your imagination and be creative!**
- Some examples are: coffee cup with spoon holder, soup bowl with extendable feet for stability, a “Swiss army knife” except with a fork, spoon, and chopsticks instead of the knife, refrigerator with doors on opposite corners, or bottle cork with a necklace holder instead of a handle.
- Please contact the judges for clarification.

Contest Guidelines:

The contestant can pick any item, big or small, from the kitchen or dining room. Its best if they have the item available in person to take measurements and reference. An example will be given on a separate page.

The contestant will be challenged with reverse engineering a physical item, design changes in their software, and print a completed project for display at the contest.

A set of completed STL designs (with print settings*) and digitized notebooks (PDF or JPG) will need to be submitted no later than March 30th to skillsusa.3dprinting@gmail.com. This way our judges can come up with questions ahead of time.

Scans from a copier or pictures from a cell phone are allowed. Please number the images if phone images are supplied.

The following items will need to be brought for judging:

- Printed Piece
- Physical Notebook
- Picture of the original item or the item itself
- Ball of spaghetti or failed print

Day 1 Expectations:

On Day 1, each contestant will bring in their finished design, notebook, and “ball of spaghetti” and place it on a table provided.

On the excel file provided to each of the sponsors or mentors (which will be sent out before the contest), schedule a 10-to-15-minute interview slot with the judge. Interviews are spaced with 15 minutes between interviews. It will be first-come-first-served.

Each contestant will be given 3 to 5 minutes to present their project. This includes describing the inspiration, design, difficulties, and troubleshooting. The judges will ask questions about the project, the finished print, and general questions.

Contestants are welcome to stay and hang out to chat with the judges and other contestants.

Day 2 Expectations:

On Day 2, interviews will continue if the schedules do not line up. These will be done early in the day to allow time for final judging.

After all projects are presented, they will be put on display for others in the building to observe. The judges will deliberate and decide the winners. Contestants will be allowed to ask for feedback from the judges after the judging as concluded and scores have been tallied.

Judging will be finished, submitted, and announced at the awards ceremony.

Contest Requirements

- Clothing requirements
- Model Size and Specifications
- Documentation / Notebook / Balls of Spaghetti

Clothing Requirements

No specific requirements outside of the base guidelines for the event overall.

Model Size and Specifications

Size:

- Each component should not be larger than 200mm x 200mm x 200mm
- Multiple components can be used and assembled; however, no single component may be larger than those dimensions.
- Fully assembled designs should not be larger than 350mm x 350mm x 350mm.

Filament:

- Models must be printed in PLA or PETG. Do not use other filaments like TPU, PC, ABS, or Nylon.
- Color and filament variations are encouraged such as matte, glossy, glow in the dark, wood, and similar.
- Projects must not weigh over 2 KG fully assembled. (up from 1 KG last year)

Understanding Techniques and Complexity:

- Technique and understanding your design tools as well as your slicer are key.
- Some examples:
 - o Layer height (gain or lose details),
 - o Supports and support removal (can it be done cleanly),
 - o Wall count (will it be flimsy or too heavy)
 - o Overhang \ Bridging (the fine balance between sagging and avoiding supports)
 - o Infill (rigidity and printing time)

Movement and Interactions

- Movement is not required. Movement can increase scores in the “complexity” section. However, having a mechanism fail will count against the score.
- Mechanical movement is allowed, and the designer can interact with the project to show the movement.
- Paint, stickers, glue, welding, fasteners (excluding printed pieces), liquids, motors, lights, LED, speakers, batteries, laser, screens, LCD, arduino, IoT, raspberry pi, or programmable components are not allowed.
- Projectiles that are round in shape and have no fine points are allowed as long as they do not move more than 2 feet from the exit point. Projects with projectiles will be pointed towards the back wall away from other people.

Documentation / Notebook / Balls of Spaghetti

Notebook

- Documentation or a notebook should be used to keep track of the progress of the project.
- Notebooks should be Composition Size 9" x 7" or larger. Grid is allowed
- It should have a description of the project, inspirations, initial concerns, design revisions, notable failures, lessons learned, and finished design notes.
- Dates and revision numbers are required.
- Documentation / Notebooks should be handwritten and legible.
- Drawings should be isometric or 2D with notes and a scale reference.
- Printed screenshots are allowed to be pasted into the notebook.
- A bill of materials needs to be in the notebook.
- Print settings need to be added for each component. This can evolve with each revision.
- There should be between 5 and 10 pages of notes however this is a recommendation and not a requirement. Please do not add unnecessary notes to make the notebook longer.

"A ball of spaghetti"

- Anyone who 3d prints knows the dreaded "ball of spaghetti" print failure.
- Each contestant will be required to bring a **1 or more** partial, failed, or concept component prints during the progression of the project. This is in addition to the final print.
- Descriptions of why the component failed or the circumstances around the piece should be available.

From the chair:

- This contest should showcase the contestant's imagination, design ability, and troubleshooting skills and not show off what money can buy.
- I'm doing my best to keep the printer models and capabilities out of consideration.
- A \$3000 BambooLabs or SnapMaker will create a much more polished print than a \$200 Ender 3.
- I want to see how the contestants brain worked, designed, overcame obstacles, and triumphed through it all.
- In previous years we had contestants create something that I could not figure out how they did it. Even after reading their notebooks, I tried all evening with my laptop but couldn't duplicate it. That is the goal of this contest.

Recommendations based on my notes from last year:

- o Projects MUST come printed to the contest.
- o A 3d printer is not provided to print a contestant.
- o Take time writing the notebook. It accounts for over half of the total points.
- o Time Management! Have the contestant consider which parts are most prone to printing failure, what is necessary to present, and what can be done if something fails. Last year we had contestants who couldn't get a successful print and ended up bringing just a notebook.
- **The main goal is for everyone to HAVE FUN!!!**
- 3D Printing is a topic that's fun to start but difficult to master. I want our contestants to show that new technologies are just as fun as other more tried and true contests.

Collaboration among contestants and supporters.

- Please sent an email to skillsusa.3dprinting@gmail.com to be on a group message with all sponsors. You can email any questions, and I will respond to all for transparency.
- Any changes to these guidelines will be emailed to all contestants and supporters through that email thread.
- Questions regarding designs can be sent to the judges at any time, however it will be up to our discretion whether we will answer them.
- Questions and replies will be made public between contestants and supporters to avoid giving any one contestant an advantage.

Contestant Checklist and Reminders

Project Notebook Requirements

- 5 to 10 pages
- Sketches, notes, measurements, and results.
- Describe the different phases of the project and how it evolved.

Required upload before March 30th

- Digitized notebook
- Final STL files.

Before you leave home!

- Printed project
- Physical notebook
- At least one ball of spaghetti or failed prints with descriptions.

When you arrive:

- Place project table as shown below.
- Printed project
- Physical notebook
- Ball of spaghetti or failed prints with descriptions.

