SkillsUSA Additive Manufacturing Competition **Unleash**

Your Creativity!

About the Competition

The **SkillsUSA Additive Manufacturing Competition** is designed to provide students with an opportunity to showcase their knowledge, skills, and creativity in the world of additive manufacturing, also known as 3D printing. Participants will compete by creating real-world projects that involve design, problem-solving, and the application of advanced 3D printing technology.

This competition tests the participants' ability to design and print parts, ensuring they meet specific industry standards. From prototyping to producing functional components, the competition highlights the growing role of additive manufacturing in industries such as aerospace, automotive, medical devices, and more.

Competition Overview

- **Level**: State
- **Eligibility**: High School and College students enrolled in SkillsUSA-affiliated programs
- **Equipment Used**: 3D printers, CAD (Computer-Aided Design) software, scanning tools, and other relevant technologies.

Key Skills Tested

1. **CAD Design & 3D Modeling**
    - Designing functional parts using industry-standard CAD software.
    - Translating designs into 3D models ready for printing.
2. **Problem Solving & Innovation** ○ Applying creative thinking to solve manufacturing challenges. ○ Creating prototypes that meet specific criteria and demonstrate practical use.

3. **Quality Control & Material Selection** ○ Ensuring the accuracy and quality of printed parts.
    - Choosing the right material for durability, flexibility, and cost efficiency.
4. **Team Collaboration** ○ Effective teamwork and communication to complete tasks within deadlines.

Competition Format

1. **Design Phase**
   Competitors will design a part or product based on a set of criteria using CAD software. The designs will be evaluated on creativity, functionality, and how well they meet the specifications.
2. **3D Printing Phase**
   Participants will print their designs using state-of-the-art 3D printers, ensuring that the printed parts match their digital models in terms of size, detail, and accuracy.
3. **Presentation & Evaluation**
   After the print phase, competitors will present their final product to a panel of judges. The judges will evaluate the work based on craftsmanship, functional testing, and overall presentation.

Judging Criteria

- **Design & Innovation**: Originality, creativity, and problem-solving in design.
- **Functionality**: How well the printed item meets the intended purpose.
- **Accuracy**: Precision of the printed model and adherence to design specifications.
- **Presentation**: Ability to clearly communicate design choices, challenges faced, and solutions found.

Contact Information

For more details on registration, eligibility, and competition guidelines, please visit: **Website**: https://www.arskillsusa.org/

Arkansas Competition Link: https://www.arskillsusa.org/competition-updates

SkillsUSA 2025 Additive Manufacturing State Challenge

Make It Run

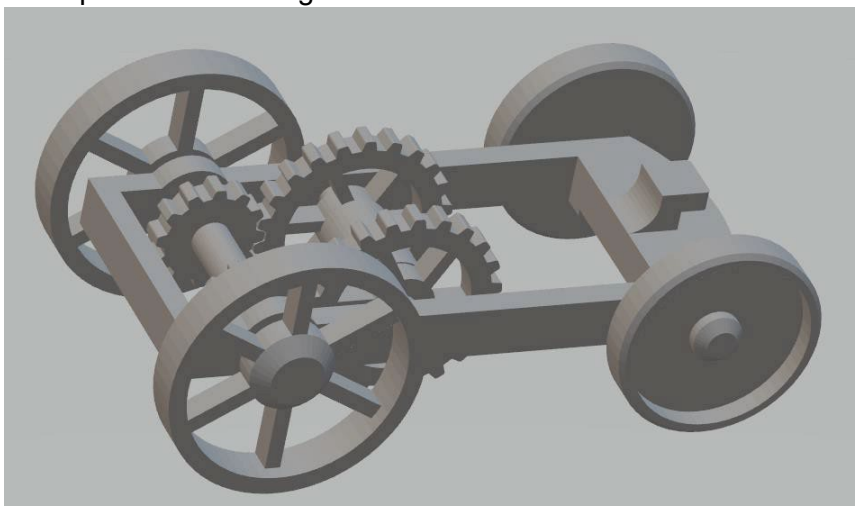
Welcome to the “Make It Run” challenge!

The task at hand is to design and fully print a 4 wheeled vehicle powered only by a single rubber band. The vehicles will then be tested on the convention center floor for functionality, and additional scoring.

Design Considerations:

- Interlocking parts
- Printed Assemblies
- Snap fits
- Printable Tolerances
- Motion
- Kinetic to Potential Energy

Example of Basic Design



Competition Requirements

1. The design **must** be completely 3D printed.

2. The design **must not** contain any outside hardware (axles, screws, washers
3. The design **must** contain a legibly printed team number/name
4. The design **can** contain 3D printed bodies that are assembled after printing for the final part.
5. The final design **can** use super glue for assembly, for a loss of points (see grading rubric)
6. Parts **must** have 3D printed wheels
7. The design **must** contain at least 3 moving parts
8. Wheels **can not** be larger than 3 inches in diameter
9. The design **must** be powered only by a single rubber band
10. The design **must not** exceed 6" x 4" x 4"
11. 3D Printed Design - Students **must** create a design that:
    - ○ Is original and designed by contestant ○
    Print all parts in less than **12** hours total
    - ○ Uses less than **5** cubic inches of model and/or support combined for all parts.

12. Students **must** submit files to be printed via email to skills@ttaweb.com no later than 11:59pm central time on March 28th, 2025. Final prints will be delivered on the day of the contest so that students can assemble, test and be evaluated.

Tips for Competitors

Here are some tips to maximize the points awarded to you:

- Build debossed text on a horizontal surface for best results. This may require building the part on its edge or standing up.
- Utilize soluble support structures for print in place assemblies
- Understand the achievable design tolerance of your printer for print in place, or hand assembled designs to allow motion between parts.
- Leverage post-processing techniques to smooth printed bodies.
- Additional moving parts may add to your score but can produce more points of failure on the final assembly.
- Use online resources (YouTube, GrabCAD Tutorials)
- Whenever intellectual property (IP) deters you from a project, try using approximate geometries to communicate the design intent.
- Optional design for additive manufacturing learning resources:
- Stratasys Think Additively™ Masterclass:
    - ○ https://youtube.com/playlist?list=PLUYaY5EIPtNBdU-s-7l9rl05lBHHlTarI

State Competition Procedure

Before or on contest day:

1. Students submit Engineering Notebook (Engineering notebook guidelines below)
2. Students submit print files from GrabCad Print (free download here: https:// ttaweb.com/product/grabcad-print-download/) as .print to Skills@ttaweb.com, using file name:ARteam#_____
3. Ensure that you have set your grabcad print printer to the F370 (select from dropdown in bottom right corner.)
4. Check in with event chair to receive your parts
5. Students submit final assembly if applicable
6. Students submit their Presentation

State Competition Judging Criteria

1. The Engineering Notebook should contain robust content, including at a minimum the following:
    1.1. Be clearly labeled with contestant name(s), date and page # on each page
    1.2. Begin with a problem statement
    1.3. Include discovery and documentation of approach to solve problem
    1.4. Include sketched design concepts with critical features labeled
    1.5. Critical dimensions clearly labeled in design sketch
    1.6. Considerations for designing for additive manufacturing distinctly addressed (i.e. part strength, part orientation) especially including any expected risks during printing
    1.7. Screenshots of the print time and material usage for all printed parts
    1.8. Design decisions and alternatives are documented and evaluated thoughtfully

2. The design must adhere to the Competition Requirements stated in the prior page.

3. Quality of final assembly
    3.1. Does it perform the function in the manner it was designed to do?
    3.2. Does it meet all requirements in contest guidelines?
    3.3. Do inserted components or multiple printed parts mate together properly?
    3.4. Did the students design the part with additive manufacturing in mind?
    3.5. Is there sufficient tolerance between parts for movement?

4. The design must illustrate best practices for “design for additive manufacturing (DFAM)”. Below are some *potential* DFAM metrics to optimize for.
    - 4.1. Build Time
    - 4.2. Post-Processing/Support Removal Time
    - 4.3. Functionality Optimization (gear ratio, pliability, strength, etc.)
    - 4.4. Monetary Savings
    - 4.5. Material Consumption
    - 4.6. Energy Usage
    - 4.7. Component Consolidation (lack of store-bought hardware)
    - 4.8. Lightweighting for Ergonomics

5. Presentation Criteria

5.1. The team clearly describes their understanding of the problem to be solved.

5.2. Design Process: good design logic is used for key design choices. Intentional and well-communicated

5.3. The presentation is professional and well-rehearsed

5.4. The presentation emphasizes quantitative improvements (measured and estimated) of the time, quality, or cost of the improvement as well as any DFAM tactics employed.

5.5. Practical evaluation: team demonstrates visually (videos, photos, drawings, animation, etc.) the task they improved, both before and after.

6. Racetrack Setup

6.1. Front tire/tires must begin behind the starting line.

6.2. A **small** nudge can be used to help get the car moving (see grading rubric)

6.3. Each design will have 2 chances to run. The better of the two scores will be used for final judging.

6.4. Final distance of vehicle is measured where the front wheels touch the ground