SkillsUSA 2024 Additive Manufacturing State Challenge - VIRGINIA

Medallion Models

Welcome to the “logo Medallion” challenge!

The task at hand is to design an eye-catching Medallion that represents yourself, mascot, state, country, event, or hobby.

NOTE: Your design must not include any identifying information; this includes any references to your name, school, school district (city or county), or SkillsUSA Virginia district. Any designs that incorporate these elements will be disqualified.

Design Examples:

- Bump Maps
- Displacement Texture
- Color/Material Changes
- Embossed/Debossed Text
- Motion

Example of a Basic Design:

Competition Requirements:

1. The design **must** be completely 3D printed.
2. The design **can** be 3D printed using any technology.
3. The design **must** contain at least two legibly printed words.
4. The design **can** contain 3D printed bodies that are glued together for the final part.
5. Parts **can** be colored or painted.
6. The printed design **can** have moving bodies.
7. The design **must** be at least 3” x 3” x ¼”
8. 3D Printed Design - Students **must** create a design that:
    - Is original and designed by contestant
    - Prints all parts in less than **8** hours
    - Uses less than **5** cubic inches of model and/or support combined for all parts.

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.
- Paint 3D is a free tool to help design the part.
- Try to leverage a design with multiple printed colors or technologies for a more creative part.
- Leverage post-processing techniques to smooth or color 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-s7l9rl05lBHHlTarI

State Competition Procedure

Prior to the day of the contest, contestants will be expected to develop a solution to the contest problem, prepare prototype(s) as described in the contest problem, and develop an engineering notebook documenting their design solutions.

On the day of the contest, all teams must report to the contest site (location will be stated in the SLC guide) at 8:00am to check in and receive their interview time assignment. All team members must be present to check in.

At their assigned interview time, teams will be interviewed by the contest judges for approximately 20 minutes, during which time they will be asked to discuss their solution to the problem, their design approach, and will demonstrate the use/function of their prototype. Teams should arrive at the contest site, ready to interview, at least 10 minutes prior to their scheduled time slot.

All team members must be present during the interview. Teams must bring their physical prototype and their engineering notebook with them to the interview.

State Competition Judging Criteria

1. The Engineering Notebook should contain robust content, including at a minimum the following:
    - 1.1. Be clearly labeled with team identification letters and/or numbers, date and page # on each page – **DO NOT include any identifying information such as contestant names, school, school district, or SkillsUSA Virginia district**
    - 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.
    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.