SkillsUSA 2024 Additive Manufacturing State Challenge

Medallion Models

Welcome to the “logo Medallion” challenge!

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

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 competitor
    - Prints all parts in less than **8** hours
    - Uses less than **5** cubic inches of model and/or support combined for all parts.

9. Students **must** submit files to be printed via state designated file share site no later than [TIME] on [SUBMISSION DATE]. Final prints will be delivered the day of the contest so that students can test, assemble/modify 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.
- 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-s-7l9rl05lBHHlTarI

State Competition Procedure

Before or on competition day:

1. Students submit Engineering Notebook (See engineering notebook guidelines below.)
2. Students submit print files in both CAD (.step, .iges, .sldprt, etc.) and mesh (STL, 3MF, OBJ, etc.) format to [State Designated File Share Site]
3. Students submit physical parts.
4. Students submit final assembly, if applicable.
5. 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 competitor 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 on 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 competition 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.