

Contest Sponsor



ADVANCED TECHNOLOGIES CONSULTANTS, INC.

Additive Manufacturing Demonstration Contest

Purpose

To evaluate each team's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of Digital and Additive Manufacturing.

Additive manufacturing embraces a wide range of materials and derivative processes building parts suitable for end-use service. The virtually unlimited design freedom enabled by additive manufacturing allows the creation of shapes and the integration of feature and function that previously required subassemblies.

Employment opportunities for creative individuals are growing while industry adopts AM methods. Ready access to workstations and service providers makes the Internet a growing marketplace for public AM gadgets.

Clothing Requirements

Industry typical clothing, safety glasses with side shields or goggles are required. (Prescription glasses can be used only if they are equipped with side shields. If not, they must be covered with goggles.) Note: National qualifiers will be required to conform to the national clothing requirements, go to www.skillsusa.org

Eligibility

Open to active SkillsUSA students if they are enrolled in Computer Aided Design classes, design classes, manufacturing, etc.

LUNCH:

Lunch will be provided for all contestants and their advisors.

Equipment and Materials

1. Supplied by the technical committee:
 - a. All additive manufacturing equipment and material, (design submitted on April 3, 2017, will be printed and made available to teams day of contest)
2. Supplied by the contestant:
 - a. Design file (STL Format) must be submitted via E-Mailed by: April 3, 2017, 12:00PM, to andrew@ttaweb.com
 - b. Computer system (Laptop) with a computer design system capable of rendering files in STL format (**Please disable any automatic updates of software**).
 - c. USB Drive for transferring STL file
 - d. All competitors must create a one-page résumé and submit a hard copy to the technical committee chair at orientation. Failure to do so will result in a 10-point penalty.

Note: Your contest may also require a hard copy of your résumé as part of the actual contest. Check the Contest Guidelines and/or the updates page on the SkillsUSA website: www.skillsusa.org/compete/updates.shtml

Scope of the Contest

Knowledge Performance

This contest will include a written knowledge exam assessing general knowledge related to direct digital manufacturing technology in such areas as: additive manufacturing technologies, basic design technologies, additive manufacturing materials.

Skill Performance

This contest will be a team-oriented event. Teams will consist of two contestants for the same school in the same division. This contest includes two elements to evaluate teams for employment in additive manufacturing fields. The initial design problem will be **to design a car so that the wheels and/or axles** move freely based on the cars design.

Prepare in advance of the competition, a model of a car with the build envelope no greater than 4" (L) by 1.25" (W) by 2" (H). Car make is determined by the contestants. The volume of material usage for model and support must be no greater than 5 cubic inches. The build time must be no greater than 6 hours and 30 minutes. The cars will be placed on a "Hot Wheels" track with a slight decline. The cars will be judged on the distance in which it travels down the track.

A second design challenge will be provided the day of the competition.

Moving parts that rotate freely must be part of the design. The design will show the benefits of additive manufacturing by incorporating complex geometric features. The geometry of the design must be defined within a three-dimensional (3D), computer design system

capable of rendering files in STL format. The car may have up to three build parts (Body, Axles, Wheels), although, a single build part is also welcomed. Contestants will be given a specific amount of time to assemble their designs before running them on the track.



*Example photo of Hot Wheels Track

Process considerations:

1. All cars must fit on a standard, store bought, "Hot Wheels" track.
2. Hot Wheels Track is nominal 1.5" in width, allowing a wheel base width of 1.25". **The rails on each side are .125" wide.**
3. The Body, Wheels and Axles allowed to be printed **can be individual parts and assembled the way that you choose.** However, if the design allows, it can also be printed as a single part.
4. Self-supporting angles are 45 degrees.
5. The more support that is required means longer build time along with longer post processing time.
6. Air gap for freedom of movement in parts ≥ 0.023 ".
7. How the file is oriented to be built will affect the amount of support material being deposited and the overall time of the build.
8. Utilize the advantages of Additive Manufacturing processes by incorporating more complex geometry into your design, without affecting the overall structural integrity of the part.

Information on the technology that will be used to build these designs can be found online at this Stratasys website:

<http://www.stratasys.com/3d-printers/technologies>

And here: <http://www.stratasys.com/3d-printers/technologies/fdm-technology>

For the second element, completed onsite at the SkillsUSA competition, teams will receive a challenge to perform within a set timeframe involving a design change. Each team member will be required to participate in the design change to demonstrate design program competencies.

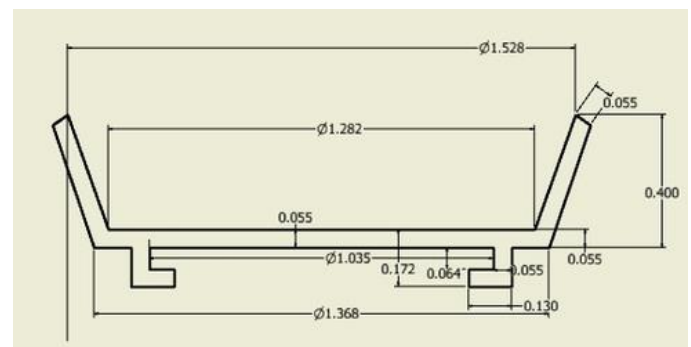
The printed design and design change in software will be presented **to be judged** along with an engineering portfolio. The engineering portfolio will demonstrate design history and intent of both original design and design change (**see scorecard for portfolio content**).

Contest Guidelines

- 1) In advance of the competition, the student team is asked to design a device that performs useful work and produces a product of value. Student designers are asked to go beyond “just parts” to utilize additive manufacturing (AM) for the creation of a machine. The result will be a functional mechanism or assembly with moving parts. The geometry of the design must be defined within a three-dimensional (3D), computer design system capable of rendering files in STL format. Design file must be uploaded via E-Mail by April 3, 2017, 12:00 P.M, to andrew@ttaweb.com
- 2) File name must be **the team number** assigned for contest (it is important that students do not name their STL file(s) with any part of their name, school name, or otherwise).
- 3) While onsite at the SkillsUSA competition, teams will have a set amount of time to perform finishing work on their printed designs.

- 4) While onsite at the SkillsUSA competition, the student will receive a challenge involving a design change to perform within a set timeframe. This will be judged immediately and be part of the final scoring to determine ultimate success in completing the two challenges.
- 5) Students will have an allotted amount of time to complete a written knowledge exam. This exam will focus mainly on the various types of 3d printing, along with general Additive Manufacturing knowledge questions.
- 6) Each team will present to the judge(s) the following:
 - a) A finished, printed design
 - b) An STL file(s) of your design with onsite change
 - c) Engineering notebook
 - d) A one-page summary stating why your design is suited for additive manufacturing is to be turned in at the contest orientation.
 - i) Include the benefits your design would bring to the customer.
 - ii) Include **contest/team** number.
 - iii) Computer generated image of design.

Revised 3/8/17



Track cross-section