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.

The goal of the 2018 SkillsUSA Additive Manufacturing State Competitions is to prepare students for a National Competition that will focus on an additive manufacturing design with strict requirements on form, fit, and function.

The below contest has been designed with the National Competition in mind. These competitions will prepare students for competing at Nationals and challenge their understanding of Additive Manufacturing.

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

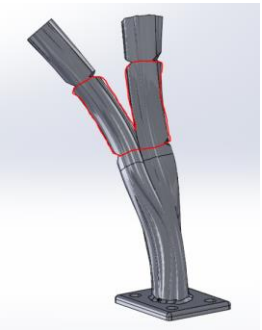
1. Supplied by the technical committee:
    a. All additive manufacturing equipment and material, (design submitted on March 12, 2018, will be printed and made available to teams' day of contest)
2. Supplied by the contestant:
    a. Design file (CMB Format) must be submitted via E-Mailed by: **Monday, March 12th 2018, 5:00 Eastern Standard Time**, 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. 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.
d. Engineering Notebook- there will be a lot of emphasis on the execution of a notebook that takes the judges through the process, since there is not a design change in this years contest.

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

This contest focus around a tree branch file that can be accessed on GrabCad Workbench here: https://grabcad.com/library/skillsusa-2017-additive-manufacturing-state-competition-file-1. The tree branch file has been prepared with a designated connection point. The designated connection point is an area where the students' designs must touch the tree branch. The designated connection point is outlined in red in the below image. :



Tire Swing Challenge:

Students must design a fixture that connects a tire swing to a tree branch in a designated location. The tire swing fixture must stay connected to the tree branch when force is applied. Force is defined as a person moving the tire swing fixture with a light amount of pressure. The tire swing fixture must include a moving assembly and hold a chain that is *insert chain measurements and weights*.

Students must create a design that prints in no more than *2 hours* with a build volume of *1X1X1in*. Students may use no more than *x amount* of build material and *x amount* of support material. Students must submit CMB files to be printed via GrabCad

For the contest:

- Tree Branch file can be found on GrabCad Workbench.
- Students should submit contest designs via *GrabCad Workbench*. See instructions for creating a GrabCad Workbench here: http://help.grabcad.com/article/83-demo?locale=en
- **When converting the STL file using GrabCad software, you will need to create the CMB File using the F370 template – 3D printer. .010 Layer Resolution**

Knowledge Performance

The Knowledge Performance is based on the knowledge/ experience provided by the students during their presentation, the engineering notebook and supporting documents.

2018 TENNESSEE SkillsUSA CHAMPIONSHIPS
TASK & MATERIAL LIST

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 contest will be to design a fixture that connects a tire swing to a tree branch

Prepare in advance of the competition, a model of a fixture with the build envelope no greater than 1.00" (L) by 1.00" (W) by 1.00" (H). The volume of material usage for model and support must be no greater than X cubic inches. The build time must be no greater than 2 hours.

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. Contestants will be given a specific amount of time to prep for their presentations. Engineering Notebook and supporting documents/files should be prepared prior to the competition day.

Process Considerations

1. How the file is oriented to be built will affect the amount of support material being deposited and the overall time of the build.
2. 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

The printed design will be presented to be judged along with an engineering portfolio. The engineering portfolio will demonstrate design history and intent of fixture (**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
2) File name must be the team number assigned for contest (it is important that students do not name their CMB 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) Each team will present to the judge(s) the following:
   a) A finished, printed design
   b) An CMB file(s) of your design on a thumb drive.
   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.

Judging the Contest:

Students will be judged on:

1) Engineering notebooks (portfolio)
    a) Did the students follow any guidelines provided?
    b) Did students show their design process?
2) Following all requirements outlined in contest
    a) Build time
    b) Build volume
    c) Material usage
    d) Support material usage
    e) Did the students consider additive manufacturing when creating their design? Are they able to explain the role that additive manufacturing played in their design?
3) Presentation
    a) Does the presentation include:
        i) Explanation of the design process through examples in their engineering notebook
        ii) Understanding of form, fit, and function
4) Quality of final 3D printed part
    a) Does it perform the function in the manner it was designed to do?
    b) Does it meet all requirements in contest guidelines?
    c) Does the printed part include a moving assembly?
    d) Did the students design the part with additive manufacturing in mind?