

2021 MICHIGAN SKILLSUSA CHAMPIONSHIPS TASK & MATERIALS LIST

SKILL OR LEADERSHIP AREA: Additive Manufacturing

CONTEST LOCATION:

Virtual

Contest: On April 22, 2021 at 9:00 a.m. EST student teams will meet with the judge(s) to present their project and engineering notebook (engineering design process). Student has until April 21, 2021 at 5:00 p.m. EST to submit required documentation to (TBD)

- Pictures of completed project
- Pictures, scans or files of complete engineering notebook or engineering design process (including completed drawings).
- RESUME: Each student must submit a one-page printed resume before the contest start at the contest site (present to contest coordinator, not judges). The resume is no longer submitted online. This is the only time that resumes can be turned in. Failure to do so will result in a 10 point penalty.

CONTEST INFO:

- ***Please refer to the National Technical Standards for detailed information related to this contest.***
- How to access SkillsUSA National Technical Standards:
https://www.youtube.com/watch?v=aR9Jet0PRP8&feature=emb_logo
- National Contest Updates are located:
<https://www.skillsusa.org/competitions/skillsusa-championships/contest-updates/>

NOTE 1: Contest Planning Team finds that competitors do best when they know what to expect out of nationals. A few years they were lucky enough to be able to interview student teams and put together a video, that you can share with your educators and state competitors. If any of you ran the tree branch challenge at State, you will see the connection here to the national challenge re: organic shapes. Access it here

NOTE 2: PRACTICE! Additionally, we often get requests for access to challenges where students can work on their skills. Throughout the year we host many within the GrabCAD community. Extreme Redesign is one just for students it is open till the end of February and you can access details about it here:

<https://grabcad.com/challenges/>

If you have questions about the contest, please email:

edu.curriculum@stratasys.com or you can reach out to me and I will assist to get your answer.

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

Clothing: Jeans (with no holes) or Khakis accepted. No shorts or open toed shoes or sandals. Students can wear tennis shoes or work boots, but laces must be tied. Short sleeve polo, button up shirts and plain non-graphic T-shirts also acceptable. School logos on clothing must be covered with tape. No cell phones or Smart Watches!

Contestants: 2 team from each school that has pre-registered to be part of the event.

Requirements: Each team is responsible for bringing their 3D Printed model to the competition for testing. No parts will be printed at the competition. Testing Rigs will be provided by the competition committee. Models must adhere to the contest outlines from the proposed standards.

Contest Criteria

On contest day, students will:

- Provide Engineering Notebook (Engineering notebook guidelines below)
- Present Design to judges and answer questions.
- Test 3D printed design on provided test rig for judging.
- Resume to show to judges (each participant must have one, these will not be collected, only verified that they have them).

Engineering Notebook Guideline:

- Be clearly labeled with contestant number, date and page # on each page
- Begin with a problem statement
- Include discovery and documentation of approach to solve problem
- Include sketched design concepts with critical features labeled
- Critical dimensions clearly labeled in design sketch
- Considerations for designing for FDM distinctly addressed (i.e. part strength, part orientation) especially including any expected risks during printing
- Design decisions and alternatives are documented and evaluated thoughtfully

3D Printed Design Specification - Students must create a design that:

- Prints in less than 3 hours
- With a build volume of no greater than 3X3X3in.
- Using no more than 5 in³ of build material
- Using no more than 2 in³ of support material
- Print Model material usage must be verified within Engineering Notebook documentation, via a print screen

Presentation Criteria

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

- Design Process: good design logic is used for key design choices was intentional and well-communicated
- The presentation is professional and well-rehearsed
- Practical evaluation

Knowledge Test:

A Knowledge Exam will also be administered during the competition to test students understanding of Additive Manufacturing and general CADD knowledge.

For questions pertaining to the competition, please contact Andy Close (Andyclose@atctrain.com) or Gregg Zydeck (Gzydeck@atctrain.com).

Additive Manufacturing Rubric

Items Evaluated		Possible Points
Original Design		
	Function	40
	Durability of Design	40
	Manufacturability	40
	demonstrates complex surface detail as used in current methodology in automotive industry	40
	finishing & aesthetics of printed piece	100
Modification On-site		
	CAD and virtual modeling ability demonstrated by completing engineering change	220
Engineering Portfolio		
	concept description	45
	specifications	20
	dimensional and tolerance drawings	45
	engineering design tree	45
	other relevant information/documentation	45
	finishing aspects that impact design	20
	mistakes/lessons learned	40
Presentation		
	Professionalism	40
	Clear Communication	40
	description of component design	30
	description of economics and commercialization	30
Knowledge Exam		
	20 questions, 5 points/question	
Skills Assessment	Assessment	20
	Demonstrate part cleaning skills	
Résumé Penalty		0 or -10 only
Clothing Penalty		0 or -50 only
Time Penalty		0 or -50 only
Team Penalty (if competing with less than the required number of team members)		-100
Total Possible Points		1,000



SkillsUSA 2021 – Additive Manufacturing State Challenge – Power Up!

Overview

The goal of the 2021 SkillsUSA Additive Manufacturing State Competition is to challenge competitors at that state level and send the best prepared students to compete at the National Competition in June. Each year's suggested state competition focuses on an additive manufacturing design with strict requirements on form, fit, and function of compact and intricate designs like nationals.

The below contest has been designed with the upcoming National Competition in mind and is designed to challenge the understanding of students and their skills in Additive Manufacturing.

This year's contest challenges students to redesign an outdoor 3D-printed outlet enclosure to be a USB outlet cover that leans into the needs of today's power user.

Competitors will need to use their 3D printing knowledge to design a part that prints within the specified build volume, materials and times specified. The designed enclosure will need to screw into the testing rig and meets the specified requirements on the score sheet.

If you have questions about the contest, please email:
edu.curriculum@stratasys.com

Materials & Supplies Needed

Materials to be Provided by Student Competitor:

- 3D design
- Engineering notebook
- Presentation
- 3D printed testing rig
- Lumber (something to attach the rig to)
- USB cord (such as iPhone charging cable)
- Screws (must fit through a 2.5mm diameter hole)
- *Student designs 3D printed

**At the national competition Stratasys prints on-site, at the state level students have to print their designs before and bring them or print them at a 3D printing partner before and bring them on competition day.*

About the Testing Rig

- The Challenge Rig simulates a piece of drywall with the mounting plate protruding out of it.
- The overall dimensions of the rig are as follows: 100mm (long) x 100mm (wide) x 33mm (tall).
- It is recommended that competition host have the rig printed and attached to a flat surface (a piece of lumber or plywood is sufficient).
- The files to print can be found on GrabCAD here:
<https://grabcad.com/library/skillsusa-2020-state-challenge-1>

Judging Suggestions:

Students should be judged on:

- 1) Engineering notebooks
 - a) Did the students follow the guidelines provided? States are encouraged to provide their own Engineering Notebook Guidelines.
 - b) Did students show their design process?

- 2) Following all requirements outlined in contest criteria
 - a) Dimensions
 - b) Build time
 - c) Build volume
 - d) Material usage
 - e) Support material usage
 - f) 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?



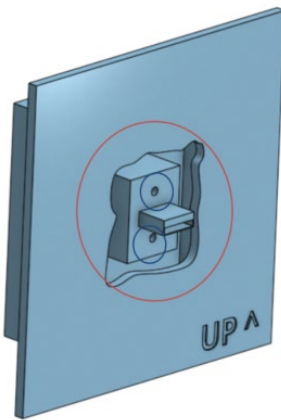
SkillsUSA 2021 Additive Manufacturing State Challenge

Power Up! - USB Outlet Redesign

Welcome to the “Power Up!” challenge! The task at hand is to design a hinged, covered enclosure (like the one pictured above) for a wall-mounted standard USB port.

“What’s the catch?” you say. Well, there are five, and here they are:

1. The enclosure must affix securely to the provided USB port (see illustrated CAD below) using the screw holes (screws will be provided at the testing location).
2. The enclosure must completely close the “hole in the wall” (see illustrated CAD below by red circle)



3. The enclosure must have a mechanically hinged lid (printed in place) that does not use external parts or hardware. This enclosure lid must open at least 180 degrees and stay open at 90 degrees when placed in that position.
4. Device should have some uniqueness in design – such as shape, 3D printed texture, text... the options are endless – you are the product designer – flex your creative muscle.
5. The device must follow these 3D printing specs measured in GrabCAD Print (when measured using 0.010” solid ASA standard build settings):
 - Prints in less than *3 hours*
 - With a build volume of no greater than *3X3X3in*.
 - Using no more than 5 in³ of build material
 - Using no more than 2 in³ amount* of support material

2021 Contest Criteria

On April 7: Resumes and Liability forms are due within the Conference LMS

Between April 7-11: PD Assessment is due

By April 16: Additive Manufacturing Technical Assessment due

By April 12: All contest submissions are due in Conference LMS

1. Engineering Notebook (Engineering notebook guidelines below)
2. 3D printed design files
3. Pictures of printed part

April 19: Contest date – student demonstrate final project and present their design

1. Engineering Notebook should:

- Be clearly labeled with contestant name(s), date and page # on each page
- Begin with a problem statement
- Include discovery and documentation of approach to solve problem
- Include sketched design concepts with critical features labeled
- Critical dimensions clearly labeled in design sketch
- Considerations for designing for FDM distinctly addressed (i.e. part strength, part orientation) especially including any expected risks during printing
- Design decisions and alternatives are documented and evaluated thoughtfully

2. 3D Printed Design - Students must create a design that:

- Prints in less than *3 hours*
- With a build volume of no greater than *3X3X3in*.
- Using no more than 5 in³ of build material
- Using no more than 2 in³ amount* of support material

3. Presentation Criteria

- The competitor clearly describes their understanding of the problem to be solved.
- Design Process: good design logic is used for key design choices was intentional and well-communicated
- The presentation is professional and well-rehearsed
- Practical evaluation: Part functions way team intended 100% of time.