

SAMPE Benelux

Additive Manufacturing Contest for engineering students



INVITATION

SAMPE Benelux has the great pleasure to announce the 2022-2023 Additive Manufacturing Contest: an exercise in design of a bell crank structure for a Formula Student Car that will be tested to failure.

SAMPE Benelux is a networking organisation of 200+ professionals and students in advanced materials, very active in composite materials. Promoting technical excellence by exchanging know how is one of SAMPE's key objectives. To create a dialogue and network with tomorrow's engineers, SAMPE Benelux organises its third additive manufacturing competition. Teams of Benelux engineering students are invited to join the competition and show their additive manufacturing and design skills. We look forward to the creative designs in this year's competition!

The contest duration is five months and could be performed within a course or project framework. Students will have to use their knowledge and creativity to design a bell crank that will be tested to failure. Students will learn and expand their abilities in additive manufacturing and engineering design: starting from a concept, design calculations and structural optimisation, the students work towards a digital model that is printed by Ultimaker and finally mechanically tested.

Prizes will be awarded based on the design that meets the imposed performance targets in the most optimal way. The contest competition day will take place on 31st of March 2023 at Delft University of Technology, The Netherlands.

IMPORTANT DATES

Detailed information on contest after registration: 21st of October 2022

Deadline for registrations: Monday, 21st of November 2022

Preliminary design: Friday, 16th of December 2022

Final design: Friday, 10th of February 2023

Additive Manufacturing Contest: Friday, 31st of March 2023

PARTICIPANTS

If you are a Bachelor, Master or PhD student in Belgium, The Netherlands or Luxembourg, you can apply to this contest. Students participating in the contest will have to establish teams. Each team will design and test the structure made by additive manufacturing. Teams consist of 1 to 5 students. Bachelor, Master and PhD students can cooperate and get together in one team. You apply for the competition with names of the team, students, coach and affiliation.

TECHNICAL RULES

General information

- Students will design and structurally test a bell crank.
- The applied load will be limited to 20kN.
- The material that will be used is PET filled with carbon fibre.
- Each entry must be printed in one single print envelope. That is, each entry (including all pieces) must be able to fit within the dimensions of Ultimaker S5 (330 x 240 x 300 mm) including bed adhesion.
- Standard entries will be printed with standard Cura profile with the exception of 100% infill and no more than 3 shells.

- Support material will be the same as the print material. Any trapped support material will be considered part of the structure and thus included in the weight.
- Basic hand tools (hobby knives, files and sand paper) will be available for finishing and fitting work during the test day. Post-processing and assembly may be done until test time.

Printing

- Students will submit an 3MF file and desired printing orientation of their design for printing via e-mail. 3MF files will be checked for quality and prepared for printing by the committee. Printing parameters are intended to be consistent across all contestants and will only be adjusted if approved by the committee. All entries will be printed by Ultimaker.

Design and structural test

- Design a load carrying structure which fits within the design space as shown in Figure 1. More information on the supports and loading pins will be given upon subscription. The structural design can be chosen freely within these dimensions.

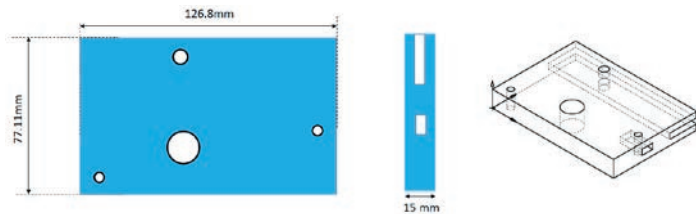


Figure 1. Schematic of design space with load introduction points indicated in white

- The structure will be loaded statically using a tensile test (see Figure 2). Please consider the design at the load introduction points carefully.

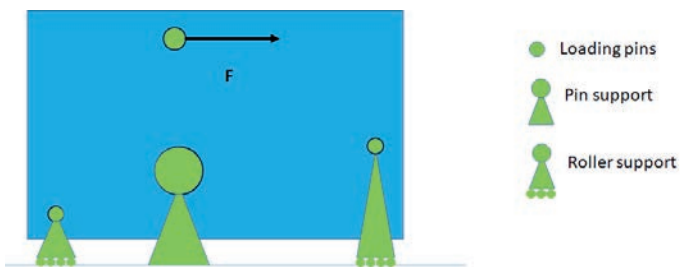


Figure 2. Mechanical test of bell crank structure

Scoring

The part performance will be ranked according to the score below and will be based on the normalised weight and load during testing. For the ranking, higher values of Score are better. The normalisation is based on the minimum and maximum values of all competitors.

$$\text{Score} = -3W + 2F$$

With:

$$W = \text{Normalised weight} = (W_{\text{structure}} - \text{Min}(W_{\text{competitors}})) / (\text{Max}(W_{\text{competitors}}) - \text{Min}(W_{\text{competitors}}))$$

$$F = \text{Normalised load} = (F_{\text{structure}} - \text{Min}(F_{\text{competitors}})) / (\text{Max}(F_{\text{competitors}}) - \text{Min}(F_{\text{competitors}}))$$

AWARDS

Awards will be granted to the structure with the highest score, meeting all the requirements listed above. Weight will also be given to the design justifications entered and the presentation given by the team prior to testing. Jury members chosen by SAMPE and the competition sponsors will evaluate the work of all the teams and will appoint the winners. The winners will receive € 400. A series of other prizes will be awarded depending on received sponsorship. A one year SAMPE student membership is offered to all participants.

REGISTRATION TO THE CONTEST

Send an e-mail to additivemanufacturing@sampe-benelux.org providing the following information.

- Team name
- Team members
- Team point of contact e-mail
- Team coach name and e-mail
- Affiliation

AGENDA OF THE TEST DAY

During the testing day, the printed models will be prepared for testing, the teams will present their designs and potentially assist during the structural testing. The jury will determine the winners at the end of the contest.

CONTACT

For more information and your team's application, please contact: Dr. ir. Julie Teuwen or Dr.ir. Ruben Sevenois (additivemanufacturing@sampe-benelux.org)
Board Members of SAMPE Benelux.

SAMPE Benelux thanks the sponsors of this SAMPE Benelux students event:

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