



# 3D Printing Competition

*Brought to you by The Cube, Organized in collaboration with McGill Engineering Undergraduate Society Tech Week*

The Cube and the EUS will be hosting a 3D printing design competition in collaboration with the EUS Tech Week happening January 22-27, 2017.

We are looking for support in the form of funds for advertising and running the competition, feedback and ideas on the competition specs and possibly assistance with the adjudication process.

The purpose of this document is to provide an outline of the current plan for the competition.

## History of The Cube

The Cube is a 3D printing center run by students at McGill University. They operate in collaboration with Mechanical Engineering to utilize the department's 3D printers during down times and provide services to anyone seeking to manufacture 3D parts. The service started in September 2015 and has since grown to be the most popular place for 3D printing on campus. Student technicians at The Cube worked to develop their own easy to use online order system tailored specifically to their needs. The order placement platform on their website as well as the dedication of the technicians have made The Cube an extremely efficient and convenient option for any 3D printing needs.

For more information please contact

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Or visit the cube website at: <http://uprint3d.xyz/>

## Competition Prompt

You are working for NASA, and have been tasked with designing a robotic manipulator for the purpose of handling hazardous chemicals in experiments aboard the ISS. NASA wants to be able to send raw materials (3D printing material, bearings, actuators, etc.) to the ISS, and then print and assemble the design in space. The design requirements are:

- Four-joint manipulator with a radial range of 14"
- Mounting flange on one end to secure the arm to the laboratory table (hole pattern provided)
- Small flange on opposite end for attaching the articulated gripper (hole pattern provided)
- Arm must be capable of 270 degrees of radial motion, and must be able to access the entire area within this 270 degree hemispherical section up to 14" in the radial direction (image provided)
- Arm must be capable of picking up 10 lbs. (simple design calculations using isentropic material properties, actuator ratings, etc., required).
- Design must be able to be printed on FMD printer (within the volume of the printers we have available) with limited support material.

## Logistics

- Groups of 3-5 students.
- Design phase will span one week.
- Deliverables: Full CAD model of design, brief report and presentation for presentation for the judges.
- Judging criteria:
  - Designed for additive manufacturing - Joints are properly tolerated, and issues such as thermal warping, location of support material, and other factors have been considered. Generating your "own" support material gets bonus points.
  - Anticipates real-world needs.
  - Maximizes material usage.

## Outcomes

- Top 3 designs will be printed free of charge for display.
- This competition provides McGill students with a rare opportunity to apply their knowledge to a real design problem.
- Cash prize for the winning team.

