

**Carnegie Mellon University
Department of Mechanical Engineering**

**24-632 and 39-601 Additive Manufacturing Process and Product Development
Fall Semester 2022**

**Team Design Project
Part 1**

Objective

The objective of this design project is to conceptualize, design and fabricate a new product made of a polymer material. The principal design goals/constraints are:

1. Your product has to be able to be fabricated in prototype form on a “maker” grade polymer AM machine (FDM-based or SLA-based) or on an FDM machine. During your design work you can make your product on machines available in the TechSpark lab.
2. Your product will ultimately target being sold. In other words, you need to choose a product that is cost effective and appealing when printed by AM.
3. The product does not have to be mechanical in nature, though when you think about your advantage vs. the competition, exploiting your engineering knowledge may be a good strategy.

An important part of your grade for this project will be a reflection on the entire process that you submit in the final part of the project. In this way, a thoughtful analysis of successes and failures for a less successful product may be graded higher than a poor analysis of a more successful product. Even a successful product can likely be improved.

Design Teams

The products will be designed, built, and operated by design teams of 3-4 students. Teams have been assigned for this project and team assignments are available on Canvas.

Project Part 1: Initial Product Proposal Due Thursday, October 6, 2022:

For this part of the project, design teams will perform up-front research on their proposed products on the internet (or through other sources) and write a short report on their findings, to be handed in on the due date above. You will consider multiple products and print a very early concept of one of your products.

The 5 page maximum report (1.5 line spacing, times 12 point font) including figures will consist of five sections:

- 1) **Team Organization:** Is there a leader? How are you breaking down tasks for the project? Do any members have special skills (such as is one person a CAD guru)?

- 2) The Proposed Product Category or Categories:** State the type of product you want to create (the product category or categories, such as cell phone covers). You can consider multiple products in multiple product categories if you want to. What need or want have you identified that your product can fill? How will your product fill it?
- 3) The Status of the Competition:** What is your competition in this product category, including typical costs for such products and sales popularity? What specifications will your product have to satisfy to be successful (to satisfy the wants or needs identified above)?
- 4) First Design Concepts:** Describe 3 or more product design concepts, including hand sketches or 3-D CAD renditions for clarity. For this report you will be graded on the quality of the ideas, not the beauty of the drawings or CAD renditions (though completely messy renditions will be penalized). Make your pitch for why you think each design idea could be successful. At this point it is ok if your ideas are still not fully formed – as long as they are creative.
- 5) First Print:** Choose one of your product concepts, render it in a CAD package and print it. This first rendition of one of your products can be crude, but you have to submit a print. The goal of this is to give you a very early reality check on printability for your products.

Note: You will not be bound by the designs from this portion of the project during the next phase of the project. However, if you change course significantly, you will have to explain why you had to do it.