

**Senior Capstone Design Project**  
**Open-Source 3D Printed Foot Prosthesis**  
**Prototype Summary**

**Team 18F04**  
**Abdulwahab Zaidan**  
**Ali Abdullah**  
**Omar Alajmi**  
**Salman Malallah**  
**2018-2019**



**Northern Arizona University**  
**Dr. Sarah Oman**  
**Matthew Batten**

This summary is about the demonstration day. The demonstration day is presenting your prototype, Bill of material (BOM) and the solid-work that you are working on, and after that listen to the feedback from the Professor, Teacher assistant and the students in order to improve the teams design.

## 1. Prototype

Our design is to build a 3D printed below knee prosthetic leg. On the day of the demo the team presented the prototype of the 3D printed foot and explained each part and how it functions. The team Prototype total length was 10 inches with a color green. The explanation is that it is separated into five parts, which are lower joint, supporting channel, metal stick, pin, foot and the last part which is bought by itself called a sheath. The supporting channel function is similar to a normal human knee, can move back and forward at an angel of 15 degrees and has a hole in the middle in order for the sheath to be attached to it. The Sheath is a sock which has a metal stick on the end of it which sticks in the hole inside the supporting channel. Lower joint part helps to stabilize the supporting channel which has pins to connect the supporting channel and the lower joint. The function of the metal stick is to adjust the height that the person would be comfortable in. The foot is a spring to make a balance when walking. The team was assigned three important feedbacks that was given to the team, first one is that not everything should be built from 3D and that the team could order the parts from a website that is known worldwide. The parts that should not be built from 3D are the metal stick and the pins, the reason for that is because after adding the pressure of the human it would break after three or four times of use because it is not a metal. The material that the team is going to use are nylon or HIPS. The second one is the team have to search about the human factors in order to know the average size of height and dimensions of adults from 13 years of age and higher. The last feedback is that the team's plan was after finding the right dimensions for the 3D printed foot is to send it to the company in Phoenix called STAX, which they are going to print it because Northern Arizona University (NAU) only has the filament type of PLA and the team is going to build the design with either Nylon or HIPS. The professor advises us to print it in NAU with the filament PLA with full size, so that we can test it before going to STAX which will normally cost much more. It would be cheaper if there was something wrong with the design and needs fixing, rather than paying 1500\$ and has problems that needs to be fixed.



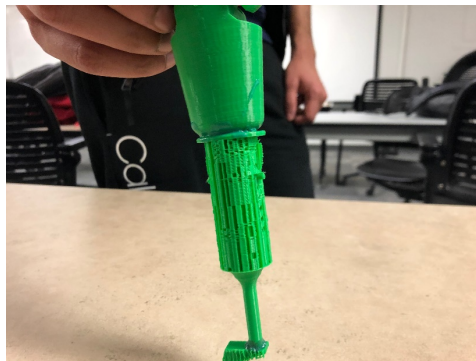
Figure 1.1 Supporting Channel



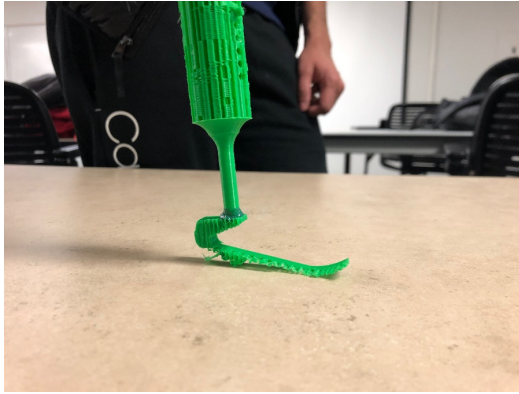
**Figure 1.1.1 Supporting Channel (inside)**



**Figure 1.2 Lower Joint**



**Figure 1.3 Metal Stick**



**Figure 1.4 Foot**



**Figure 1.5 3D Printed Foot**



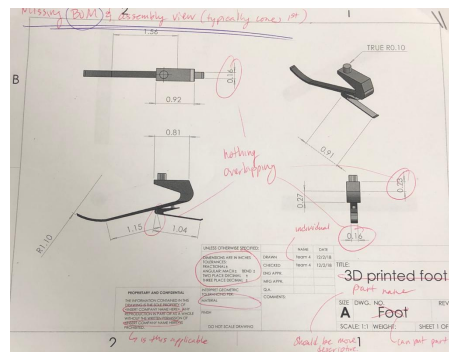
**Figure 1.5.1 3D Printed Foot**



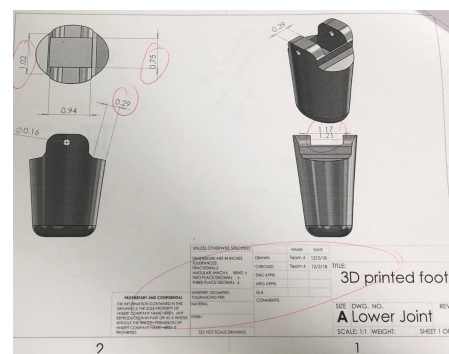
**Figure 1.5.2 3D Printed Foot**

## 2. Solid-work

The Solid-work part should have been the dimensions of the average human factors since the team still didn't figure out these dimensions so we handed in paper the dimensions that we did in for the prototype.



**Figure 2.1: Foot drawing**



**Figure 2.2: Lower joint drawing**

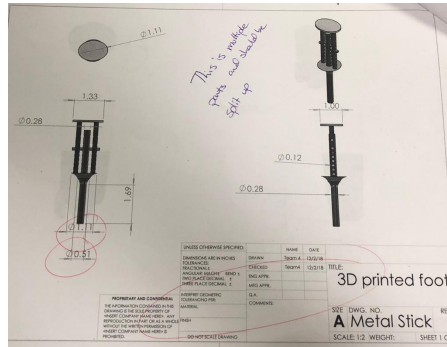


Figure 2.3: Metal stick drawing

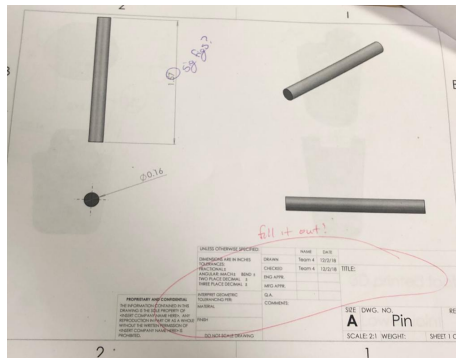


Figure 2.4: Pin drawing

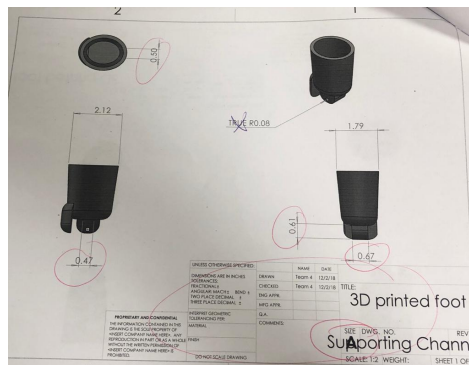


Figure 2.5: Supporting channel drawing

### 3. Bill of material (BOM)

The Team didn't submit the bill of material because we couldn't know the real cost of each part when it comes to building them with the company STAX. The team contacted them, but they gave us an estimate of nylon filament only, and the team knows that these are not accurate, that's why the team didn't submit it. On the other hand, we had a feedback from the professor if it's possible to attach an email of what estimates they gave us in order to show that the team tried on asking them.





**Video 3D Printed Foot**