ECE Capstone program
Spring 2018
Project Abstract & Info

Please provide the following information to be shared with on capstone information exchange platform:

1. Project number: 68

2. Project title (as will appear on the poster): Dextera Dei: EMG Controlled Prosthetic Hand with Bio-Feedback

3. Team members: Sean Byju (POC)
Jesse Gatling
Jonathan Olcheski
Alejandro Sanchez

4. Adviser(s) name(s): Laleh Najafizadeh
Li Zhu

5. At least 5 keywords that will help to classify the project scope:
"Biomedical", "analog circuit design", "microcontrollers", "wearables", "Electromyography"(EMG), "signal processing".

6. Project abstract (up to 250 words) to be shared with judges:

Dextera Dei aims to set a precedent for what midrange prosthetics should be—one that does not compromise on functionality, quality and affordability. In the current prosthetics market there is a disparity between functionality/ease of use of prosthetics and price—on one end of the spectrum the "affordable" options such as body/cable powered prosthetics are very cumbersome to use and are imprecise almost bordering on being unwieldly. On the other hand, high quality prosthetics do exist but these unfortunately are exorbitantly expensive (upwards of $60,000) and so few amputees are privileged enough to afford such devices. There is no clear middle ground when it comes to prosthetic hands which is where Dextera Dei comes in. Dextera Dei is a low-cost prosthetic hand that is controlled using the muscles on one's arm through electromyography (EMG); it will also have a bio-feedback system that notifies the user how much force they are applying when they grip an object. By being controlled via EMG, Dextera Dei will be easier to use and significantly more precise because the muscles that control it will be localized on the arm making it a far more graceful option that it's cheaper counterparts while the EMG technology will allow even the slightest muscle activity to translate to hand movement, thus allowing for an unprecedented range of precision when it comes to moving the fingers on the hand. By 3D printing the parts for the prosthetic very low costs for Dextera Dei can be achieved. The Bio-feedback system, achieved by translating signals received from sensors attached at the fingertips of the hand to a haptic system the user is wearing will enable one to feel how much force is being applied to objects thus allowing one to be able to adjust their grip accordingly—a feature that is more commonly seen in high-end prosthetics. By offering many of the qualities of high-end end prosthetics at a low-end price, Dextera Dei aims to provide a better middle-ground and life for amputees.