

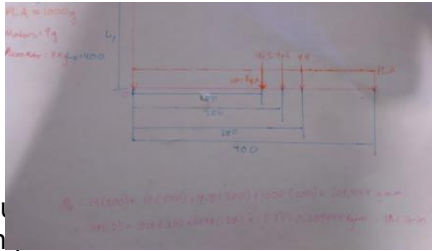
# ACTION ITEMS

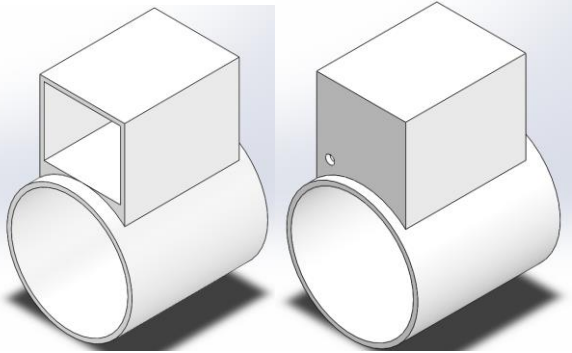
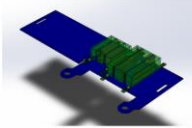
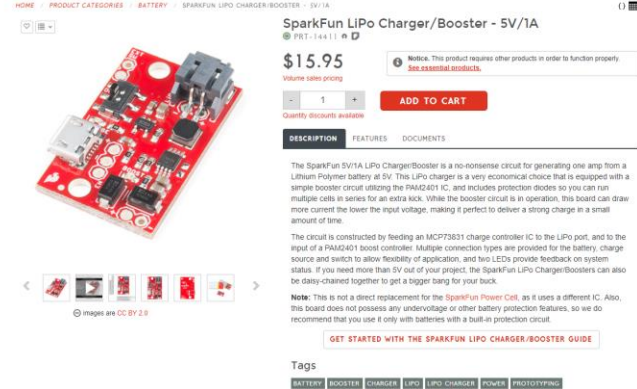
## TEAM 12: Active Prosthetic Arm

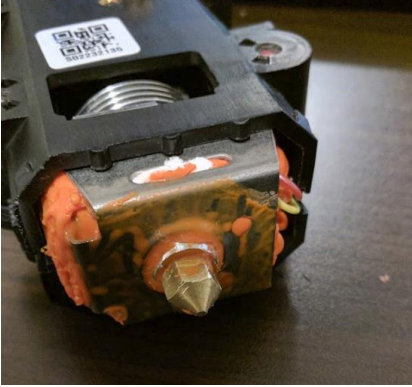
Due Date:  
Wednesday, February 27, 2019 5:30pm

The following are the Action Items from last week:



### Team Member: Felicity Escarzaga

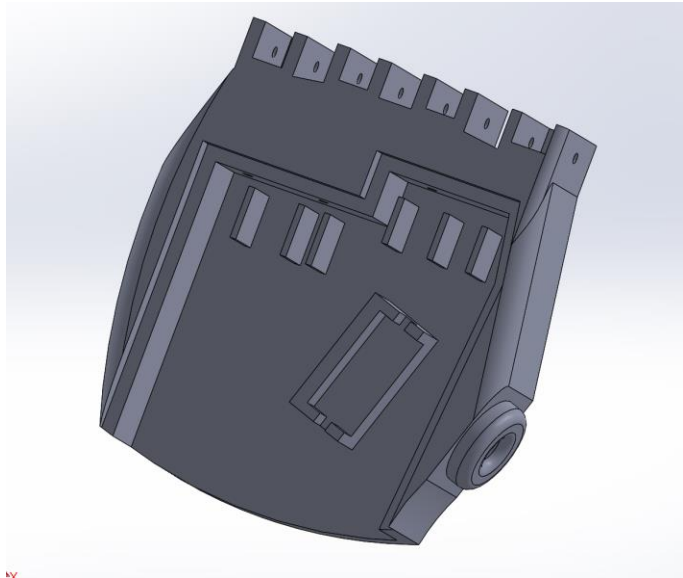

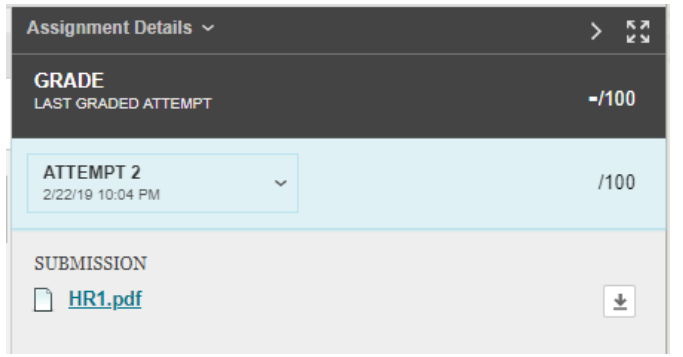






Action Item	Date Due	Date Completed	Result/Proof of Completion
1. Calc needed spring force for elbow assist.	2/27	2/23	 <p>Torque Spring</p> <p><a href="https://www.grainger.com/product/GRAINGER-APPROVED-270-Degree-Carbon-Steel-Music-3HPL6">https://www.grainger.com/product/GRAINGER-APPROVED-270-Degree-Carbon-Steel-Music-3HPL6</a></p> <p>GRAINGER APPROVED <b>GRAINGER CHOICE</b></p> <p>270 Degree Carbon Steel Music Wire Torsion Spring with 1.342" Outside Dia.</p> <p>Item # 3HPL6 Mfr. Model # 3HPL6 Catalog Page # 2159 UNSPSC # 31161908</p> <p>Web Price \$5.15 / each</p> <p>One Time Delivery <input checked="" type="radio"/> Shipping <input type="radio"/> Pickup</p> <p>Expected to arrive Fri, Mar 01 Ship To 85001 (Change)</p> <p>1 <input type="button" value="Add to Cart"/> <input type="button" value="Add to List"/></p> <p>☆☆☆☆ Be the first to write a review</p> <p>Shipping Weight 0.09 lbs.</p> <p>Country of Origin <b>USA</b>   Country of Origin is subject to change. Note: Product availability is real time updated and adjusted continuously. The product will be reserved for you when you complete your order.</p> <p>How can we improve our Product Images? <input type="button" value="Compare"/></p>
2. Design container for spring to attach to cuff.	2/27	-	No longer need this design
3. Redesign cuff size and electronic attachments.	2/27	2/24	<p>Possible Redesign 1:</p> <p>Pros:</p> <ol style="list-style-type: none"> <li>1. Arduino and battery could slip easily</li> <li>2. Arduino sits flat against the cuff</li> <li>3. Wires are pulled through the opening in the bottom</li> </ol> <p>Cons:</p> <ol style="list-style-type: none"> <li>1. Need to design a cap to keep arduino in place.</li> </ol>

			<p>2. Need wire wrap to keep wires together (Similar to the Prusa's extruder wiring)</p> <p>3. Scaling smaller will not allow arduino to fit inside.</p>  <p>Top Bottom</p>
<p>4. Work on Hardware Review with team</p>	<p>2/22</p>	<p>2/22</p>	<p>My section for the hardware review was the cuff which was completed by submission.</p> <p><b>Cuff</b></p> <p>This component of the arm is Felicity's responsibility. In figure 1 the current model for the cuff and its motor and arduino attachments are shown. This design featured flexible boxes that should have rounded as the cuff was thermoformed. The pin attachment is adjustable for scaling and possible thermal deformation. Any unneeded pin holes could be removed from the length with pliers.</p>  <p>Figure 1. Current Cuff Design</p> <p>The design did not function as intended as shown in figure 2. The electronics' boxes were not as flexible as originally thought and were not able to allow the pins to reach the holes. The holes were then stretched and the pin attachments were bent to see if a new attachment type could be made with little modification to the original design but the changes were found to be unusable and the cuff would need to be redesigned.</p>
<p>5. Meet with Dr. Winfree</p>	<p>2/27</p>	<p>2/25</p>	<p>Met with Dr. Winfree over skype. Decided to use an Arduino Micro instead of the teensy to talk to xbee at the foot. We discussed the proper battery supply for the arm and found a better battery charger that included a booster.</p> <p><a href="https://www.sparkfun.com/products/14411">https://www.sparkfun.com/products/14411</a></p>  <p>HOME PRODUCT CATEGORIES BATTERY SPARKFUN LIPO CHARGER/BOOSTER 1V/1A</p> <p>SparkFun LiPo Charger/Booster - 5V/1A</p> <p>\$15.95</p> <p>Notice: This product requires other products in order to function properly. See essential products.</p> <p>Volume sales pricing</p> <p>Quantity discounts available</p> <p>ADD TO CART</p> <p>DESCRIPTION FEATURES DOCUMENTS</p> <p>The SparkFun 5V/1A LiPo Charger/Booster is a no-nonsense circuit for generating one amp from a Lithium Polymer battery at 5V. This LiPo charger is a very economical choice that is equipped with a simple booster circuit utilizing the PMA42401 IC, and includes protection diodes so you can run multiple cells in series for an extra kick. While the booster circuit is in operation, this board can draw more current the lower the input voltage, making it perfect to deliver a strong charge in a small amount of time.</p> <p>The circuit is constructed by feeding an MCP73831 charge controller IC to the LiPo port, and to the input of a PMA42401 boost controller. Multiple connection types are provided for the battery, charge source and switch to allow flexibility of application, and two LEDs provide feedback on system status. If you need more than 5V out of your project, the SparkFun LiPo Charger/Boosters can also be daisy-chained together to get a bigger bang for your buck.</p> <p>Note: This is not a direct replacement for the SparkFun Power Cell, as it uses a different IC. Also, this board does not possess any undervoltage or other battery protection features, so we do recommend that you use it only with batteries with a built-in protection circuit.</p> <p>GET STARTED WITH THE SPARKFUN LIPO CHARGER/BOOSTER GUIDE</p> <p>Tags</p> <p>BATTERY BOOSTER CHARGER LIPO LIPO CHARGER POWER PROTOTYPING</p>

6. Meet with EE Team	2/27	2/25	<ul style="list-style-type: none"> <li>● Met with the EE team.</li> <li>● Clarified each teams' responsibilities.</li> <li>● Clarified we do intend to use toe control not myoelectric since that would be too difficult for average people to set up themselves.</li> <li>● Worked with Allison and Ethan on the Xbee code.</li> </ul>
7. Cleaning/Fixing Extruder	2/27	2/27	<p>The last print set was pulled off the bed and clogged the extruder.  Cleaning the extruder so that it can home has taken several hours.  Spare Extruder also could not home and needed to be cleaned.</p> <p>Current progress on first extruder</p> 

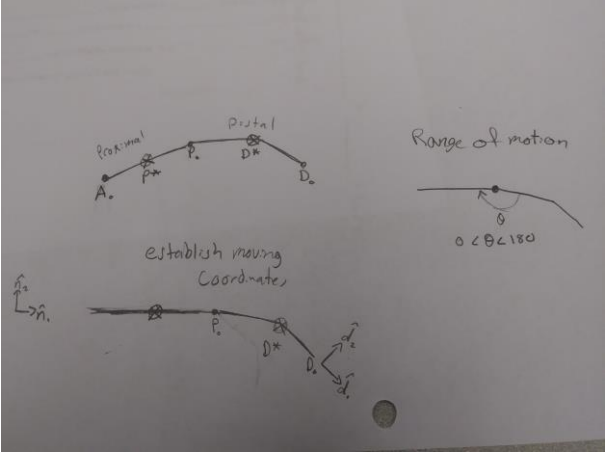
## Team Member: Antoinette Goss

Action Item	Date Due	Date Completed	Result/Proof of Completion
Print palm and hinge to understand the dimensions	2/27/2019	2/27/2019	<p>Due to clogged printer, palm is now going through the makers lab and should be ready by saturday or so</p> <p>3D Print Request Confirmed </p> <p> Library.MakerLab@nau.edu to me</p> <p>Thank you for confirming your 3D print job. Turnaround time for 3D prints can vary widely based on demand for the printers but we'll send you an email when your 3D Model is ready to pick up.</p> <p>Thanks for using the Cline Library MakerLab!</p> <p>Sincerely,  Library MakerLab Staff  Questions? Ask us!  Cline Library MakerLab  @202-502-5500  <a href="mailto:Library.MakerLab@nau.edu">Library.MakerLab@nau.edu</a></p>

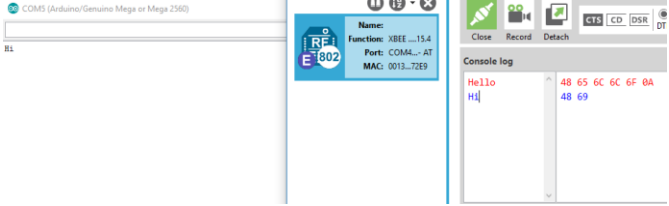
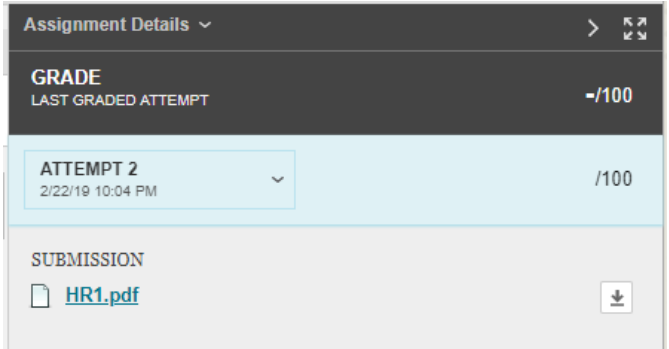
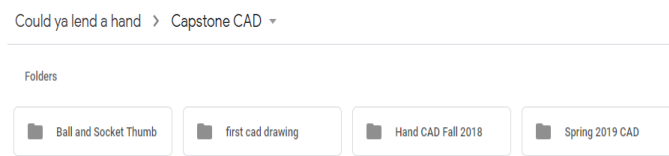
Make modifications to palm	2/27/2019	2/27/2019	 <p>Modifications include better thumb mobility and holes perfected to allow for both the sensor and wire to go through the fingers per EE teams request. Opening hinge has been adjusted and better scaled</p>
begin printing hole and connections to understand the best fit for individual analysis	2/27/2019	2/27/2019	<p>3D Print Request Confirmed </p> <p><a href="mailto:LibraryMakerLab@nau.edu">LibraryMakerLab@nau.edu</a> to me</p> <p>Thank you for confirming your 3D print job. Turnaround time for 3D prints can vary widely based on demand for the printers but we'll send you an email when your 3D Model is ready to pick up.</p> <p>Thanks for using the Cline Library MakerLab!</p> <p>Sincerely, Library MakerLab Staff Questions? Ask us! Cline Library MakerLab (928) 523-6920 <a href="mailto:LibraryMakerLab@nau.edu">LibraryMakerLab@nau.edu</a></p>
Work on hardware review with team	2/21/2019	2/21/2019	 <p>Assignment Details   </p> <p><b>GRADE</b> LAST GRADED ATTEMPT <span style="float: right;">-/100</span></p> <p><b>ATTEMPT 2</b>  <span style="float: right;">/100</span> 2/22/19 10:04 PM</p> <p>SUBMISSION  <a href="#">HR1.pdf</a> </p>

**Team Member: Jannell Broderick**

Action Item		Date Due	Date Completed	Result/Proof of Completion
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Pint fingers		Feb 25	Incomplete	After meeting with the EE Team the finger design must be altered again to incorporate the pressure sensors. This will be a action items for next week.
Individual analysis		Feb 29	In progress	<p>The individual analysis has been changed from Opensim to MATLAB. Once completed, the code will plot the movement of the fingers (and rest of forearm if time permits). It will also be able to calculate the velocity of the tip and center of mass of each finger section. I am also hoping to plot the movement in 3d.</p> 
Work with Toni to connect fingers to palm.		Feb 29	Incomplete	Due to the focus on our individual analysis, Toni and I decided to move this to next week.
Find potential materials for artificial tendons.		Feb 29	Feb 29	<p>The material for the tendons needs to be flexible to move through tendon channels, strong enough to withstand forces of the motors, and elastic so it will not break under high stress.</p> <p>Potential candidates: fishing line, string, wire.</p> <p>Fishing line seems to fit the requirements best!</p>
Hardware review was completed by the team		Feb 22	Feb 22	Hardware review shows the progress made by the team up until the 22nd of February. The hardware review can be seen on bblearn, Google docs, and soon to be added to the team website.

**Team Member: Allison Cutler**

Action Item	Date Due	Date Completed	Result/Proof of Completion
Code and test XBEE and arduino communication	2/27/2019	2/26/2019	 <ul style="list-style-type: none"> <li>The test was successful, as the word "hi" was communicated from the XBee (right) to the arduino (left)</li> <li>The test used an Arduino Mega instead of an Arduino Uno</li> </ul>
Write individual analysis report	2/27/2019	Not Complete	<ul style="list-style-type: none"> <li>The report has been started but is not complete because the due date is actually Friday (3/1).</li> <li>Completed so far: <ul style="list-style-type: none"> <li>Summarized introduction</li> <li>Copy of Code</li> <li>Results with bullet points</li> </ul> </li> <li>Needs: Formal/Professional paragraphs</li> </ul>
Work on Hardware Review with team	2/22/2019	2/22/2019	<p>Completed "Forearm" and "Code" section, as well as contributed to "Future Work" section</p> 
Organize Google Drive CAD folders	2/27/2019	2/25/2019	 <ul style="list-style-type: none"> <li>The folders are now separated per semester, where old CADs can be used as reference and new CADs are clearly labeled as the current design</li> </ul>

Met with EE Capstone team	Unassigned	2/25/2019	<ul style="list-style-type: none"> <li>• Discussed how sensors will work</li> <li>• Worked together to make each capstone's teams' designs work together</li> <li>• Worked on code with Felicity and Ethan</li> </ul>
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The following are the Action Items for next week:

<b>Team Member</b>	<b>Action Items</b>	<b>Date Due</b>
Felicity	<ol style="list-style-type: none"> <li>1. Meeting with Whinfrey</li> <li>2. Contact Cline to get them certified to print</li> <li>3. Add forearm attachments to cuff</li> <li>4. Complete Analytical Analysis</li> </ol>	<ol style="list-style-type: none"> <li>1. 3/4/2019</li> <li>2. 3/6/2019</li> <li>3. 3/6/2019</li> <li>4. 3/1/2019</li> </ol>
Antoinette	<ol style="list-style-type: none"> <li>1. complete testing on door design to see if latch design is successful. Print latch component</li> <li>2. Work with Jannell to connect fingers to palm</li> <li>3. Make modifications to palm top after testing</li> </ol>	<ol style="list-style-type: none"> <li>1. 3/6/2019</li> <li>2. 3/2/2019</li> <li>3. 3/6/2019</li> </ol>
Jannell	<ol style="list-style-type: none"> <li>1. work with toni to connect fingers to palm</li> <li>2. Design new fingers that incorporate the sensors and grips</li> <li>3. test printed finger</li> <li>4. Update website (make it look more aesthetically pleasing)</li> </ol>	<ol style="list-style-type: none"> <li>1. 3/6/2019</li> <li>2. 3/6/2019</li> <li>3. 3/6/2019</li> <li>4. 3/6/2019</li> </ol>
Allison	<ol style="list-style-type: none"> <li>1. Sketch new forearm design</li> <li>2. Create new forearm design in SolidWorks</li> <li>3. Print new forearm design</li> </ol>	<ol style="list-style-type: none"> <li>1. 3/1/2019</li> <li>2. 3/4/2019</li> <li>3. 3/6/2019</li> </ol>