**Execution Plan** - What we want to get done during the week of “...” (e.g. during the week of 1/21, we want to get the CAD design approved by Park)

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| **Week** | | **1/21** | **1/28\*\*** | **2/4** | **2/11\*\*** | **2/18** | **2/22-24** | **2/25\*\*** | **3/4** | **3/11** | **3/18\*\*** | **3/25** | **4/1\*\*** | **4/8** |
| **Design** | **Structure &**  **Power** | Park approved CAD design for structure | 3D printing for structure started, Order additional materials needed for structure, Research new power supply | Research new power supply, Order components for new power supply (likely not feasible but will try ) | Make changes to structure depending on stress validation, print components required to hold other subsystems | Incorporate other subsystems into structure, Build power system | **BLITZ**  Everything should be integrated by bitz (if not, finish integrating during blitz) and during blitz, we will begin doing initial testing of the integrated system by the end of blitz we should have identified issues with the integrated system and begin tweaking. | Fix design issues identified in Blitz | **No design updates/issues after February. There should only be “bug fixes” or “tweaks” that are needed as a result of testing.** | | | | | Device  Passes  All  Cases |
| **Artificial Muscle** |  | Part replacement received | Develop structural integration components |  |  | Fix design issues identified in Blitz |
| **Sensor**  **&**  **Micro- Controller** | • Acquire Polina’s Code | • Redesign sensor system based on past success of sensor system prototype (redesign to fix bugs)  • Begin designing PCB | • Review Polina’s code and confirm it functions properly  • Begin integrating sensor code and Arduino code  • FSR integ. w/ struct. | • Finish designing PCB  • Design circuit carrying case  • Identify temperature sensor & tests for it  •Identify validation tests for integrated S/MC | **• Integrate Code & FSR/EMG Sensors.**  **• Continued research into temp. Sensor (**order one) | Fix design issues identified in Blitz |
| **Test** | **Structure &**  **Power** | Solder & Validate existing Power Supply | If power requirements change, select/design new power supply | Watch Artificial Muscle validation to get better grasp of power requirements | Begin testing for stress areas by having Alfred walk with the structure | Validate power system, Try to integrate with Artificial Muscle | Test changes | Test changes | **Spring Break** | Test changes | Test changes | Test changes |
| **Artificial Muscle** |  |  | Begin retesting for power output with structural casing  Validate internal resistance |  |  | Test changes | Test changes | Test changes | Test changes | Test changes |
| **Sensor**  **&**  **Micro- Controller** |  | •Identify more thorough validation tests for sensors and code  • Test microcontroller subsystem code against “dummy” values  • Test FSR sensors to confirm proper output | • Validate FSR sensors against Tekscan documentation  • Confirm Arduino code functions like before  • Identify potential additional validation tests for EMG | • Identify Validation tests for Arduino code  • Validate code against the new identified tests  • Validate EMG sensors against Myoware documentation and the new identified tests | • Validate the integrated code & sensors against the tests for the individual FSR, EMG, & code tests & against integrated system tests | Test changes | Test changes | Test changes | Test changes | Test changes |
| **Notes** | | • Semester just began  • Our team is meeting w/ our sponsor Dr. Park the thursday before each presentation. | • TAs and professors announce the need for better validation plans  • This requires us to identify tests for this semester’s integrated design goals and for last semester’s subsystems. | • Request for LEDs was made by sponsor  • Request for temperature sensor was made by sponsor  • FSR sensor integra. w/ the structure needs to be redesigned (past issues) | • A single PCB should be designed if possible to house all major circuitry.  • Include circuitry for FSR, EMG, power, temperature, LEDs, artificial muscle, and Arduino on one PCB. | •  •  •  •  •  •  • | •  •  •  •  •  •  • | | •  •  •  •  •  •  • | | •  •  •  •  •  •  • | |

**Validation Plan** - What we want to get done during the week of “...” (e.g. during the week of 1/21, we want to get the CAD design approved by Park)

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| **Week** | | **1/21 and 1/28\*\*** | | **2/4 and 2/11\*\*** | | **2/18 and 2/22-24 and 2/25\*\*** | | | **3/4 and 3/11 and 3/18\*\*** | | | **3/25 and 4/1\*\*** | | **4/8** |
| **Structure &**  **Power** | |  | | Newtonmeter validation with final A.M. fittings in and out of structure  Initial 3D print structure validation  Achieve ankle joint movement with mounted A.M.  Pre-built power supply simulation | | Achieve ankle joint movement with A.M. with human body weight  Pre-built power supply operational validation with bench DC power supply  Power supply operation with battery  H-bridge operation validation with bench DC power supply  H-bridge operation validation with battery power | | | Final structure design validation with A.M.  Battery power H-bridge & A.M. integration validation  Battery Power H-bridge & Sensor/Microcontroller integration validation | | | Skin force measurement test on optical treadmill, with and without walking | | Device  Passes  All  Cases |
|
| **Artificial Muscle** | |  | | Newtonmeter validation with final A.M. fittings in and out of structure  Ankle joint movement mounted on structure | | Ankle joint movement with structure with human body weight | | | H-bridge & A.M. integration validation  Microcontroller/H-bridge integration validation | | | Skin force measurement test on optical treadmill, with and without walking | |
|
| **Sensor**  **&**  **Micro- Controller** | | • Test FSR sensors to confirm proper output. Perform the same tests that were performed last semester to prove that the sensors are functioning properly (tests are detailed in final subsystem report).  • Validate FSR sensor circuit by validating the individual components.  • Validate FSR against Flexiforce A301 sensor Tekscan documentation.  • Validate MCP6004 against the IC’s datasheet. | | • Test microcontroller subsystem code against “dummy” values. Perform the same tests that were performed last semester to prove that the subsystem was functioning properly (tests are detailed in final subsystem report). Also validate against newly identified tests.  **•** Test EMG sensor to confirm proper output. Perform the same tests that were performed last semester to prove that the sensor is functioning properly (tests are detailed in final subsystem report). Also validate against the newly identified tests. | | • Validate the integrated code & sensors against the tests for the individual FSR, EMG, & code tests & against integrated system tests | | | • Temperature Sensor validation  • New code for temperature sensors, LEDs, and additional feature validation | | | Skin force measurement test on optical treadmill, with and without walking | |
|
| **Notes** | | • Identify validation test for the proper positioning of the FSR sensors  •  •  • | | • Identify validation test for the proper positioning of the EMG sensor  • Identify validation test for the proper positioning of the temperature sensor  • Identify validation tests for the integrated sensors and microcontroller  • Identify validation test for temperature sensors | | •  •  •  •  •  •  • | | | •  •  •  •  •  •  • | | | •  •  •  •  •  •  • | |  |

**Previous Execution Plan**

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| **Week** | | **1/21** | **1/28\*\*** | **2/4** | **2/11\*\*** | **2/18** | **2/22-24** | **2/25\*\*** | **3/4** | **3/11** | **3/18\*\*** | **3/25** | **4/1\*\*** | **4/8** |
| **Design** | | • Acquire Polina’s Code | • Redesign sensor system based on past success of sensor system prototype (redesign to fix bugs)  • Begin designing PCB | • Review Polina’s code and confirm it functions properly  • Begin integrating sensor code and Arduino code  • FSR integ. w/ struct. | • Finish designing PCB  • Design circuit carrying case  • Identify temperature sensor & tests for it  •Identify validation tests for integrated S/MC | **• Integrate Code & FSR/EMG Sensors.**  **• Continued research into temp. Sensor (**order one) | **BLITZ**  Everything should be integrated by bitz | Test changes | Test changes | Test changes | Test changes | Test changes | Test changes | Test changes |
| **Testing &**  **Validation** | |  | •Identify more thorough validation tests for sensors and code  • Test microcontroller subsystem code against “dummy” values  • Test FSR sensors to confirm proper output | • Validate FSR sensors against Tekscan documentation  • Confirm Arduino code functions like before  • Identify potential additional validation tests for EMG | • Identify Validation tests for Arduino code  • Validate code against the new identified tests  • Validate EMG sensors against Myoware documentation and the new identified tests | • Validate the integrated code & sensors against the tests for the individual FSR, EMG, & code tests & against integrated system tests | Test changes | Test changes | Test changes | Test changes | Test changes | Test changes | Test changes |

**Updated Execution Plan**

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| **Week** | | **1/21** | **1/28\*\*** | **2/4** | **2/11\*\*** | **2/18 & Blitz** | | **2/25\*\*** | **3/4** | **3/11** | **3/18\*\*** | **3/25 & 4/1\*\* & 4/8** | | |
| **Design** | | • Acquire Polina’s Code | • Redesign sensor system based on past success of sensor system prototype (redesign to fix bugs)  • Begin designing PCB | • Review Polina’s code and confirm it functions properly  • Begin integrating sensor code and Arduino code  • FSR integ. w/ struct. | • Downloaded Altium  • Looked into temperature sensors LEDs & corresponding code for each | • Integrated Code & FSR/EMG Sensors.  • Continued research into temp. Sensor  • Identified possible LEDs, temp. Sensor, and code for each | | • Begin PCB  • Select Temp Sensor  • Select LEDs  • Code LEDs and Temp  • Get EMG functioning | Finish PCB | Design circuit carry case | Integrate with other subsystems | Entire AAFO System  • Test  • Design Tweaks  • ReTest  • Repeat  • Pass all tests  • Polish and document | | |
| **Testing &**  **Validation** | |  | •Identify more thorough validation tests for sensors and code  • Test microcontroller subsystem code against “dummy” values  • Test FSR sensors to confirm proper output | • Validate FSR sensors against Tekscan documentation  • Confirm Arduino code functions like before  • Identify potential additional validation tests for EMG | • Identify Validation tests for Arduino code  • Validate code against the new identified tests  • Validate EMG sensors against Myoware documentation and the new identified tests |  | | • Validate the integrated code & sensors against the tests for the individual FSR, EMG, & code tests & against integrated system tests  • Validation test for temperature sensor and code  • Validation test for LEDs and code | | | |
| **Notes** | | • Semester just began  • Our team is meeting w/ our sponsor Dr. Park the thursday before each presentation. | • TAs and professors announce the need for better validation plans  • This requires us to identify tests for this semester’s integrated design goals and for last semester’s subsystems. | • Request for LEDs was made by sponsor  • Request for temperature sensor was made by sponsor  • FSR sensor integra. w/ the structure needs to be redesigned (past issues) | • A single PCB should be designed if possible to house all major circuitry.  • Include circuitry for FSR, EMG, power, temperature, LEDs, artificial muscle, and Arduino on one PCB. | • PCB should include FSR, EMG, Temperature, and LEDs at a minimum. Power system might also be included  • There should be LEDs for motor activation, temperature sensor, EMG sensor, FSR sensor, and battery life  •  •  •  •  • | | | | | | | | |

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| **Week** | | **1/21 - 3/25** | | | | | | | | | | **4/1\*\* & 4/8** | | |
| **Design** | | * ✅ PCB designed, ordered and arriving 4/1 or 4/2 * ✅ All new components ordered, arrived and started testing * ✅ Coding and Circuits in final stages of testing * ✅ Sensors, Microcontroller, Code are ready to be completely integrated with motor and Power Subsystem | | | | | | | | | | • Polish Code & Circuits  • Solder PCB  • Complete Integration | | Entire AAFO System  • Test  • Design Tweaks  • ReTest  • Repeat  • Pass all tests  • Polish and document |
| **Testing &**  **Validation** | | * ✅ Sensors and Code validated * ✅ Individual components validates | | | | | | | | | | • Circuits & Code give correct output  • PCB operates as expected  • Correct motor output is processed by H-bridge and gives correct motor commands | | • Test the entire system |
| **Notes** | | • Semester just began  • Our team is meeting w/ our sponsor Dr. Park the thursday before each presentation. | • TAs and professors announce the need for better validation plans  • This requires us to identify tests for this semester’s integrated design goals and for last semester’s subsystems. | • Request for LEDs was made by sponsor  • Request for temperature sensor was made by sponsor  • FSR sensor integra. w/ the structure needs to be redesigned (past issues) | • A single PCB should be designed if possible to house all major circuitry.  • Include circuitry for FSR, EMG, power, temperature, LEDs, artificial muscle, and Arduino on one PCB. | • PCB should include FSR, EMG, Temperature, and LEDs at a minimum. Power system might also be included  • There should be LEDs for motor activation, temperature sensor, EMG sensor, FSR sensor, and battery life  •  •  •  •  • | | | | | |  | |  |