## BME 484 Biomedical Engineering Capstone Design Project Proposal

Project Title: Wearable Bluetooth Vital Sign Sensors Embedded into Firefighter Face Mask Seal Team: Sydney Beck, Project Manager Aaron Gilmore, Hardware Engineer Emily Ensom, Software Engineer Abstract: Firefighters play a very important role in society. They save countless lives and in the process, endanger their own. One of the problems they face is protecting themselves. To help ease this problem we plan to create a pulse oximeter sensor to rest inside the seal of firefighters face mask against the forehand. These sensors will take heart rate and blood oxygen concentration readings and relay this information back to an operator running a receiving program, so they can monitor every firefighter's vitals individually. This project will help protect the lives of the firefighters and will allow them to continue to save the lives of many others. The expectation of this project is to take vital sign readings using PPG modules embedded in the sensors small enough to fit inside a face mask comfortably, and create a program to receive these readings in real-time. Innovation: This product will create new and exciting possibilities in attaining accurate vital sign information from firefighters by relaying it to an external display. It is different from other wearable sensors on the market because it is a one-time installation process in addition to eliminating the need of firefighters to wear yet another device. Materials. We plan to use existing schematics and designs of the PPG circuit, its bluetooth relay, and Android application from BME 363 lab. We also plan to use PCBs to put these designs into a smaller unit to fit inside the face mask. Subtasks: 1. Design and construct Bluetooth PPG circuit on a breadboard 2. Embed PPG sensor within a firefighter face mask forehead seal 3. Utilize code to relay PPG signal to an external Android device 4. Create smaller version of PPG circuit on a PCB to minimize weight and space

Timeline: The project timeline is included below.

Firefighter Facemask Sensor General Timeline	09/11/17	09/18/17 09/25/17	10/02/17	10/09/17 10/16/17	10/23/17	11/30/17	11/13/17	11/20/17	11/27/17	12/14/17	12/18/17	12/25/17	01/01/18	01/15/18	01/22/18	01/23/10	02/12/18	02/19/18	02/26/18	03/05/18	03/19/18 03/19/18	03/26/18	04/02/18	04/09/18	04/16/18 04/23/18	04/30/18	05/07/18
1. Team & topic																											
2. Design																											
3. IRB application (if applicable)																											
4. Mid-year progress report																Τ											
5A. Project prototype (Design and construct PPG on breadboard)																										_	
5B. Project prototype (Embed sensor in facemask)								-																		_	
5C. Project prototype (Utilize code to relay PPG signal to Android device)																											
5D. Project prototype (Condense PPG on PCB to minimize weight and space	e)																										
6. Testing & improvement																											
7. NEBEC Conference paper																										_	
8. Grant proposal (TBA)																											
9. NEBEC Conference (TBA)																											
10. Final Report																											

References: M. Petrillo. (2012, Nov. 1). Real-Time Physiological Monitoring for Firefighters Coming [Online]. Available: <u>http://www.fireapparatusmagazine.com/articles/print/volume-17/issue-11/features/real-time-physiological-monitoring-for-firefighters-coming.html</u>

> Sharma. (2017, Jan.). Designing a heart rate monitor interfaced with bluetooth for wireless transmission of data [Online]. Available: <u>https://search.proquest.com/openview/fe5ff47fcc7b2fa1e53c9aaae5d16da5/1?pq-origsite=gscholar&cbl=18750&diss=y</u>

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