ECE4011/ECE 4012 Project Summary

Project Title	FatTracker
Team Members (names and majors)	
	Marty Alcala, EE
	Brandon Bruen, EE
	John Bush, EE
	Philip Gordon, EE
Advisor / Section	Professor Pamela Bhatti / A05
Semester	Year/Semester Intermediate (ECE4011)
Project Abstract (250-300 words)	Our project is to alter the existing consumer body fat analyzers model to be able to achieve a higher level of accuracy and be able to transmit the data to a Android based smartphone for the user to be able to monitor their progress over time. This device will use Bluetooth to transmit the data from the data acquisition system to the user's Android device. These changes will provide a great improvement to what is currently on the market. Most on the market scanners range in accuracy from 15% to 20%. Our goal is to achieve accuracy on the order of 5% to 10%. This information will be presented to the user via an application on their Android device. From there, the user will be able to see if there has been any change in their body fat over time. This will allow them to track their progress easily. The FatTracker system will be comprised of the following components: sensors to send pulses through the body, a microcontroller to process the data and transmit it via Bluetooth, and finally a smartphone application to receive the data and present it to the user. The algorithm to compute body fat will be derived from what is currently available on the subject as well as data collected in testing. In order to fine tune the equations, we will use professional grade testing in order to get controls that are very precise. We will use this testing to decide what body types to restrict this product to for further improvements in accuracy.

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List **codes** and **standards** that significantly affect your project. Briefly describe how they influenced your design.	• Bluetooth (IEEE 802.15.1) This is the code and standard for the 2.4GHz range of data communication. It is required for the communication between the processor and any Bluetooth rated device. The standard must be followed to ensure that there is proper communication between the devices. • IEC 60601 This is the medical standard for electrical devices that are used commercially. It defines safety and efficiency standards for approval for commercial distribution. Its requirements must be met for a product to be sold as a medical device.
List at least two significant **realistic design constraints** that applied to your project. Briefly describe how they affected your design.	• Many of the devices on the market today allow for considerable margins of error when testing, with errors as high as 20%. To compensate, the devices are limited to specific demographics of people. This allows for an increased accuracy in those groups of people. We will design our device to achieve an accuracy of 5-10% Also, we will make the population base for our device as possible, but limit our target in ways that allow us to reach our goal accuracy. Both these goals can be achieved through user input during first operation. Based on the information provided, the most appropriate equation can be chosen for the individual, and accuracy can be maximized. • Additionally, it is our desire to ensure that the user is able to compete our test quickly. With this in mind, we will design our device so that the testing process takes no more than 2 minutes, with a goal of decreasing testing time further to 1 minute or less.
Briefly explain two **significant trade-offs** considered in your design, including options considered and the solution chosen.	• There is a large trade off between cost and accuracy. In order to improve the algorithm used to calculate body fat more tests need to be conducted using professional grade measuring equipment. These tests are very expensive to conduct, but having more data points will allow for a more accurate product. • People can have significantly varying body types. In order to increase accuracy, the test subjects must be limited to a certain body type. The more body types you allow for, the lower your accuracy will be.
Briefly describe the	The body fat measurement device requires 3 main hardware components to facilitate body fat computation:

computing aspects of your projects, specifically identifying **hardware-software** tradeoffs, interfaces, and/or interactions. *Complete if applicable; required if team includes CmpE majors.*	● Microcontroller ● Bluetooth module ● Smartphone The microcontroller will be embedded into the body fat measurement device and will be electrically connected to multiple electrical pulse generators and sensors. The role of the microcontroller will be to generate electrical pulses from one part of the body (such as a wrist) via a pulse generator and to determine the time it takes for the pulse to be received by a sensor on another part of the body (such as an ankle). The microcontroller will then transmit the measured value of the pulse propagation time to a smartphone via a Bluetooth module. Upon receipt of the pulse propagation time from the microcontroller, the smartphone will plug the measured value of the pulse propagation time into a regression equation that has been preconfigured by the user to take into account additional factors such as age, height, activity level, etc. The result of the regression equation calculation will yield an estimated body fat percentage, which will then be displayed to the user on the smartphone screen and stored in non-volatile memory for long-term tracking.

ECE4011/ECE 4012: International Program

(Only groups with one or more International Program participants need to complete this page)

Project Title	
Global Issues (Less than one page)	(10 point font, single spaced)