

ECE4011/ECE 4012 Project Summary

Project Title	Meat Fat Scanner
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 (ECE4012)
Project Abstract (250-300 words)	<p>Our project was to design a system that would measure the fat percentage of a piece of meat. The concept of being able to do this is based on the idea presented by on the market body fat analyzers.</p> <p>On the market devices present a low accuracy rating of within 15% to 20% of the actual value. The goal of our project is to build a device that will perform the same function on a piece of meat with an accuracy of within 15%.</p> <p>The user inputs the weight of the meat into the app and the test is initiated from the application as well. Once the test is completed, the result is displayed on screen for the user.</p> <p>This device is comprised of the following components: probes to be inserted into the meat, an Arduino Uno connected to a board with a simple circuit involving a known resistor, a RedBearLab Bluetooth Shield, a smartphone application with Bluetooth functionality.</p> <p>The model used to calculate the body fat percentage, was generated through the testing of over 50 pork samples. Weight and resistance was measured for each piece. Once these measurements were taken, the pork was boiled down, separating lean mass from fat and water. This allowed for the measuring of the real percentage of fat that each pork contained. The value our device presents does not include water weight. The rationale is that the consumer will not be concerned with water when wanting data for their meat. All this measured info was used to generate a regression model for the estimation of fat percentage.</p>

Project Title	Fat Tracker
List codes and standards that significantly affect your project. Briefly describe how they influenced your design.	<ul style="list-style-type: none"> 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.
List at least two significant realistic design constraints that applied to your project. Briefly describe how they affected your design.	<ul style="list-style-type: none"> We found that as we tested meat, if the pork cuts were not of a consistent nature (size and weight), that our model became less predictive. As a result, we chose to limit ourselves to pork chops. This allowed for us to more accurately model the predictive qualities of weight and resistance pertaining to fat content. 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.	<ul style="list-style-type: none"> In order to make our model more accurate, we needed to find as many statistically valuable variables as possible to increase our accuracy. When testing, we spent much of our time measuring capacitance, but once we were able to accurately do so, we found that it was insignificant to the model. Time constraints restricted us from pursuing other variables. We chose to stick with weight and resistance. When generating our model, we chose pork as our test subject. Pork is cheap and would allow us to do significant testing within our budget. This does present an issue in that pork is fairly consistent in fat content from pig to pig. As a result, our model showed that the weight of the pork chop was the most statistically significant factor. If we had the budget, beef would have been a better choice. Cuts of steak vary greatly in their fat content.
Briefly describe the computing aspects of your projects, specifically identifying hardware-software tradeoffs, interfaces,	<p>The FatAnalyzer requires 4 main hardware components to facilitate body fat computation:</p> <ul style="list-style-type: none"> Microcontroller Bluetooth module Smartphone Simple known resistor circuit

<p>and/or interactions.</p> <p><i>Complete if applicable; required if team includes CmpE majors.</i></p>	<p>The Arduino is the heart of our device. It is used to apply a test voltage to the input of our circuit, measure the current through the known resistor, and then through Ohm's law calculate the resistance of the pork. That information is then transmitted to the smartphone via Bluetooth.</p> <p>Upon receipt of the resistance data, the smartphone plugs the measured value of resistance into a regression equation along with the weight the user measures. The result of the regression equation calculation will yield an estimated meat fat percentage, which is then displayed to the user on the smartphone.</p>
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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)