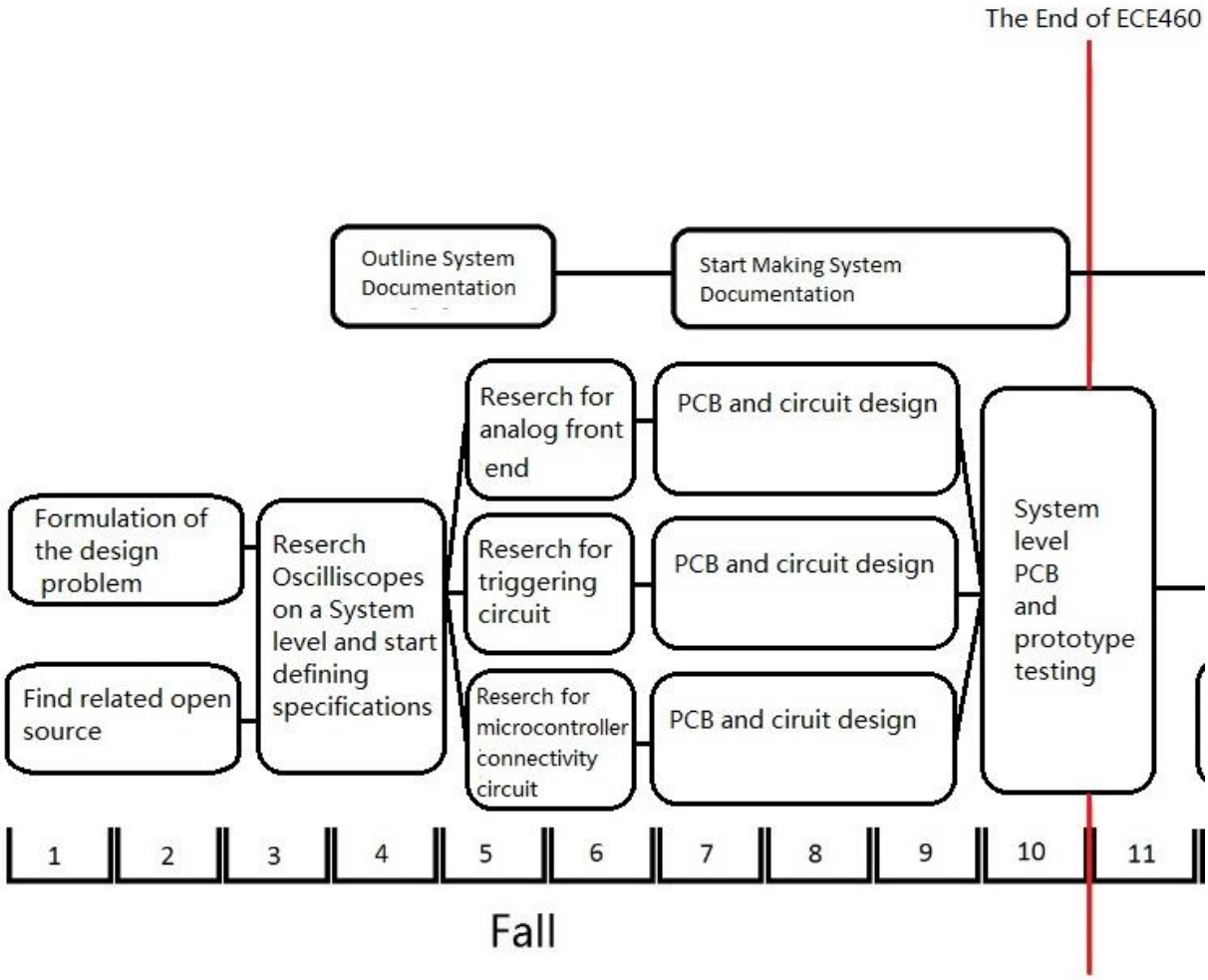
To: Mark Yoder, TI
From: Eric Taylor
Raymond Montgomery
Yaohui Wang
Date: 10/5/2014
Subject: Project Plan

Executive Summary

The purpose of this project is to provide both hobbyists and professionals with an oscilloscope that they can use for their day to day projects. Current options are fairly expensive in the above $100 range and can be too expensive for the common hobbyist so we want to provide a cheaper solution. To make this scope we want to make a BoosterPak for a common TI LaunchPad so the user would just have to buy the BoosterPak and attach it to the LaunchPad to have a high performing scope.
The BoosterPak we are designing would consist of a high performance Analog to Digital Converter that can sample at high rates to measure signals up to 25MHz, and also include a black/white colored screen. The user then can control the two channels on the oscilloscope with mechanical buttons and knobs attached on the LaunchPad. Overall the results of this project could be useful to a wide scope of engineers and provide a priced under $50 and reliable measuring tool that they can use on their projects.

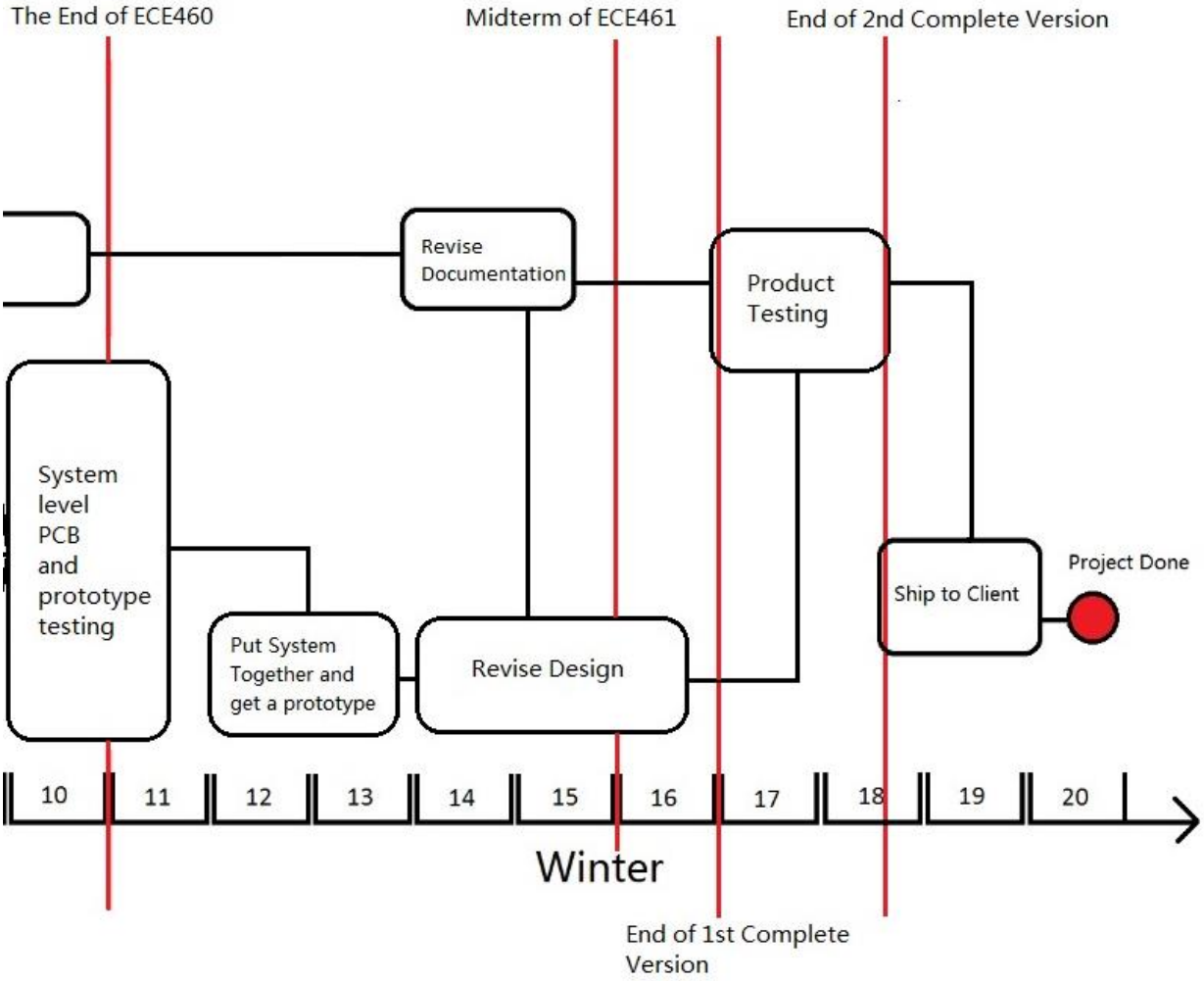
Project Workflow (1st Quarter)



The thought process going into making the first quarter project flow was to get all necessary research and understanding to start making our first prototype going into the second quarter. This is so we can hit the second quarter running in terms of having a working device.

The initial research goes into how the scope parts will fit together. What design considerations we need to keep in mind and start creating specifications for each sub system. Once we have a good understanding of the whole system we break off into each subsystem researching how it works, getting an initial circuit design, and start seeing how the code will have to come together. After that is accomplished we move into designing the PCB for each system to start testing them. It's almost like a broken up prototype.

Project Workflow (2nd Quarter)



The purpose of the second quarter is to get the final prototype in ready to ship conditions. With the work coming from the first quarter we have a good idea of the system level design of the scope and started making the first prototype board in the PCB design block. Once this initial design is done we want to get the system put together and the software to be able to communicate with each part if the system.

Once we get our first prototype we start going through design cycles in both hardware and software to get to a final version. While this is happening we will probably revising our documentation and user's manual. Once an acceptable prototype is made we want to create a final system and start testing. At this point hardware should be solidified and at this point only fixing software.

Once all testing is done we will polish documentation and the user's manual and ship it off to the client.

Major Milestones

Milestone	Description
The End of ECE 460	During this quarter we want to get a complete understanding of the system and its parts. By the end of the term we want working hardware to demonstrate that this project can work. We want - A working version of the Analog Front End - A working version of the Triggering Circuit - A working Display interacting with the microcontroller - A working ADC interfacing with the microcontroller If we have all of these working parts we can start the system integration at the beginning of ECE 461. This is sort of our first prototype but it is split up into sections. By working we also mean that they do the job. There may be room for improvement but should be working enough to demonstrate that each component will work and is ready to be implemented in one system.
Midterm of ECE 461	By the midterm of ECE 461 we want to have complete hardware so the focus can mostly be on software. We want an integrated system of the above parts so it is working. Again there may be room for improvement but we want working hardware to start finalizing the software. The system will include - Working Display - Working Trigger - Working Analog to ADC - Working Controls
End of 1st Complete Version	At the end of the first complete version of software and hardware we want to have a working system where we can start doing final testing. So all of the features listed above should be working. - Math Functions - Triggering - X and Y Scaling
End of 2nd complete Version	The second complete system should have every function working how it is supposed to alongside any additional functions implemented. This should be ready to ship to the client.

Division of Labor

Team Member:	Division of Labor
Raymond Montgomery	Raymond has taken communication systems and is focusing on analog so he will be working on the Triggering Circuit.
Eric Taylor	Eric will be doing most of the software so he is responsible for the ADC and Display working with the microcontroller. (Connectivity)
YaoHui Wang	YaoHui also works mostly with analog so he will be focusing on the Analog Front End.

Training Plan

1. In order to complete this project the team needs to
    a. Construct an Analog Front End to receive the analog signal and input it to the ADC
    b. Have knowledge of the SPI Interface to connect the ADC and Display to the Microcontroller
    c. How to process the samples as they come in over the SPI Interface on the microcontroller
    d. How to construct a triggering circuit to trigger off a signal

Team Skills

Team Member:	Current Knowledge and Skills
Raymond Montgomery	- Experience with PCB board design - Knowledge of communication systems - Knowledge of signal processing
Eric Taylor	- Knowledge of embedded programming and development - Knowledge of digital signal processing and FPGAs - Some knowledge of Hardware and PCB design
YaoHui Wang	- Knowledge of Hardware Design - Electromagnetic Waves and Field

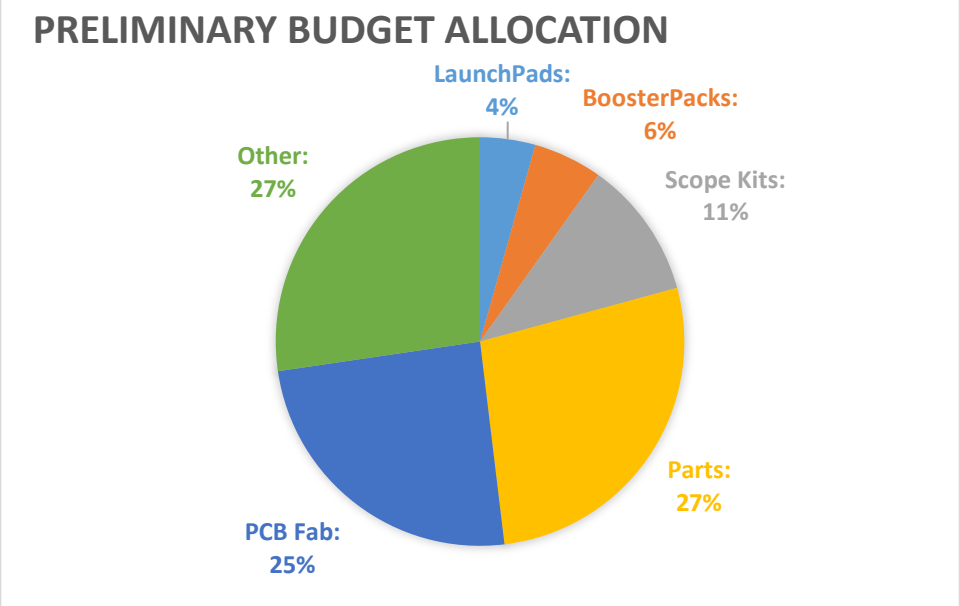
Team Major Tasks for First Quarter

Team Member:	Tasks	Due Date:
Raymond Montgomery	- Have knowledge of Energia and how it incorporates into our project. - Have initial circuit design of triggering circuit in EAGLE - Initial simulations in OrCAD	End of 5th Week
	- Create a Working Triggering Circuit on a PCB	End of 10th Week
Eric Taylor	- Have knowledge of Energia and how it incorporates into our project. - Find SPI drivers for Energia and select Display and ADC parts to use. - Buy display and ADC Boosterpacks that I can interface through SPI.	End of 5th Week
	- Have ADC and Display circuitry on a single PCB that can connect through the Boosterpack Interface.	End of 10th Week
YaoHui Wang	- Have knowledge of Energia and how it incorporates into our project. - Have initial analog front end circuit in EAGLE - Initial simulations in OrCAD	End of 5th Week
	- Create a Working Analog Front End on a PCB	End of 10th Week

Resources Needed

Resource	Description	Due Date:
Circuit Diagram	We need EAGLE PCB designs of each of the systems by 10th week to start initial prototype design.	Start of 10th Week
PCB Prototype 0v1	We need the initial prototype to start finishing hardware and getting software started.	Start of 15th Week
PCB Prototype 1v0	We need to get the first final version of the hardware to start solidifying the software	Start of Week 17
LaunchPads	To start Research into using them for design	End of Week 4
EAGLE	Software used for PCB design.	Start of week 7
Boosterpacks	Boosterpacks to aid in research into system parts	Start of Week 6

Budget



LaunchPads:	$80
BoosterPacks:	$100
Scope Kits:	$200
Parts (ADC Chips, PGA Chips, Displays):	$500
PCB Fab:	$450
Other (FPGA Dev Kits, Misc. Research Kits):	$500
Total:	$1,830
Budget:	$2,500