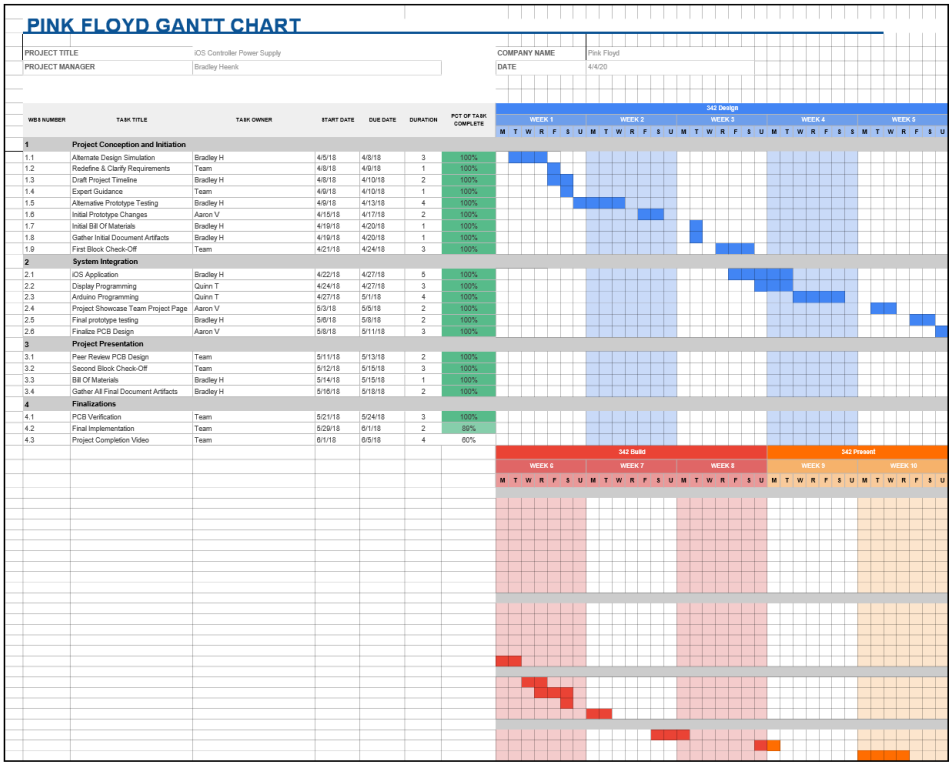
Project Summary – iOS Power Supply

A functional bench power supply is an essential tool for any electrical engineering student. Everything we make requires controllable power for operation as well as testing. Our engineering team, PINK-FLOYD, set out to solve this problem with a flashy iOS interface, on-board touch screen controller, that featured US standard plugins and connectivity to peripheral devices. The outputs will be controllable with 10mV resolution in constant voltage mode and 50mA resolution in constant current mode. Since some of our electronic devices are susceptible to noise (ripple) at their input, the iOS Power Supply will produce an output with no more than 100mA or 5% output voltage ripple (whichever is greater). The device will need to be safe to operate, and for this we will design a robust 3-D printed enclosure that will not allow any object with a diameter greater than 1mm to enter the enclosure. Furthermore, the input current will be limited to 2 amperes to reduce risk of overcurrent faults resulting from internal or external short circuits.

In order to organize the project, we began with a discussion of each member's strong points. This steered the division of labor into three categories. Microcontroller coding, electronic circuit design, and iOS application development. Although, in the end, the complexity of the project required complete melding of the team to tackle design complications. A strong direction and timeline helped us to know when someone was behind and rally others for support.



PINK FLOYD GANTT CHART

PROJECT TITLE	iOS Controller Power Supply
PROJECT MANAGER	Bradley Heenk
COMPANY NAME	Pink Floyd
DATE	4/4/20

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	DURATION	PCT OF TASK COMPLETE
1	**Project Conception and Initiation**					
1.1	Alternate Design Simulation	Bradley H	4/5/18	4/8/18	3	100%
1.2	Redefine & Clarify Requirements	Team	4/8/18	4/9/18	1	100%
1.3	Draft Project Timeline	Bradley H	4/8/18	4/10/18	2	100%
1.4	Expert Guidance	Team	4/9/18	4/10/18	1	100%
1.5	Alternative Prototype Testing	Bradley H	4/9/18	4/13/18	4	100%
1.6	Initial Prototype Changes	Aaron V	4/15/18	4/17/18	2	100%
1.7	Initial Bill Of Materials	Bradley H	4/19/18	4/20/18	1	100%
1.8	Gather Initial Document Artifacts	Bradley H	4/19/18	4/20/18	1	100%
1.9	First Block Check-Off	Team	4/21/18	4/24/18	3	100%
2	**System Integration**					
2.1	iOS Application	Bradley H	4/22/18	4/27/18	5	100%
2.2	Display Programming	Quinn T	4/24/18	4/27/18	3	100%
2.3	Arduino Programming	Quinn T	4/27/18	5/1/18	4	100%
2.4	Project Showcase Team Project Page	Aaron V	5/3/18	5/5/18	2	100%
2.5	Final prototype testing	Bradley H	5/6/18	5/8/18	2	100%
2.6	Finalize PCB Design	Aaron V	5/8/18	5/11/18	3	100%
3	**Project Presentation**					
3.1	Peer Review PCB Design	Team	5/11/18	5/13/18	2	100%
3.2	Second Block Check-Off	Team	5/12/18	5/15/18	3	100%
3.3	Bill Of Materials	Bradley H	5/14/18	5/15/18	1	100%
3.4	Gather All Final Document Artifacts	Bradley H	5/16/18	5/18/18	2	100%
4	**Finalizations**					
4.1	PCB Verification	Team	5/21/18	5/24/18	3	100%
4.2	Final Implementation	Team	5/29/18	6/1/18	2	89%
4.3	Project Completion Video	Team	6/1/18	6/5/18	4	60%

The first steps were to chose architecture and general functionality we needed to implement, along with how to control this functionality with the app and microcontroller. We began with a small circuit that consisted of switching regulator and Arduino with some LEDs. After testing on a breadboard, we decided it was too simple and went for the gusto. We had to upgrade our microcontroller from a simple on board atmega-328pu up to the heavy hitting raspberry pi 3 B do deal with all the controls needed for the more complex architecture. This final architecture needed many additional circuit elements to stabilize and drive the outputs and internal signals to our design criteria. We decided on a switching regulator with linear output regulation.

The 24 volt output we desired began to become a big issue to control with a 5 V microcontroller. We ran into more issues with internally driving the switching regulator that, in the end, were not resolvable with our chosen IC. Everything simulated in LT Spice but we could not recreate this on the circuit. The microcontroller, touch screen, iOS app, and USB DCP worked well at the end of the project. More work on the switching regulator will happen this summer with hopes of a finished product before fall term.

We learned a lot of tricks to drive integrated circuits with external CMOS elements, and how to quickly change gears and adapt to problems on the fly. Most of all, great communication and team support made this project close to functional. The exposure to this complicated and sometimes stressful project will prepare us all for future successes in senior design and beyond.