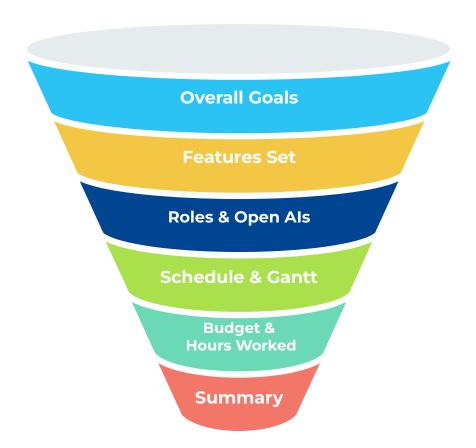




Kristella Lieu, Jianna Nieves, Nicolette Tumasz

#### **Outline**







#### **Overall Goals**

- Create an LED RGB banner display with text and graphics for the ECE Center for Intelligent Systems.
- Display colors and crawls, configurable with a command-line interface.
- Expand from a single display to multiple chained displays.



#### **Features Set**

- Display text in a specific font
  - Computer or custom font
- Text scrolls across the display
- Display RGB colors
  - o 3 colors (Red, Green, Blue)
  - Can be blended to make ~4096 colors
- Text stored in memory
- Power supply connected to an outlet

## **Hardware Specs: Display**

- 5 in (height) x 10 in (length) display
- 4 in (height) x 2 in (length) display letters



- 4mm pitch
- \$39.95
- Chaining Support
- 12 Digital Pins Each
- 800 Byte Each
- 3 Letters/Display

## **Hardware Specs: Power Supply**



- Each display requires about 5 volts and 4 amps (12A total)
- LCS75US05
- 5V
- 14 Amps
- \$16.50 + \$6.99 shipping

## **Hardware Specs: Microcontroller (TBD)**

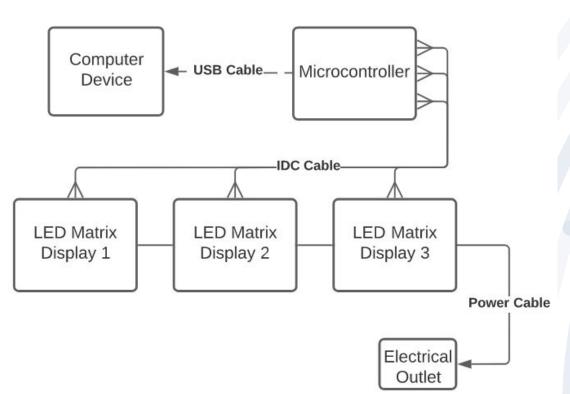


- At least 54 digital I/O pins
- 10kB RAM needed for chaining
- USB Support

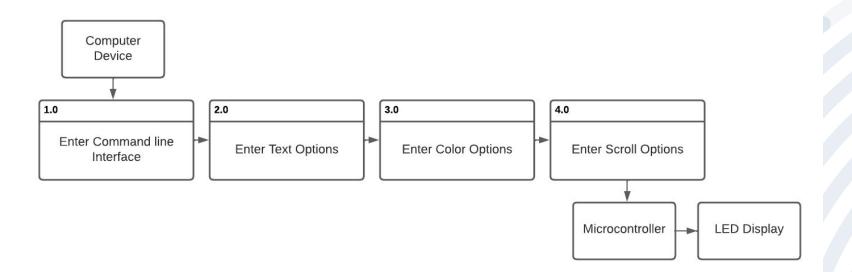
#### **Software Features**

- Compatible with Windows
- Command Line Interface
  - Enter a text phrase to be displayed
  - Option for text to scroll
  - Different styles to choose from
    - Colors, animations

# **Block Diagram: Hardware**



# **Block Diagram: Software Interface**





## **Project Plan: Roles**

#### Jianna

- Rendering text and graphics on the display, by maintaining a memory-mapped version of the display pixels.
- Create or download an appropriate bitmapped font with alphanumeric and punctuation characters.

#### Nicolette

- Design the software and hardware interfacing between the memory-mapped graphics data structure and the physical display.
- Construct wiring harnesses through the selection of cables and connectors, and any other physical/mechanical considerations.

#### Kristella

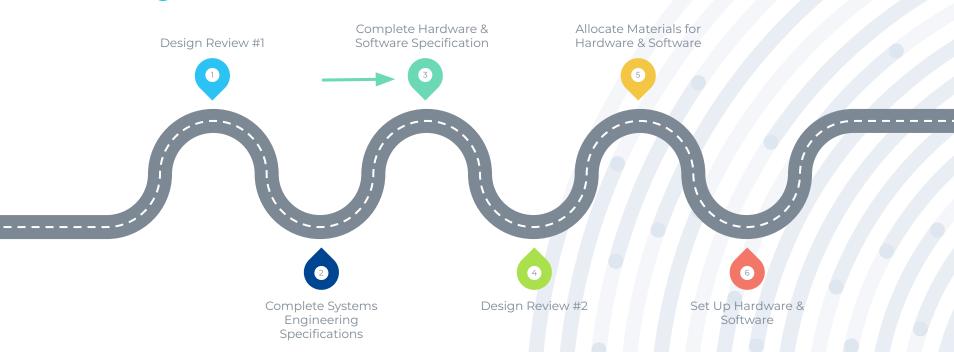
- Responsible for architecting the command-line interface, and implementing this on the embedded device.
- Design the configuration menu in the command line to allow choices between number of rows, static/scroll, animations, etc.

### **Open Als**

- Contact Adafruit about a detailed datasheet for the hardware interface of the LED display
  - Need before finalizing microcontroller hardware choice



# **Project Plan: Tasks**



	0	Task Mode •	Task Name ▼	Duration ·	Start	Finish 🔻	% Complete ▼	September 2022 29   3   8   13   18   23	October 2022	November 2022	December 2022
0			4 First Semester	72 days	Tue 8/30/22	Wed 12/7/22					19%
1	V	-5	<ul> <li>Project Definition and Planning</li> </ul>	22 days	Tue 8/30/22	Wed 9/28/22	100%		100%		
2	1	*	Request Website URL	1 day	Tue 8/30/22	Tue 8/30/22	100%	<b>= 100%</b>			
3	1	*	Design Review #1	6 days	Wed 8/31/22	Wed 9/7/22	100%	100%			
4	1	*	Systems Engineering Spec	8 days	Fri 9/2/22	Tue 9/13/22	100%	100%			
5	<b>V</b>	*	Hardware & Software Engineering Spec	11 days	Tue 9/13/22	Tue 9/27/22	100%		100%		
6	1	*	Design Review #2	4 days	Fri 9/23/22	Wed 9/28/22	100%		100%		
7		-		12 days	Mon 9/19/22	Tue 10/4/22	29%		29%		
8	V	*	Map out Letters on Display	1 day	Fri 9/23/22	Fri 9/23/22	100%	-1	00%		
9		*	Order Hardware	2 days	Wed 9/28/22	Thu 9/29/22	25%		<b>25</b> %		
10	1	*	Develop Website	1 day	Thu 9/22/22	Thu 9/22/22	100%	■ 10	0%		
11		*	Research Software Functionality	12 days	Mon 9/19/22	Tue 10/4/22	20%	-			
14		*	Research Hardware Functionality	11 days	Mon 9/19/22	Mon 10/3/22	25%	=			
17		*	■ Project Integration	36 days	Mon 10/3/22	Mon 11/21/22	0%				
18		*	▶ Command Line Interface	16 days	Mon 10/3/22	Mon 10/24/22	0%				
21		*	Set Up Hardware	6 days	Mon 10/10/22	Mon 10/17/22	0%		0%		
22		*	Map Pins	16 days	Mon 10/10/22	Mon 10/31/22	0%			0%	
23		*	Memory Mapped Display Pixels	16 days	Mon 10/3/22	Mon 10/24/22	0%		0%		
24		*	PCB Design	11 days	Mon 10/31/22	Sun 11/13/22	0%			0%	
25		*	Create/Downlaod bitmapped font	25 days	Mon 10/10/22	Fri 11/11/22	0%			0%	
26		*	Render Text On Display	16 days	Mon 10/31/22	Mon 11/21/22	0%			0%	
27		*	■ Troubleshooting & Testing	18 days	Mon 11/14/22	Wed 12/7/22	0%				<del></del>
28		*	▶ Test Hardware	11 days	Mon 11/14/22	Mon 11/28/22	0%				
32		*	▶ Text Rendering Testing	11 days	Mon 11/14/22	Mon 11/28/22	0%				i
35		*	<ul><li>Hardware/Software Demos</li></ul>	8 days	Mon 11/28/22	Wed 12/7/22	0%				

### **Schedule: Project Definition and Planning**





	0	Task Mode ▼	Task Name ▼	Duration -	Start -	Finish 🔻	% Complete 🔻	September 2022 29 3 8 13 18 23	October 2022	November 2022	December 2022
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3	V	*	Design Review #1	6 days	Wed 8/31/22	Wed 9/7/22	100%	100%			
4	<b>V</b>	*	Systems Engineering Spec	8 days	Fri 9/2/22	Tue 9/13/22	100%	100%			
5	<b>V</b>	*	Hardware & Software Engineering Spec	11 days	Tue 9/13/22	Tue 9/27/22	100%		100%		
6	V	*	Design Review #2	4 days	Fri 9/23/22	Wed 9/28/22	100%	-	100%		
7		===	Project Development	12 days	Mon 9/19/22	Tue 10/4/22	29%		29%		
17		*	Project Integration	36 days	Mon 10/3/22	Mon 11/21/22	0%				
27		*	▶ Troubleshooting & Testing	18 days	Mon 11/14/22	Wed 12/7/22	0%				<u> </u>

#### **Schedule: Project Development**

▶ Project Integration

▶ Troubleshooting & Testing 18 days

-

36 days

Mon 10/3/22 Mon 11/21/22

Mon 11/14/22 Wed 12/7/22



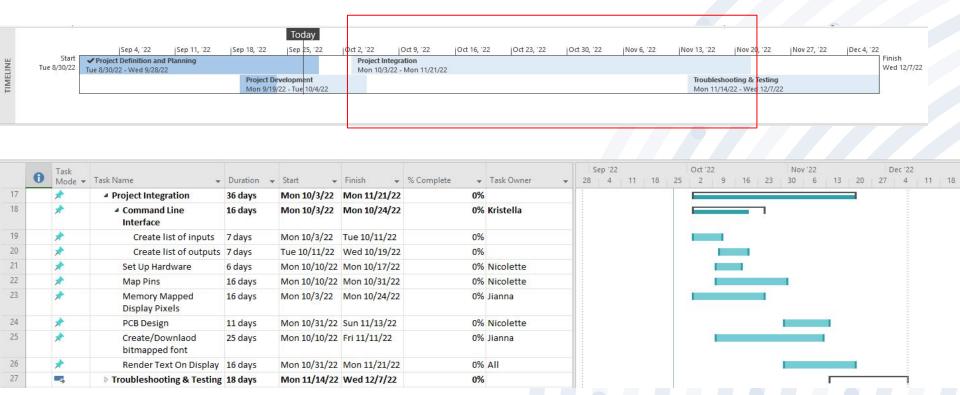
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15		*	Research how to connect MCU &	7 days	Mon 9/19/22	Tue 9/27/22	32%						1											
16		*	Research PCB Design	2 days	Thu 9/29/22	Fri 9/30/22	0%																	
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#### **Schedule: Project Integration**





#### **Schedule: Troubleshooting & Testing**

■ Hardware/Software

Create Poster

Practice Demo

Demos

8 days

5 days

4 days

Mon 11/28/22 Wed 12/7/22

Mon 11/28/22 Fri 12/2/22

Wed 12/7/22

Fri 12/2/22



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27		=	■ Troubleshooting & Testing	18 days	Mon 11/14/22	Wed 12/7/22		0%											Г				
28		*	■ Test Hardware	11 days	Mon 11/14/22	Mon 11/28/22		0%	Nicolette														
29		*	Test Power Connection	5 days	Mon 11/14/22	Fri 11/18/22		0%															
30		*	Test MCU Connection	5 days	Mon 11/14/22	Fri 11/18/22		0%															
31		*	Test LED lights up	6 days	Fri 11/18/22	Fri 11/25/22		0%															
32		*	■ Text Rendering Testing	11 days	Mon 11/14/22	Mon 11/28/22		0%	Jianna & Kristella											1000			
33		*	Test Transfer of Data to MCU	6 days	Mon 11/14/22	Mon 11/21/22		0%											ı		II.		
34	=	-5	Test correct text is displayed	5 days	Mon 11/21/22	Sat 11/26/22		0%															

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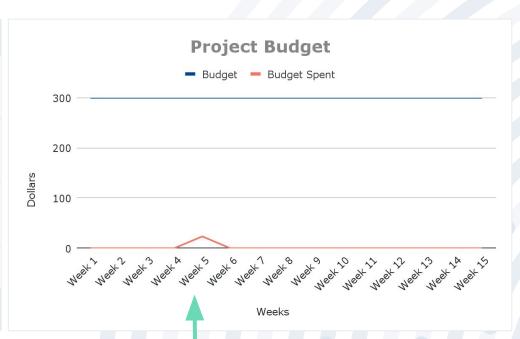
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# **Budget**

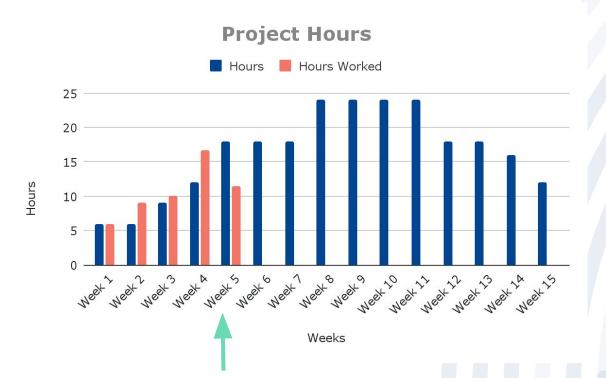
Hardware	Cost
64x32 RGB LED Matrix x3	\$119.85
Power Supply x1	\$23.49
Microcontroller x1	\$?
3 ft USB Cable x1	\$2.95
Total Cost	\$146.29+

#### Total: \$300





#### **Hours Worked**



#### Website

URL: https://engprojects.tcnj.edu/tcnj-ece-banner-2022/



#### **PROJECT OVERVIEW**

Edit

Our senior project is a Banner Display for the ECE Center for Intelligient Systems. The display will be about 7" x 36" with LED texts and graphics. We plan to iclude interesting capabilities such as colors, crawls, and animations.

#### **Detailed Specifications:**

- This project will include PCB design and embedded system design.
- · Project will be programmed in 'C'.
- We will use an external program connected via USB to update and maintain the display.
- A power source will also need to be included in order to power the displays.



## **Summary**

- We now have finalized our features set
- On schedule as we are finishing our hardware specifications
- We have submitted an ordering form for our power supply
- Next tasks are to
  - Finish selecting our hardware components
  - Ensure its within budget
  - Order hardware