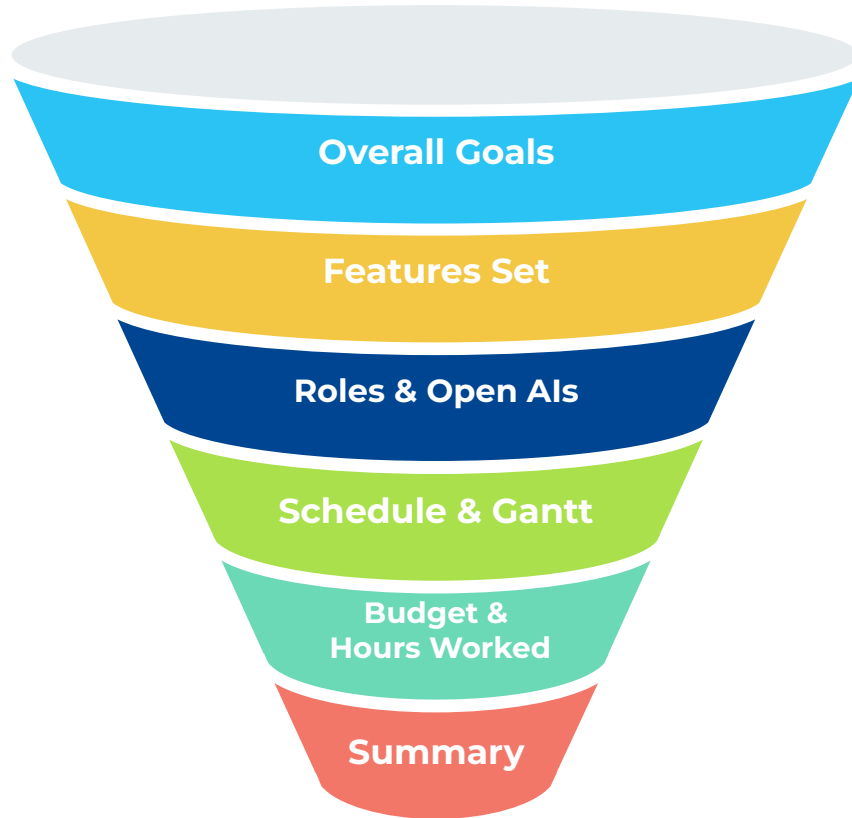




Kristella Lieu, Jianna  
Nieves, Nicolette Tumas

# 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
  - 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



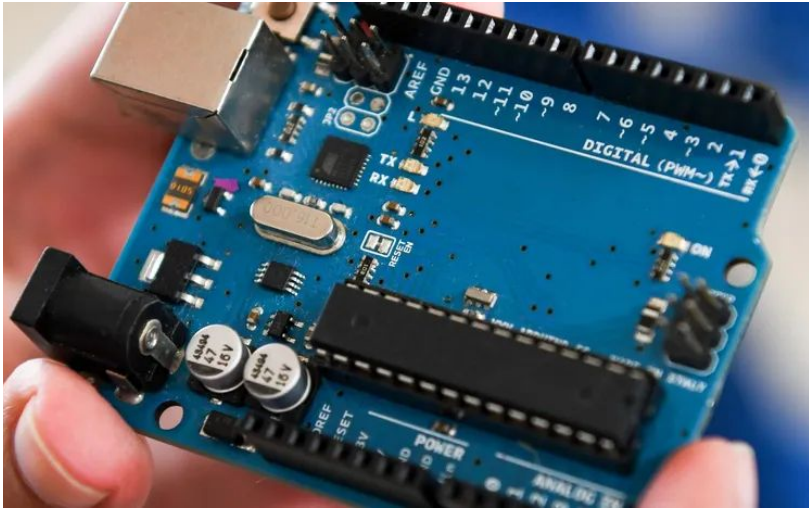
- 4mm pitch
- \$39.95
- Chaining Support
- 12 Digital Pins Each
- 800 Byte Each
- 3 Letters/Display

# Hardware Specs: Power Supply



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

# Hardware Specs: Microcontroller (TBD)

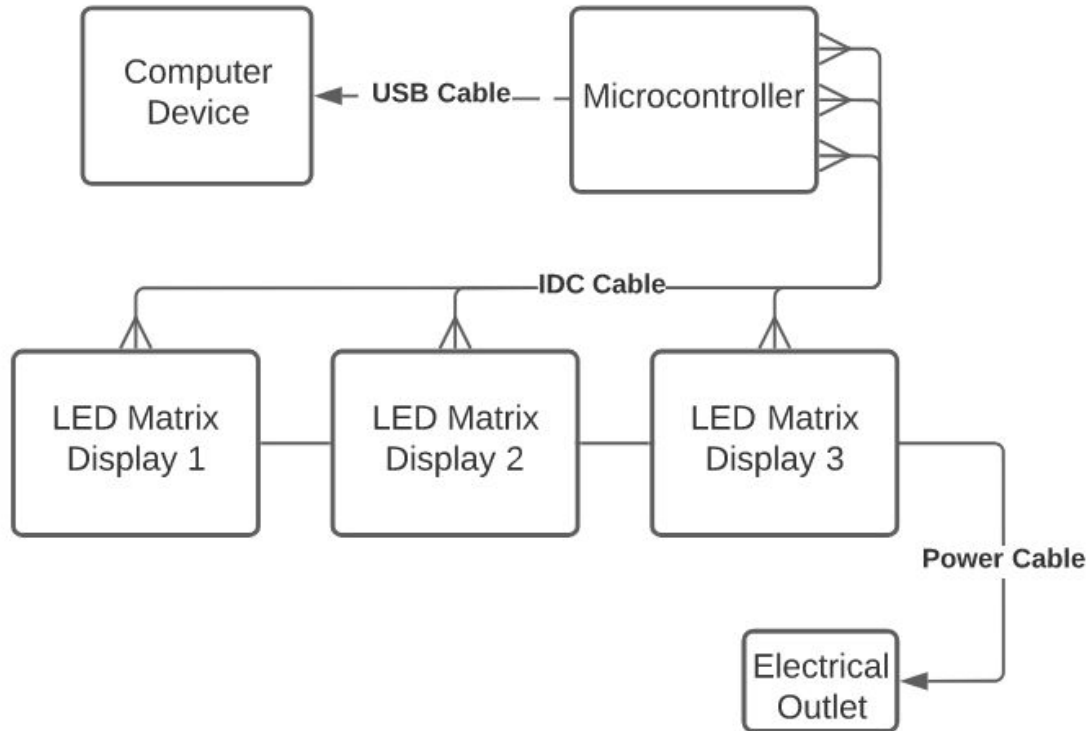


- At least 54 digital I/O pins
- 10kB RAM needed for chaining
- USB Support

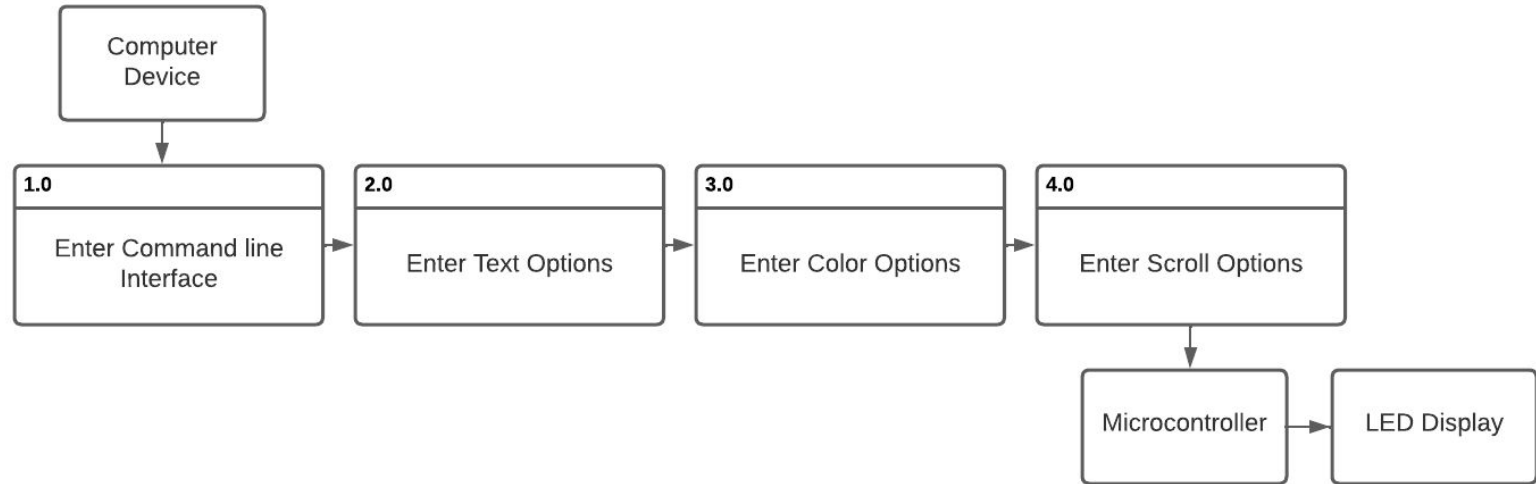
# Software Features

- 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



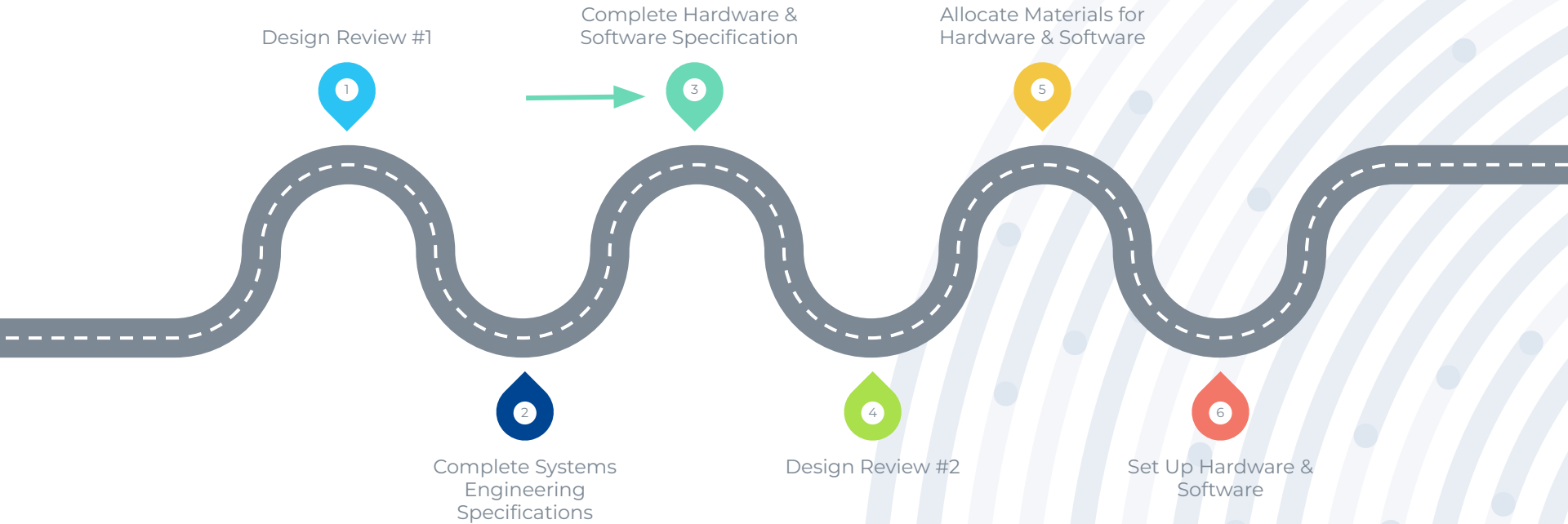
# Project Plan: Roles

- 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 AIs

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

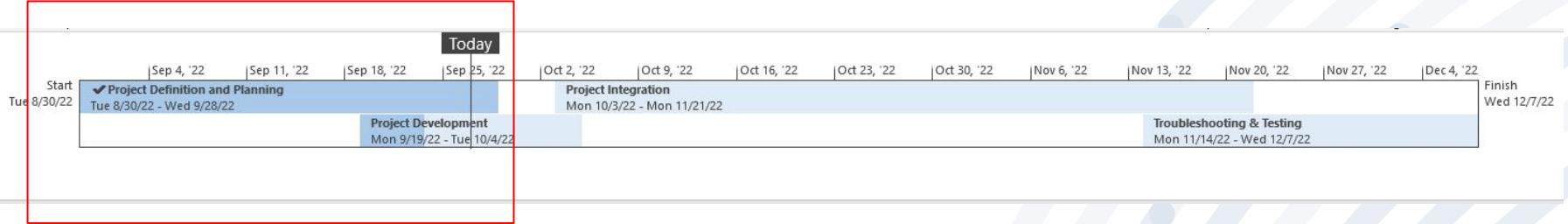
# Project Plan: Tasks



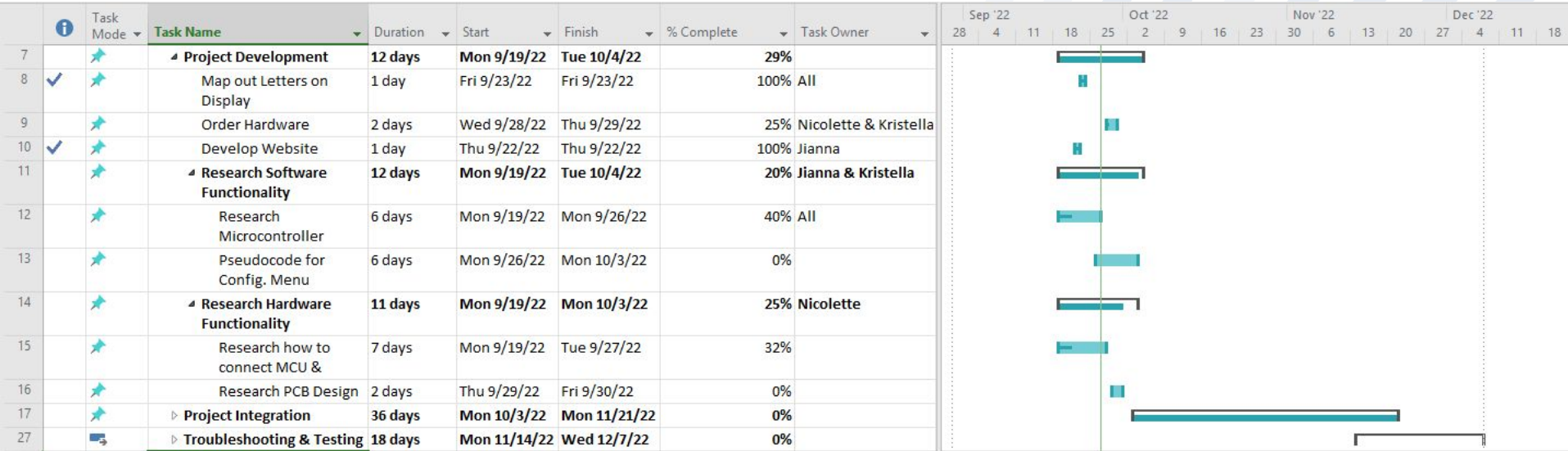
	<div><div>i</div></div>	<div>Task Mode ▾</div>	<div>Task Name ▾</div>	<div>Duration ▾</div>	<div>Start ▾</div>	<div>Finish ▾</div>	<div>% Complete ▾</div>	September 2022						October 2022						November 2022						December 2022									
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0		<div><div>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

# Schedule: Project Definition and Planning

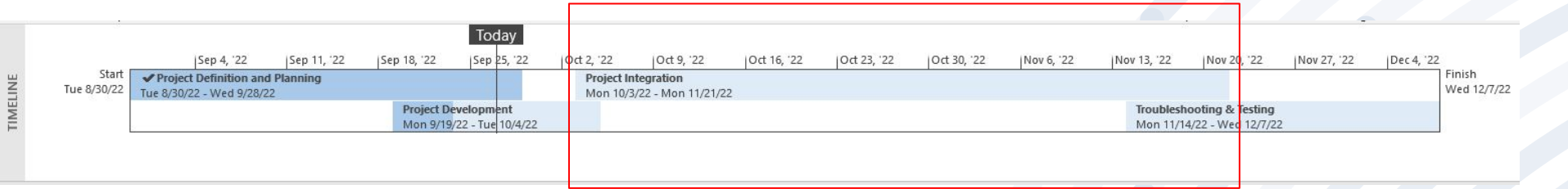
TIMELINE



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1	✓		▸ Project Definition and Planning	22 days	Tue 8/30/22	Wed 9/28/22	100%																													100%
2	✓		Request Website URL	1 day	Tue 8/30/22	Tue 8/30/22	100%																													100%
3	✓		Design Review #1	6 days	Wed 8/31/22	Wed 9/7/22	100%																													100%
4	✓		Systems Engineering Spec	8 days	Fri 9/2/22	Tue 9/13/22	100%																													100%
5	✓		Hardware & Software Engineering Spec	11 days	Tue 9/13/22	Tue 9/27/22	100%																													100%
6	✓		Design Review #2	4 days	Fri 9/23/22	Wed 9/28/22	100%																													100%
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27			▸ Troubleshooting & Testing	18 days	Mon 11/14/22	Wed 12/7/22	0%																													

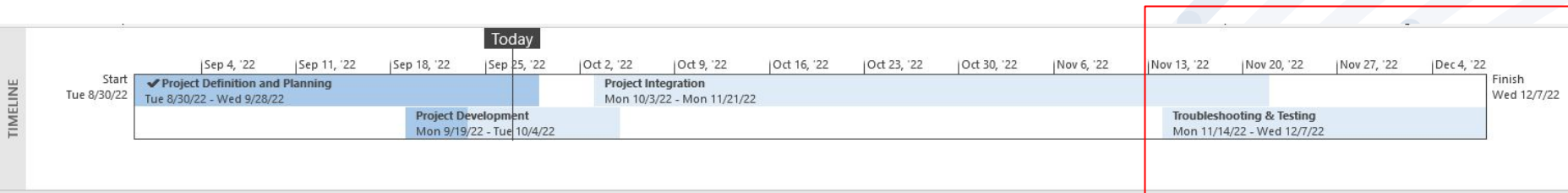


# Schedule: Project Integration



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17	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	28	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18
18	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>																	
19	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>																	
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21	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>																	
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23	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>																	
24	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>																	
25	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>																	
26	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>																	
27	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>																	

# Schedule: Troubleshooting & Testing

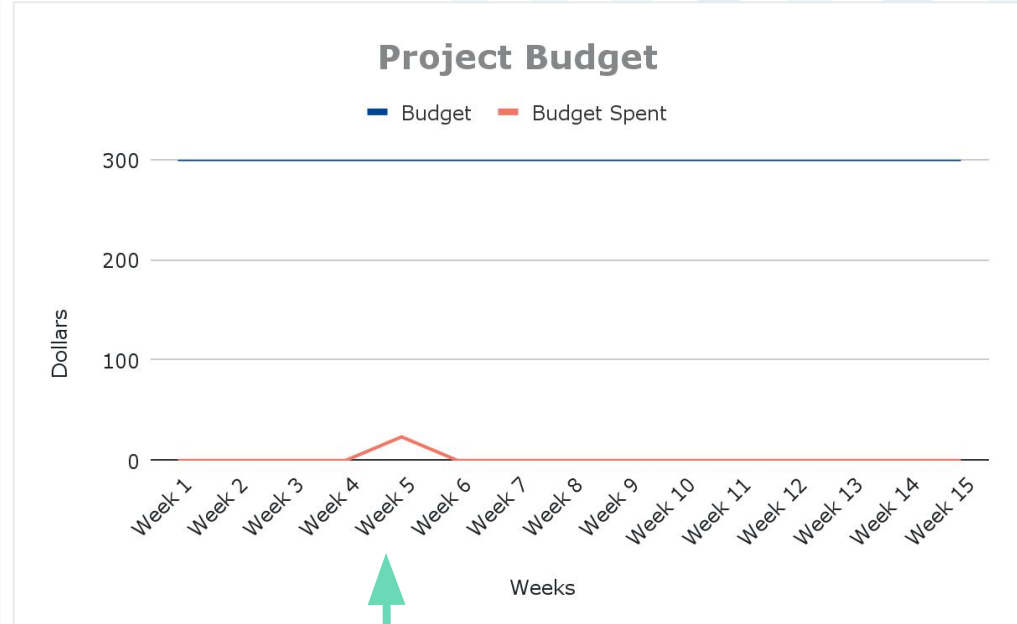


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27	<div><div></div><div></div><div></div></div>	<div><div>⌵</div><div>Troubleshooting &amp; Testing</div></div>	18 days	Mon 11/14/22	Wed 12/7/22	0%																		
28	<div><div></div><div></div><div></div></div>	<div><div>⌵</div><div>Test Hardware</div></div>	11 days	Mon 11/14/22	Mon 11/28/22	0%	Nicolette																	
29	<div><div></div><div></div><div></div></div>	<div><div></div><div>Test Power Connection</div></div>	5 days	Mon 11/14/22	Fri 11/18/22	0%																		
30	<div><div></div><div></div><div></div></div>	<div><div></div><div>Test MCU Connection</div></div>	5 days	Mon 11/14/22	Fri 11/18/22	0%																		
31	<div><div></div><div></div><div></div></div>	<div><div></div><div>Test LED lights up</div></div>	6 days	Fri 11/18/22	Fri 11/25/22	0%																		
32	<div><div></div><div></div><div></div></div>	<div><div>⌵</div><div>Text Rendering Testing</div></div>	11 days	Mon 11/14/22	Mon 11/28/22	0%	Jianna & Kristella																	
33	<div><div></div><div></div><div></div></div>	<div><div></div><div>Test Transfer of Data to MCU</div></div>	6 days	Mon 11/14/22	Mon 11/21/22	0%																		
34	<div><div></div><div></div><div></div></div>	<div><div></div><div>Test correct text is displayed</div></div>	5 days	Mon 11/21/22	Sat 11/26/22	0%																		
35	<div><div></div><div></div><div></div></div>	<div><div>⌵</div><div>Hardware/Software Demos</div></div>	8 days	Mon 11/28/22	Wed 12/7/22	0%	All																	
36	<div><div></div><div></div><div></div></div>	<div><div></div><div>Create Poster</div></div>	5 days	Mon 11/28/22	Fri 12/2/22	0%																		
37	<div><div></div><div></div><div></div></div>	<div><div></div><div>Practice Demo</div></div>	4 days	Fri 12/2/22	Wed 12/7/22	0%																		

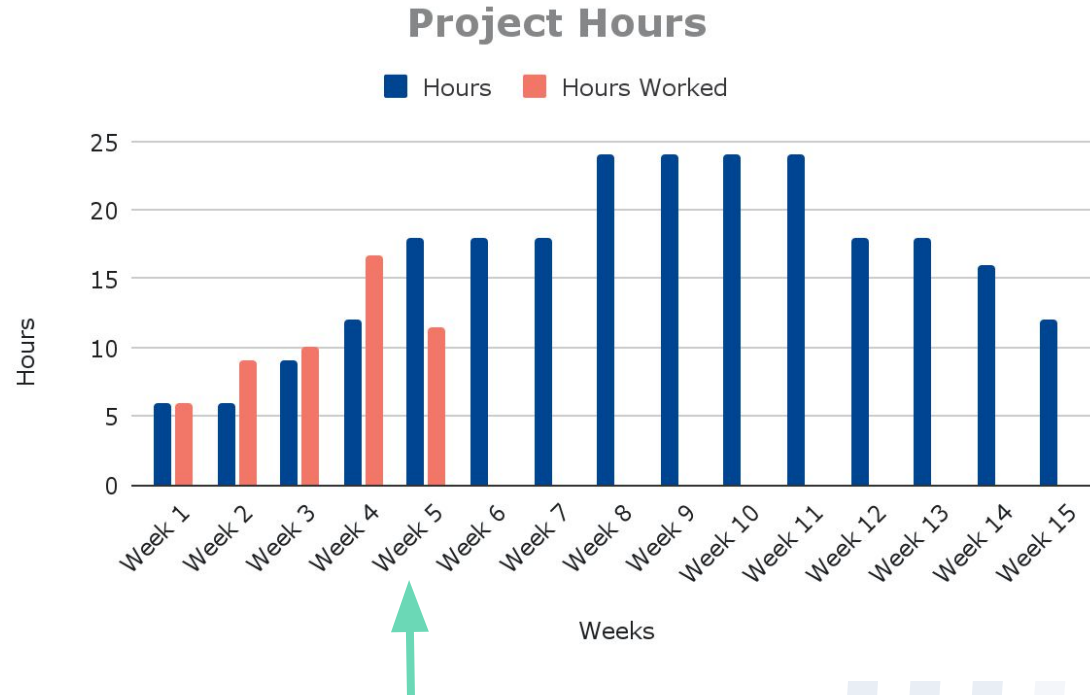
# Budget

Total: \$300

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

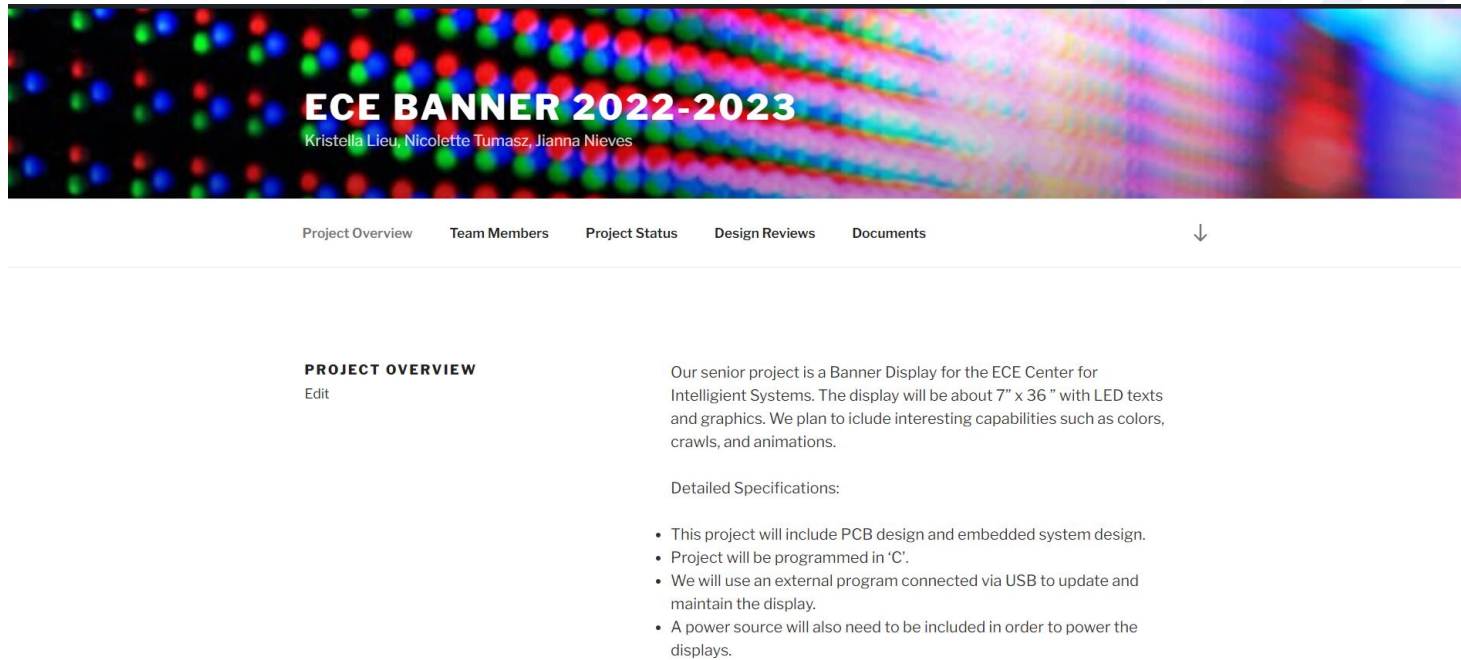


# Hours Worked



# Website

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



# 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