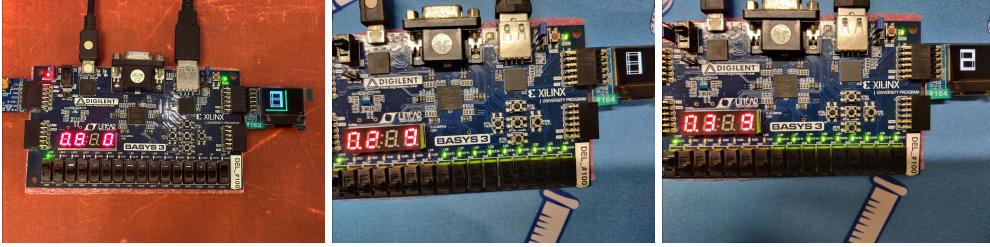
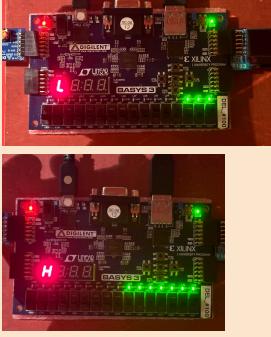
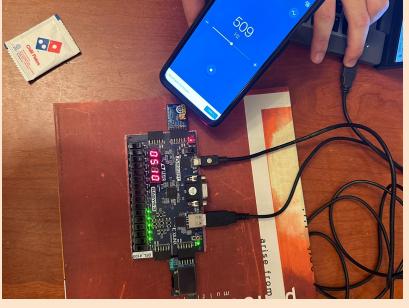
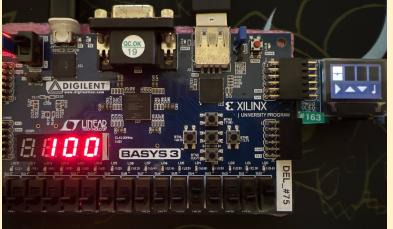
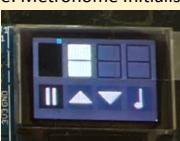


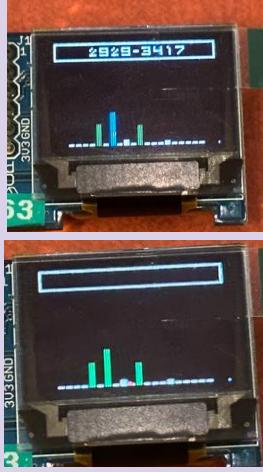
## EE2026 Report

Student A: Lee Jun Hao Bryan (A0233090R)  
 Student B: Goh Jing Hong (A0233722M)  
 Student C: Caleb Chan Jia Le (A0234569U)  
 Student D: Oong Jin Rong Jared (A0180023X)

S3–13

GROUP TASK (SECTION 4.E)		
PERSONAL AND TEAM IMPROVEMENTS		
Improvement Name	Improvement Description	Images / Photos
Student A: Bryan Lee "Frequency detector"	<ul style="list-style-type: none"> <li>When SW5 is on, the anode will display "L", "M" and "H" depending on the frequency that is being received by the mic instead of numbers 1-9</li> <li>After entering the "F" option in the main menu, you will come across the frequency detector. It will be able to display the frequency of the sound wave that is being played into the mic and show the values on the anode and LED 3-15 will light up accordingly from 300-1500hz</li> <li>When SW1 is on, the mic will take in the current frequency that is being played and store it and LED1 will be switched on</li> <li>When SW1 is switched off, if the frequency goes below the frequency that is stored, LED0 will not light up. However if the range of frequency that is played is close to the frequency that is stored, LED0 will start to light up</li> </ul>	  
Student B: Goh Jing Hong "Virtual piano"	<ul style="list-style-type: none"> <li>A piano keyboard will be displayed on the OLED screen.</li> <li>The mouse may be used to control the on-screen cursor to click on the keys, producing a square wave with frequency corresponding to the note played for as long as the mouse button is held down.</li> <li>The up and down push buttons can be used to adjust the volume of the note and the left and right push buttons can adjust the octave of the notes.</li> <li>The seven segment display shows the current octave (O) and the current volume ((L)oudness).</li> </ul>	

<p><b>Student C: Caleb Chan</b> "Metronome"</p>	<ul style="list-style-type: none"> <li>Beats are displayed in white on the OLED and heard by a beep sound.</li> <li>SW4/SW3/SW2/SW1 determines the number of beats in a bar (Only that one switch must be on). "Beat rectangles" not in use will be covered in the same colour as the background.</li> <li>User can start and pause the metronome by clicking on the bottom left button on the OLED screen.</li> <li>BPM count is displayed on the 7 segment display.</li> <li>User can increase and decrease the BPM by clicking on the up and down buttons on the OLED or the btnU and btnD buttons of the board respectively. Holding will increase the rate of change gradually.</li> <li>Clicking on the "beat rectangles" will change their state which is reflected by their base colour and changes the sound output of its beep. If fully black - high frequency beep, half covered - low frequency beep, fully covered - muted.</li> <li>Clicking on the bottom right button of the OLED will switch the beat count from crotchet (normal) to quaver (double time). Second beat of each "beat rectangle" will be shown in yellow.</li> </ul>	 <p>Figure: Metronome Initialisation</p>  <p>Figure: SW2, last 2 not in used</p>  <p>Figure: 2nd beat low freq and 4th beat muted)</p>  <p>Figure: Double time, yellow (not clear in photo) flash</p>
<p><b>Student D: Jared</b> "Automatic keyboard"</p>	<ul style="list-style-type: none"> <li>When SW15 is on, all output is cleared and no input will be registered.</li> <li>When SW2 is on, pulsing RGB backlight will be on. Otherwise, the keyboard border will be white.</li> <li>When SW0 is off, the keyboard is in manual mode, if SW0 is on, keyboard in auto mode</li> <li>In manual mode, user can left mouse click on the keys to display the characters. After reaching the maximum position at bottom right, the keyboard cursor wraps back to the top left.</li> <li>In manual mode, 'CLEAR' button clears the entire screen and sets the cursor to top left. 'DEL' button moves the cursor back 1 position. 'ENTER' key sets the cursor to the next row.</li> <li>In auto mode, pressing and holding btnC causes random characters to appear.</li> <li>In auto mode, setting SW1 to on causes random characters to appear.</li> </ul>	
<p><b>Team</b> "Selection Menu"</p>	<ul style="list-style-type: none"> <li>The menu is done by changing the colors of the pixels individually.</li> <li>Before hovering across the letters to select which page to navigate to, the flowers will appear as shown on the first 2 pictures.</li> <li>When the mouse cursor hovers over the specific "flower pots" the flowers from the other flower pot will start to disappear to show that the mouse cursor is currently on that particular pot.</li> </ul>	

<p><b>Team</b> "FFT Analyser"</p>	<ul style="list-style-type: none"> <li>• 2048 point FFT method is used.</li> <li>• Sampling rate is at 20kHz, and a total of 20 bins are shown, hence each bin is roughly 500Hz</li> <li>• When SW0 is on, set to analyzing mode, when SW0 is off, set to detection mode.</li> <li>• In detection mode, bars are shown in 4 different colors, white, green, yellow and red in terms of increasing intensity.</li> <li>• In detection mode, if the tallest bar remains green for at least 2 seconds, the range of frequencies the bin represents is shown at the top.</li> <li>• In analyzing mode, hovering over the bin changes the bin color to blue and the range of frequencies represented by the bin</li> <li>• In analyzing mode, holding left click on the bin produces audio output with the frequency of the output oscillating between the range of the bin.</li> </ul>	
---------------------------------------	--	---

## References:

<http://zipcpu.com/dsp/2018/10/02/fft.html>  
<https://github.com/ZipCPU/dblclockfft>