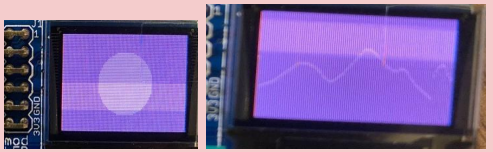
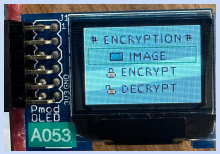
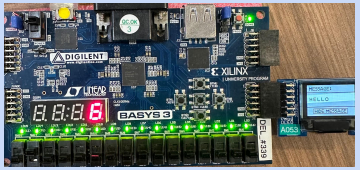
S1_09
ANNE LEONG SONG EN | DAVIAN KHO YONG QUAN | KUEK YEAU HAO, JONATHAN | NICHOLAS TAN YUN YU

Personal and Group Improvements		
Student and Improvement Name	Improvement Description	Images / Photos
S1_09 *Basys3 Unleashed: Bridging Real and Digital Worlds*	The main idea is to explore various modes of information transmission and to visualize and experience it using the basys3 board with the help of the oled and other devices. Group implementation: Main Menu When the basys is just programmed and all switches are off, user toggle between programmes using the switches and enter each program by turning on sw14. To return back to the main menu user toggle sw14 to off. Easter Egg: At the start of the program, the player enters a 4 digit password which corresponds to a set of activities they have to accomplish as they go through the four programs on the oled.	 Password enter  Main Menu
Student A: KUEK YEAU HAO, JONATHAN Audio Representation	SW0 == 0: Shows Wave Visualiser mode, input from mic_in values SW0 == 1: Shows Audio Ball mode, input from mic_in values LEDs 0 to 14 will light up according to mic_in values, so the louder the input audio, the more LEDs will light up. Softest audio only LED0 lights up, loudest will cause LEDs 0 to 14 to light up. According to levels of mic_in (loudness of input audio), the segments and anodes will change. When audio is: soft (level <= 6), segments show “good” Medium (6 < level <= 14), shows “hmmm” Loud (level > 14), shows “ouch”	 Two different audio representations  Medium level sound  Acceptable volume  LEDs indicating sound level  Very loud sound
Student B: DAVIAN KHO YONG QUAN Steganography	Home Page: - Within the home page, if btnR is pressed, the data stored within the image can be erased and the image data restored back to original Encrypt Page: - The user can enter in a string message to be hidden in the image. The seven segment will show the remaining number of characters available to be typed. - To store the image, btnC can be pressed. The data is saved when all LED lights up. The message in the encrypt page can be cleared by pressing ESC on the keyboard.	 Home Page  Encrypt Page  Decrypt Page Incorrect Key

	- Before storing, the user has an option to activate SW[9] - SW[1]. The switch acts as a key for encrypting and decrypting the message. - The option to save will only appear if a minimum of one character is typed in. Decrypt Page: - The user will see the decrypted message in this page. - With the correct key (correct SW turned on), the message will be seen, otherwise random characters will be read instead.	  Image Representation Character space left in SEG, LED shows data is stored
Student C: NICHOLAS TAN YUN YU Powerpoint Simulator	Key in a character using the laptop's keyboard. Character is generated using a bitmap, with knowledge of the character's location, width and height in the bitmap. LEDs led[15:8] show the x coordinate, and led[7:0] show the y coordinate of the character on the screen. POS mode (SW[3:0] = 4'b0000): Move character on screen using basys3 buttons SNAP mode (SW[3:0] = 4'b0001): Snap character to the edge of the screen using buttons SIZE mode (SW[3:0] = 4'b0010): Change the size of the letter by pressing either btnR or btnU to increase the size and btnL or btnD to decrease the size COL mode (SW[3:0] = 4'b0100): Change the colour of the letter using the buttons. 7 different colours available. BG mode (SW[3:0] = 4'b1000): Change the colour of the background using the buttons. 7 different colours available.	 Single char display with 7-seg display  Change colour Change size Change BG colour
Student D: ANNE LEONG SONG EN Morse Code Display	Homepage: - Press center button to change the colour of 'learn' banner - Select 'learn' using cursor to toggle to main program Mainpage: - Image displaying morse code for various alphabets - Left click to select alphabet's morse code to be shown on the segment display (dot is displayed faster, dash display is delayed) - Right click to clear segment display - Select 'back' to return to homepage; select arrow to toggle between pages Lastpage: - "Coming soon" -- too many alphabets :'(- Black square at corner of screen, press center button for square to turn blue and then buttons can be used to move the square around the screen (similar to basic task D) Improvements: - cursor does not overflow when it has reached the border of the oled screen - Change of mouse cursor for selection, i.e. initial cursor colour is blue and turns orange when a selection can be made	  Homepage Mainpage (uploaded image of alphabet display)    Morse Code Segment Display 'Coming Soon' - initial black square, turns blue (control movement with buttons - L, R, U, D)

References

UART receiver - https://www.youtube.com/watch?v=XpfEHPq5AxU&ab_channel=ElectronicswithProf.Mughal
Keyboard input - https://students.iitk.ac.in/eclub/assets/tutorials/keyboard.pdf
Generate bitmap from font file - https://github.com/vladimirgamalyan/fontbm/tree/master
Implementing Block RAM Using Verilog - https://community.element14.com/challenges-projects/design-challenges/summer-of-fpga/b/blog/posts/number-plate-recognition-3-implementing-block-ram-using-verilog
Mic input: https://github.com/yanquantan/FPGA-Snake-Game
Implementing menu and image display - https://github.com/alfred-leong/EE2026-Digital-Design-Project.git

Feedback: We spent too much time on this. The final project implementation took around 32 hours straight as a group. Vivado's software needs major improvement, and we have collectively decided never to touch it again :)