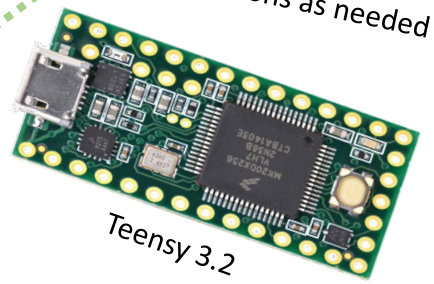
Task Description:

You are asked to implement an uC –based system that provides the following functionality:

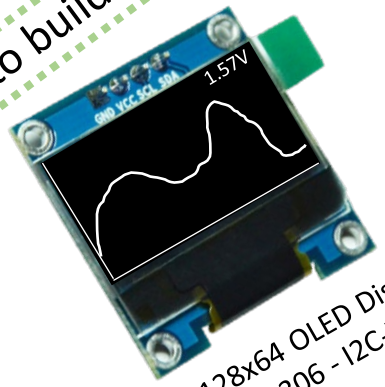
- One channel oscilloscope (0V - 3.3V) using the uC ADC peripheral
- One channel function generator using the uC DAC with the option to select between at least a square, triangle and sin signal)
- One channel logic analyzer, that allows for decoding of a 9600 baud serial frame
- When acting in one of the above-mentioned modes, the relevant signals should be streamed out in “real-time” via UART(-> USB) to a connected PC and visualized using a serial plotter and in parallel displayed on the provided OLED display
- It should be possible to control the different functions(modes) via connected push-buttons and in parallel via commands send from the PC to the uC via USB(->UART)
- The system should be structured and implemented as a finite state machine

Use the pictured components to build freely as needed. Additional functionality can be added.

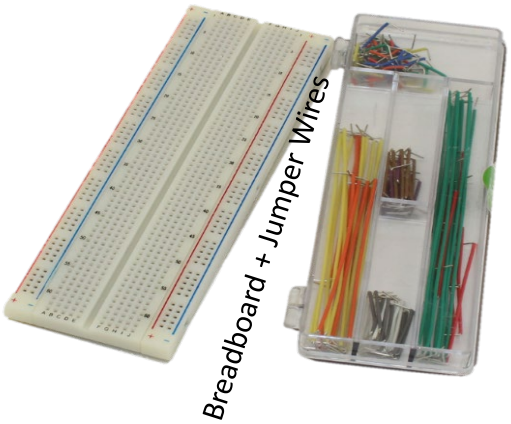
Buttons as needed



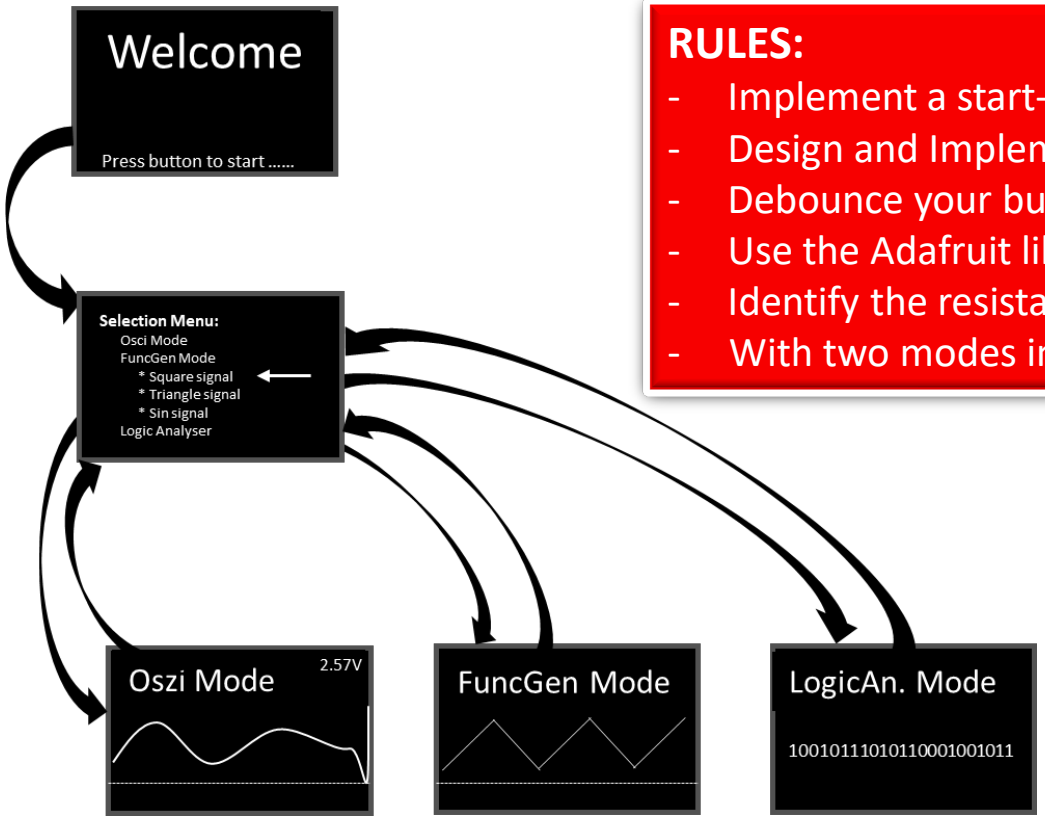
Teensy 3.2



128x64 OLED Display
SDD1306 - I2C-Version



Breadboard + Jumper Wires



RULES:

- Implement a start-screen, the menu screen and the mode screens
- Design and Implementation as a finite state-machine
- Debounce your button(s)
- Use the Adafruit libraries: Adafruit_SSD1306 and Adafruit_GFX
- Identify the resistance value of the pull-ups on the display module
- With two modes implemented you can reach a maximum of B+

This Projects accounts for 40% of your overall course mark.

Use Git + GitHub for development and documentation

Questions:
Slack or
Frank.Beinersdorf@weltec.ac.nz

REQUIRED PROJECT OUTPUT:

- Working hardware prototype
- Video of yourself explaining the structure (code, hardware) and the correct operation of your system (incl. serial plot visualization)
- Project report, including
  - General project description (purpose, …)
  - Describe your design process (**incl. state – transition diagram**)
  - Schematics
  - Source Code (well commented)
  - Limitations of your project + possible future improvements
  - Appendix with relevant datasheets(if available)
  - Use of proper APA referencing