

# TEJ4M Design Project – March 2021

Mr. Emmell

Your task will be to **design** and **create** a solution to the “Simon” game challenge. This includes the plan, the prototypes (yes, two!), and the final printed circuit board design.

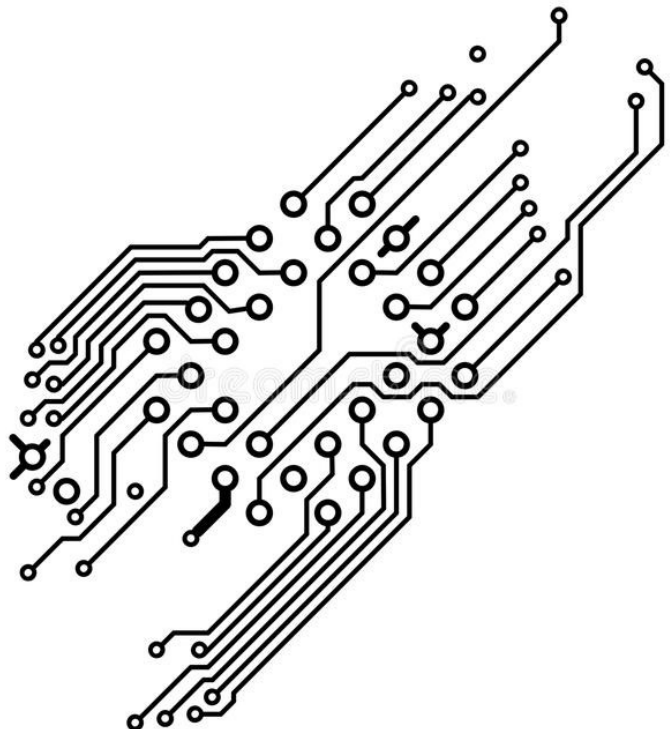
You will be designing a printed circuit board game in to recreate the class “Simon Says” game, driven by an Arduino.

## Formal Project Specifications:

- 1x Microcontroller: Arduino Uno
- 4x Buttons: Illuminated 12x12mm buttons (contain both a button and LED)
- 1x Speaker: Standard piezo speaker
- 1x OLED Display: SSD1306
- Resistors as appropriate (for LEDs and I<sup>2</sup>C lines)

## Expected design process:

- Write abstract section as outlined below
- Write requirements section as outlined below
- Create prototype in TinkerCAD circuits
- Write enough code to confirm functionality of all devices
  - o Especially referring to requirements section you just wrote
- Once function has been confirmed, layout on physical breadboard
- Run test code and confirm function
- Create schematic in KiCAD
- Confirm exact footprints to use with Mr. Emmell
- Create PCB
- Print PCB on paper to verify size / layout



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Your **document** will include the following sections:

## 1) Abstract (1-2 paragraphs)

- Describe the problem you are trying to solve
- Describe your solution as it would exist as a **final product**
- Describe the **prototype** that you will build to demonstrate the behaviour

## 2) Requirements

- Clearly define the required behavior
- Describe the functions that can be easily tested

## 3) Technical Details

- Parts list
- Working test code
- Screenshot of TinkerCAD prototype
- Picture of breadboard prototype

## 5) Summary (1-2 paragraphs)

- Critical evaluation of strengths/weaknesses of your design
- Potential extensions/improvements

You will also attach your Final Proposed PCB

- All three KiCAD files (.pro .sch .kicad\_pcb)

## Submission Instructions

- 1) Your final document will be submitted in **.pdf** format and emailed to [stephen.emmell@ocdsb.ca](mailto:stephen.emmell@ocdsb.ca) along with your three KiCAD files.
- 2) Final submission will also include demonstration of game on your prototyped breadboard.
- 3) Final demonstration and submission due by the last day of the quadmester.

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## Assessment Rubric

### Documentation

Presentation/Organisation	Inc	R	-	1	+	-	2	+	-	3	+	-	4	+	++
Wiring Diagrams	Inc	R	-	1	+	-	2	+	-	3	+	-	4	+	++
Code Organisation/Efficiency	Inc	R	-	1	+	-	2	+	-	3	+	-	4	+	++
Summary/Improvements	Inc	R	-	1	+	-	2	+	-	3	+	-	4	+	++

### Prototypes

Wiring	Inc	R	-	1	+	-	2	+	-	3	+	-	4	+	++
Functionality	Inc	R	-	1	+	-	2	+	-	3	+	-	4	+	++
Representation	Inc	R	-	1	+	-	2	+	-	3	+	-	4	+	++

### Printed Circuit Board

Part Placement	Inc	R	-	1	+	-	2	+	-	3	+	-	4	+	++
Trace Layout	Inc	R	-	1	+	-	2	+	-	3	+	-	4	+	++
Silk Screening	Inc	R	-	1	+	-	2	+	-	3	+	-	4	+	++

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## Appendix

Illuminated switch datasheet:

[https://omronfs.omron.com/en\\_US/ecb/products/pdf/en-b3w-9.pdf](https://omronfs.omron.com/en_US/ecb/products/pdf/en-b3w-9.pdf)

*(Use this to determine which resistors to use for the LEDs)*