

# Countdown Timer

Design and develop a programmable countdown timer

Achieved	Merit	Excellence
Use complex techniques to develop an electronics outcome.	Use complex techniques to develop an informed electronics outcome.	Use complex techniques to develop a refined electronics outcome.

## Introduction

This assessment requires students to design and develop an electronic system suitable for programming and controlling a countdown timer. Students must demonstrate the use of complex iterative processes to design, develop and test their electronic system, ensuring they construct an outcome that meets specifications and addresses relevant implications. This assessment starts on ... and finishes ...

## Task

Timers are an important feature for sports, cooking and many other applications. Your task is to design and develop a programmable countdown timer. You have been provided with a list of specifications, use these to inform the development of your electronic system.

## Specifications

### Specifications

- Real Time Clock interface via I2C
- Provides user interface controls ...
  - The ability for the user to control the selection of a range of timer durations,
  - Start, Stop / Restart of the timer
- Neopixel display to visually show the countdown timer in action

You will be expected to improve and refine the countdown timer beyond the specifications given

### Relevant Implications

The following relevant implications need to be considered

- A. Software Standards and Maintainability
  - a. Functions
  - b. Readable and understandable code
  - c. External Software Libraries
- B. Understandable user Interface
  - a. Understandable user input controls for automated timer durations, and the timer reset
  - b. Understandable display controls for programming timer and showing countdown
- C. Hardware Reliability
  - a. Improved Regulation / Stabilization of power supply (Protecting voltage drops)
  - b. Switch Debounce

# Completing the task

As you perform the task, make notes and gather evidence for inclusion electronics portfolio:

## 1. **Project Brief**

It's good to start by clarifying what you intend to do

- a. Identify the inputs and outputs used in this task.
- b. Identify the relevant implications and how these will be addressed.

## 1. **Circuit schematics of the electronic system**

- a. Sketch a circuit schematic for your proposed electronic system, include correct circuit symbols and labels for components you select.

## 2. **Construct your electronics system**

Evidence constructing, testing, and debugging your electronics system on all input/output interfaces.

Include

- a. Testing of your input interfaces (switch/buttons, potentiometer) on a range of operating conditions
- b. Testing output displays (LCD or Neopixel) on a range of inputs conditions
- c. Evidence of modifying and debugging software code
- d. Show how you addressed the relevant implications within development

## 3. **Trailing and iterative improvement of the Electronics Sensor**

Iterative improvement within your work will show evidence of using documented cycles to refine functionality, reliability, user interface and fitness for purpose. Evidence needs to show

- a. Software Standards and Maintainability
  - i. Functions
  - ii. Readable and understandable code
  - iii. External Software Libraries
- b. Understandable user Interface
  - i. Understandable user input controls for automated timer durations, and the timer reset
  - ii. Understandable display controls for programming timer and showing countdown
- c. Hardware Reliability
  - i. Improved Regulation / Stabilization of power supply (Protecting voltage drops)
  - ii. Switch Debounce

## 4. **Purpose and function of components and interfaces**

Include evidence that shows you are able to describe/explain/justify the interfaces and functions of the components of the systems used

- a. A photograph of your electronics system. Annotate your photographs with descriptions of:
  - i. each component and interface (what it does, how it functions),
- b. Explain the behaviour and function of the electronics outcome
  - i. C++ Functions
  - ii. Potentiometer (Voltage Divider) and Arduino Analog to digital conversion
  - iii. I2C communications and LCD interface and RTC interface
  - iv. Switch debounce and software or hardware solutions to solve debouncing
- c. Justify your choice of the components and systems used
  - i. Justify User Interface features used (control used to program timer, display system used to view timer)
  - ii. Justify methods used to resolve switch debounce