# [ DRAFT ] Line Following Robot

Design and develop a Line following robot using basic electronic components and a microcontroller

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| **Achieved** | **Merit** | **Excellence** |
| Develop an electronics outcome | Develop an informed electronics outcome | Develop a refined electronics outcome |

## Introduction

This assessment requires students to develop a Line following robot able to follow a clearly marked, curved line. Students must demonstrate the use of basic iterative processes to develop and test their Line following robot ensuring they construct an outcome that meets specifications and addresses relevant implications. This Assessment starts on Week 6 (Fri 9th March) and finishes Week 9 (Thursday 29 March)

## Task

Select appropriate electronics components for an interface that links the Line following robot to the microcontroller. Show how you have used data sheets or calculations to assist in selecting these components. You may use circuit diagrams to assist in showing this. Write a computer program that controls the Line following robot and allows it to work according to the specifications provided.

## Specifications

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| **Specifications**   * *DC motors / gearing will move the Robot* * *Sensors will be used to detect position of Robot relative to a Dark line. ·*   *.*  *·* | **Implications**  You will need to consider the following implications::   1. Reliability of inputs sensors (sensors used to detect dark/light) 2. Reliability of output. (*speed and direction of motors).* 3. Robustness of electronic system & enclosure (secure wiring and mounting of components) |

# Completing the task

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

1. **Project Brief**It's good to start by clarifying what you intend to do
   1. Identify the Input and Output interfaces you will construct
   2. Describe relevant implications and how explain how these will be addressed
2. **Testing, Modifying and Debugging your electronics sensor**Evidence of Testing, Modifying and Debugging your Line following robot on your input and output interfaces. Include testing tables that show
   1. Testing of your analogue sensor on a large range of values
   2. Testing motor control on a range of light levels
   3. Provide evidence of modifying code
3. **Trailing and iterative improvement of the Electronics Sensor**Iterative improvement within your work will show evidence of ongoing testing and debugging to diagnose the electronic system to improve reliability and fitness for purpose. Include evidence to show trailing and improvement of
   1. Reliability of inputs sensors (sensors used to detect dark/light)
   2. Reliability of output. (*speed and direction of motors).*
   3. Robustness of electronic system & enclosure (secure wiring and mounting of components)
4. **Purpose and function of components and interfaces**Include evidence that shows you are able to describe the interfaces and functions of the components of the systems used, explain the behaviour and function of the electronics outcome and justify your choice of the components and systems you have used. Include in your evidence:
   1. A photograph of your electronics system. Annotations on your photographs that describe the purpose and functions of components and systems used
   2. Circuit schematics for all interfaces (include correct symbolic conventions and labels)
   3. Explanations of
      1. Voltage, Current and Resistance characteristics in each of your interfaces
      2. Voltage, Current and Resistance in Series and Parallel circuits
   4. Justification of why you chose specific components or systems
      1. Justify your selection of specific sensors and how these improved
      2. Justify your selection of resistor values and how this affects resistive sensor in a voltage divider
      3. Justify your selection of Motor / Transistor switch components

# [ DRAFT ] Car Park Barrier Arm

Design and develop a car park barrier arm using basic electronic components and a microcontroller

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| **Achieved** | **Merit** | **Excellence** |
| Develop an electronics outcome | Develop an informed electronics outcome | Develop a refined electronics outcome |

## Introduction

This assessment requires students to develop a car park barrier arm suitable for allowing access to a car park. Students must demonstrate the use of basic iterative processes to develop and test their Barrier Arm ensuring they construct an outcome that meets specifications and addresses relevant implications. This Assessment starts on Week 6 (Fri 9th March) and finishes Week 9 (Thursday 29 March)

## Task

Select appropriate electronics components for an interface that links the barrier arm to the microcontroller. Show how you have used data sheets or calculations to assist in selecting these components. You may use circuit diagrams to assist in showing this. Write a computer program that controls the barrier arm and allows it to work according to the specifications provided.

## Specifications

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| **Specifications**   * *A single DC motor / Servo will power the barrier arm.* * *A switch will start the raising and lowering of the barrier arm.* * *A light will turn on at night. ·*   *.*  *·* | **Implications**  You will need to consider the following implications::   1. Reliability of inputs sensors (switches and sensors) 2. Reliability of output. (*once the arm is in the vertical position, it will stay there until the operator presses a switch to bring it down again).* 3. Robustness of electronic system & enclosure (secure wiring and mounting of components) 4. Safety of Vehicle (*The speed of the arm will not be so fast that it creates a danger of hitting the car and its occupants, or so slow that people will get annoyed waiting for it)* |

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# Completing the task

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

1. **Project Brief**It's good to start by clarifying what you intend to do
   1. Identify the Input and Output interfaces you will construct
   2. Describe the considerations and relevant implications and how explain how these will be addressed
2. **Testing, Modifying and Debugging your electronics sensor**Evidence of Testing, Modifying and Debugging your Car park barrier arm on your input and output interfaces. Include testing tables that show
   1. Testing of your analogue sensor on a large range of values and your switch
   2. Testing motor control on a range of light levels and switch presses
   3. Provide evidence of modifying code
3. **Trailing and iterative improvement of the Electronics Sensor**Iterative improvement within your work will show evidence of ongoing testing and debugging to diagnose the electronic system to improve reliability and fitness for purpose. Include evidence to show trailing and improvement of
   1. Reliability of inputs sensors (switches and sensors)
   2. Reliability of output. (*once the arm is in the vertical position, it will stay there until the operator presses a switch to bring it down again).*
   3. Robustness of electronic system & enclosure (secure wiring and mounting of components)
   4. Safety of Vehicle (*The speed of the arm will not be so fast that it creates a danger of hitting the car and its occupants, or so slow that people will get annoyed waiting for it)*
4. **Purpose and function of components and interfaces**Include evidence that shows you are able to describe the interfaces and functions of the components of the systems used, explain the behaviour and function of the electronics outcome and justify your choice of the components and systems you have used. Include in your evidence:
   1. A photograph of your electronics system. Annotations on your photographs that describe the purpose and functions of components and systems used
   2. Circuit schematics for all interfaces (include correct symbolic conventions and labels)
   3. Explanations of
      1. Voltage, Current and Resistance characteristics in each of your interfaces
      2. Voltage, Current and Resistance in Series and Parallel circuits
   4. Justification of why you chose specific components or systems
      1. Justify your selection of specific sensors and how these improved
      2. Justify your selection of resistor values and how this affects resistive sensor in a voltage divider
      3. Justify your selection of Motor / Transistor switch components

# Pot Plant Monitoring

Design and develop an Environmental Sensor that allows long term monitoring of an indoor Pot Plant

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| **Achieved** | **Merit** | **Excellence** |
| Develop an electronics outcome | Develop an informed electronics outcome | Develop a refined electronics outcome |

## Introduction

This assessment requires students to develop an Electronic Sensor suitable for monitoring an indoor pot plant or potted herb. Students must demonstrate the use of basic iterative processes to develop and test their electronic sensor, ensuring they construct an outcome that meets specifications and addresses relevant implications. This Assessment starts on Week 6 (Fri 9th March) and finishes Week 9 (Thursday 29 March)

## Task

Pot plants often struggle for survival due to their small size, limited soil and water quantity Your task is to develop sensors that will enable monitoring of pot plants. You have been provided a list of specifications, you must use these specifications to inform the development of your electronic sensor.

## Specifications

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| **Possible Environmental Variables to monitor pot plant health**  Must select two of:   * Air Temp, Soil Temp, Light level, Soil moisture   *Note that one of your variables must be analogue* | **Specifications**  Inputs :   * Two environmental variables.  *One of these must be analogue*   Output   * Pot plant health warning indicator * Pot plant health critical condition sound alarm     **Implications**  Consider the following relevant implications   1. Reliability and sensitivity of input 2. Robustness of electronic system & enclosure 3. Visually appealing and audibly appealing indicators and alarms suitable to home use |

# Completing the task

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

1. **Project Brief**It's good to start by clarifying what you intend to do
   1. Identify the environmental variables you will monitor
   2. Describe the considerations and relevant implications and how explain how these will be addressed
2. **Testing, Modifying and Debugging your electronics sensor**Evidence of Testing, Modifying and Debugging your electronics sensor on your input and output interfaces. Include testing tables that show
   1. Testing of your analogue sensor on a large range of environmental conditions
   2. Testing output warning indicators on a range of sensor inputs
   3. Provide evidence of modifying code
3. **Trailing and iterative improvement of the Electronics Sensor**Iterative improvement within your work will show evidence of ongoing testing and debugging to diagnose the electronic system to improve reliability and fitness for purpose. Include evidence to show trailing and improvement of
   1. Reliability and sensitivity of input
   2. Robustness of electronic system & enclosure
   3. Visually appealing and audibly appealing indicators and alarms suitable to home use
4. **Purpose and function of components and interfaces**Include evidence that shows you are able to describe the interfaces and functions of the components of the systems used, explain the behaviour and function of the electronics outcome and justify your choice of the components and systems you have used. Include in your evidence:
   1. A photograph of your electronics sensor. Annotations on your photographs that describe the purpose and functions of components and systems used
   2. Circuit schematics for all interfaces (include correct symbolic conventions and labels)
   3. Explanations of
      1. Voltage, Current and Resistance characteristics in each of your interfaces
      2. Voltage, Current and Resistance in Series and Parallel circuits
   4. Justification of why you chose specific components or systems
      1. Justify your selection of specific sensors and how these better enable monitoring of pot plant health
      2. Justify your selection of resistor values and how this affects resistive sensor in a voltage divider
      3. Justify your selection of LED for plant health indicator and use of calculations to determine current limiting resistor value for LED

# [ DRAFT ] Coffee cup temperature monitor

Design and develop a coffee cup temperature monitor using basic electronic components and a microcontroller

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| **Achieved** | **Merit** | **Excellence** |
| Develop an electronics outcome | Develop an informed electronics outcome | Develop a refined electronics outcome |

## Introduction

This assessment requires students to develop a coffee cup temperature monitor enabling a user to see when the coffee is at perfect temperature. Students must demonstrate the use of basic iterative processes to develop and test their coffee cup temperature monitor ensuring they construct an outcome that meets specifications and addresses relevant implications. This Assessment starts on Week 6 (Fri 9th March) and finishes Week 9 (Thursday 29 March)

## Task

Select appropriate electronics components for an interface that links the coffee cup temperature monitor to the microcontroller. Show how you have used data sheets or calculations to assist in selecting these components. You may use circuit diagrams to assist in showing this. Write a computer program that controls the coffee cup temperature monitor and allows it to work according to the specifications provided.

## Specifications

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| **Specifications**   * *Sense when the temperature of a cup of coffee is too hot, too cold or just right* * *Indicate to the user the current temperature of the coffee·*   *.*  *·* | **Implications**  You will need to consider the following implications::   1. Reliability of inputs sensors 2. Visible and understandable outputs that indicate temperature of coffee 3. Robustness of electronic system & enclosure (secure wiring and mounting of components) |

# Completing the task

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

1. **Project Brief**It's good to start by clarifying what you intend to do
   1. Identify the Input and Output interfaces you will construct
   2. Describe the considerations and relevant implications and how explain how these will be addressed
2. **Testing, Modifying and Debugging your electronics sensor**Evidence of Testing, Modifying and Debugging your coffee cup temperature monitor on your input and output interfaces. Include testing tables that show
   1. Testing of your analogue sensor on a large range of values
   2. Testing outputs on a range of temperature levels
   3. Provide evidence of modifying code
3. **Trailing and iterative improvement of the Electronics Sensor**Iterative improvement within your work will show evidence of ongoing testing and debugging to diagnose the electronic system to improve reliability and fitness for purpose. Include evidence to show trailing and improvement of
   1. Reliability of inputs sensors
   2. Visible and understandable outputs that indicate temperature of coffee
   3. Robustness of electronic system & enclosure (secure wiring and mounting of components)
4. **Purpose and function of components and interfaces**Include evidence that shows you are able to describe the interfaces and functions of the components of the systems used, explain the behaviour and function of the electronics outcome and justify your choice of the components and systems you have used. Include in your evidence:
   1. A photograph of your electronics system. Annotations on your photographs that describe the purpose and functions of components and systems used
   2. Circuit schematics for all interfaces (include correct symbolic conventions and labels)
   3. Explanations of
      1. Voltage, Current and Resistance characteristics in each of your interfaces
      2. Voltage, Current and Resistance in Series and Parallel circuits
   4. Justification of why you chose specific components or systems
      1. Justify your selection of specific sensors and how these improved
      2. Justify your selection of resistor values and how this affects resistive sensor in a voltage divider
      3. Justify your selection of Input sensor components and output warning indicators

# [ DRAFT ] Healthier Homes

Use basic iterative processes to develop an electronics outcome that monitors conditions needed for healthier homes.

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| **Achieved** | **Merit** | **Excellence** |
| Use basic iterative processes to develop a digital outcome | Use basic iterative processes to develop an informed digital outcome | Use basic iterative processes to develop a refined digital outcome |

## Introduction

This assessment requires students to use basic iterative processes to develop an electronics outcome that monitors conditions needed for healthier homes.. This Assessment starts on Week XYZ (Fri XYZth March) and finishes Week XYZ (Thursday XYZMarch)

## Task

“There are three essentials that work together to create a healthy, energy efficient home – keeping your home warm, ensuring your home is dry and airing it out regularly” <https://www.energywise.govt.nz/at-home/3-essentials/>

Using the specifications below and basic iterative processes, develop a fit for purpose electronics outcome.

## Specifications

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| ***Possible Environmental Variables to monitor real world aspect of a home***  Must select two of:   * Air Temp, Light level, moisture levels, humidity levels   *Note that one of your variables must be analogue*  *.*  *·* | **Specifications**  Inputs :   * Two environmental variables.  *One of these must be analogue*   Output   * Home health warning indicator * Output 24 hr of data via serial terminal for display and analysis     **Relevant Implications**  important implications will include:   1. Robustness of electronic system & enclosure 2. Understandable/visible warning indicators. 3. Visually appealing enclosure for use in a home |

# Completing the task

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

1. **Project Brief**It's good to start by clarifying what you intend to do
   1. Sketches each of the interfaces you plan to use for your outcome. Provide labels and annotations
   2. Describe the relevant implications and how explain how these will be addressed
2. **Testing, Modifying and Debugging your electronics system**Evidence of Testing, Modifying and Debugging your electronic system on your input and output interfaces. Include testing tables that show
   1. Testing of your sensor(s) on a large range of environmental conditions
   2. Testing outputs function as expected given specific conditions
   3. Provide evidence of modifying code as a result of testing
3. **Trailing and iterative improvement of the electronics system**Iterative improvement within your work will show evidence of ongoing trialling of components, testing and debugging to diagnose the electronic system to improve reliability, justify component selection and ensure fitness for purpose. :  
   1. Evidence trailing and iterative improvement of interfaces
      1. Justify your selection of analogue sensors and components within the interface
      2. Justify your selection of resistor values and types in your LED warning indicator based on LED datasheets and calculations
      3. Justify the reliability of your system as it stores and outputs data to serial terminal
   2. Evidence trailing and iterative improvement of relevant implications
      1. How have you improved the Robustness of electronic system & enclosure
      2. How have you devised Understandable/visible warning indicators.
      3. How have you constructed Visually appealing enclosure for use in a home