

## Build Your Own Data Logger

### Module 3: Proof of Concept

### Submodule 2 – Temperature and Humidity Sensing

## Terminology Starter Guide

Video	Intro
Hygrometry (Humidity)	Concentration of water vapor present in the air.
Thermistor	A type of resistor whose resistance changes with temperature.
Resistor	<p>A resistor is an electrical component with two terminals that is used to limit or regulate the flow of electrical current in electronic circuits.</p> <p>Its purpose is to reduce current flow as well as lower the voltage levels in its general vicinity or portion of the circuit.</p>
Digital Sensor	<p>A sensor that converts the voltage from a sensor into a digital signal before sending it as an output.</p> <p>Digital sensors have their own microcontroller and analogue-to-digital converter which takes the voltage reading from the sensor, and converts it to a digital signal before sending it as an output.</p>
Analogue Sensor	<p>A sensor that outputs the voltage from the sensor as an analogue signal.</p> <p>The analogue to digital converter sits on the circuit board that receives the voltage from the sensor directly.</p>
Thermocouple	A thermocouple measures unknown temperature of the body with reference to the known temperature of the other body.

	<p>It comprises of at least two metals joined together to form two junctions.</p> <p>One is connected to the body whose temperature is to be measured; this is the hot or measuring junction.</p> <p>The other junction is connected to a body of known temperature; this is the cold or reference junction.</p>
<p>Infrared Thermometer</p>	<p>Infrared thermometers measure temperature from a distance.</p> <p>They are based on a phenomenon called black body radiation.</p> <p>Anything at a temperature above absolute zero has molecules inside of it moving around. The higher the temperature, the faster the molecules move. As they move, the molecules emit infrared radiation--a type of electromagnetic radiation below the visible spectrum of light. As they get hotter, they emit more infrared, and even start to emit visible light.</p> <p>Infrared thermometers detect and measure this radiation.</p> <p>Infrared thermometers usually use a lens to focus infrared light from one object onto a detector called a thermopile. The thermopile absorbs the infrared radiation and turns it into heat. The more infrared energy, the hotter the thermopile gets. This heat is turned into electricity.</p> <p>The electricity is sent to a detector, which uses it to determine the temperature of whatever the thermometer is pointed at. The more electricity, the hotter the object is.</p>
<p>Diode</p>	<p>Diode is a two-terminal component that will allow current to flow through it in only one direction.</p> <p>Diodes have two 'legs'.</p> <p>With the proper voltage polarity across the device, it will act as a conductor. When the voltage polarity</p>

	is reversed, the device will act as a nonconductor, allowing no current to flow.
A terminal (in an electrical component context)	<p>A terminal is the point at which a conductor from a component, device or network comes to an end.</p> <p>For example: a diode has two terminals. A transistor has three terminals.</p>
A transistor	<p>Transistors are devices that control the movement of electrons, and consequently, electricity.</p> <p>They can start and stop the flow of a current, and control the amount the current in a circuit.</p>
Polarity	<p>The directional flow of electrons in a circuit, from one pole to the other.</p> <p>On circuit designs, polarity refers to the voltage and operators +, - indicate them. In direct current (DC) circuits, the positive pole is usually marked red or with a “+” and the negative pole is usually marked black or “-“).</p> <p>The pole with relatively more electrons is said to have negative polarity; the other is assigned positive polarity.</p> <p>If the two poles are connected by a conductive path such as a wire, electrons flow from the negative pole toward the positive pole. This flow of charge carriers constitutes an electric current.</p>
Direct Current	Direct current is the one directional or unidirectional flow of electric charge.
<b>Video</b>	<b>Lab 1</b>
Absolute Humidity	Total water in a unit volume of air.

Relative Humidity	<p>Relative humidity is the amount of moisture in the air at a certain temperature compared to what the air can “hold” at that temperature.</p> <p>A reading of 100 percent relative humidity means that the air is totally saturated with water vapor and cannot hold any more.</p>
<b>Video</b>	<b>Lab 2</b>
Class	<p>Class and object are basic building blocks in object-oriented programming languages.</p> <p>A class is written by a programmer in a defined structure to create an object.</p> <p>It’s a blueprint for creating objects, and defines a set of properties (attributes) and methods (functions) that are common to all objects of one type.</p> <p>For example, a class could be a cloud, which has the attributes <i>type</i>, <i>shape</i>, <i>colour</i>, and <i>height-of-base-metres</i>.</p>
Object	<p>A specific example created using the ‘class’ blueprint.</p> <p>Each object can have unique values to the properties defined in the class.</p> <p>Eg. myCloud is a cumulus (<i>type</i>), cotton wool (<i>shape</i>), white (<i>colour</i>), and 550 (<i>height-of-base-metres</i>)</p>
<b>Video</b>	<b>Lab 3</b>
Conditional statement	<p>A code block where code is executed if a certain condition is met. It is sometimes referred to as an If-Then or If-Then-Else statement, because IF a condition is met, THEN an action is performed or IF a condition is met, THEN an action is performed ELSE do this.</p>

	<p>Eg</p> <pre>if (temperature &gt; threshold) {   Do something } else {   Do something else }</pre>
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## Tutorials

Olympia Circuits	Good overview of C++ used in Arduino <a href="http://learn.olympiacircuits.com/programming.html">http://learn.olympiacircuits.com/programming.html</a>
Tutorials Point	More detailed tutorial on Arduino <a href="https://www.tutorialspoint.com/arduino/index.html">https://www.tutorialspoint.com/arduino/index.html</a>