

# Design and Implement a Weather Station

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Report Name	Outline Project Specification
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# 1 Project Description

The design and implement a weather station project will result in a data stream from the meteorological instruments that will be used to provide a web-based interface that will act as both a representation of past and current weather data as well as providing, if a customer so wishes, a data feed for use in their own initiatives. This information will be available to all through being hosted on the Aberystwyth University servers, however this is of specific interest to those involved with leisure or work that require weather information from a particular location.

In this case the planned location for the weather station set-up is the top of the Aberystwyth University Physical Sciences Building [1], though there are proposals to test it at a location nearby Penglais Farm.

The first requirement for this project is to provide clear and detailed weather information for the locale by representing it in a web-based interface in a well presented manner. This can be accentuated by the use of good user interface design such as with Shneiderman's eight golden rules [4]. The interface will contain features such as current measurements and graphs that show relative history.

The project will also seek to provide a means by which users can receive a feed of the sensor data for their own use, such as in-conjunction with other local data to provide a more detailed area map. This could also be an expansion for future projects. The goal is far this to be reasonable simple for a user to set-up, however the method of implementing this whether through SOAP [6] or some other method is to be further explored.

In order to perform the previously stated functions the receiving and decoding of the meteorological data through the intended hardware is needed [5]. The hardware portion of this project includes a ESP8266 WiFi Module connected to some DHT22 sensors(Humidity and Temperature), a wind monitor and rain gauge.. This will be a static weather station connected to the mains and so energy consumption is not an issue. It also to be noted that the hardware can be programmed through the arduino IDE [3] and that similar tasks have been attempted before [2].

A final function of the project is to store data within a database in order to retain the history of the sensor information. Not only will this allow for further storage beyond what the controller can hold, but it will provide protection through redundancy in-case there are any issues with the hardware. Likewise holding the data within a database will help provide more storage space for the controller if there is a situation such as the WiFi connection dropping.

This project is being completed with the view that the user is of reasonable competence to understand basic computer tasks and terminology as well as having somewhat of an interest in weather information.

Though it has not be finalised the it is aimed that the project will use a modified form of Feature Driven Development (FDD) as a development methodology. This would have to be further expanded upon to detail how it will work in a single person project.

## 2 Proposed Tasks

**Project Meetings and Project Diary:** This project will involve weekly supervisor meetings along with the keeping of a project diary to record discussions and progress. This will be kept in the form of an evolving document.

**Investigation of the receiving and decoding of sensor data:** The project will use a number of meteorological instruments that will require the use of libraries or code to receive useful data. In the case of the wind monitor it will be necessary to write some code to do this. Having not previously worked with such methods further investigation into how best to go about this is required.

**Investigation of the database system:** There will be a need for some way to hold the sensor information within the project and therefore there should be further exploration into the best way to do this, whether stored on the controller or placed into a more traditional structure such as SQL.

**Investigation of the server configuration:** The design will make use of multiple components that include web based software. This will call for researching into the best configuration to enable acceptable performance and maintenance.

**Setting up the version control system:** An environment will be needed to be set-up to improve the development process, support version control and include backups. This could be a git repository.

**Prototyping of skeleton system:** The development process could make use of a prototyping to ensure all the components can work together and to foresee and problems or future requirements.

**Preparation for mid-project demonstration:** The task of this demonstration is to show the progress so far with regards to the project. Some materials and information may need to be put together.

**Full scale development:** After a number of investigations and prototyping it will be required to enter the full development of the project software. This will require formulation of the chosen development methodology to best reach the projects potential and will result in a final software package that will be handed in for assessment. See deliverables.

**Final report completion:** An entire description of the project process and content that will need to be written and handed in for assessment. See deliverables.

**Preparation for final demonstration:** The final demonstration will require presentation of the completed functionality of the project. It should be possible to explain ideas and decisions with confidence. Some materials and information may need to be put together.

### 3 Project Deliverables

Project Deliverable	Proposed Date	Description
Mid-Project Demonstration	March 14th	This concerns materials related to the mid-project demonstration including: notes, slides and shown software. The result will be the addition of this into the appendix of the final report.
Project Software	May 4th	The entirety of completed software and its incorporated components such as code, necessary files and scripts both application dependent and testing. This deliverable will include materials relating to both the sensor decoding in the arduino IDE and the server application code holding the weather information. A final version of these files will be submitted on the proposed date for assessment. They will also be provided on the chosen version control system.
Supporting Documentation	May 4th	This deliverable includes documentation related to the project that is not directly relevant but helps to support the project as a whole such as user and maintenance manuals. It will covers items such as using the system and dealing with problems.

Final Report	May 4th	The full report containing a description from beginning to end the project process, implementation and final outputs along with associated appendices. In addition to project process related information there will also be acknowledgements towards any 3rd party libraries, frameworks, tools and other sources used throughout the project.
Final Demonstration	May 9th	Though information relating to the final project demonstration will not be present in any documentation for the hand in, it is still a key deliverable in presenting the completed work.

## Annotated Bibliography

- [1] Aberystwyth University, "Physical Sciences Building Location," <http://www.aber.ac.uk/en/maps-travel/maps/buildings/physical-sciences>, 2016, [Accessed February 2016].

Shows the location of the proposed site for those unfamiliar with the area.

- [2] Adafruit, "ESP8266 Temperature / Humidity Webserver," <https://www.arduino.cc/en/Main/Software>, 2016, [Accessed February 2016].

An example of previous attempts made to do similar projects to good success. This one in particular uses the ESP8266 controller that I myself am using.

- [3] Arduino, "Arduiono IDE," <https://www.arduino.cc/en/Main/Software>, 2016, [Accessed February 2016].

The arduino website in which details information on the controller and the development environment.

- [4] Ben Shneiderman, "The Eight Golden Rules of Interface Design," <https://www.cs.umd.edu/users/ben/goldenrules.html>, 2016, [Accessed February 2016].

Shniederman provides some guidance on what makes a good interface for users to interact with such as consistency and preventing errors.

- [5] Lucsmall.com, "Hacking the WH2 Wireless Weather Station Outdoor Sensor Part 2: Protocol Specification," <http://lucsmall.com/2012/04/29/weather-station-hacking-part-2/>, 2016.

- [6] W3Schools, "SOAP," [http://www.w3schools.com/xml/xml\\_soap.asp](http://www.w3schools.com/xml/xml_soap.asp), 2016, [Accessed February 2016].

This web page provides information on Simple Object Access Protocol.