SCC204 Coursework

Design and Architecture

Due date: 2nd December, 4pm (submit through MOODLE)

Marks return by: 15th January

This coursework will give you experience of designing a class diagram for a system and builds on what you have learnt in lectures and workshops. The coursework is based on designing a simplified Domestic Power Management Application.

A system is required for users to manage their domestic power use via a householder interface. The system should enable users to manage their use of renewable energy alongside their energy use from the national power grid.

The system manages solar power (generated via domestically installed solar panels) and wind power (generated via domestic wind turbines) as the main renewable energy sources currently available. The system is likely to expand in the future to accommodate additional domestic energy sources as these sources become available for domestic use, for example hydro energy (generated via domestic water turbines).

The system has batteries that can be charged by renewable energy. The power in the batteries is used when renewable sources are not generating power and the household is using power.

The flow of power between power sources (solar, wind, grid, batteries, etc.) and power consumers (household, grid, batteries, etc.) is controlled by a device called a bi-directional inverter which reports its status every 5 minutes through a cloud API. The inverter is the only way in which the power sources can be controlled.

The system also has a heating controller which householders can use to control their domestic heating, allowing users to turn their heating on and off. An immersion water heater is also controlled by the system. When the batteries are fully charged, the excess power generated by renewable sources is diverted into the immersion water heater. In addition, the system allows the control of an electric kettle. The system is likely to expand in the future to allow the control of a range of additional domestic electrical appliances (e.g., washing machines and dryers).

The power system application should allow users to monitor throughout the day how much power the household is using (watts); the household is using from the national power grid (watts), the renewable energy sources are generating (watts), the power that is entering or leaving the batteries (watts), the percentage charge the batteries have.

In addition, users should also be able to:

- Turn their electric heating and their immersion water heater off and on.
- Turn any appliances connected to the system on and off.
- Monitor the energy consumption of their electric heating throughout the day.

Users should also be able to select to view a variety of reports analysing household power consumption over the last month. You should decide on a set of four reports that your system should be able to produce.

1. Your task

1. Create a UML Class Diagram that shows all classes for the requirements given, the relationships of these classes and their multiplicity. Note that you should provide a diagram at the specification perspective. (25 marks)

2. Please implement the SOLID principles in your design and provide a short narrative of which principles you have implemented, how and why. (8 marks)

3. Provide all the assumptions that you have made about the application on which you have based your class diagram. You can provide a maximum one page list of these on your submission or you can append your assumptions as notes on your class diagram. Be as concise as possible. (3 marks)

4. Note the set of four reports that your system produces and very briefly say why these are important. (4 marks)

2. Submission

Your work should be submitted through MOODLE as a **single PDF file**.

For the class diagram use a UML drawing tool (ideally, this will be plantUML). Hand-drawing is not allowed. The class diagram must fit on a single A4 page.

Please make sure that you **include your Student ID** in the top left corner of the first page of the PDF file.

Name the pdf file Student_ID.pdf (e.g. 34989975.pdf) before submitting.

3. Marking Guidelines

The following table gives an indication how grades will be assigned.

Marks range	**Design and Architecture**
A (+,0,-)	Fully complete **and** correct UML class diagram with correctly identified classes, relationships and multiplicity. Very well argued, clear and sensible design assumptions that show excellent understanding of the design of the system.
B (+,0,-)	Significantly complete and correct UML class diagram with mostly correctly identified classes, relationships and multiplicity. Well argued, clear and sensible design assumptions that show very good understanding of the design of the system.
C (+,0,-)	UML class diagram with the majority of correctly identified classes, relationships and multiplicity. Reasonably argued, clear and sensible design assumptions that show good understanding of the design of the system.
D (+,0,-)	UML class diagram with partially correctly identified classes, relationships and multiplicity. Reasonable design assumptions that show some understanding of the design of the system.
F	Little or very poor UML class diagram. Poor explanations of design assumptions that show poor understanding of the design of the system.