**ECE 411 Industry Design Processes: Assignment #2**

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Team: T09

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**Project Design Specification (PDS)**

**for**

**GPS enabled clock**

**Version 1.0**

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**Introduction:**

A GPS clock having high precision positioning timing prevents people from having to

manually adjust to local time when they go to different places. The GPS clock is not affected by

various electromagnetic interferences, and the time is accurate and is not limited by geography.

Although such products are already on the market, the expensive price cannot meet the

budgetary requirements of ordinary families. The purpose of the project is to create this clock

having more accurate time at a lower price so that more people can afford it.

**Purpose of the Product Design Specification Document:**

The purpose of the product design specification is to confirm that the subsequent design and

development of the product can meet the needs of the users. The project must meet all the

requirements that “Must” be completed in the specification document. “Should” and “May” are

additional but not necessary.

**Project Overview**

This project solves the problem of the prohibitive cost of traditional GPS clocks. The

GPS clock has a GPS receiver - GP-735 (56 channels) that receives GPS satellite signals. The

receiver is very small and convenient, and it can turn on/off the power through the GPIO control

pin. This can achieve the purpose of saving power loss when the GPS function is not used.

Therefore, the project achieves a small size, low cost, energy-saving, etc.

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**User Characteristic**

The following sections list the main user types to better describe the expected target

market.

● Students

The people who live and study in different places or different time zone is more likely to

buy this product. They can know the time even they go back home or go to school without

setting a clock. It is very convenient for these people to know the time.

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**System Architecture**

● Commuters and Travelers

People who like to fly or bus are always very time-conscious, and they are always

worried about missing flights or trains. The GPS clock accurately provides them with the correct

time for appropriate arrival times.

**Assumptions**

● Users are familiar with the ECE 411 practicum design guidelines.

● The system works in different regions.

● The system is at the temperature at which it can work.

**Constraints**

● Must be completed within a limited time (8 to 10 weeks).

● Use a two or more layer PCB.

● Have one or more sensors (inputs).

● Have one or more actuators (outputs).

● Have one or more processing modules which control actuators based on sensors.

● Use 25% or more surface mount components that can be hand or reflow soldered.

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**Requirements:**

**1. Functional Requirements:**

**Req# Requirement Priority Station**

1.1 Have one or more inputs or sensors Must GPS

module

1.2 receive GPS signal Must GPS

module

1.3 Communicate with an alphanumeric

display by a simple SPI interface

Must LCD/GPS

module

1.4 Hot and cold resistant Should LCD/GPS

module

1.5 Detect ambient light levels and adjust LCD

accordingly

Should LCD

Module

1.6 Alarm setting Should CPU

1.7 Automatically adjust for DST Should CPU

**Table 1: Functional Requirements**

**2. Performance Requirements:**

**Req# Requirement Priority Station**

2.1 GPS module update frequency range is

5Hz -10Hz

Must GPS

module

2.2 These tiny GPS units can use a lot of

power around 30mA at 3.3V On average

Must GPS

module

**Table 2: Performance Requirements**

**3. Economic and Marketing Requirements:**

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**Req# Requirement Priority Station**

3.1 Should not use non-standard components Should GPS

module

3.2 Buying 25 or more will save $3.76/each Should LCD/GPS

module

3.3 The whole product can be sold as $60 Should LCD/GPS

module

**Table 3: Economic and Marketing Requirements**

**4. Power Requirements:**

**Req# Requirement Priority Station**

4.1 A 5V Wall Adapter Power Supply

provides all the power for the displays and to power the Arduino

Must LCD/GPS

module

4.2 Peak current shall not exceed 2000mA Must LCD/GPS

module

4.3 The GPS module to be powered down

when not in use

Must GPS

module

**Table 4: Power Requirements**

**5. Health and Safety:**

**Req# Requirement Priority Station**

5.1 Make sure the product will not injure

people.

Must LCD/GPS

module

**Table 5: Health and Safety**

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**6. Maintainability:**

**Req# Requirement Priority**

6.1 Record the progress of the project every

week

Must

6.2 Progress reports may be submitted by

email

May

6.3 Record experimental data and results via

Github

May

**Table 6: Maintainability**

**7. Operational Environment:**

**Req# Requirement Priority Station**

7.1 Can work in hot and cold environments Should LCD/GPS

module

**Table 7: Operational Environment**

**8. Usability:**

**Req# Requirement Priority Station**

8.1 Users are able to use the system without

training

Must LCD/GPS

module

**Table 8: Usability**

**9. Manufacturability:**

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**Req# Requirement Priority Station**

9.1 Must be possible to assemble by hand Must LCD/GPS

module

9.2 Use 25% or more surface mount

components that can be hand or reflow

soldered

Must LCD/GPS

module

**Table 9: Manufacturability**

**REFERENCES**

https://en.wikipedia.org/wiki/Product\_design\_specification

https://learn.sparkfun.com/tutorials/gps-basics

https://en.wikipedia.org/wiki/Global\_Positioning\_System

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