ECE-218 Project Report Format

Except for the title page, all the sections names below (Introduction, Design Overview, etc) should be included to organize your report.

Title page – should include a project title, author (that's you), course number and title, and date.

- **Objectives** – This section should orient the reader to the project topic and detail the goals of the design. In addition to the goals given in the assignment, elaborate on any requirements that got clarified during the project implementation, or that you added as a specification.
- **Design** –Begin this section with a description of your design strategy. Describe briefly the roles of the hardware and software and how they work together to accomplish the goals of the project.
    - **Hardware**

      This section should include a block diagram of the hardware, showing all major components, but without wiring details. An example block diagram is shown in Figure 1. You will include the detailed hardware schematic in the appendix.

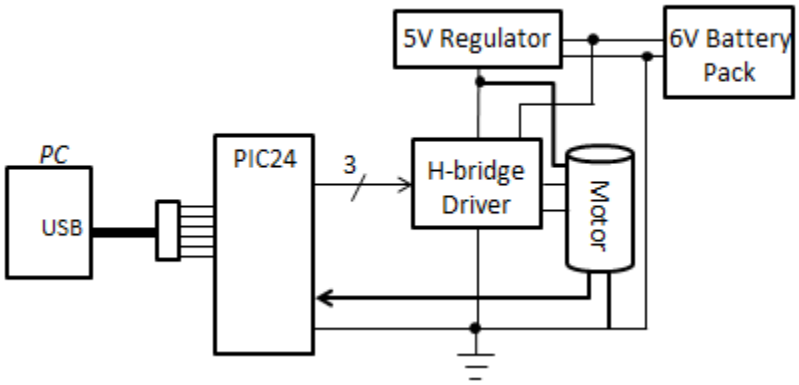

Figure 1. Example Block Diagram

Refer to the block diagram and the schematic as you explain the hardware in a logical way. One possible organization is to first describe input components and signals and then output components and signals. Discuss the important characteristics of the hardware. For example, in Project 1 the voltage range of the analog signal, the precision of the sensor, and the relationship between the temperature and the sensor voltage are a few of the important hardware aspects.

- **Software**

  The purpose of this section is to explain the software in the system. The software should be provided in the form of a state diagram or pseudocode. Figure 2 gives an example of some pseudocode.

Global functions:

configIO – maps peripheral bits to pins
initOC12 – initializes OC1 and OC2 peripherals
initIC1 – initializes IC1 and IC2 peripherals
_T2Interrupt – ISR to control PWM on OC1
_IC1Interrupt – ISR to capture pulse period
_IC2Interrupt – ISR to determine the motor direction

Setup:

Initialize ports RB8 and configure OC1, IC2, UART2 and Timer 2 peripherals
Enable IC1, Timer1 and Timer2 interrupts
Enable driver and set initial pulse widths for motors
Initialize LCD screen and pulse count

Main Loop:

Print measured pulse to LCD display
Calculate speed from measured pulse
Print speed to LCD display
Calculate number of revolutions from pulse count
Print number of resolutions to LCD display

Figure 2. Example pseudocode

The software should also be described in a logical way, usually from beginning to end. The completed commented code will be in the appendix. If your explanation of the code requires the details, small snippets can be included in the software section along with the explanation.

Example code segment with explanation:

```
void __attribute__((interrupt, no_auto_psv)) _T2Interrupt(void)
{
        OC1RS = pulse_width1;   //update duty cycle for servo1
        OC2RS = pulse_width2;   //update duty cycle for servo2
        _T2IF = 0;  //clear interrupt flag so interrupt can happen
again
}
```

The pulse-width-modulated signals were generated with the Output Compare peripherals, with the period determined with Timer 2. The above interrupt service routine code runs when Timer 2 reaches the count initialized in PR2, and will update the Output Compare Reset registers to determine the PWM pulse width for the OC1 and OC2 pins.

- **Results** – The purpose of this section is to objectively describe the behavior of the system when operating. An image of the completed system should be included. You should include other figures and data as appropriate. Be sure to compare the behavior of the system with the original specifications. Give the testing conditions for the results, and be as quantitative as possible. For example, don't say "the temperature was a little off", but instead provide data that illustrates the expected and observed temperature displayed for the full testing range. Compute the percentage error when appropriate.

- **Conclusion and Discussion** – The purpose of this section is to provide the reader with an understanding of the significance of the project design. There should be a holistic discussion of the results, and what was learned about embedded systems as a result of completing the project. If there were problems encountered in the design and implementation, discuss these. If there are improvements that you would have made if time permitted, describe these. The reader should learn about any difficulties to watch out for, and any useful strategies if they were to repeat this design.
- **Appendix** – Here is where you will provide resources that would be needed by anyone building a duplicate of your prototype. Include the complete schematic, as well as the source code for the project. You do not have to include library files unless you wrote them. Add a title for the schematic and code segments of the Appendix.

  The hardware schematic in the appendix should be complete and of sufficient detail that it could be used to duplicate your circuit. For example, include all port labels for any signals connected to the microcontroller and values or labels for all components. It should not be hand drawn. It is acceptable to use schematics provided in class or in the exercises as a starting point. EasyEDA.com offers a free web-based tool for creating schematics. There is a learning curve, but it is very powerful and useful once you figure it out.

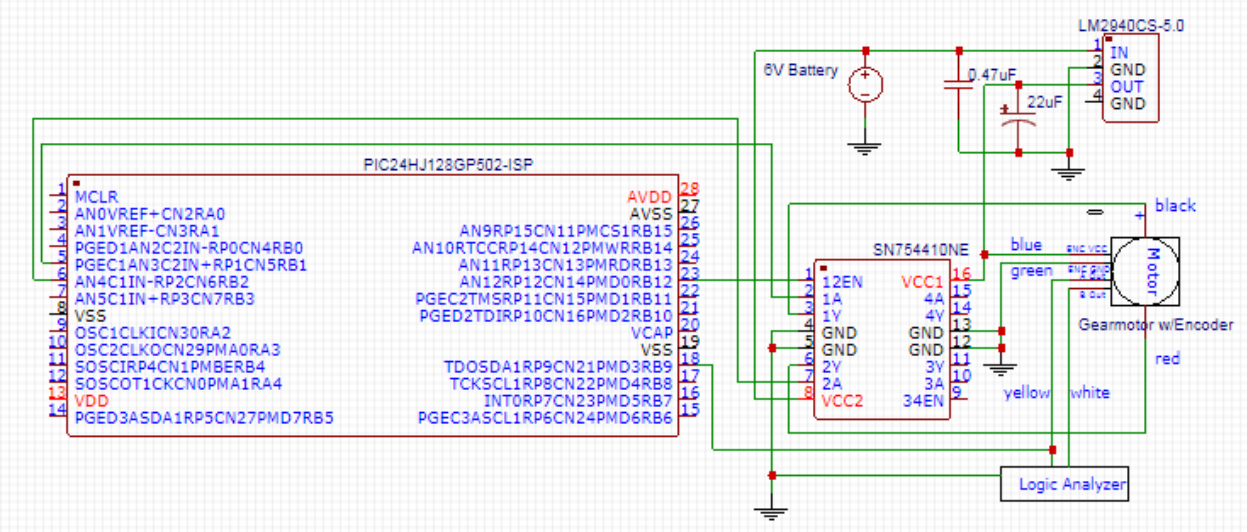

Figure 3. Example Schematic