System Requirements Specifications

1. **System Requirements**
   1. The system shall provide 12 volts of power supply for DC (Direct Current) Motor.
   2. The system shall create a thread for the reading, it shall be named **Thread\_Reading.**
   3. The system shall create a thread for the display, it shall be named **Thread\_Display**.
   4. The system shall create a thread for the algorithm, it shall be named **Thread\_Algorithm**.
2. **Reading Requirements**
   1. Thread\_Reading shall determine the number of pulses generated by hall sensor.
   2. Thread\_Reading shall get an average of read pulses each 100 miliseconds.

TOTAL\_PULSES = ((T1 + T2) / 2) / (PULSES\_PER\_SPIN)

* 1. Thread\_Readingshall get the setpoint by using the potenciometer.
  2. Thread\_Reading shall set the setpoint into a range of 800 – 3000 RPM.
  3. Thread\_Reading shall send the setpoint and speed to Thread\_Algorithm.
  4. Thread\_Reading shall send the setpoint, pwm output, and speed to Thread\_Display.
  5. Thread\_Reading shall calculate the speed of motor, it must be specified in RPM (Revolutions Per Minute)
  6. Thread\_Reading shall configure and initialize a PWM Timer module.
  7. Thread\_Reading shall configure and initialize an ADC (Analog to Digital Converter) module.
  8. Thread\_Reading shall configure and initialize an Input Capture Timer module.

1. **Algorithm Requirements**
   1. Thread\_Algorithm shall send the pwm output to Thread\_Reading.
   2. Thread Algorithm shall compute a PID Algorithm.
   3. PID Algorithm shall get the Kp, Ki, and Kd constants by using Ziegler-Nichols method.
   4. PID Algorithm shall get the error, which is the setpoint – speed.
   5. PID Algorithm shall get the acumulated error, which is the adding of error.
   6. PID Algorithm shall get the rate error which is the error – last error.
   7. PID Algorithm shall get the pwm output, which is:

pwm\_output = (Kp \* error) + (Ki \* accumulated error) + (Kd \* rate error)

1. **Display Requirements**
   1. Thread\_Display shall display the value of setpoint. See format below.

**Setpoint**: XXXX RPM

* 1. Thread\_Display shall display the value of speed. See format below.

**Speed**: XXXX RPM

* 1. Thread\_Display shall display the value of pwm output. See format below.

**Duty cycle:** XXX %

* 1. Thread\_Display shall initialize the lcd display embedded on Renesas board.
  2. Thread\_Display shall display the name of each member of the team. See format below.

**Programadores:** Apellido1, Nombre1

Apellido2, Nombre2

Apellido3, Nombre3

* 1. Thread\_Display shall display both the Software Version and Hardware Version.

See format below.

**SW Version:** X.X

**HW Version:** CESEQ-C001 / CESEQ-P001

* 1. Thread\_Display shall display the name of the project at the top of display.

See format below.

**Nombre del Proyecto:** Control Vel. Motor CD

* 1. Thread\_Display shall update the value of setpoint, speed, and pwm output each 100 ms.