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 provide 12 volts of power supply for the power circuit.
   3. The system shall provide 3.3 volts of power supply for the hall sensor.
   4. The system shall create a thread for the reading, it shall be named **Thread\_Reading.**
   5. The system shall create a thread for the display, it shall be named **Thread\_Display**.
   6. 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) units.
  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 configure and initialize the lcd display embedded on Renesas board.
   2. 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 display the value of pwm output. See format below.

**Duty cycle:** XXX %

* 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 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 update the value of setpoint, speed, and pwm output each 100 ms.