CPE301 – SPRING 2019

Design Assignment 5

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Primary Github address: <https://github.com/westbrian2/Spring2019>

Directory: <https://github.com/westbrian2/Spring2019/tree/master/DesignAssignments>

Submit the following for all Labs:

1. In the document, for each task submit the modified or included code (only) with highlights and justifications of the modifications. Also, include the comments.
2. Use the previously create a Github repository with a random name (no CPE/301, Lastname, Firstname). Place all labs under the root folder ESD301/DA, sub-folder named LABXX, with one document and one video link file for each lab, place modified asm/c files named as LabXX-TYY.asm/c.
3. If multiple asm/c files or other libraries are used, create a folder LabXX-TYY and place these files inside the folder.
4. The folder should have a) Word document (see template), b) source code file(s) and other include files, c) text file with youtube video links (see template).

1. **COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS**

Xplained Mini

Nrf24L01

LM35



1. **INITIAL/MODIFIED/DEVELOPED CODE OF TASK 1/A**

#define F\_CPU 16000000UL

#define UBRR\_9600 103 //Baud rate for 16MHz

#include <avr/io.h>

#include <util/delay.h>

#include <avr/interrupt.h>

#include <stdbool.h>

#include <stdio.h>

#include <string.h>

#include "nrf24l01.h"

#include "nrf24l01-mnemonics.h"

#include "spi.h"

//void print\_config(void);

volatile bool message\_received = false;

volatile bool status = false;

void read\_adc(void);

void adc\_init(void);

void USART\_init( unsigned int ubrr ); //Sets up usart for use

void USART\_tx\_string( char \*data ); //function that outputs data (usart)

volatile unsigned int adc\_temp; //holds temp value

char output[32];

int main(){

char tx\_message[32];

USART\_init(UBRR\_9600);

adc\_init();

nrf24\_init();

nrf24\_start\_listening();

while(1){

read\_adc();

snprintf(output,sizeof(output),"%3d\r\n",adc\_temp);

strcpy(tx\_message,output);

nrf24\_send\_message(tx\_message);

\_delay\_ms(1000);

sei();

if(message\_received){

message\_received=false;

snprintf(output,sizeof(output),"Recieved Temperature: %s\n",nrf24\_read\_message());

USART\_tx\_string(output);

\_delay\_ms(500);

status=nrf24\_send\_message(tx\_message);

if(status==true)

USART\_tx\_string("Temperature Transmitted\n");

}

}

}

void USART\_init(unsigned int ubrr){

UBRR0H=(unsigned char)(ubrr>>8); //Setting up

UBRR0L=(unsigned char)(ubrr);

UCSR0B=(1<<TXEN0)|(1<<RXEN0);//Enabling reciever, transmitter, and rx interrupt

UCSR0C=(1<<UCSZ01)|(1<<UCSZ00); //async 8 n 1

}

void USART\_tx\_string(char \*data){ //sends string

while((\*data!= '\0')){

while(!(UCSR0A&(1<<UDRE0)));

UDR0=\*data;

data++; //gets next part of data

}

}

void adc\_init(void)

{

/\*\* Setup and enable ADC \*\*/

ADMUX = (0<<REFS1)| // Reference Selection Bits

(1<<REFS0)| // AVcc - external cap at AREF

(0<<ADLAR)| // ADC Left Adjust Result

(0<<MUX2)| // setting input to PC0

(0<<MUX1)|

(0<<MUX0);

ADCSRA = (1<<ADEN)| // ADC enable

(0<<ADSC)| // ADC Start Conversion

(0<<ADATE)| // ADC Auto Trigger Enable

(0<<ADIF)| // ADC Interrupt Flag

(0<<ADIE)| // ADC Interrupt Enable

(1<<ADPS2)| // ADC Prescaler Select Bits

(0<<ADPS1)|

(1<<ADPS0); // Select Channel

}

void read\_adc(void) {

unsigned char i =4; //to get 4 samples

adc\_temp = 0;

while (i--) {

ADCSRA |= (1<<ADSC); //start conversion

while(ADCSRA & (1<<ADSC)); //waiting for coversion to finish

adc\_temp+= ADC;

\_delay\_ms(50);

}

adc\_temp = (adc\_temp / 4)-20; // Average a few samples and adjusts for slight offset

}

//Interrupt on IRQ pin

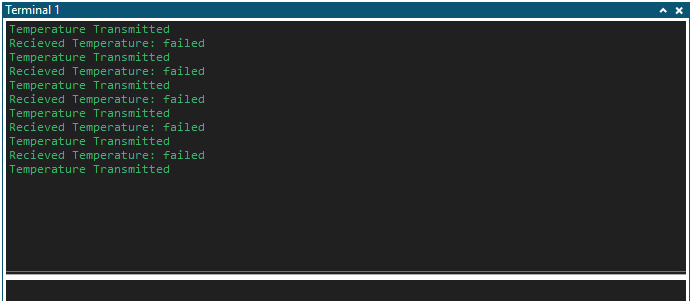
ISR(INT0\_vect)

{

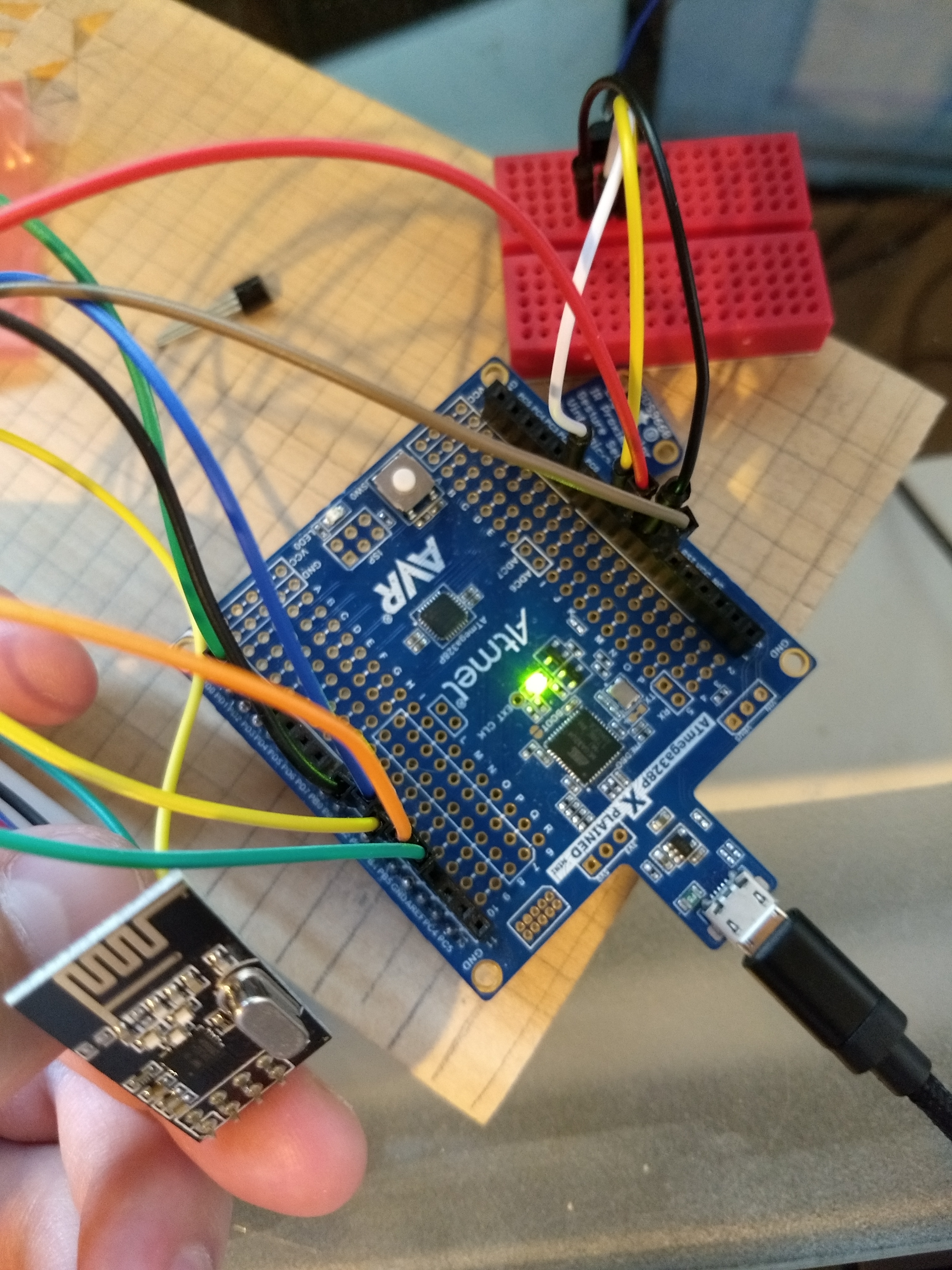
message\_received = true;

}

1. **SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)**



1. **SCREENSHOT OF EACH DEMO (BOARD SETUP)**



1. **GITHUB LINK OF THIS DA**

<https://github.com/westbrian2/Spring2019/tree/master/DesignAssignments/DA5_submission>

**Student Academic Misconduct Policy**

<http://studentconduct.unlv.edu/misconduct/policy.html>

“This assignment submission is my own, original work”.

Brian West