The goal of the assignment is to write, implement and demonstrate using Microchip Studio 7 a C code for the AVR ATMEGA328pb microcontroller that performs the following functions:

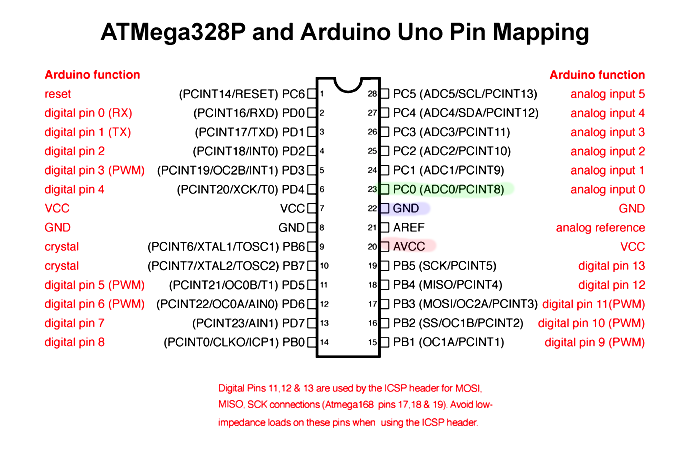
• Read the ADC value from the POT connected to AC0/PC0. Keep displaying the voltage value UART

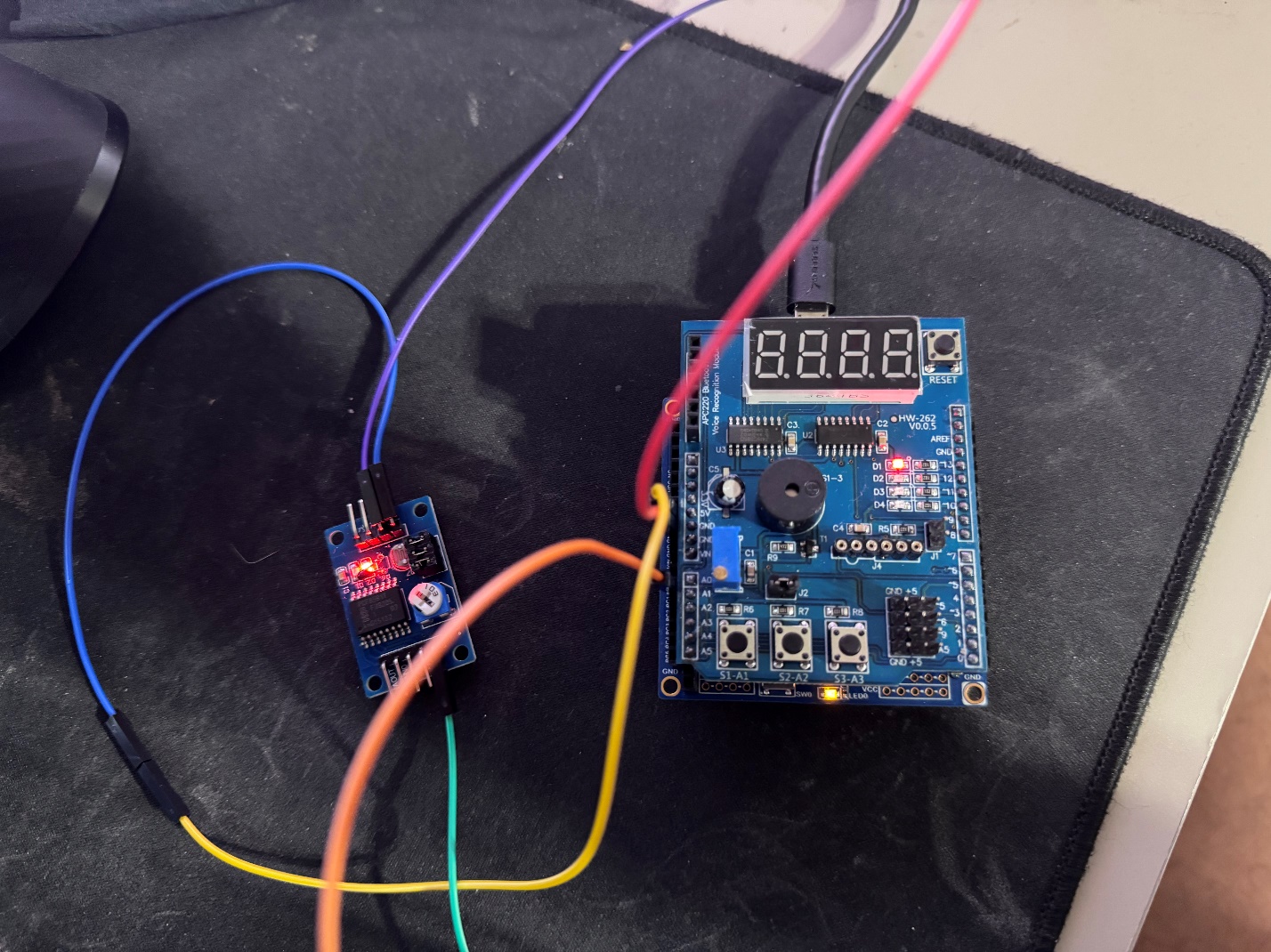
terminal every 0.01 sec. The resolution of the oscilloscope should be 0.1V. Use Timer auto-trigger for

this implementation.

• Using a GUI Python script, display the ADC values as waveform (using tkinter).

**Components Used/Connected**





Atmega328p and potentiometer setup

A screenshot of a computer

AI-generated content may be incorrect.

Schematic. Instead of an individual potentiometer I used the PCF8591T module which had a potentiometer on it. I just had to hook up AIN3 since that’s where the voltage was read.

**AVR C Code**

/\*

\* DA4.c

\*

\* Created: 4/5/2025 6:22:31 PM

\* Author : enriq

\*/

#ifndef F\_CPU

#define F\_CPU 16000000UL

#endif

#define BAUD 9600

#define UBRR\_VALUE ((F\_CPU/16/BAUD) - 1)

#include <avr/io.h>

#include <avr/interrupt.h>

#include <util/delay.h>

volatile uint16\_t adc\_result = 0;

void uart\_init() {

UBRR0H = (UBRR\_VALUE >> 8);

UBRR0L = UBRR\_VALUE;

UCSR0B = (1<<TXEN0);

UCSR0C = (1<<UCSZ01)|(1<<UCSZ00);

}

void uart\_send(char c) {

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

UDR0 = c;

}

void adc\_init() {

ADMUX = (1<<REFS0);

ADCSRA = (1<<ADEN)|(1<<ADATE)|(1<<ADIE)|(1<<ADPS2)|(1<<ADPS1)|(1<<ADPS0); // Enable ADC, Auto Trigger, Interrupt

ADCSRB = 0x00;

DIDR0 = (1<<ADC0D);

ADCSRA |= (1<<ADSC); // Start ADC conversion

}

void timer\_init() {

TCCR1B |= (1<<WGM12); // CTC Mode

OCR1A = 12499; // OCR1A = 2499; // 10ms

TCCR1B |= (1<<CS11)|(1<<CS10); // prescaler 64

TIMSK1 |= (1<<OCIE1A);

}

ISR(ADC\_vect) {

adc\_result = ADC;

}

ISR(TIMER1\_COMPA\_vect) {

uint16\_t mv = (adc\_result \* 500) / 1023; // Convert ADC to millivolts

uart\_send((mv / 10) + '0'); // Send whole number part

uart\_send('.');

uart\_send((mv % 10) + '0'); // Send decimal part

uart\_send('\n');

}

int main(void) {

uart\_init();

adc\_init();

timer\_init();

sei(); // set global interrupt

while (1) {

}

}

A screenshot of a computer program

AI-generated content may be incorrect.

Successful Compilation

A screen shot of a computer

AI-generated content may be incorrect.

Successfully reading values from potentiometer in COM3 at 9600 Baud

A graph of a wave

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A screen shot of a computer program

AI-generated content may be incorrect.  
  
Running python script. Used a generic graph template for tkinter to make the script.