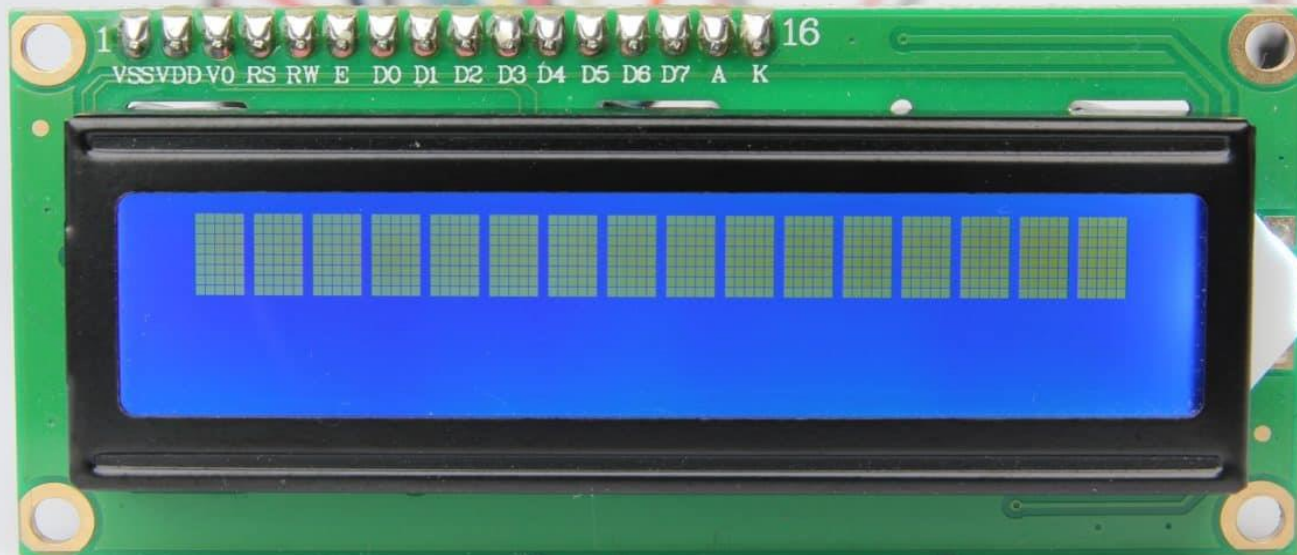# CSE423: Embedded System Summer-2020
## Working with external display (LCD)
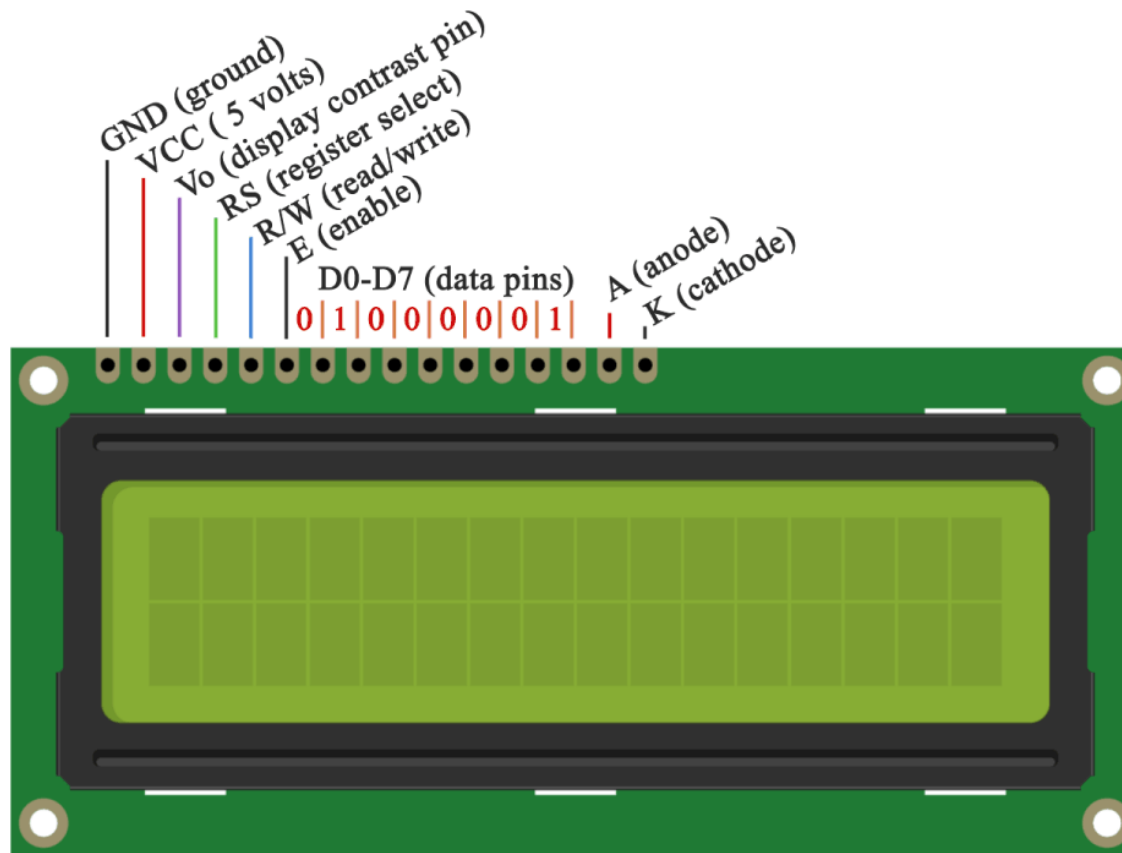
# Todays Lecture

- *What is LCD*
- *Application of LCD*
- *How to use LCD for any purpose*

# **LCD** Outlook

Liquid Crystal Display (LCD) is very popular among the Arduino Lover to display character via it.

# **LCD** Pin Function

The LCD has 16 connection pins, numbered 1-16 from left to right.

| Pin no. | Symbol | Function |
|---|---|---|
| 1 | VSS | Signal ground |
| 2 | VDD | Logic power for LCD |
| 3 | V0 | Contrast adjustment |
| 4 | RS | Register select signal |
| 5 | R/W | Read/write select signal |
| 6 | E | Operation enable signal |
| 7 – 10 | D0 – D7 | Data bus lines used for 8-bit mode |
| 11 – 14 | D4 – D7 | Data bus lines used for 4-bit mode |
| 15 | A (LED+) | Anode for LCD backlight |
| 16 | K (LED-) | Cathode for LCD backlight |

# LCD

❑ The process of controlling the display involves putting the data that form the image of what you want to display into the data registers, then putting instructions in the instruction register. The LiquidCrystal Library simplifies this for you so you don't need to know the low-level instructions.

❑ The Hitachi-compatible LCDs can be controlled in two modes: **4-bit or 8-bit**. The 4-bit mode requires seven I/O pins from the Arduino, while the 8-bit mode requires 11 pins. For displaying text on the screen, you can do most everything in 4-bit mode, so example shows how to control a 16x2 LCD in 4-bit mode.

# Hardware Required

❑ Arduino or Genuino Board

❑ LCD (16x2)

❑ USB Cable

❑ 10 kΩ potentiometer

❑ 220 ohm resistor
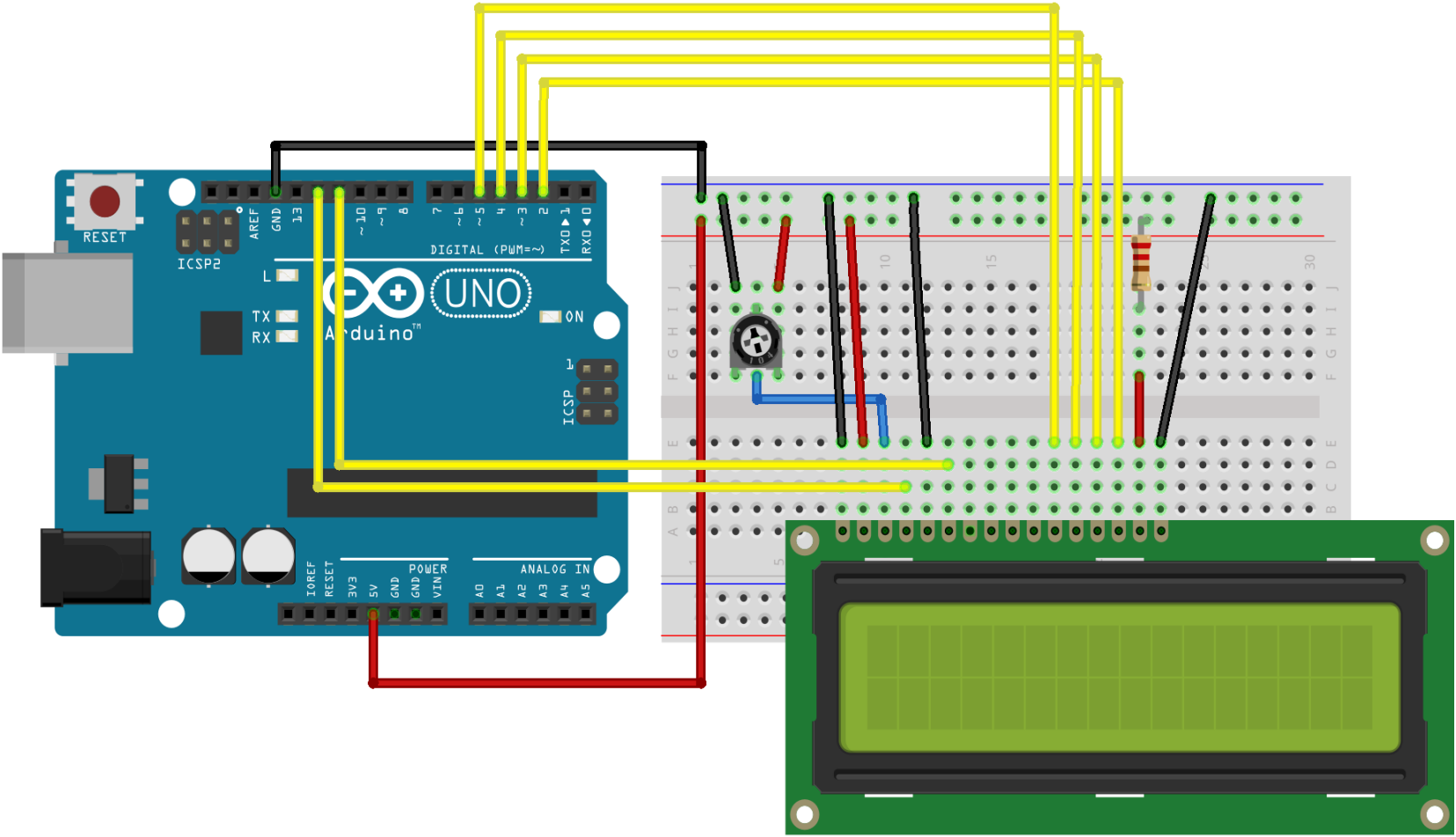
❑ Jumper wires

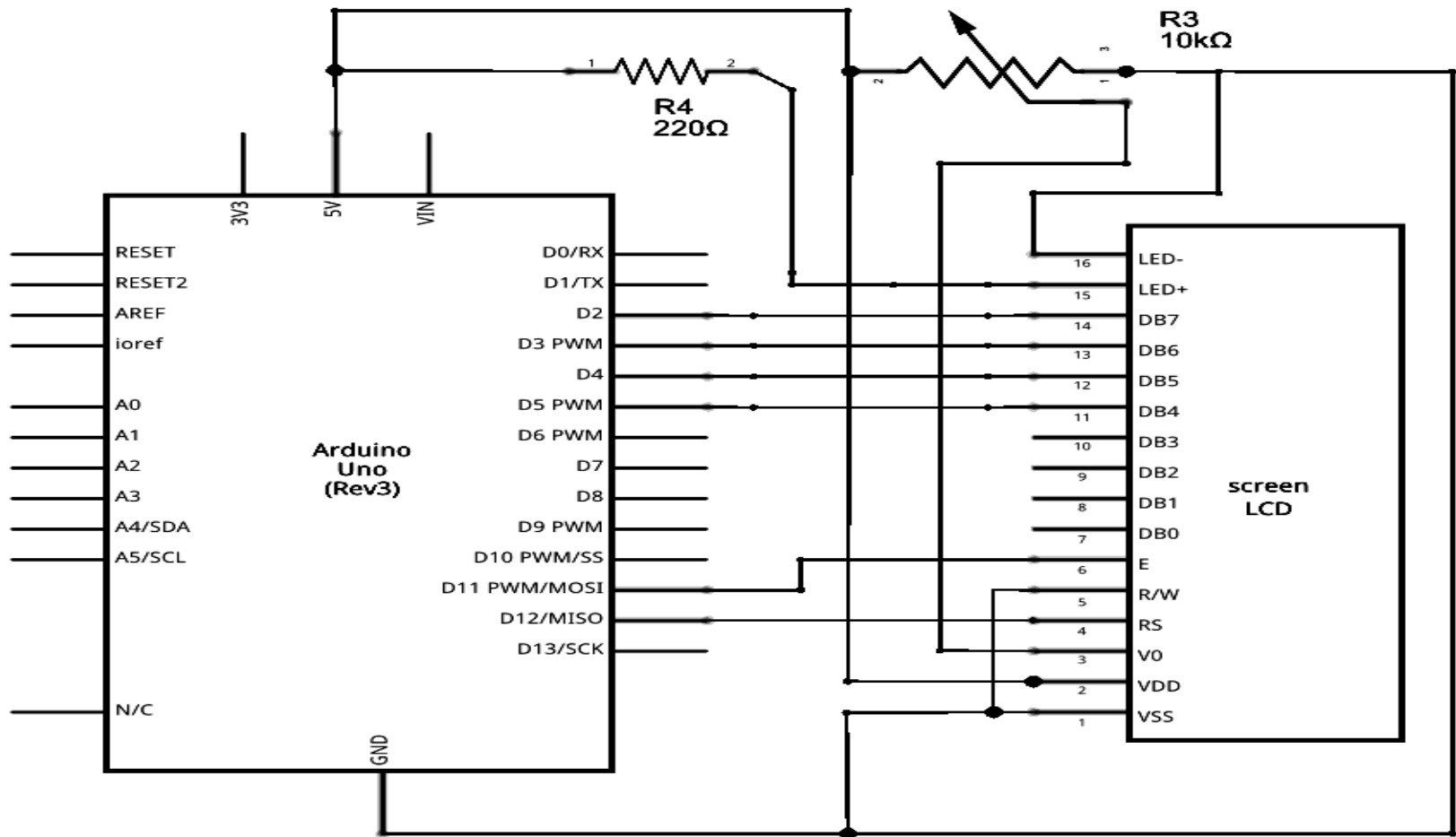❑ Breadboard

# Pin Connection

To wire your LCD screen to your board, connect the following pins:

- LCD RS pin to digital pin 12

- LCD Enable pin to digital pin 11

- LCD D4 pin to digital pin 5

- LCD D5 pin to digital pin 4

- LCD D6 pin to digital pin 3

- LCD D7 pin to digital pin 2

# LCD Connection Diagram

# LCD Schematic Diagram

# LCD Code

```
#include <LiquidCrystal.h>              // include the library

LiquidCrystal lcd(12, 11, 5, 4, 3, 2);    // initialize the library with the numbers of
                                                          the interface pins
void setup()
{
  lcd.begin(16, 2);                        // set up the LCD's number of columns and rows
  lcd.print("hello, world!");       //  Print a message to the LCD
}


void loop()
{
  lcd.setCursor(0, 1);                  // set the cursor to column 0, line 1
                                        // (note: line 1 is the second row, since
                                              counting begins with 0)
  lcd.print(millis() / 1000);       // print the number of seconds since reset:
}
```