SPI Lab

Example:

Let's do SPI communication using AVR family based ATmega328P (Master) and ATmega328P (Slave). Master will send continuous count (from 1 to 100) to Slave. Slave will read data then add 100 on it and send it back to master. Both Master and slave will print the received data on serial monitor

Steps

1. Let's first program **Master device**
   - **SPI Master Initialization steps**

     To initialize as Master, do the following steps
     - ✓ Make MOSI, SCK and SS pins directions as output.
     - ✓ Make MISO pin direction as input.
     - ✓ Make SS pin High.
     - ✓ Enable SPI in Master mode by setting SPE and MSTR bits in SPCR register.
     - ✓ Set SPI Clock Rate Bits combination to define SCK frequency.
     - ✓ After initialization you need to start SPI slave by set SS pin Low and wait for 1 second to allow slave to up
   - **SPI Master Write steps**
     - ✓ Copy data to be transmitted in SPDR register.
     - ✓ Wait until transmission is complete i.e. poll SPIF flag to become High.
     - ✓ While SPIF flag gets set read SPDR using flush buffer.
     - ✓ SPIF bit is cleared by H/W when executing corresponding ISR routine.
     - ✓ Note that to clear SPIF bit, need to read SPIF and SPDR registers alternately.
   - **SPI Master Read steps**
     - ✓ Since writing to SPDR generates SCK for transmission, write dummy data in SPDR register.
     - ✓ Wait until transmission is completed i.e. poll SPIF flag till it becomes High.
     - ✓ While SPIF flag gets set, read requested received data in SPDR.
2. Now Program for **Slave device**:
   - **SPI Slave Initialization steps**
     - ✓ Make MOSI, SCK and SS pins direction of device as input.
     - ✓ Make MISO pin direction of device as output.

- ✓ Enable SPI in slave mode by setting SPE bit and clearing MSTR bit.

- **SPI Slave transmit steps**
  - ✓ It has same function and steps as we do SPI Write in Master mode.
- **SPI Slave Receive steps**
  - ✓ Wait until SPIF becomes High.
  - ✓ Read received data from SPDR register

Notes:

- **You need to open different Arduino IDE to allow you to open two serial monitors**
- **After program two boards and open serial monitor restart two board at the same time to rerun them again from beginning by press push button on boards**