| **Component** | **Pin(s)** | **Arduino Pin** | **Direction** | **Purpose / Reason** |
| --- | --- | --- | --- | --- |
| **Soil Moisture Sensor** | Analog Output → A0 | PC0 (ADC0) | **Analog Input** | Reads analog voltage corresponding to soil moisture level (0–1023). Analog pins are needed because they measure continuous voltage, not just ON/OFF. |
| **Tilt Switch (KY-017)** | Signal → D2 | PD2 / INT0 | **Digital Input (Interrupt)** | Detects leaf movement (wind). Connected to external interrupt pin **INT0** so it can trigger an interrupt whenever state changes. |
| **Relay Module (SRD-05VDC-SL-C)** | IN → D7, VCC → 5V, GND → GND | PD7 | **Digital Output** | Controls the water pump. The relay allows Arduino’s low-power signal to switch ON/OFF the higher current needed by the pump. |
| **Yellow LED** | Anode → D8, Cathode → GND | PB0 | **Digital Output** | Lights when moisture is **low** (warning). |
| **Red LED** | Anode → D9, Cathode → GND | PB1 | **Digital Output** | Lights when moisture is **very low** — below alert threshold — “Water the Plant”. |
| **Green LED** | Anode → D10, Cathode → GND | PB2 | **Digital Output** | Lights when pump is ON — indicates watering in progress. |
| **I2C LCD (16x2 with I2C adapter)** | SDA → A4, SCL → A5 | PC4, PC5 | **I²C Communication (Digital)** | Displays soil moisture %, messages like “Moisture Low”, “Water the Plant”, or “Wind Available”. |
| **Water Pump (3–5V Micro Pump)** | +V → Relay COM, GND → GND | Controlled by Relay | **Output Device** | Activated via relay when soil moisture is below 4%. Waters the plant automatically. |
| **USART (Serial for Debugging)** | TX → USB via Serial | PD1 | **TX Output** | Sends real-time data (like moisture readings) to PC terminal for debugging. |