
Breathing LED Effect using Arduino Uno

Objective:
Create a soft fading effect where an LED gradually brightens and dims, mimicking a “breathing” rhythm.

Components Required:

- Arduino Uno
- 1 LED
- 1 Resistor (220Ω–330Ω)
- Breadboard & jumper wires

Circuit Overview:

- The **LED** is connected to a **PWM-capable digital pin** (e.g., D9) through a current-limiting resistor.
- The Arduino controls the LED brightness using **PWM (Pulse Width Modulation)**.

Working Principle:

- The brightness is gradually increased and decreased by smoothly changing the **PWM duty cycle**.
- This creates a continuous **fading in and out** effect — similar to how a light “breathes.”
- The transition is made smooth using a loop that slowly steps the brightness up and down.

Use Cases:

- Visual indicators for power or standby
- Mood lighting
- Learning PWM and analogWrite() concepts

Note:
This project is simple but very effective for understanding smooth brightness control.
