Adaptive LED Brightness Based on Ambient Light

Scenario:

An energy-efficient streetlight prototype where the LED brightness automatically adjusts based on ambient light measured by an LDR. At dusk, the LED gradually brightens; at dawn, it dims, saving power while maintaining visibility.

Project Statement:

Use an LDR and STM32F446RE ADC to measure ambient light and adjust LED brightness using PWM. Log light level and duty cycle over UART.

Success Criteria:

- Smooth PWM brightness adjustment based on light
- ADC sampling every 500 ms
- UART logs light level and PWM duty cycle
- LED response time

Tasks to be Performed:

- Design ADC input for LDR
- Configure PWM output for LED
- Implement light-to-duty mapping logic
- Transmit logs over UART