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**(COMPUTER STREAM)**

Embedded Systems (ECEg 5403)

Project – 1

- **Embedded System Design:** LED Control with SPST Switch Using PIC24F04KA200

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## **Embedded System Design: LED Control with SPST Switch Using PIC24F04KA200**

- ❖ This project uses a PIC24F04KA200 microcontroller to control three LEDs (Red, Green, and White) with a SPST switch. When the switch is on, the Red LED stays on, and the Green LED blinks every 2 seconds. When the switch is off, only the White LED lights up. The microcontroller handles the timing and controls the LEDs based on the switch's position.

### **Description of Components Used**

- ❖ **PIC24F04KA200 Microcontroller:** This microcontroller is the heart of the project, handling all control and timing operations.

#### **Some Key Features from the datasheet**

- ✓ 16-bit architecture with an efficient RISC CPU for fast processing.
  - ✓ Operates with an internal oscillator up to 8 MHz, eliminating the need for an external crystal in this project.
  - ✓ Low power consumption, making it suitable for battery-powered or low-energy applications.
  - ✓ Includes multiple I/O pins to interface with LEDs and a switch.
  - ✓ Timer modules (like Timer1) allow precise time-based operations, such as toggling the Green LED every 2 seconds.
- ❖ **SPST (Single Pole Single Throw) Switch:** Acts as a user input device to toggle between two operational states (ON and OFF).

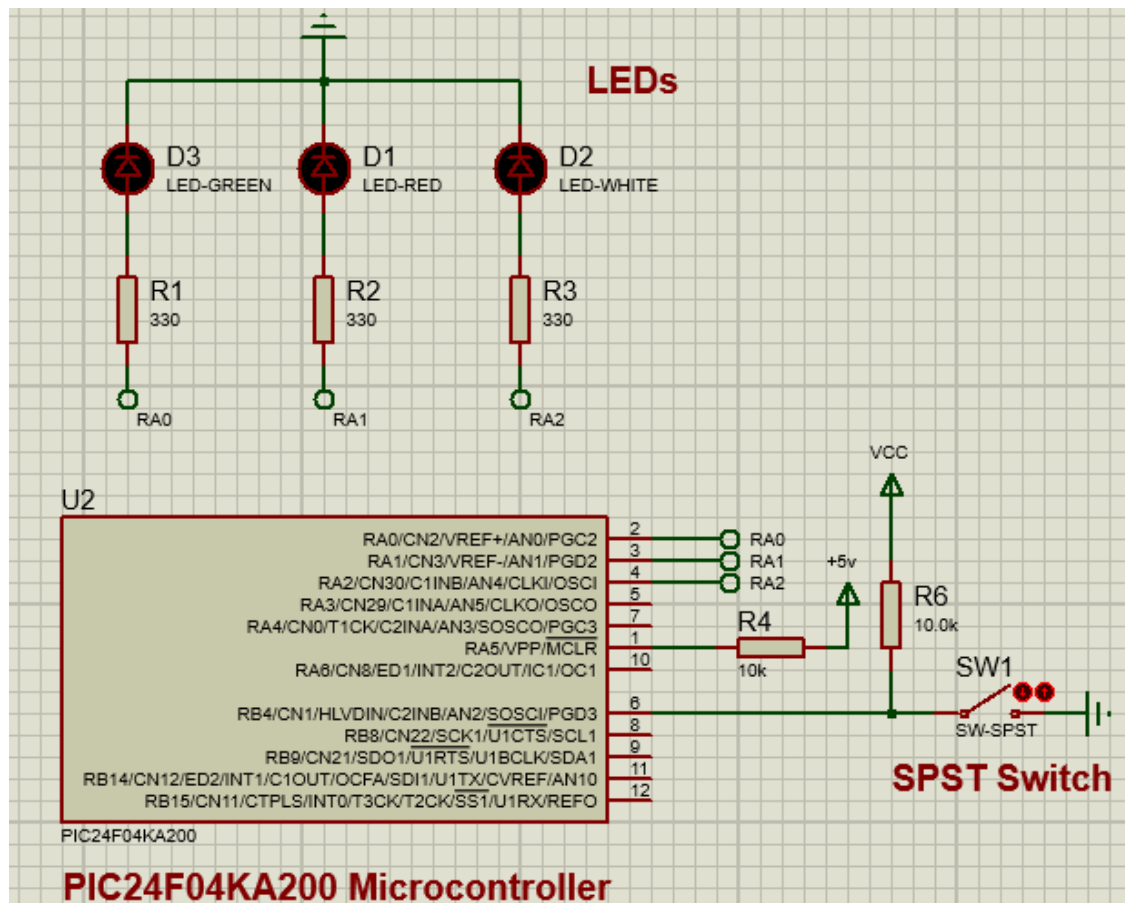
#### **Some Key Features**

- ✓ Simple design with two terminals for easy interfacing.
  - ✓ Provides a straightforward mechanism to change the circuit's behavior without requiring additional components or coding complexity.
  - ✓ Reliable switching mechanism suitable for low-voltage DC circuits like this project.
- ❖ **220 Ohm Resistors (x3):** Protect the LEDs by limiting the current flowing through them, ensuring they operate within safe limits.
- ✓ Resistors are selected based on the LEDs' forward voltage (approximately 2V) and current (typically 20mA).
  - ✓ Provide precise resistance, ensuring consistent brightness across all LEDs.
  - ✓ High tolerance for temperature changes, ensuring stability in operation.

- ❖ **LEDs (Red, Green, and White):** Serve as visual indicators for the system's state.

- ✓ Brightness and visibility are optimized for user feedback in different colors.
- ✓ Operate with a forward voltage of around 2.2V, matching the resistors' specifications for safe operation.
- ✓ Long-lasting and energy-efficient components.

### Circuit diagram using Proteus software



 **Code for the PIC24F04KA200 using MPLAB X IDE for pic compiler**

/ \*

```
* File:  main.c
```

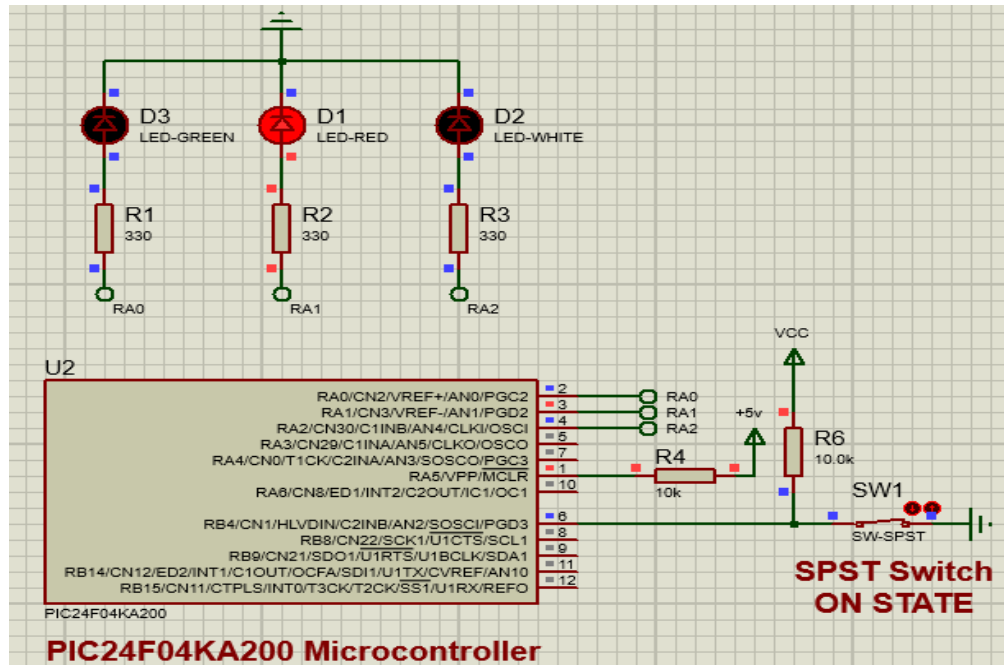
\* Project Name: PIC24F04KA200\_SPST\_LEDs

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- ✿ Located in the repository folder on GitHub

## Simulation result

- ❖ When the SPST switch is on, the red led lights on and the green led is observed during simulation.



- ❖ When the SPST switch is off, the white led lights on leaving the other leds turned off.

