

# CircuitLab Simulation

## ECE 401 - Homework #4

### Due Week #8

Once the project has been selected and the group chosen, you will need to research the needed parts and design the circuit. Make sure that you take into considerations the requirements that are listed below.

Simulate the major sections of your circuit using CircuitLab

- DC Analysis
  - Currents and voltages
- Transient Response (if applicable)
  - Simulate waveforms if using a 555 timer
  - Check resulting frequency and duty cycle

Compare the simulation results vs. your calculations

- Were your calculations correct?

Adjust your components so that your circuit meets your requirements (if necessary)

**Test Points:** Your simulation results should show a minimum of the listed test points.

- DC Measurements (all cases)
  - Vbat (9V)
  - Vreg (5V)
  - Vbe for the NPN transistor when ON
  - Vce for the NPN transistor when OFF
  - Current through the LED when ON
  - Total current draw
- If using a 555 Timer, also provide waveforms (transient response: 2-3 cycles)
  - Waveform @ C1
  - Waveform @ Threshold
  - Waveform @ Discharge
  - Waveform @ Timer Out
- If using an op-amp (MCP602), also provide the following DC measurements:
  - Voltage at inverting input when on and off
  - Voltage at non-inverting input when on and off
  - Voltage at Op-Amp output when on and off
- If using a microcontroller (PIC18F2720)
  - Model the microcontroller with a 500 Ohm resistor connected to +5V (10mA draw @ 5V)
  - Model the input voltage to the NPN and PNP transistors with 0V or 5V sources (uP output: 0V or 5V)
  - Also provide the DC voltage at the PNP transistor (Vb, Vc, Ve)