

# 01-Introduction

ECEGR 210  
Electric Circuits I



# Overview

- Course Objectives
- DC Circuits
- Switching Circuits
- Operational Amplifiers



# Course Objectives

- Analyze electric circuits in the time domain
  - DC Circuits
  - Switching Circuits
  - Operational Amplifiers
- Circuit theory is used in most undergraduate electrical engineering course
  - Power and Energy
  - Electronics
  - Controls



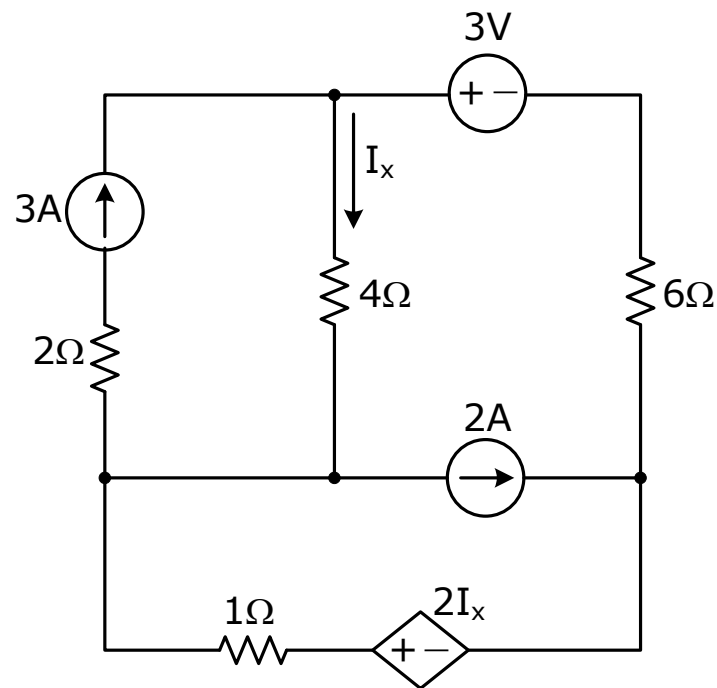
# Course Objectives

1. Understand the definitions of electrical quantities and circuit elements.
2. Compute currents, voltages, power, energy in resistive circuits
3. Analyze circuits with dependent sources.
4. Analyze and design elementary ideal op amp circuits.
5. Use equivalent circuits (Norton, Thevenin).
6. Perform mesh and nodal analysis.
7. Analyze and design first order circuits.
8. Analyze and design second order circuits.
9. Use SPICE-based software for simulation.
10. Communicate engineering data and results in a clear and concise way.



# DC Circuits

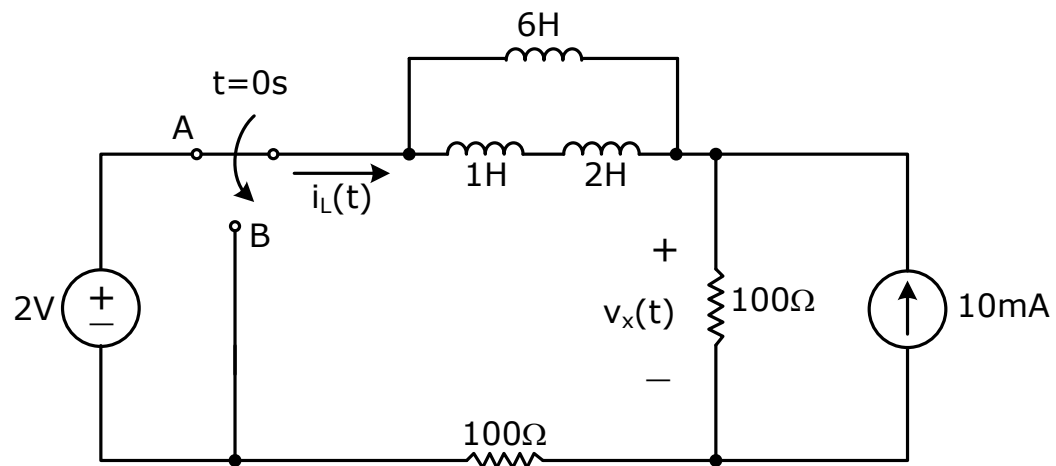
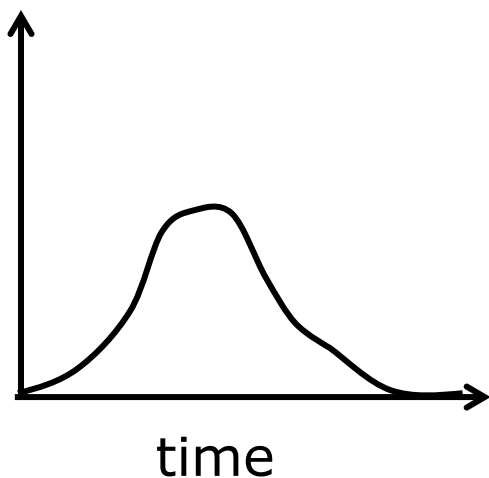
- DC: Direct Current
  - Batteries
  - Electronic devices
  - Some motors, generators
  - Automotive
- Steady-State Analysis
- Interested in
  - Voltage
  - Current
  - Power





# Switching Circuits

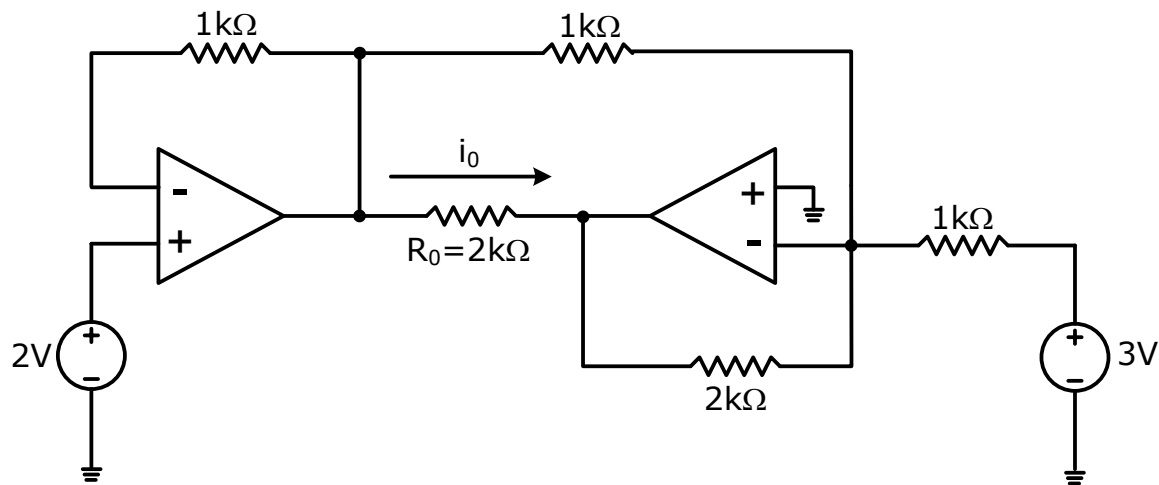
- Circuits with switching elements
  - On/Off, Open/Close
- Interested in behavior wrt time
- Solving using differential equations





# Operational Amplifiers

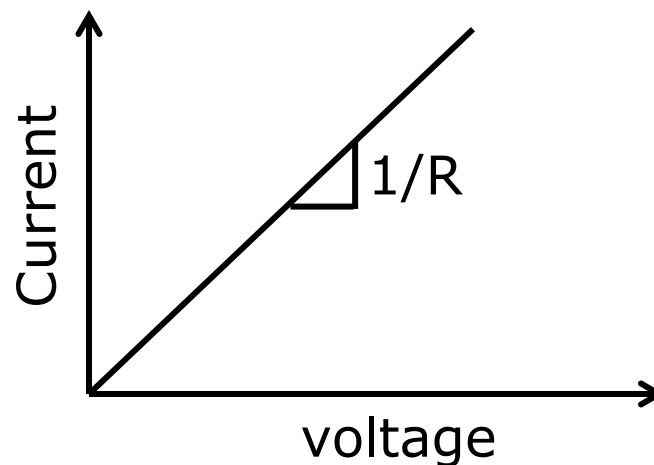
- Integrated Circuit
- Very common in electric circuits
- Not concerned with internal components
- Interested in
  - Gain
  - Other characteristics





# Electric Circuits

- Circuits considered are linear
- Linear equations are easily solved
- Voltage, current, impedance are linearly related  
 $V = IR$  (linear equation)
  - V: voltage
  - I: current
  - R: resistance







## Example

- If voltage is doubled, and resistance is fixed, what happens to the current?  $V = IR$ 
  - A. No Change
  - B. Doubles
  - C. Reduces by one half



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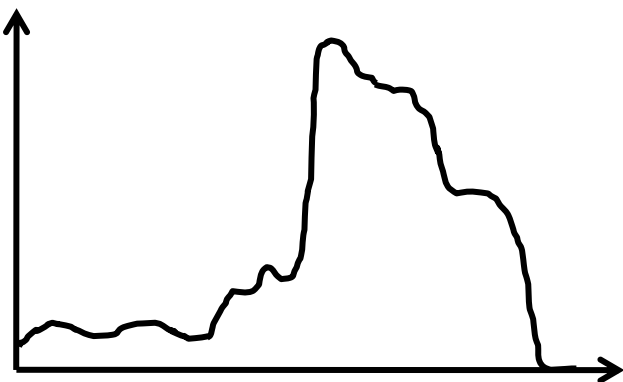
# Electric Circuits

- Fundamental concepts of electrical engineering
- Problem formulation
- Problem solving
- Analogous concepts in:
  - Thermodynamics
  - Electromagnetics (magnetic circuits)
  - Other linear systems

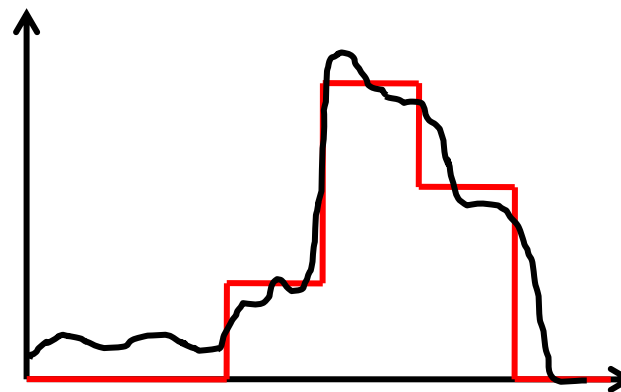


# Electric Circuits

- Circuits are analog (compare to digital systems in ECEGR 201)
- Analog: something that can assume a continuous range of values
  - Temperature
  - 0-5 Volts



time  
Analog Signal



time  
Digital Signal