

# Modules in Electrical and Computer Engineering

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# Contents

## Chapter 1

Node Voltage Analysis \_\_\_\_\_ Page 2

## Chapter 2

Mesh Current Analysis \_\_\_\_\_ Page 3

2.1 Special Cases \_\_\_\_\_ 3  
Dependent Sources — 3 • Current Sources — 3 • Super Mesh — 3

## Chapter 1

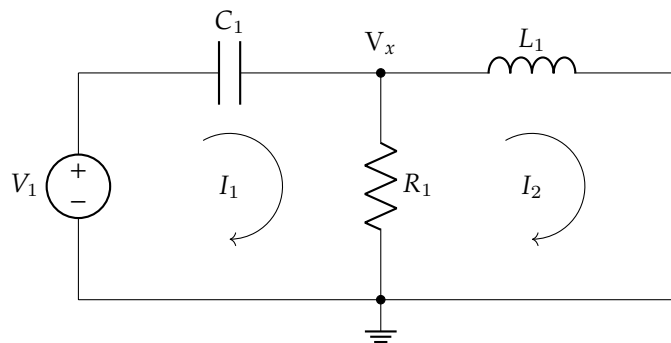
# Node Voltage Analysis

## Chapter 2

# Mesh Current Analysis

While a loop can be any closed path in a circuit, a mesh must be a loop with no loops contained. To perform mesh analysis:

1. Identify all of the meshes in the circuit
2. Pick a direction to be positive for the currents in the meshes (clockwise or counter-clockwise)
3. Apply Kirchhoff's Voltage Law (KVL), adding voltage increases and subtracting voltage drops.



**Note:**

It is safe to assume that a resistor will always cause a voltage drop in the direction of the mesh current, but pay attention to what direction voltage sources are oriented. When the current goes from the negative terminal to the positive terminal of a voltage source, add the voltage, but when the current goes from the positive terminal to the negative, subtract the voltage.

## 2.1 Special Cases

### 2.1.1 Dependent Sources

### 2.1.2 Current Sources

### 2.1.3 Super Mesh

A *super mesh* is created when a current source is shared between two meshes. To perform mesh analysis with super meshes or dependent sources:

1. Identify all of the meshes in the circuit
2. Pick a direction to be positive for the currents in the meshes (clockwise or counter-clockwise)
3. If there are any current sources shared between two meshes, temporarily remove it to create a larger mesh.
4. Apply the super mesh constraint
5. Apply Kirchhoff's Voltage Law (KVL), adding voltage increases and subtracting voltage drops.

**The Super Mesh Constraint** The super mesh constraint is a simple equation that relates a current source shared between two meshes to the mesh currents of those meshes. The super mesh constraint will be of the form:

$$I_s = I_1 - I_2$$

Where:

$I_s$  is the value of the shared current source

$I_1$  is the mesh current parallel to the current source

$I_2$  is the mesh current anti-parallel to the current source