



Linear Circuits and Systems



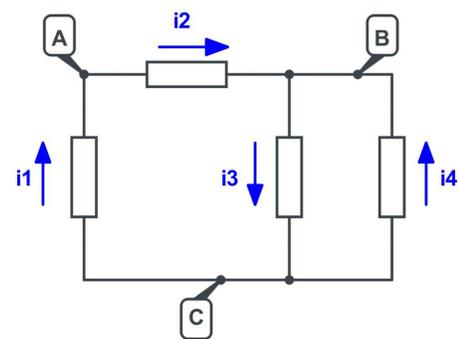
**Kirchhoff's Circuit Laws
and Circuit Analysis
Techniques**

Course: Linear Circuits and Systems
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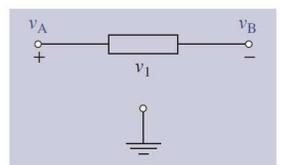
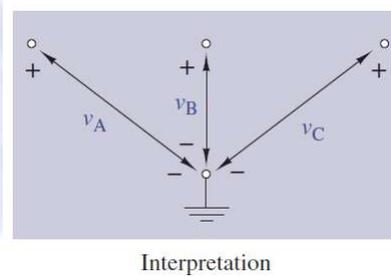
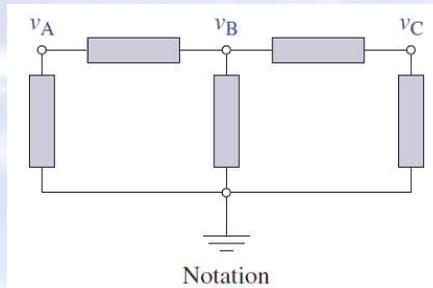
Kirchhoff's Current Law (KCL)

- The sum of all currents entering a node must equal to zero
 - *Node equation:* currents entering = currents exiting
- In a closed circuit with N nodes there are $N - 1$ independent *node equations*

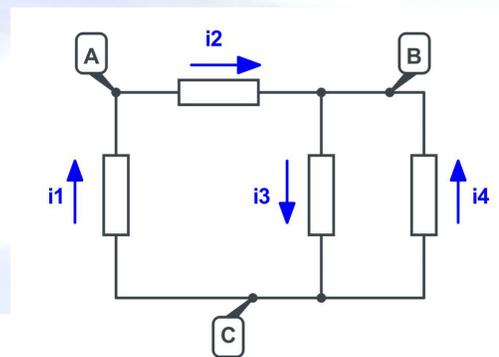
Kirchhoff's Current Law (KCL)



Node Voltage – Terminology

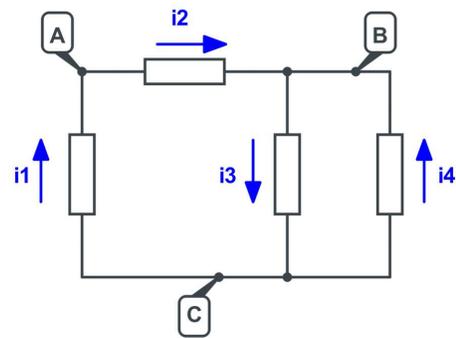


Node Voltage Analysis (NVA)



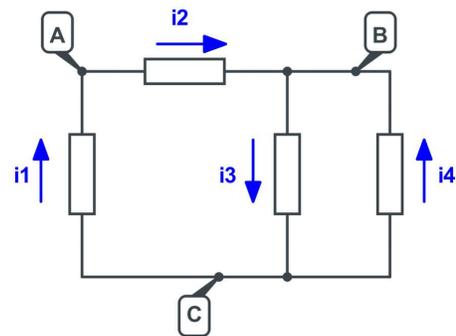
Kirchhoff's Voltage Law (KVL)

- For a loop, the voltage drops across elements in a loop must add to zero.
- In a closed circuit with N loop independent *loop equations*



CIRCUITLAB UltimateElectronics / KCL Three Node Example
<http://www.circuitlab.com/2477206/553>

Kirchhoff's Voltage Law (KVL)



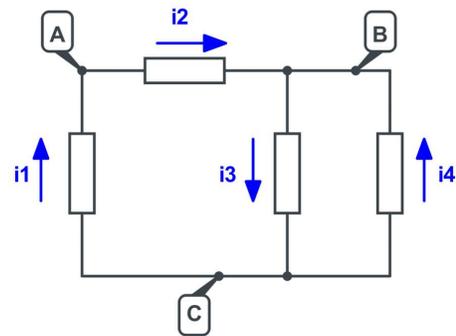
CIRCUITLAB UltimateElectronics / KCL Three Node Example
<http://www.circuitlab.com/2477206/553>

Loop/Mesh current – Terminology

If the K th two-terminal element is contained in meshes X and Y , then the element current can be expressed in terms of the two mesh currents as

$$i_K = i_X - i_Y$$

where X is the mesh whose reference direction agrees with the reference direction of i_K .

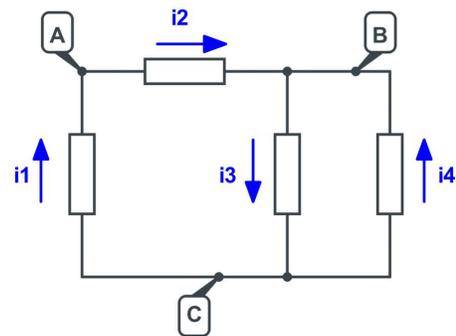


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CIRCUIT

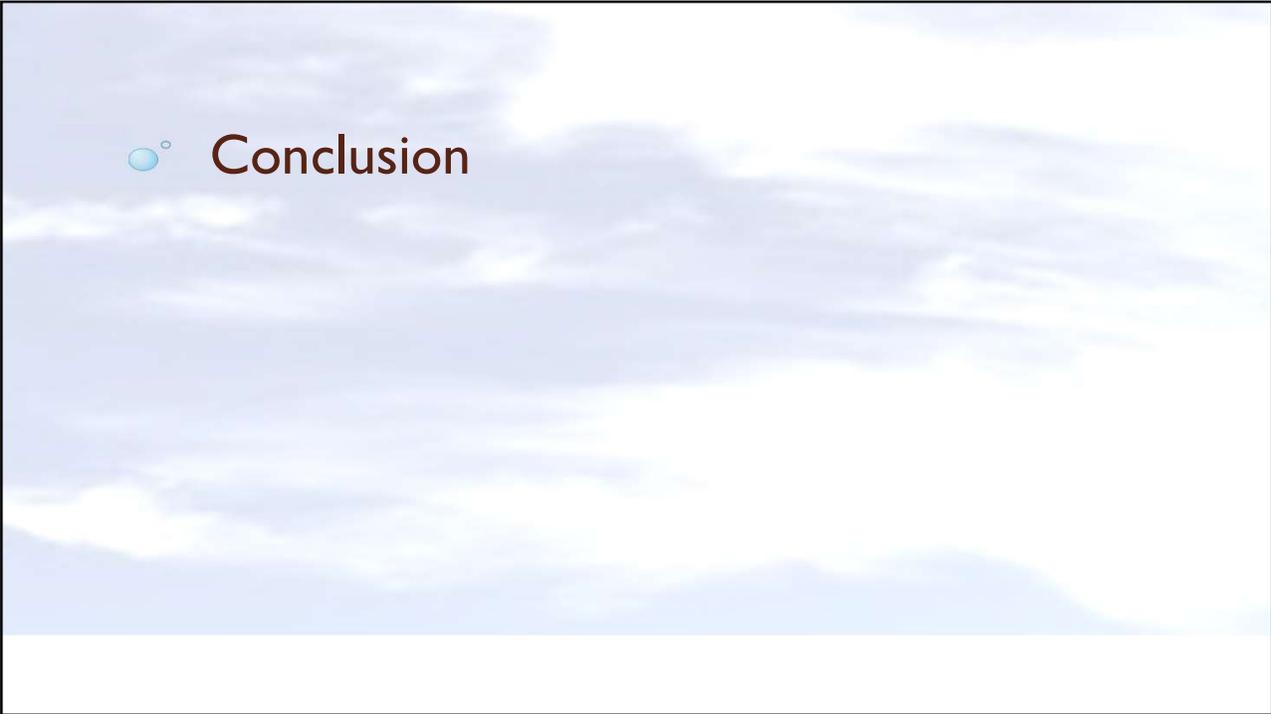
UltimateElectronics / KCL Three Node Example
<http://www.ultimateelectronics.com/2012/07/05/kcl-three-node-example/>

Mesh Current Analysis (MCA)

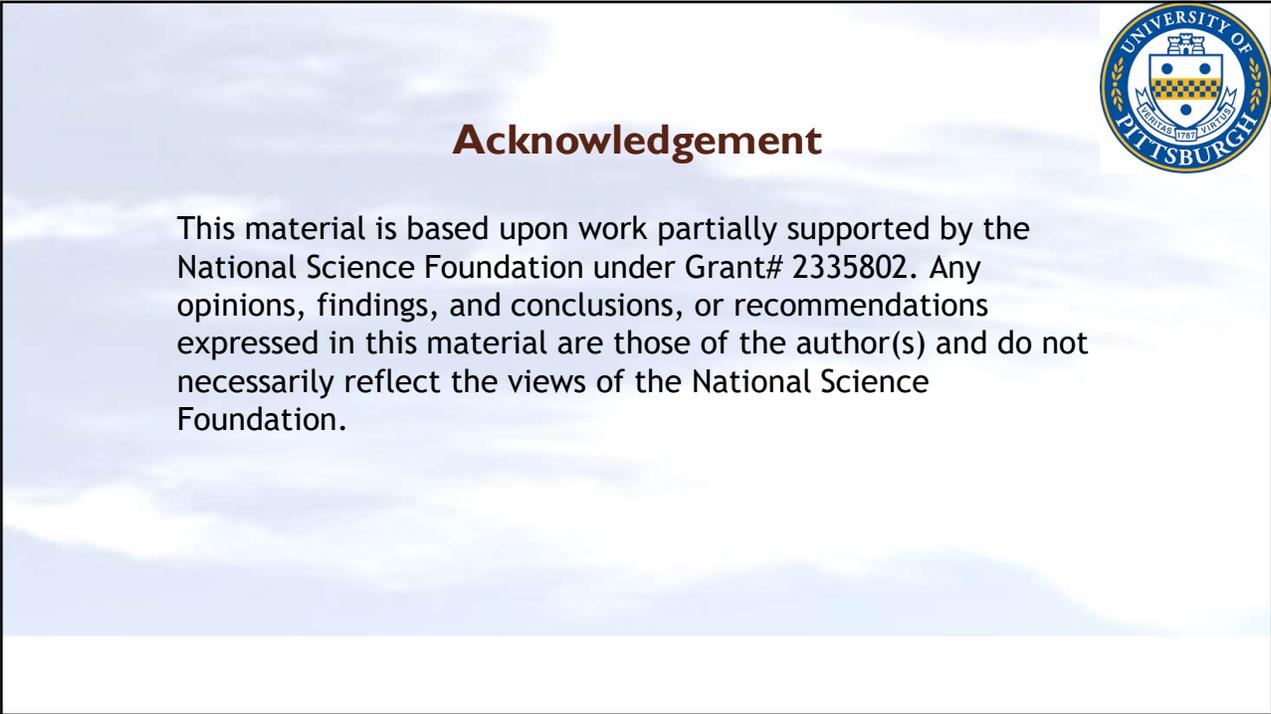


CIRCUIT

UltimateElectronics / KCL Three Node Example
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Conclusion



Acknowledgement

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