



# Fundamentals of Electric Circuits

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## References:

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(\*) <http://www.mica.edu.vn/perso/Nguyen-Viet-Son/courses.html>



# FUNDAMENTALS OF ELECTRIC CIRCUITS



## Contents of Part 1: DC circuits

### Chapter 1: Basic concepts.

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|--------------------------|-----------------------|
| I. Introduction.         | IV. Voltage.          |
| II. Systems of Units.    | V. Power and Energy.  |
| III. Charge and Current. | VI. Circuit elements. |

### Chapter 2: Basic laws.

- |                                  |  |
|----------------------------------|--|
| I. Introduction.                 | V. Series resistors and voltage division.    |
| II. Ohm's law                    | VI. Parallel resistors and current division. |
| III. Nodes, branches, and loops. | VII. Wye-delta transformations               |
| IV. Kirchhoff's laws.            |  |



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## Contents of Part 1: DC circuits

### Chapter 3: Methods of analysis.

- I. Introduction.
- II. Nodal analysis.
- III. Mesh analysis.
- VI. Nodal versus mesh analysis.

### Chapter 4: Circuit Theorems.

- I. Introduction.
- II. Linearity property
- III. Superposition.
- IV. Source transformation.
- V. Thevenin's Theorem.
- V. Norton's theorem.
- VI. Derivations of Thevenin's and Norton's theorems
- VII. Maximum power transfer



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## Contents of Part 1: DC circuits

### Chapter 5: Operational amplifiers.

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|---|--------------------------------|
| I. Introduction.                        | V. Summing amplifier.          |
| II. Operational amplifiers.             | VI. Difference amplifier.      |
| III. Ideal Op Amp.                      | VII. Cascaded Op Amp circuits. |
| IV. Inverting – Non-inverting amplifier | VIII. Applications             |

### Chapter 6: Capacitors and Inductors.

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|--------------------------------------|-----------------------------------|
| I. Introduction.                     | IV. Inductors.                    |
| II. Capacitors.                      | V. Series and parallel inductors. |
| III. Series and parallel capacitors. | VI. Applications                  |



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## Contents of Part 1: DC circuits

### Chapter 7: First-order circuits.

- I. Introduction.
- II. The source-free an RC/RL circuit.
- III. Singularity functions
- IV. Step response of an RC/RL circuit.
- V. First-order Op Amp circuit.
- VI. Applications.

### Chapter 8: Second-order circuits.

- I. Introduction.
- II. Finding initial and final values
- III. The source-free series / parallel RLC circuit.
- IV. Step response of a series / parallel RLC circuit.
- V. General second-order circuits.
- VI. Second-order Op Amp circuits.
- VII. Applications.