TKU212143

DC Circuits Analysis

Analisis Untai Elektrik DC

BASIC INFORMATION

Course Credit	3 / 150 minutes per Week
Course Type	Required
Course Classification	Engineering Topics
Prerequisites	Fluid, Heat & Waves; Electricity & Magnetism; Complex Variable Analysis; Linear Algebra; Differential Equations

STUDENT AND LEARNING OUTCOMES

Covered Student Outcomes

Fundamental and Engineering Knowledge (KP.1) Development of Engineering Solution (KP.2)

Learning Outcomes

LO1 Students are able to analyze steady-state DC circuits using basic laws such as Ohm's and Kirchhoff's Law, Nodal and Mesh analysis, Superposition, Thevenin's and Norton's theorems.

LO2 Students are able to understand basic components of electric circuits.

LO3 Students are able to analyze DC circuits during transient period.

COURSE DESCRIPTION

This course deals with the analysis of steady-state DC circuits using basic laws, e.g. Ohm's and Kirchhoff's Law, Nodal and Mesh analysis, Superposition, Thevenin's and Norton's theorem. It also studies the analysis of basic components in electric circuits such as capacitors, inductors, and operational amplifiers. In the last part of the course, students are introduced with the analysis of DC circuits during transient.

TOPICS

1. Basic Concepts

1.1 Systems of Units

1.2 Charge and Current

1.3 Voltage

1.4 Power and Energy

1.5 Circuit Elements

2. Basic Laws

2.1 Ohm's Law

2.2 Nodes, Branches, and Loops

2.3 Kirchhoff's Law

2.4 Series Resistors and Voltage Division

2.5 Parallel Resistors and Current Division
2.6 Wye-Delta Transformations

3. Methods of Analysis
3.1 Nodal Analysis
3.2 Nodal Analysis with Voltage Sources
3.3 Mesh Analysis
3.4 Mesh Analysis with Current Sources
3.5 Nodal and Mesh Analyses by Inspection

4. Circuit Theorems
4.1 Linearity Property
4.2 Superposition
4.3 Source Transformation
4.4 Thevenin's Theorem
4.5 Norton's Theorem
4.6 Maximum Power Transfer

5. Operational Amplifiers
5.1 Operational Amplifiers
5.2 Ideal Op Amp
5.3 Inverting Amplifier
5.4 Noninverting Amplifier
5.5 Summing Amplifier
5.6 Difference Amplifier
5.7 Cascaded Op Amp Circuits

6. Capacitors and Inductors
6.1 Capacitors
6.2 Series and Parallel Capacitors
6.3 Inductors
6.4 Series and Parallel Inductors
6.5 Application: integrator& differentiator

7. First-Order Circuits
7.1 The Source-Free RC Circuit
7.2 The Source-Free RL Circuit
7.3 Step Response of an RC Circuit
7.4 Step Response of an RL Circuit
7.5 First-Order Op Amp Circuits
7.6 Application: Delay circuits

8. Second-Order Circuits
8.1 Finding Initial and Final Values

8.2 The Source-Free Series RLC Circuit
8.3 The Source-Free Parallel RLC Circuit
8.4 Step Response of a Series RLC Circuit
8.5 Step Response of a Parallel RLC Circuit
8.6 Second-Order Op Amp Circuits
8.7 Application: Smoothing Circuits

REFERENCES

[1] Fundamentals of Electric Circuits, Charles K. Alexander, dan Matthew N.O. Sadiku, Fourth Edition, McGraw Hill, 2009