

TKE212202

AC Circuits Analysis Analisis Untai Elektrik AC

BASIC INFORMATION

Course Credit	3 / 150 minutes per Week
Course Type	Required
Course Classification	Engineering Topics
Prerequisites	Electricity & Magnetism; Differential Equations; DC Circuits Analysis

STUDENT AND LEARNING OUTCOMES

Covered Student Outcomes

Development of Engineering Solution (KP.2) Engineering Design (KP.3)

Learning Outcomes

- LO1** Students are able to analyse steady-state single and three-phase AC circuits using the notion of phasor.
- LO2** Students are able to understand the frequency response of AC circuit.
- LO3** Students are able to analyze AC circuits using more advanced methods such as Laplace transforms, Fourier transform, and two-port model.

COURSE DESCRIPTION

This course is the continuation of DC circuits and studies the analysis of AC circuit. In the first part, the students are introduced with the notion of phasor and steady-state AC circuit analysis. It includes the study of three-phase circuits, which includes transformers. In the second part, the frequency response of RLC circuits is studied. The last part, the AC circuits are analyzed using more advanced methods such as Laplace transforms, Fourier transform, and two-port model.

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 Non-Inverting 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