

Basic of Electrical Circuits

EHB 211E

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Lecture 1: Course Introduction

Basic course information

Day(s)/Time/Place/

Exams

Final Exam:

Grading

Web

<http://www2.itu.edu.tr/~yalcinmust/ehb211.html>

Schedule

Contents I

- 1 Introduction [Chua, Desoer & Kuh Linear and Nonlinear Circuits, pp. 1-45]
 - Physical Circuit
 - The Fundamental Variables
 - Lumped Circuit
 - Electric Circuit and Circuit Elements
 - Modelling Circuit Element
 - First Postulate of Circuit Theory
 - From Circuit to Graph
 - Kirchhoff Voltage Law (KVL)
 - Kirchhoff Current Law (KCL)
 - Examples
 - Tellegen Theorem

- 2 Graph Theory [Chua, Desoer & Kuh Linear and Nonlinear Circuits, pp. 700-719]
 - Fundamentals of Graph Theory
 - Independent KCL Equations

Contents II

- Independent KVL Equations
- Fundamental Loop Analysis
- Mesh Equation
- Fundamental Cut-set
- Example

3 Circuit Elements

- Two-terminal Elements
- Two-port Elements
- Multi-terminal Circuit Elements
- Elementary Function
- Electrical power and Energy
- Active and Passive Element

4 Analysis Methods

- Chord (Link) Current Method
- Generalized Chord Current Method
- Branch Voltages Method

Contents III

- Generalized Branch Voltages Method
- Nodal Analysis
- Generalized Nodal Analysis
- Loop Current Method (Mesh Current Method)
- Generalized Mesh Current Method

5 Thevenin & Norton Equivalent Circuits and Nonlinear Resistive Circuits

- Superposition Theorem [Chua, Desoer & Kuh Linear and Nonlinear Circuits, pp. 243-266]
- Thevenin Equivalent Circuit
- Norton Equivalent Circuit
- Analysis of Nonlinear Resistive Circuits [Chua, Desoer & Kuh Linear and Nonlinear Circuits, pp. 83-100]
 - DC analysis
 - AC analysis

6 State Equation

- Analysis of Circuits Containing RLC Elements

Contents IV

- Durum Denklemlerinin Elde Edilmesi
- RLC and multi-terminal elements
- Obtaining State Equations directly from the circuit
- Solution of State Equations
 - First-Order Linear System
 - Zero-input and Zero-state Responses
 - Homogeneous and Particular Solutions
 - Solution of Second Order State Equations
 - Solution of the Homogeneous Second-Order Equation