

ECE 204: Introduction to Electrical Engineering

IN

OUT

Mathematical Skills

- Can apply rules and hand-calculate with complex numbers in rectangular, polar, and trigonometric forms
- Can solve $n \times n$ system of equations
- Can represent answer with significant figures

DC Circuit Analysis

- Knows basics of DC circuit analysis:
- Current, charge, power, energy
 - Ohm's Law, KCL, KVL
 - Can calculate equivalent resistance

Pre-requisites:

- MATH161 and PH142

Concepts:

- Current, charge, power and energy
- Absorbing and supplying power
- KCL, KVL, Voltage and current divider
- DC Circuit solving techniques
- R_{eq} , L_{eq} , C_{eq}
- Independent and dependent sources
- First order circuits
- Phasor representation of current and voltage
- Equivalence between time and frequency domain
- Sinusoidal steady-state analysis
- Complex power, Instantaneous and average power, apparent power, pf, pf correction
- Effective (RMS) values
- Balanced three-phase circuits
- Magnetic flux and transformers
- Ideal and autotransformers
- Operational amplifiers
- Diodes
- Transistors
- Boolean algebra and logic circuits
- Truth table
- Binary number system
- Ones and twos complement
- Addition, subtraction and multiplication of binary numbers

Circuit basics

- Knows basic circuit laws and properties
- Understands difference and application of different circuit elements: R, L, C, OpAmp, Transformers, Diodes, Transistors
- Knows properties of independent and dependent sources

DC and AC Circuit Analysis

- Can use mesh and node analysis to analyze circuits with independent sources
- Can apply superposition, source transformation, Thevenin and Norton theorems
- Knows how to accomplish max power transfer
- Can calculate instantaneous and average power
- Understands the difference between maximum and RMS value and can apply correct formulas
- Understands principles of power factor correction
- Can use PQS triangle

1st and 2nd Order Circuits

- Can calculate steady state
- Can calculate response of a first order circuit
- Knows types of responses of a second order circuit

Three Phase Circuits

- Knows configuration of three-phase circuits
- Can tell if a system is balanced or unbalanced

OpAmps, Diodes, Transistors, Transformers

- Can solve simple circuits with the above elements

Boolean, Logic, Binary

- Can write expressions for simple logic circuits
- Can make a truth table for given expression
- Decade to binary, and vice versa
- Knows basic operations with binary numbers