

# ECE 204: Intro to Electrical Engineering

IN

## Mathematical Skills

- Apply rules and hand-calculate with complex numbers in rectangular, polar, and trigonometric forms
- Solve  $n \times n$  system of equations
- Represent answer with significant figures
- Differentiate and integrate sinusoidal and exponential functions
- Add vectors

## DC Circuit Analysis

- Knows basics of DC circuit concepts:
- Current, charge, power, energy, Ohm's Law, KCL, KVL
- Calculate equivalent resistance
- Identify series and parallel elements

## Pre-requisites

- MATH 161; PH 142

## Concepts:

- Current, charge, power and energy
- Absorbing and supplying power
- KCL, KVL, Voltage and current divider
- Thevenin and Norton equivalents
- DC Circuit solving techniques
- $R_{eq}$ ,  $L_{eq}$ ,  $C_{eq}$
- Independent 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
- 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
- Logic gate circuit diagrams
- DeMorgan's Law

OUT

## Circuit Basics

- Knows basic circuit laws and properties
- Understands difference and application of different circuit elements: R, L, C, OpAmp, Diodes, Transistors
- Knows properties of independent sources
- Understands operation of first and second order circuits\Derive characteristic equation, determine type of response and find total response of a circuit

## DC and AC Circuit Analysis

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

## 1st Order Circuits

- Calculate steady state
- Calculate response of a first order circuit

## Three Phase Circuits

- Knows configuration of three-phase circuits
- Evaluate if a system is balanced or unbalanced
- Solve for V, I P in balanced 3-phase system

## OpAmps, Diodes, Transistors

- Solve simple circuits with the above elements
- Identify non-linear circuit elements
- Identify operating regions of diode and transistor characteristics

## Boolean, Logic, Binary

- Write expressions for simple logic circuits
- Make a truth table for given expression
- Decimal and hexadecimal to binary, and vice versa
- Knows basic operations with binary numbers
- Apply DeMorgan's Law to transform simple logic circuits