ECE 204: Introduction to Electrical Engineering

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

Pre-requisites:
- MATH161 and PH142

As of 3/11/13

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

$1^{st}$ and $2^{nd}$ 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