

ECE 461: Power Systems

IN

OUT

Calculus and Algebra

- Work with complex numbers
- Understand elementary calculus

Circuit Theory

- Understand AC circuit theory and use of phasors
- Operate with vectors in all coordinate systems
- Fourier series analysis

Fields

- Understand electric and magnetic fields
- Use Coulomb and Gauss law to calculate electrostatic fields surrounding wires conducting AC current at arbitrary voltages
- Understand the lumped parameter approximations for L-R-C
- Understand magnetic fields and forces

Pre-requisites

- ECE 332 with a minimum grade of C

Concepts:

- Single and three phase electric circuit analysis
- The application of magnetization and magnetic fields for modeling and analyzing power transformers
- The use of Fourier series analysis to quantify power quality and line distortion
- The role of the P-Q-S triangle in conventional and alternative power systems
- Explore the use of MATLAB for circuit analysis and Workbench software for computer laboratory experiments
- Learn the concepts of per unit analysis
- Overview of DC, AC and PMAC motors with associated power Electronics drives

Applications:

- Calculation of power system flow, stability and loading
- Charge and current density in conductors with different geometries
- Wave propagation in free space for transmission lines
- Magnetic circuits in transformers

Tools:

- Calculus and phasor analysis for solution of analytical AC circuits
- Complex algebra
- MATLAB and Workbench software

Three-Phase Circuits

- Analyze and determine V-I in phasor form at various points in a complex power system in both absolute and per unit
- Understand the methods to change per unit specifications of rated equipment into the operational values
- Determine capacitance, inductance, and resistance of transmission lines
- Identify and model AC three-phase circuits that include motors, generators, and connective lines in a complex industrial load
- Lab experience with power electronic motor drives

Future Alternative Energies

- Explain how power-electronic devices will be used in modern homes, buildings, and industrial plants
- Explain the basic operation of distributed, renewable energy systems and their integration with the future electrical grid.