ECE 461/2: Power Systems I

IN

Calculus and algebra

- Can work with complex numbers
- Understands elementary calculus
- Familiar with computer software like SPICE
- Understands AC circuit theory and use of phasors
- Can operate with vectors in all coordinate systems

Fields

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

Pre-requisites:

- MATH 340 or 245 with a C- or better and PH142 with a C- or better

Concepts:

- Single and three phase electric and magnetic fields
- Maxwell's equations in integral and differential form to calculate transmission line inductances and capacitances
- Three phase circuit analysis
- The role of the P-Q-S triangle in conventional and alternative power systems
- Explore the use of PSSE software (Spice of the power industry) iu computer laboratory experiments
- Learn the concepts of per unit analysis

-Overview of DC, AC and PMAC motors with associated power Electronics drives

Applications:

- Employing PSSE to calculate power system flow, stability and loading
- Charge and current density in conductors with different geometries
- Wave propagation in free space
- Magnetic circuits

Tools:

- Calculus for solution of analytical AC circuits
- Complex number algebra
- PSSE software

OUT

Three-phase circuits

- Can analyze and determine V-I in phasor form at various points in a complex power system in both absolute and per unit
- Understands the methods to change per unit specifications of rated equipment into the operational values
- Can determine capacitance, inductance, and resistance of transmission lines
- Can 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

Power System Analysis

- Learns basic capabilities of PSSE AC system software
- Uses PSSE to model the addition of a wind farm to the AC grid
- Can understand the complex billing structure of the power industry
- Understands basic ideas in AC system synchronism and stability

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