

ECE 465: Electrical Energy Generation Technologies

IN

OUT

Circuit Theory

- Use mesh and node analysis to analyze circuits with independent and dependent sources
- Apply superposition, source transformation, Thevenin and Norton theorems

Heat Transfer and Basic Power Systems Analysis

- Basic thermodynamics
- Understand principles of displacement power factor correction
- Use P-Q-S triangle

Pre-requisites

- ECE 202 with a C or higher

Concepts:

- Energy units including: BTU's, Watt-hours, Joules and conversion factors between them
- Energy transport costs for both freight and people; hybrid electric truck, bus and car issues
- Energy sources for transport
- Imbalance between energy costs and sources and its implications
- Alternative sustainable energies are covered in depth including: Solar, Wind, Hydro and Geothermal.
- Shortcomings of alternative energies in terms of capacity factors, cost and reliable interfaces to the electric grid
- Need for fossil fuels for peak loading and as backup for alternative energies
- Laws of Physics are contrasted to laws of man including: role of tax breaks, government grants and loans, government mandates and feed in tariffs for alternative energies

Applications:

- Solar and wind farms as well as large scale hydro and their environmental impacts
- Niche applications of hydro, wind and solar energies that are cost effective without subsidies or mandates

Tools:

- Use of word processing and presentation software to prepare group presentations

Double Entry Energy Accounting

- Understand energy use in transportation and compare energy density of batteries to hydrocarbons,
- Non-linear loads distortion power factor
- Identify alternative energy sources for transportation fuels including: biofuels, gas and coal to liquid fuel conversions as well as wind, solar and hydro
- Compare gas and coal energy conversion to wind, solar and hydro Battery technology for cell phones, electric cars and the power grid
- Use backup power to achieve 24/7 operation
- Understand concepts for energy saving via LED lighting and variable frequency motor drives

Future Alternative Energies

- Understand geothermal heat and hydro power generation possibilities
- Understand Wave and tidal power generation possibilities
- Understand the role of heat pipes in modern HVAC systems
- Understand recycling as a form of energy conservation